This page intentionally left blank.

2. An Account of a Large Branchiate Polynoid from New Zealand, *Lepidonotus giganteus* Kirk. By W. Malcolm Thomson, B.A. (N.Z.). With an Introduction by Professor W. Blaxland Benham, D.Sc., M.A., F.Z.S., Otago University.

[Received November 19, 1900.]

(Plates LX.–LXII.)

Introduction. By Prof. Benham.

In introducing to the zoological world a new author, I think it is only just, both to members of the Society and to my pupil, Mr. Thomson, to state that, though the paper has been written and the drawings executed by him, I have throughout constantly supervised his work, so that I can confirm all his statements of fact, to which, too, I have here and there added a note.

In the course of an examination of a collection of Annelids obtained during a recent experimental trawling expedition, carried out by the Fisheries Department of the New Zealand Government—during which provision was generously made for the collection of zoological material,—I had occasion to identify a large species of *Lepidonotus*, the subject of the present paper. I soon discovered that this *Lepidonotus giganteus* of Kirk [8] had been previously described under the name *Aphrodita squamosa* by Quatrefages many years before; and a question arises as to the strict application of the laws of nomenclature.

The commonest Polynoid on the coasts of Britain is *L. squamatus* L.; and it appears to me that on the grounds of clearness and convenience—which, after all, are the foundations of any system of nomenclature—it would be desirable to depart in this instance from the strict letter of a law which, if applied, might lead to some confusion between the old established *L. squamatus* L. and the New Zealand species *L. squamosus* Q.

It is true that in faunistic accounts these two names would probably never actually clash, for the British species does not occur on the coasts of New Zealand. But it is not impossible that *L. squamosus* may occur in Arctic seas, side by side with *L. squamatus*; for in a collection of Polynoids made within the Arctic circle, and handed to me by Prof. D'Arcy Thompson (for identification—which, however, I had to return to him unidentified, on leaving Oxford), I remember a large specimen of about the same size and colour as the subject of the present note. But as I have no literature here upon Arctic Annelids, I am unable to ascertain whether the Arctic species is identical with our Southern form; yet, if the "Bipolar Theory" be true, it is not impossible that it may be: then confusion between the two names would arise.

I have therefore retained the name given by Kirk, who recognized its proper genus; in preference to the specific name conferred by Quatrefages, who had most unaccountably referred it to *Aphrodita*.

The most striking and interesting feature about the Annelid is the very definite, subelytral groove along the back (Plate LX. fig. 3) with the row of tubercles for the support of the overlapping moieties of the elytra, so that the groove is constantly open for the respiratory current. I am not aware that anything so definite has been hitherto noted in any Polynoid, and I suggest the term "respiratory channel" for it.

The definite "exhalant aperture," too, formed by the emarginations of the last pair of elytra (Plate LX. fig. 1) complete the utility of this channel. The presence of such an aperture formed in this way is mentioned and figured by Huxley for *L. squamatus*, in his 'Manual of Anatomy of the Invertebrates,' 1877, p. 228. The peculiar hair-like character of the neuropodial bristles—suggesting the felted hairs of *Aphrodita*—are also a peculiarity of the species, especially in their number and softness of texture.

Description of the Species. By W. Malcolm Thomson.

General appearance.—The specimens measured in a preserved condition ranged in length from 80 mm. downwards and in breadth from 35 mm. Average specimens were about 68 mm. long by 25 mm. broad. In shape the animal is a very regular oval, the anterior end being rather narrower than the posterior. The upper surface of the body is strongly convex, both in the longitudinal and transverse planes, the ventral surface being flat or even inclined to be convex, but with the usual median groove. The dorsum is completely covered by the large imbricate elytra, of which there are twelve pairs (Plate LX. fig. 1). Between the first pair a small median notch allows the protrusion of the palps and tentacles. There is a smooth tract over the mesial moiety of the series of the elytra, bounded on each side by a row of oblong transverse ridges representing the areolæ or areas of attachment of the elytra (Plate LX. fig. 1, *a*). The median moiety of each elytron constituting this tract is coloured a warm brown, and this colour is continued outwards behind the areola (Plate LX. fig. 1, *c*), the anterior surface of which is coloured light buff and is smoother than the general surface. The median tract ceases at the last pair of elytra, the inner margin of each of which is notched, so as to produce a small oval aperture with distinct, upturned lips: this aperture is the exhalant respiratory pore, to which we shall return. The posterior and lateral surfaces of an elytron are beset with numerous spiny processes and also with fine hairs. The margin of the body, as seen from above, is formed by a fringe of hairs constituted by the successive bundles of notopodial bristles. These hair-like bristles and the processes of the elytra collect a considerable amount of mud and afford a foothold for foreign organisms, which no doubt aid in the concealment of the animal.

Here and there along the sides of the body the tips of the dorsal cirri may be seen protruding. The tips of the stout neuropodial bristles are also visible at certain points (Plate LX. fig. 1, *ch.*).

When the body is viewed from below, the eye is at once caught by the stout parapodia (Plate LX. fig. 2) and by the large mouth. The body consists of 27 segments, including the peristomium and the pygidium, which do not carry typical parapodia; of which, therefore, there are only 25 pairs. Each parapodium is provided with a ventral cirrus, and just at the point of attachment of the foot with the body there occurs a prominent nephridial papilla (Plate LX. fig. 2, *neph.*) These become less marked towards the anterior end, and are absent from the first four or five pairs of parapodia [1] (the rudiments show up more clearly in some specimens than in others). Each papilla springs from the body, from the corner of a little square area raised into ridges, these areas forming a band down each side of the body. The middle of the body is occupied by a smooth surface, marked with fine transverse lines. Down the median line is a reddish-brown line seen, by transparency, lying in the mid-ventral groove, and representing the ventral nerve-cord. The colour is probably due to hæmoglobin, which has been demonstrated by Prof. Ray Lankester [1] in the nerve-cords of *Aphrodita aculeata*. The mouth is very conspicuous and is bounded by four large thick lips, of which one is posterior and transverse, two are lateral and obliquely placed, while the fourth, median anterior, is wedged in between the oblique lips. The actual position of the mouth seems to be between the second and third pairs of parapodia; in other words, the mouth has moved backwards from its primary position, so that three segments with their appendages lie in front of the mouth, a phenomenon which we are accustomed to meet with in Arthropods [2]. The mouth is thus further back than is represented in most of the figures of *Lepidonotus* available.

