On the Structure and Characters of the Lernæa elongata, Gr. *a New Species from the Arctic Seas.* By R. E. Grant, M. D., F. R. S. E., Fellow of the Royal College of Physicians of Edinburgh, and formerly Lecturer on Comparative Anatomy.

The various classes of animals spread over the globe, whether inhabitants of the dry land, or of lakes and rivers, or of the atmosphere, or dispersed through the vast abyss of the ocean, find in the rich and varied clothing of organic matter covering the nakedness of the earth, sufficient nourishment not only for their own subsistence and growth, and for the continuance and multiplication of their species, but likewise sufficient to enable each individual to support various tribes of parasitic inhabitants. Innumerable species of *Insects*, *Arachnidæ*, and *Annelides* move to and fro on the surface of their bodies, feeding on the excreted matters of the skin, or sucking the vital fluids from the interior. Various kinds of *ova* are deposited, matured, and hatched under the skin, although the animals they contain are not destined to a parasitic life. An immense variety of *Worms* live and propagate, imbedded in the muscular and cellular tissues, in the internal cavities and vessels, and in the parenchymatous substance even of the best protected organs of the body. And various fluids and secretions of the living system contain myriads of *Infusoria*. The class of Worms, to which the following undescribed animal is considered as most nearly allied, contains the most remarkable forms, and the greatest number of species of parasitic animals; and from their ravages in the living body of man, and of the animals most subservient to his wants, from the very equivocal nature of their origin, and from their singular forms, structure, and habits, these species have engaged the particular attention of many distinguished naturalists, as Redi, Le Clerc, Muller, Bremser, Rudolphi, &c. Although most parasitic worms live entirely imbedded in the animals on which they feed, the remarkable tribe of *epizoariæ* to which the *Lernæa* belongs, are found only attached to the surface, or par-

tially buried in the superficial soft parts of marine and fresh-water fishes, while the rest of their body hangs constantly exposed to the action of the external element. From this partially exposed situation of the *Lernææ*, they partake of a mixed life, exhibiting in the same individuals a combination of the characters and forms both of *entozoa* and of *insects*. Like intestinal worms, they have a simple structure, a soft, naked, and feebly irritable body, they are permanently fixed to the animal, and they live by sucking the internal fluids. From the external situation of the *Lernææ*, however, they have not only organs for piercing and sucking the animal substance like *entozoa*, but also parts variously constructed for attaching themselves to the surface of the body like *insects;* they exhibit the rudiments of antennæ, and some of the species are asserted by Blainville to have sessile eyes. (See *Journal de Physique*, xcv. 374.) The constant exposure of their body to the vicissitudes of a foreign element has rendered it more consistent and stiffer than in those which are always buried in the fleshy substance, and consequently the *Lernææ* exhibit the rudiments of articulations to admit of their necessary movements, like the higher animals which have an external or internal skeleton. No articulations are necessary where the animals are composed entirely of soft parts. These affinities with the higher classes of invertebrate animals, which have induced Lamarck to consider the *epizoariæ* as a distinct class, higher in the scale than worms, and which have greatly perplexed other naturalists in their classification, are well exemplified in the *Lernæa elongata*, particularly in the perfect symmetry of its form, in the great length and regularity of the two tentacula, in the distinctness and firm texture of the head, in the rudimentary antennæ and appendices of the mouth, and in the regular form of the body and two ovaria.

The *Lernæa elongata*, which I have so named from its very elongated and slender form, has been several times observed attached to the eyes of the Greenland shark by that enterprising and intelligent navigator, Captain Scoresby, and is mentioned and figured in his *Account of the Arctic Regions*, (vol. i. p. 538, and Pl. XV.) as " a singular appendage to the eye" of that animal. " To the posterior edge of the pupil of the

Greenland shark," (he says,) " is attached a white vermiform substance one or two inches in length. Each extremity of it consists of two filaments; but the central part is single." Two specimens of this remarkable parasite, preserved in spirits along with the eyes of the shark to which they adhered, were brought by him some years ago from the Arctic Seas, and presented to Dr Brewster, then engaged in investigating the structure and functions of the organ of vision, who has kindly favoured me with the larger of the two specimens, nearly three inches long, and probably the largest *Lernæa* hitherto met with. From the corrugated appearance of the tentacula, and the firm texture of the whole body, this specimen appears to have contracted by the long action of the spirits. In its present state the dimensions of its parts are:—

		Inches.	Lines.
Tentacula,	length,	1	1
	thickness,		$\frac{3}{4}$
Head,	length,		$1\frac{5}{4}$
	breadth,		$1\frac{1}{2}$
Body,	length,		$7\frac{1}{2}$
	breadth,		2
Ovaria,	length,	1	$1\frac{1}{2}$
	thickness,		1