The median anterior lip hides the base of the median tentacle and is separated from it by a deep groove, so that it cannot be mistaken for a facial tubercle.

Returning to the dorsal surface (Plate LX. fig. 3), after the removal of the elytra it is seen that the upper surfaces of the parapodia are produced towards the centre of the back as broad, flat ridges, of which the usual alternate ones carry the elytra. These ridges are oblong or rectangular in shape, with distinct edges, and are separated by

[1] The absence of nephridial papillæ from the more anterior segments in Polynoids was remarked by Bourne [**3**] for *L. clavus*, in which papillæ are stated to be absent from the first 8 segments, as is also the case in several species recorded recently by H. Johnstone [**9**].

[2] This shifting of the mouth in Annelids back through one or more segments occurs in Amphinomidæ, Acœtidæ, in *Chrysopetalum*, and in *Aphrodita*; but it has been but little remarked upon in connection with the same phenomenon, to which Lankester was the first to draw attention, in the case of Arthropoda.

Its occurrence in these families of Annelids, all of which are undoubtedly much modified as compared with the typical annelid, is of interest and of theoretical importance.—W. B. B.

narrow transverse grooves, which lead inwards to a median dorsal groove or channel lying between the ridges of the right and left sides. This channel is incompletely divided into two, longitudinally, by a series of firm, truncated tubercles, which posteriorly form a single median row, but anteriorly a double row, enclosing a spindle-shaped raised area, the channel passing forwards outside the tubercles (Plate LX. fig. 3). The result is that the channel bifurcates anteriorly; but on the second segment there are again a couple of median tubercles (Plate LX. fig. 3 & Plate LXI. fig. 4), and the channel is thus carried forwards right to the base of the prostomium (Plate LXI. fig. 4). Posteriorly, the tubercles cease on segment xix, while the channel continues backwards to segment xxii. The tubercles serve to support the mesial moieties of the elytra, thus leaving a clear subelytral channel, which, from its function, may be termed the dorsal "respiratory channel." Towards the posterior end the channel becomes deeper, and is closed by the transverse union of the parapodial ridges of the last elytriferous segment. The channel thus ends just under the aperture mentioned above, formed between the last pair of elytra.

Looking more closely at the parapodial ridges, a number of small processes are observable, at their outer ends and especially towards the margins of the transverse canals. These processes may be as many as twenty in number on a cirriferous segment, rather fewer on an elytriferous segment (Plate LXI. figs. 7 & 8). They are little finger-shaped evaginations of the body-wall, rarely branched, and evidently serve as gills [1]. Unfortunately there were no living specimens obtainable, so that we could not verify the following inferences, but the appearances seem to justify them:—currents of water are brought by ciliary action [2] into the transverse canals; the water is filtered by the bunches of notopodial hairs, and passes thence over the branchiæ, oxygenating the blood; the water then passes into the dorsal median canal and finds its way out by the posterior aperture.

Haswell, in his Monograph of Australian Aphroditea [2], mentions that both Williams and Quatrefages record a respiratory current in *Aphrodita* and *Hermione*, caused by the rhythmical movements of the elytra under the felty coating of the back. But he adds:—"In species in which the felt-like dorsal covering does not exist, this function would appear to be in abeyance, and in *Polynoë* and allied genera, so far as I have observed, the elytra remain perfectly motionless while the animal as a whole is at rest."

It is suggested that, in *L. giganteus*, while probably no actual movement of the elytra is necessary to produce the stream, yet, by means of the "respiratory channel" and the dorsal tubercles

[1] Compare Buchanan's figure 4 in illustration of *Eupolyodontus cornishii*, in Q. J. Micr. Sc. vol. xxxv.

[2] Cilia have been observed by several naturalists on the sides of the parapodia in Polynoids; but Mr. Thomson did not examine the histological structure of the body-wall in the present annelid.—W. B. B.

supporting the mesial regions of the elytra, a continuous stream of water may, nevertheless, be passed over the back, thus producing the same result as the rhythmical movements observed in *Aphrodita*. This is interesting as showing how the same need has been met in animals of different structure by adaptations of different kinds. The apparatus in this species seems to have attained a considerable degree of perfection, and in the literature at our disposal I can find no reference to any similar arrangement.

In this dorsal view further points of interest may be noted. When the elytra were removed in a female, a pale pinkish substance was observed, especially above the bases of the notopodial bunches of hair. This, when examined under the microscope, was found to consist of numerous ova which did not seem to have been fertilized; for neither were polar bodies to be seen, nor were any eggs segmented, while they all presented the large vesicular nucleus characteristic of the unfertilized ovum. It would seem, therefore, that the ova are all passed up under the elytra (the female contained a great number of eggs in the cœlom), and are there fertilized by sperms carried in by the respiratory current. According to a statement made by Haswell, development must also take place there to a certain extent.

The elytriferous segments are 2, 4, 5, 7 &c., 21–23, the elytrophore being a special part of the parapodial ridge. The alternate parapodia carry dorsal cirri with bulbous tips, long enough to protrude freely (as much as 3 mm.) beyond the edges of the elytra. The base of the cirrus is extremely muscular (Plate LX. fig. 3 and Plate LXI. fig. 7), and they are evidently capable of considerable movement. The dorsal cirri of the first, *i. e.* the peristomial segment, are without this muscular base and resemble the prostomial tentacles in appearance.

One more point to be noted in this view of the dorsal surface is the anus, which lies just beyond the end of the dorsal respiratory channel, separated from it by the transverse ridge already referred to. The two ventral pygidial cirri represent the ventral cirri of the pygidium, and are directed backwards, as are also the dorsal cirri of three pairs of parapodia immediately anterior to the pygidium. Thus four pairs of these tactile organs may be seen curling up round the edge of the elytra at the extreme posterior end. It seems rather remarkable that there should be such a good supply of "feelers" at this end, and indicates that it is the habit of the animal to explore crannies and holes among stones &c., from which it must often make its exit backwards.

The Head.—The head consists of prostomium and peristomium (the first segment), the whole being retractile to a slight degree under the next segment, which bears the first pair of elytra (Plate LXI. fig. 4). The prostomium is irregularly oval, convex above, well defined posteriorly. Its base is, in the preserved specimens, overhung by the first "dorsal tubercle," which belongs to the peristomial segment. There are two pairs of eyes—a posterior larger, and an anterior smaller eye on each side,—which are so close together that at first sight a single pair only appears to exist, but its anterior limit is not distinctly marked, as it is produced into the cylindrical bases of the three tentacles [1]. The length up to the base of the median tentacle is about equal to the breadth ($2\frac{1}{4}$ mm. by $2\frac{1}{2}$ mm.). The median tentacle is slightly longer than the lateral, and its base is depressed very slightly below those of the lateral pair, which thus form a shallow V-shaped groove behind it. The median tentacle is about 6 mm. long; the lateral pair being 5 mm. each, measured to the posterior end of the base. Arising between the prostomium and peristomium, on the lower surface of the head, is a pair of palps about 9 mm. long, which just below the tip narrow suddenly to a fine point; they bear 7 to 9 longitudinal rows of papillæ, which take a somewhat spiral course.

The peristomium bears a pair of considerably modified parapodia. Each consists of a conical base bearing two cirri, a dorsal and a ventral, which resemble the tentacles (Plate LXI. fig. 4). On the anterior dorsal surface of the base a very small bunch of hair-like bristles protrudes, corresponding to the notopodial hairs of succeeding segments.

On the ventral surface of the head the mouth has been already sufficiently described; only one point remains to be noticed, namely, that the ventral cirri of the second segment are elongated and bulbous below the tip, just like the preceding pair. They are generally inclined towards the mouth, and are termed the buccal cirri. In some specimens the ventral cirri of the next segment showed a tendency to swell below the tip, more marked than in those further back (Plate LX. fig. 2).

Elytra.—A reference to fig. 1 will give a better idea of the arrangement of the elytra than any description. They are attached to the body by a considerable area, the "areola," of an oblong form and of considerable breadth. The corresponding area on the body is the elytrophore (Plate LX. fig. 3), and lies obliquely transverse on the flattened parapodial ridge mentioned above. The colour of a typical elytron is a warm brown behind a line taken transversely across about its middle, the colour advancing forwards somewhat at the inner end (indicated by dots in Plate LXII. fig. 10). The part covered by the preceding elytron is light buff, and this colour extends backwards over the anterior slope of the areolar ridge.

The elytra vary considerably in size and shape according to their position, the terminal ones being smaller. Plate LXII.

[1] In *Lepidonotus* it is usually stated that the "prostomium is produced into the base of the lateral tentacles"; as a matter of description this is true, but, from the comparative anatomy of the group, it appears that the cylindrical "prolongation" (marked *b.t.* in the figure) should be regarded as the base of the tentacle fused with the anterior margin of the prostomium: this margin is in the present annelid just indicated by a faintly marked, oblique line; and if this be compared with the prostomium of *Harmothoë* and others, this interpretation seems reasonable.—W. B. B.

fig. 10 gives a drawing of an elytron from the middle of the left side, which may be described as being typical of the rest. The measurements of the transverse diameters are 9 mm. by 21 mm. The general shape is transversely oval, but with a shallow sinus in the elongated anterior border. All the elytra bear a number of processes arranged around the external and posterior edges and also on the neighbouring surface. The margins have further a fringe of small hairs almost all round, which are visible in Plate LXI. figs. 5, 6, and Plate LXII. figs. 9, 10. Plate LXII. fig. 9 is an enlarged view of the part of fig. 10 between *L.* & *e.* The appearance presented is curious, as two types of processes are seen. The margin is produced into a number of very slender, round-ended, hair-like processes (Plate LXII. fig. 9, *h*), and immediately within these there is a series of stout, more or less cylindrical spines, ending in a point and bearing conical thorn-like outgrowths just below the apex (Plate LXII. fig. 9, *e*). Occasionally there are short and much more thorny processes (Plate LXII. fig. 9, e^1). The bases of the spines are bluntly conical, and appear from a surface view to be simply embedded in the elytra. The spines arising from the flat surface further away from the margin are much stouter, with fewer outgrowths, and arise from the surface of the elytron by broad, star-like, spreading bases (Pl. LXII. fig. 9, *st.b.*). Many of them also have a little patch of pigment near the tip and a small vesicle, for neither of which could any function be guessed[1]. The surface of the elytra abounded in similar, but smaller, star-like bases, bearing, however, only incipient processes. The spines, especially the rooted ones, were more numerous on the posterior elytra than on those situated further forwards.

The first and last pairs differ in form from the remainder and from one another. Of the first pair, the right member is almost circular in outline; the left is similar but has a wide notch in its anterior border (Plate LXI. fig. 5, *n.*). The hinder margin of the notch is covered by the edge of the elytron of the right side, with which the anterior boundary of the notch forms an angle, lying in the middle line, and evidently intended to allow freer protrusion of the head or its appendages, which in preserved specimens are seen below the notch (Plate LX. fig. 1).

Each elytron of the last pair has a pear-shaped outline (Plate LXI. fig. 6); the broader end is directed backwards and the narrower is overlapped by the preceding elytron. The mesial edge, just in front of the constriction between the two regions, is upturned, so as to form a lip; so that when the pair is *in situ*, an oval aperture is formed, which overlies the hinder end of the dorsal subelytral respiratory channel; this aperture is shown in Plate LX. fig. 1, *ex.ap.*

Parapodia.—Of these there are twenty-five typically constructed pairs, each of which consists of neuropodium and notopodium, the former being much the larger. The notopodium is a mere lobe

[1] It will be noted that this paper is simply an account of purely superficial anatomy.

of the neuropodium, lying on its dorso-anterior face rather than directly dorsal (Plate LX. fig. 2 and Plate LXI. figs. 7, 8); it has thus lost its direct connection with the dorsal cirrus which springs from the "basipodium" or common base of the two parapodial lobes (Plate LXI. fig. 7). As before mentioned, the base of each parapodium, elytriferous or cirriferous, is produced dorsally towards the median line as a broad flat ridge with distinct and almost overlapping edges (Plate LX. fig. 3 and Plate LXI. figs. 7, 8). Round the outer edges of the ridge, and especially at the base of the dorsal cirrus, are numerous branchial outgrowths with thin walls. The neuropodium bears a short but rather stout and pointed ventral cirrus. The notopodial bristles are hair-like; the notopodials are typical chætæ.