It has a straight, lengthened, and slender form, without any lateral prolongations or branchial appendices. Its surface is naked, smooth, glistening, and of a pale yellowish white colour; and it has a pretty firm cartilaginous consistence, probably increased in the present instance by the action of the spirits. It consists of two long cylindrical *tentacula* (*a*, *b*,) Plate II. Fig. 5, by the extremities of which it adheres to the outer surface of the cornea of the shark; a very distinct depressed *head*, (*c*, *d*,) with four antennæ, and two hooks at the sides of the mouth; a subconical *body*, (*d*, *e*,) tapering above towards the head, and terminated below by a broad base, in the middle of which are two thick pendent *labia* concealing the anus (*e*;) and two long, thick, cylindrical *ovaria*, (*f*, *p*.) The *tentacula* arise from the sides of the lower surface of the head, and appear a little compressed and contracted at their origin, (*b*.) From this part they are

regularly cylindrical, and taper almost imperceptibly to near their extremities, where they taper more suddenly, and terminate in four small round fleshy tubercles surrounding a very small amber-coloured horny disk. They are covered with a thick, transparent, colourless, and tough membrane, deeply marked transversely with numerous corrugations, and through which we can perceive with a common lens numerous white longitudinal striæ composed of muscular filaments. The outer transparent membrane appears quite homogeneous. The two horny disks of the tentacula were applied closely to each other, buried in the substance of the cornea, and covered with a hard transparent amber-coloured substance, which cemented their concave surfaces firmly together. Other fourteen circular diseased marks were discoverable on the transparent cornea, occasioned either by the bites of the same animal, or by the attachment of different individuals. The interior of the tentacula contained a white soft flocculent matter, surrounding a thick central fasciculus of very coarse straight stiff fibres of a grey colour, extending the whole length of the tentacula. The white longitudinal muscular bands were very distinctly seen on the inside of the tough covering of the tentacula, and a tough white filament, sending off branches like a nerve, was found running along the whole cavity of each tentaculum. This nervous filament was proportionally as large and distinct as that found in the central cavity of the arms of cephalopodous animals. There is a very thin layer of white transverse muscular filaments surrounding the tentacula exterior to the longitudinal bands. On examining the extremities of the tentacula under the microscope, I could perceive no reflected teeth on the tubercles or disk for piercing, as we find on the anterior tubercles of the *Echinorynchus* and other *entozoa.*

The *head* is shaped like the body of a common spider-crab, being broad and round behind, and tapering to a point on the fore part. It is convex, smooth and glistening above, and on each side of its anterior margin there is a small white knotted process *(c)* like the rudiment of a jointed antenna. Immediately below the beak we observe the circular extremity of a short cylindrical tubular proboscis, *(h)* at each side of which there is another very small and soft antenna, *(n, n.)* Beneath this

second pair of antennæ, there are two rudimentary lips embracing the proboscis. Near the back part of the lower surface of the head arise two fleshy peduncles *(m)* from the same broad fleshy protuberance, and extend forward along the base of the head. Each of the fleshy peduncles is terminated anteriorly by a broad compressed white horny hook, *(l)* curved inwards, and tuberculated on its concave margin like the pincers and the inner jaws of a crab. The hooks are strong, white, opaque, and elastic; and the outer covering of the whole head is of an elastic horny texture, so transparent on the upper surface as to allow the internal parts to be seen through it. On removing this horny case from the head, a very complicated, though extremely minute structure presented itself beneath. Within the anterior prominent beak there was a white pulpy matter like the ganglion we find in that situation in crabs, and the nerves of the tentacula could be traced nearly to that part. There was no appearance of eyes on this remarkably distinct head. The head is united to the body by a very narrow contracted neck, *(d)* as in insects. The *body* is of a lengthened, straight, and subconical form, slightly carinated longitudinally in the middle of the anterior and posterior surfaces, prominent and muscular along the sides, and marked transversely with two small contractions in the upper narrow part, and one near the middle. The membrane covering the body is so transparent before and behind, as to exhibit the glandular parts surrounding the intestinal canal within. The body is a little ventricose in the middle, and terminates suddenly below by a broad and lobed base, in the middle of which two large prominent labia conceal the anus, (*e.*) The intestinal canal, of great width, passes in a straight line from the mouth to the anus without the slightest convolution or curvature. The upper part of the intestinal canal in the situation of the neck (immediately below *d)* I found much dilated, of a glandular texture, and filled with a firm yellow coagulated matter, probably the remains of the food last swallowed. I have found a similar coagulated matter, of a darker colour, filling the intestinal canal of the skate-leech, *(Pontobdella muricata*, Lam.) which lives by sucking the white blood from the surface of the skate. The whole digestive canal of the *L. elongata* was surrounded