Both neuropodium and notopodium have large setigerous sacs, but there are no acicular papillæ noticeable, such as Bourne has observed in *L. clavus* and *L. squamatus* [**3**].

Chætæ.—The neuropodial chætæ are large and stout, and number about 30 to 35 in each foot; they have a very slight **S**-shaped curve towards the tip, which is somewhat tapered but blunt (Plate LXII. fig. 11). The upper, or convex, surface is smooth all the way along; on the lower, or concave, side there is a smooth region just below the tip, followed by a short spinulose region covered with rows of minute filiform spines, but bearing no comb-like plates. Below this the chæta is marked by fine transverse lines, some distance apart and gradually disappearing towards the embedded end of the bristle. These neuropodial chætæ are arranged in the sac in horizontal rows, the topmost row containing the longest chætæ, and the lower rows successively shorter. There are generally five or six rows, with about six in each row.

The notopodial chætæ, on the other hand (Plate LXII. figs. 12 *a*, 12 *b*) are more slender and more numerous than the neuropodial. The appearance of the bunch *in situ* is much like that of a short, but rather broad, camel-hair brush. Examined under the microscope, each bristle is seen to consist of two distinct portions of about equal length. The proximal half is smooth and hand-like, but broader in the centre than at either end. The distal half has a median, narrow, smooth axis with a serrated portion on each side, though often only one side is to be seen; this portion is of almost uniform breadth, tapering gradually to a very fine point deprived of serrations.

Pharyngeal Teeth.—The protruded pharynx terminates in a wide aperture, transversely elongated and bounded by a dorsal and a ventral lip, each of which carries a series of papillæ (Plate LXII. fig. 13). Of these, there is a median and 6 lateral on each side on each lip, but the median papilla is not distinguishable from the rest by any other peculiarity than its position. Each papilla is like a very squat **T**; the base is broad, the bar is also broad and oval, terminating in a point at each end, as can be seen in fig. 14 on the left side. The papillæ diminish in size rather suddenly on the right and left of the series.

Within the lips are seen the four dark brown teeth or jaws [1], a dorsal pair and a ventral (Plate LXII. fig. 13); but in this front view only the terminal claw-like tip of the tooth can be seen, its base, hidden in a muscular cushion (*e*), can only be seen by slitting up the wall of the pharynx.

Each tooth springs from a wide, somewhat triangular base of greenish-brown colour, less hard than the actual tooth, and marked by a series of concentric lines like a lamellibranch shell. The right and left tooth of each pair are connected by what is, no doubt, a secondary formation of calcareous material deposited on the convex side of each claw (*c*); this additional matter increases in thickness backwards, till the two touch and fuse.

The outer margin of the base of the tooth dips down into an elongated slit-like pit between itself and the muscular cushion (*e*). This cushion is continued anteriorly into a small, reflexed, papilla-like structure fitting against the concave side of the claw-like tip of the tooth; the latter projects—when at rest—into a pit anteriorly, immediately behind the lip, which is now seen to be in reality the hinder end of the thin-walled, eversible buccal region (*g*).

The ventral teeth are almost identical with the dorsal pair.

It may be as well to mention that the base of the tooth (*a*) is hollow, and occupied by a mass of muscle after the fashion usual in annelidan jaws or teeth; further, the internal root of the claw-like tooth is produced into a longer and narrow plate for the attachment of muscles, but which is not represented in the drawing, as it is embedded deep in the wall of the pharynx.

Localities.—Specimens were received from Otago Harbour on the east coast of the South Island of New Zealand, captured under stones and also taken from the stomachs of fish. Others were obtained from various stations along the east coast of the South Island, as far north as Tasman Bay, where they were brought up in the trawl from depths of 10–30 fathoms. The specimens named by Kirk [8] were collected in Wellington Harbour, North Island. It is evidently of wide distribution along our coasts.

Those from different localities varied considerably in colour: some were uniformly dark coffee-brown, above and below; while others were yellowish white below, and a warm brown dappled with light buff on the dorsal surface.

The elytra are in some specimens thickly covered with muddy particles attached to the spines, the notopodial hairs being

[1] I would suggest the word "stomatognath" as a convenient term by which to refer to the various chitinous, or calcified, or siliceous "teeth" or "jaws" occurring as specialized thickenings of the lining of the stomodæum, such as the teeth or jaws of Annelids, including Leeches; the "teeth" in the gastric mill of Crustacea; the elements of the "mastax" of Rotifers; the individual members of the radular apparatus of Mollusca; and possibly, also, the horny teeth of Cyclostome fishes. The word was used by me some years ago, in a course of advanced lectures on the Annelida that I gave in the University of Oxford; and it appears to me that some such word would be useful in referring to these and kindred structures.—W. B. B.

similarly muddy. In other individuals, however, the body was clean, indicating differences in the character of the habitat.

The whole form of the animal shows that it moves by walking or creeping rather than swimming; and several facts indicate that it lives among stones and mud, seeking prey rather in the dark than in the open. For example, the head (at any rate in the dead specimens) is completely withdrawn beneath the elytra, only the tips of the tentacles and palps showing. The eyes are right at the back of the head, and consequently are of no use unless the head were protruded at least 4 mm. The anterior pair of eyes, too, is much reduced (Plate LXI. fig. 4). Further, the lateral and posterior edges of the body are provided with numerous elongated movable feelers, protruding far enough to feel anything before it touches the side of the body. Unfortunately this is all guesswork, and can only be verified by observations of animals in the living state.

Under the name "*Aphrodita squamosa*" this annelid has been described by Quatrefages [4]. He puts it in his fourth division of the genus *Aphrodita*, with the following characters:—"Espèces dont les poils sont beaucoup trop courts pour former une voûte dorsale, et dont les élytres sont par conséquent à découvert." He made this division solely for this animal, of which he had only one specimen, and he characterizes it as follows:—

"Aphrodite écailleuse: *A. squamosa*.

"Caput parvum, distinctum, elytris prominentibus occultatum. Antenna media brevis, crassa, truncata (?). Antennæ laterales duplo longiores, graciliores. Cirri tentaculares breves. Corpus 27 annulis compositum, mediocre elongatum. Pedes quasi uniremes, prominentes. Elytra 24, maxima, rugosa, robusta, corpus totum obtegentia. Cirri superes longiusculi, in mamilla crassa, compressa affixi. Pili breves, in penicillum crassum de pedunculo conico orientes. Pro branchiis tubercula plus minusve conica, sparsa.

"Hab. la Nouvelle Zélande. C. M."

Quatrefages goes on to give a more detailed description of the specimen, which leaves no doubt that it is identical with the subject of the present paper. His specimen was 11 cm. long and 4 cm. broad, which is larger than any I have had in my hands, although a badly preserved one reached 10 cm. in length. The median tentacle in his specimen was, as he suspected, broken off short at the base. His 27 segments were completed by the anal segment, which bears, as he says, no parapodia. All the other points are in perfect agreement with the description given above; and further points in his description complete this harmony between the accounts. He says:—

"Le long de la ligne médiane du dos règne une sorte de gouttière où la peau est plus lisse qu'ailleurs, et où l'on ne distingue plus de traces de la division du corps en anneaux." But he makes no mention of the dorsal tubercles.

Having thus shown this identity, I must now show that Quatrefages has placed this animal in the wrong genus. According to his own table of genera [5] it is evident that he employs the existence of jaws as a character distinguishing *Lepidonotus* and *Polynoë* on the one hand from *Aphrodita* on the other. If he had followed his own table, he should have put the animal in the genus *Polynoë*; but the "pili breves, in penicillum crassum" evidently caused him to overlook the existence of jaws. Further, in comparing the diagnoses of the two "families" Aphroditidæ and Polynoidæ, in the Monograph by Prof. McIntosh, recently published by the Ray Society, it is apparent that our specimen differs from the Aphroditidæ (*a*) by the possession of lateral tentacles, (*b*) by the want of a facial tubercle, and (*c*) by the possession of jaws and papillæ on the pharynx; also (*d*) by the want of felt and (*e*) of the long stiff ventral bristles [6]. On the other hand, the following is McIntosh's diagnosis of the genus *Lepidonotus* [7]:—

"Body short, more or less linear. Anterior part of the cephalic lobe produced into the bases of the median and lateral tentacles. Palpi smooth or with papillæ in five longitudinal rows. Three comparatively short alimentary cæca directed forwards into the peri-pharyngeal space. Elytra 12 pairs, covering the dorsum entirely, and occurring on the segments bearing feet thus: 1, 3, 4, 6, 8, and so on to 20, 22. Bristles of the superior lobe slender, serrate, shorter than the inferior, which have a smooth portion below the slightly hooked tip, and then a spinulose region beneath. Nerve-trunks in the granular layer of the epiderm, between the powerful oblique muscles."

From this it is evident that our animal belongs to the genus *Lepidonotus*, the only point of difference being that the rows of papillæ on the palps are 7 or more instead of 5.

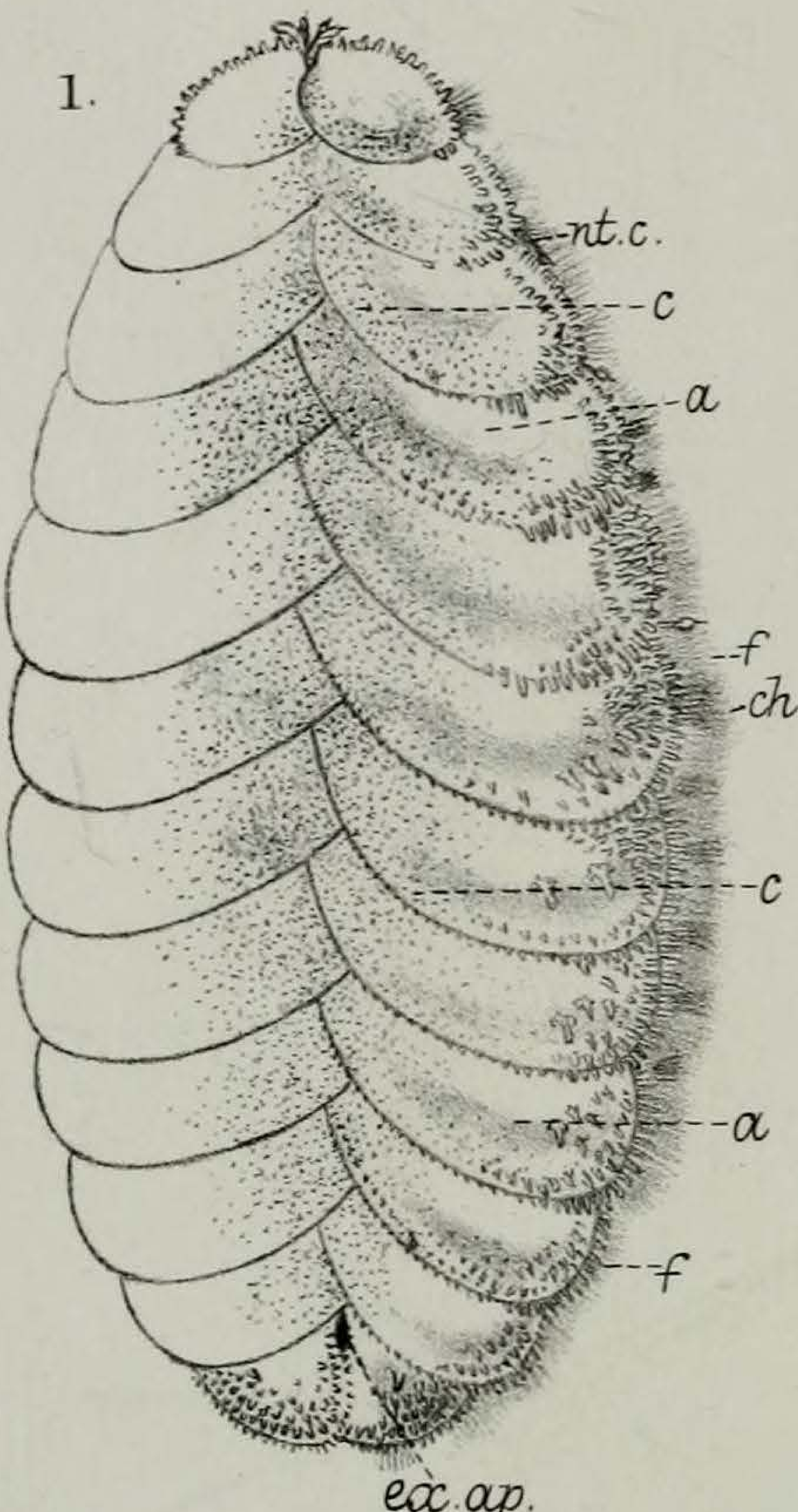
A comparison of the above account of this worm with that given, in brief and without figures, by Mr. Kirk [8] makes it quite evident that Quatrefages's "*A. squamosa*" is identical with Kirk's *L. giganteus*; and it is not to be wondered that the latter author overlooked the description by Quatrefages, as the worm is so palpably not a member of the genus to which he ascribed it.