with, and imbedded in a soft glandular mass of a yellow colour, and consisting of innumerable small lobes, filling the greater part of the abdominal cavity. This glandular substance corresponds in situation and appearance with the liver of crustaceous and molluscous animals. The abdominal parietes consisted of a double membrane, with numerous strong longitudinal fasciculi of muscular fibres interposed between them. The muscular bands were strongest on the sides. There were some loose portions of coarse circular fibres adhering to the outside of the body, which fell off on first handling the specimen. Two white longitudinal filaments running along the back part of the abdominal cavity, appeared to be nerves continued from the œsophageal ganglion of the head. The wide intestinal canal contracted as it approached the two external protuberances, between which it opened at the base of the body. The anus lay on the back part of the depression between these labial protuberances, and a minute aperture, *(o,)* like the puncture of a needle, was seen on the fore part of that depression. I could perceive no indications of a circulating system in this animal, although it was carefully dissected under pure water, and examined with the aid of lenses. Blainville was equally unsuccessful in his attempts to discover traces of a circulation, although he believes in its existence, on the reports of those who have examined *Lernææ* alive. The absence of a circulating system would remove the *Lernææ* to a place much below the class of molluscous animals, in which Linnæus, Bruguières, Ocken, and many other naturalists have placed this genus.

The two *ovaria*, of great size and length, hang by very narrow oviducts, *(f,)* from deep depressions on the outside of the labial protuberances. They resemble the enlarged figure of those of the *L. clavata* given by Muller, (*Zool. Dan.* Pl. XXXIII. Fig. 1. *b.*) They were quite straight, cylindrical, of equal thickness throughout, distended with ova, glistening, and smooth on the surface, and regularly rounded at both extremities. The delicate membrane containing the *ova* is so transparent and colourless, that the angular forms of the *ova* can easily be perceived through it. The *ova* viewed through the coat of the ovarium appear regular hexagonal bodies of an opaque yellow

colour, and disposed in perpendicular and transverse rows; but when removed from the ovaria they appear spherical, and their angular appearance on the surface, which has been remarked in other species, is probably occasioned by the pressure of the external coat. When the ova were torn under the microscope, they appeared to consist of a thin vesicle filled with a soft opaque yellow matter. On breaking the ovarium the ova appeared to be disposed in regular concentric layers, and connected together by a glutinous matter. The oviducts are only narrow continuations of the two sacs containing the ova, and after entering the abdomen on the outside of the labia, they open into the bottom of the intestinal canal close to the anus. There is a small white depressed glandular body, within the abdominal cavity, placed on each oviduct close to its entrance into the anus or cloaca. It is probable, from the structure of the parts, that the ova, when mature, pass into the abdomen to be discharged by the anus, or by the minute aperture anterior to the anus, and that they receive some covering from these white glands as they pass through that part of the oviducts. From analogy and appearance, there can be no doubt that the yellow spherical bodies filling the two pendent ovaria are the ova of this animal; but it is not yet ascertained whether all the individuals possess these ovaria, or whether there are separate sexes. In the specimen of the *L. elongata* retained by Dr Brewster, the two ovaria were wanting, but it is very probable that they had fallen off, from their naturally feeble attachment to the body, and from there being no other perceptible difference in their external form and parts. Scoresby likewise has described and represented the ovaria as parts of constant occurrence in this animal. The fixed life of the *Lernæa* would lead us to suppose the sexes united in the same individual. Some of the species live so deeply imbedded in the surface of the animals to which they adhere, that only the ovaria are seen projecting. The internal structure, and the mode of generation of *Lernææ*, and even the place which they occupy in the scale of animals are still undetermined. Much light might be thrown on this genus, and many new species discovered by the attentive observation of those annually engaged in the whale fisheries in the Greenland seas, where the

largest species are known to abound. Many species of this animal have been described and figured by Muller, Linnæus, Bosc, Bruguières, Ocken, Lamarck, Lesueur *(Jour. of Philadelphia)*, and Blainville, but the species above described appears to have escaped their notice. The most obvious characters of the *L. elongata* are two simple cylindrical *tentacula* longer than the body; *head* distinct, ovate, depressed, with four small antennæ, two serrated hooks, and a circular mouth in form of a proboscis; *body* subclavate, ventricose, simple, terminated above by a narrow neck, and broad and lobed at the base; two *ovaria* longer than the body, thick, straight, cylindrical, and exhibiting through the outer covering hexagonal ova disposed in perpendicular rows.

Plate II, Fig. 5, represents the *Lernæa elongata* twice the natural size, adhering by its tentacula to the outer surface of the transparent cornea of the shark.

a, The horny extremities of the tentacula buried and cemented together under the surface of the cornea.

b, The compressed origin of the tentacula from the under and back part of the head.

c, The anterior pair of knotted antennæ.

d, The narrow neck most distinct on the back part.

e, The anus,

f, The oviduct.

g, A hard flat pointed prominence above the mouth.

h, The cylindrical proboscis.

i, The anterior point of the head.

l, The horny serrated base of the jointed hook or lateral jaw.

m, The fleshy peduncle of the hook or jaw.

n, *n*, Two very small and soft filiform antennæ.

o, Minute opening on the fore part of the base of the abdomen.

p, *p*, Lower rounded terminations of the two ovaria.

q, Numerous diseased circular spots on the cornea.


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