Dunedin, Aug. 24, 1900.

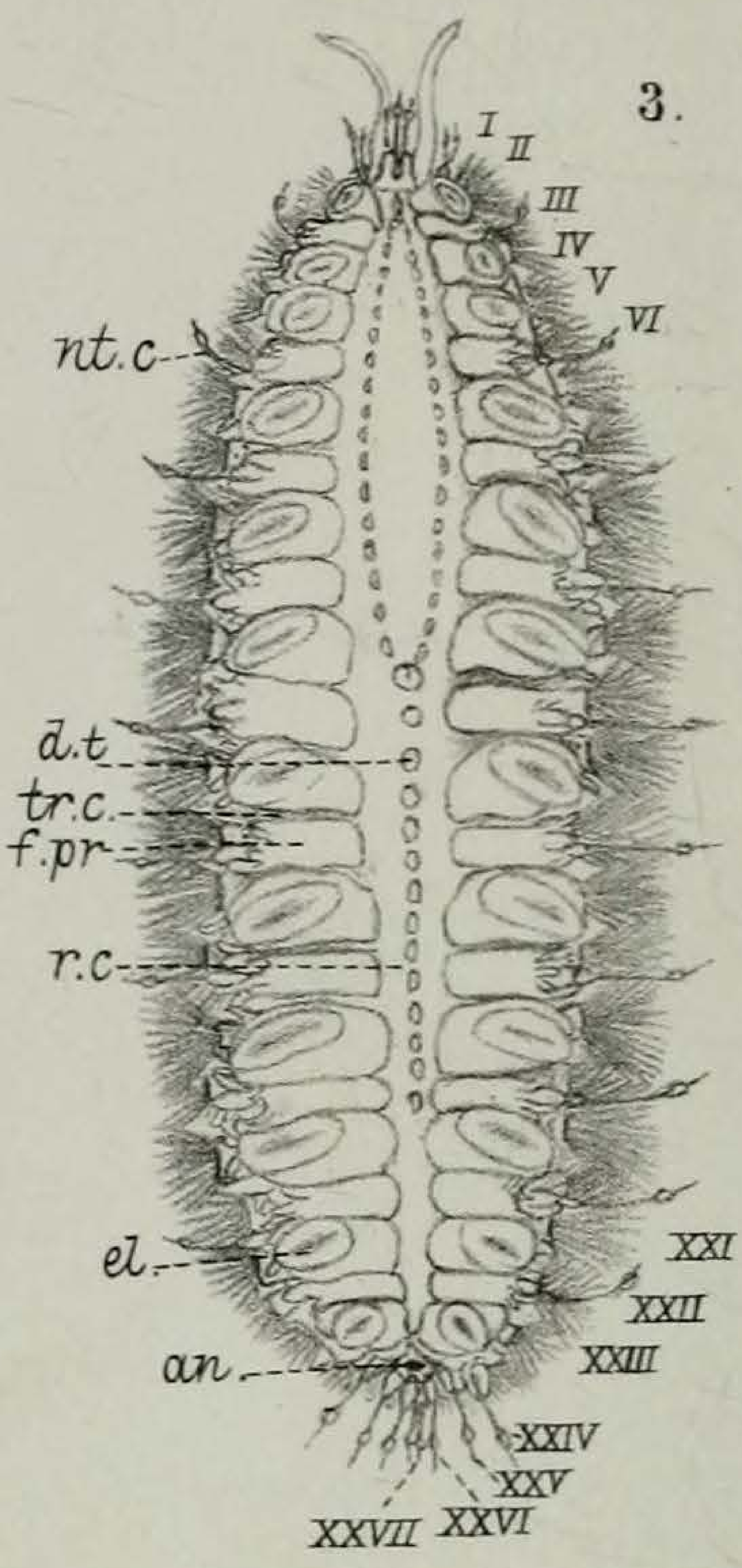
List of Literature referred to.

1. Ray Lankester. Proc. Roy. Soc. 1873.
2. W. Haswell. Proc. Linn. Soc. N. S. W. vii. pp. 255-256.
3. A. G. Bourne. Trans. Linn. Soc. Lond. 1883.
4. Quatrefages. Annelida, vol. i. pp. 201–203.
5. Id. ibid. p. 186.
6. W. McIntosh. British Annelida, p. 241.
7. Id. ibid. p. 273.
8. T. W. Kirk. Trans. N. Z. Inst. vol. ii. p. 399.
9. H. Johnstone. Proc. Calif. Ac. Sci. 1897.

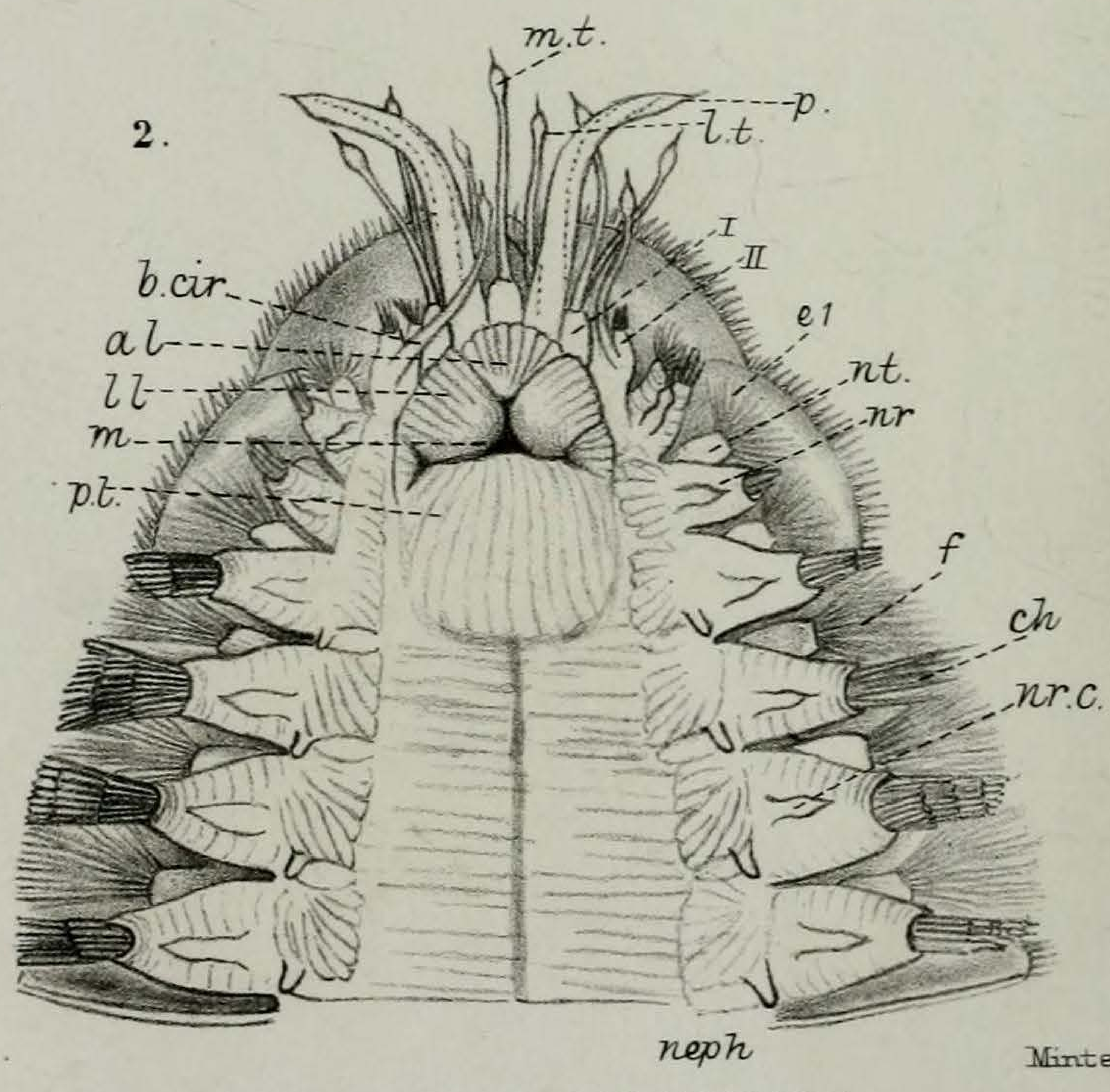
1.



3.



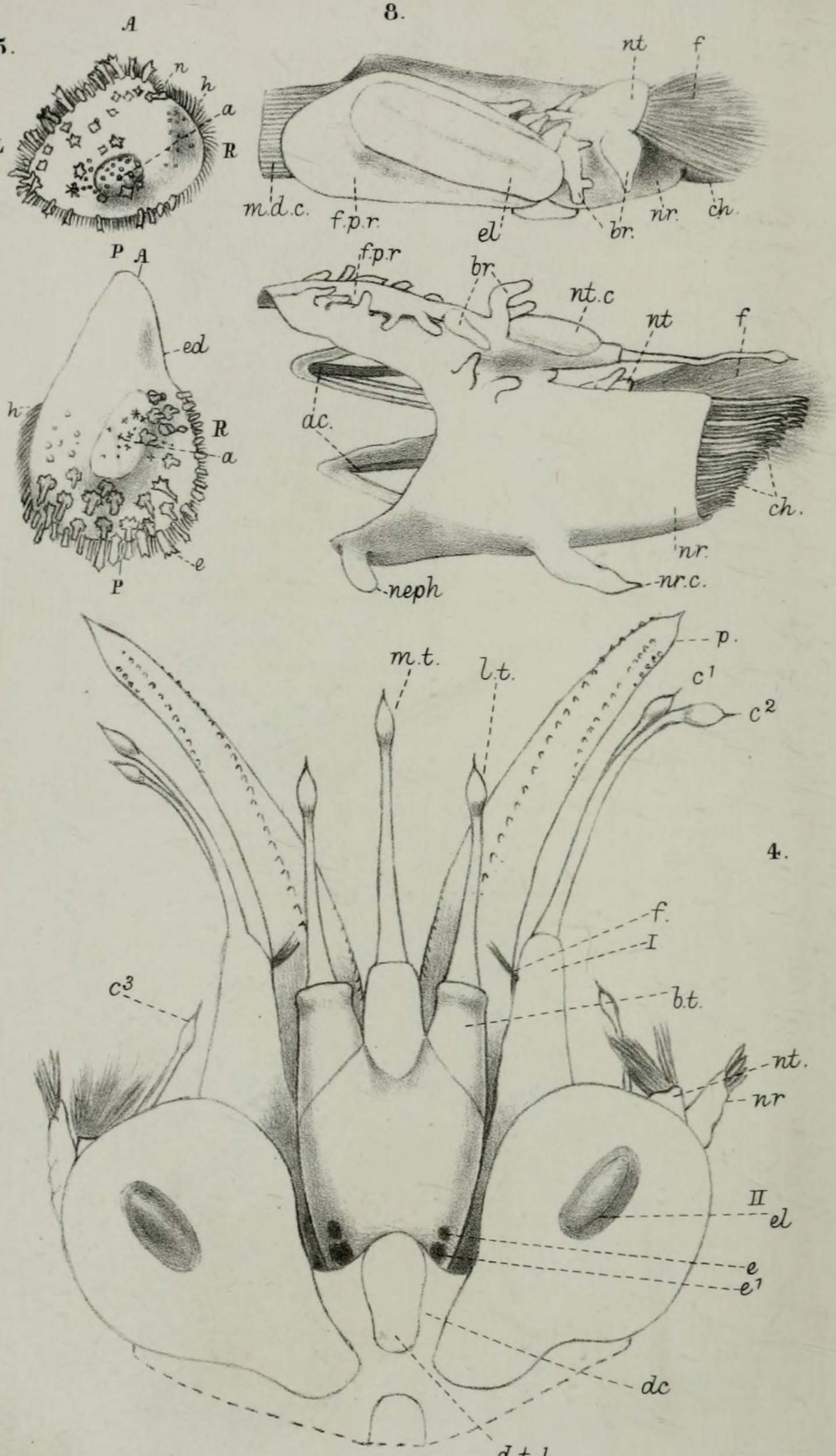
2.



J. Smit lith.

Mintern Bros. imp.

LEPIDONOTUS GIGANTEUS.



J. Smit lith.

Mintern Bros. imp.

LEPIDONOTUS GIGANTEUS.

EXPLANATION OF THE PLATES.

Plate LX.

Fig. 1. Dorsal view of *Lepidonotus giganteus* (completed on the right side only) (nat. size).

a, areola or area of attachment of elytron: coloured in life light buff.
c, dotted portions of elytron: coloured warm, or even dark, brown.
ch., neuropodial chætæ, seen here and there.
ex.ap., exhalant aperture of subelytral respiratory channel.
f, notopodial hairs forming a fringe along each side.
nt.c., notopodial cirrus.

Fig. 2. View of the ventral surface of the anterior seven segments.

I. First, or peristomial, parapodium. ×2.
II. Second, or first elytriferous, parapodium.

a.l., anterior lip.
b.cir., buccal cirrus.
ch., neuropodial chætæ.
el., elytron.
f, notopodial hairs.
l.l., lateral lip.
l.t., lateral tentacle.
m., mouth.
m.t., median tentacle.
neph., nephridial papilla.
nr., neuropodium.
nr.c., neuropodial cirrus.
nt., notopodium.
p., palp.
p.l., posterior lip.

Fig. 3. Dorsal view of another individual after removal of all the elytra: showing the median respiratory channel and its lateral affluents. × 2.

I–XXVII. Segments numbered.

an., anus.
d.t., dorsal tubercle.
el., elytrophore.
f.p.r., flattened parapodial ridge.
nt.c., notopodial cirrus.
tr.c., transverse respiratory channel.
r.c., mid-dorsal respiratory channel.

Plate LXI.

Fig. 4. Enlarged view of the head of *Lepidonotus giganteus*, seen dorsally after removal of elytra. × 4.

I. Peristomial parapodium, bearing the peristomial cirri (c^1, c^2).
II. First elytriferous parapodium.

b.t., base of prostomial tentacle.
c^1, c^2, ventral and dorsal peristomial cirri.
c^3, buccal cirrus, belonging to segment II.
d.c., anterior end of the dorsal respiratory channel.
$d.t_1$, first dorsal tubercle, in respiratory channel.
e, anterior eye.
e^1, posterior eye.
el., elytrophore.
f, notopodial chætæ of peristomial parapodium.
l.t., lateral prostomial tentacle.
m.t., median prostomial tentacle.
nr., neuropodium.
nt., notopodium.
p., palp.

Fig. 5. Left elytron of the first pair. × 2.
Fig. 6. The last elytron of the left side. × 2.

Lettering of figs. 5, 6, 9, & 10:—

A.P., antero-posterior direction.
L.R., transverse (left to right) direction.
a, areola.
c, darker pigmented region (dotted).
e, spine on the edge with conical base.
e_1, another type of the same, less common.
ed., prominent, upturned margin forming the edge of the exhalant aperture.
h., hairs on the edge of the elytra.
n., notch in the anterior border of the 1st elytron on the left side.
p.s., pigment-spot in a spine.
s., star-rooted spine, springing from the surface of elytron.
st.b., base of ditto.
v., vesicle in apex of spine.

Fig. 7. A cirriferous parapodium of the right side drawn from behind (enlarged).
Fig. 8. An elytriferous parapodium drawn from above (enlarged).

Lettering of figs. 7, 8 :—

ac., acicula.
br., branchiæ.
ch., neuropodial chætæ.
el., elytrophore.
f, notopodial bunch of hair.
f.p.r., flattened parapodial ridge.
m.d.c., median dorsal respiratory channel.
neph., nephridial papilla.
nr., neuropodium.
nr.c., neuropodial cirrus.
nt., notopodium.
nt.c., base of notopodial cirrus.

Plate LXII.

Fig. 9. The part of fig. 6, much magnified.
Fig. 10. Large typical elytron from the middle of the left side. × 2.
Fig. 11. Neuropodial chæta of *Lepidonotus giganteus*, much magnified (camera).
Fig. 12 *a*. *pr.e.*, proximal half of a single notopodial hair.
Fig. 12 *b*. *d.e.*, distal half of the same.
Fig. 13. Anterior end of the protruded pharynx, showing the circle of papillæ (*d*), the paired dorsal and ventral teeth (*b*), supported on the lateral cushions (*e*) of the lining of the pharynx. × 4.
Fig. 14. The dorsal pair of teeth, seen *in situ*, after the retracted pharynx and buccal region have been slit open. × 4.

a, the chitinous expanded base of the tooth.
b, the claw-like terminal tooth.
c, secondary calcified junction across the dorsal line.
d, prepharyngeal papillæ.
e, cushion, between which and the base is a deep furrow.
f, dorsal groove of pharynx.
g, buccal region.

3. On a new Genus of Flat-fishes from New Zealand. By H. M. Kyle, M.A., B.Sc., St. Andrews.[1]

[Received November 26, 1900.]

The new genus of Flat-fishes which it is proposed to establish is founded on a single specimen contained in the collection of Prof. D'Arcy W. Thompson, C.B., of the University College, Dundee. It was presented by Prof. Jeffrey Parker of New Zealand, and had been labelled by him *Rhombosolea monopus*. A cursory glance, however, was sufficient to distinguish it from *Rhombosolea*; and a more careful examination and comparison with the description of the known and already described forms showed that it was different from them all, and merited a place in the classification of the Flat-fishes (*Heterosomata*) as a distinct genus.

It is somewhat precarious perhaps to found a new genus on a single specimen, but it would be absurd to suppose that this specimen was the only one of its kind. To describe this form at present, also, will lead to its earlier detection and differentiation from the other forms of the New Zealand fauna.

It is proposed to call this specimen *Apsetta thompsoni*, the generic term arising from its affinities, which are not with the

[1] Communicated by G. A. Boulenger, F.R.S., F.Z.S.

J. Smit lith.

Mintern Bros. imp.

LEPIDONOTUS GIGANTEUS.