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Fig. 5.—Typical mammalian.

Fig. 6.—*Ornithorhynchus.*

Fig. 7.—*Echidna.*

Fig. 8.—*Myrmecophaga.*

*Lettering thus in figs.* 5-8 :—

A.—Mesoscapular border (spinous).

B.—Prescapular border (anterior or coracoid).

C.—Postscapular border (posterior or glenoid).

D.—Subscapular (?) ridge.

*Lettering of figs.* 1*a*-4*a*.

*Ac. Tr.'*—Acromio-trachelien insertion of dorsal part. *Ac. Tr."*—Acromio-trachelien insertion of ventral part. *Clav. Delt.*—Clavicular part of deltoid muscle, origin. *Inf. Sp.*—Infraspinatus origin. *O.H.*—Omohyoid. *Rb.'*—Rhomboid, ant. part. *Rb."*—Post. part. *Sc. Delt.*—Origin of scapular deltoid. *Ser. Mag.*—Ins. of cervical part of serratus magnus. *S. M. Cost.*—Ins. costal part. *Sb. Sc.*—Origin of subscapularis on 'inner' surface. *Sub Sc.*—Subscapular origin on 'outer' surface. *Sup. Sp.*—Origin of supraspinatus muscle. *T. Major.*—Teres major, origin. *T. minor.*—Teres minor, origin. *Triceps L. H.*—Scapular triceps, origin. *Trap.'*—Ant. part of trapezius. *Trap."*—Post. part of trapezius.

N.B.—Figs. 1-4 are from drawings from nature by Mr. G. H. Barrow.



# *TRICOMA* AND OTHER NEW NEMATODE GENERA

(With Fifty Illustrations in the Text).

By N. A. Cobb.

## Introductory Note.

This article is descriptive of twenty new species of Nematodes, including ten new genera, found by the author at various times since November, 1888. The worms are all free-living and marine, having been taken from the Atlantic (Mediterranean), Indian (Ceylon), and South Pacific (Australia) Oceans. The Mediterranean and Ceylon species are described from specimens preserved in balsam ; the Australian species are described also from specimens in balsam, excepting the species of *Monhystera*, which were examined fresh.

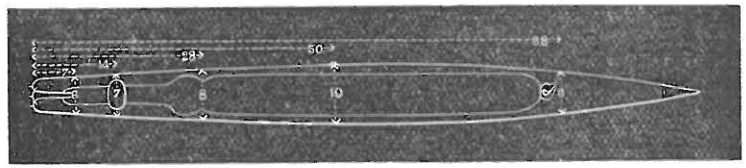

Fig. 1.—Diagram in explanation of the descriptive formula used for Nematode worms; 6, 7, 8, 10, 6 are the transverse measurements, while 7, 14, 28, 50, 88 are the corresponding longitudinal measurements. The formula in this case is :—

$$\frac{7\cdot\ 14\cdot\ 28\cdot\ 50\cdot\ 88\cdot}{6\cdot\ 7\cdot\ 8\cdot\ 10\cdot\ 6\cdot}$$

The unit of measurement is the hundredth part of the length of the worm, whatever that may be. The measurements become, therefore, percentages of the length.

The measurements are taken with the animal viewed in profile; the first is taken at the base of the pharynx, the second at the nerve-ring, the third at the cardiac constriction, the fourth at the vulva in females and at the middle (M) in males, the fifth at the anus.

## I. Tricoma, new genus.

The worms belonging to this genus will in future be readily recognised by the unusual appearances presented by the cuticula. The striations are so coarse as to suggest the segmentation

of an annelid. This appearance is so deceptive that one of the most renowned helminthologists in Europe pronounced the only specimen yet seen to be the larva of an annelid worm. It was therefore with some hesitation that I included the specimen in my Nematode collection. However, after careful examination I am convinced that the worm is a representative of an hitherto unknown Nematode genus. The only specimen in my possession was probably either lost or destroyed; not, however, until after the accompanying reliable drawings of the two extremities had been made with the aid of the camera lucida.

T. CINCTA, n.sp. The length, which I give from memory, was somewhere between one and two millimetres, and the width probably about three to four hundredths as great. The coarsely striated cuticula bore hairs throughout the length of the worm, in cycles of three. The head, surmounting a cylindroid neck,

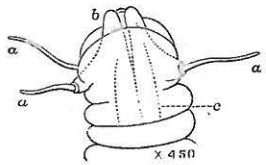


FIG. 2.—Head of *Tricoma cincta*.
*a*, three cephalic setæ; *b*, mouth; *c*, œsophagus.

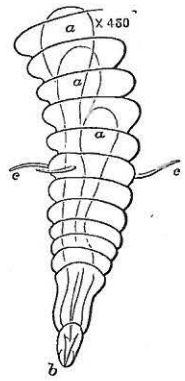


FIG. 3.—Tail of *Tricoma cincta*.
*aaa*, three caudal glands; *b*, terminus; *c*, caudal hairs.

bore three setæ, nearly as long as the neck was wide, each of which issued from a conoid projection at the base of one of the three lips. The lips projected forward in the form of a cone and were flanked by large cuticular expansions, or cephalic alæ. The œsophagus averaged nearly one-third as wide as the neck;—I remember nothing further concerning its structure. Whether any bulbs existed I cannot say. The tail ended in an unmistakable



outlet for the three caudal glands, which were to be dimly seen. These few notes comprise all that is known concerning the structure of a worm which, were it less remarkable, I should not notice at this writing.

*Hab.*—Sea-sand, Bay of Naples, 1888.

## II. PELAGONEMA, new genus.

*Pelagonema* is a genus related to *Oncholaimus*. The walls of the pharynx, however, bear no teeth. At the very base of the pharynx an indistinct elevation is to be seen, but I am doubtful whether it is homologous with any mouth-part in *Oncholaimus*. The neck is slender and tapers much. The œsophagus is very narrow in the anterior half, but gradually expands behind the broad and conspicuous nerve-ring until in the posterior fourth it becomes about three-fourths as wide as the neck. Opposite the lower part of the pharynx are several bodies characterised by staining in carmine. These are round or ellipsoidal and about one-half as wide as the pharynx. It is probable that two of these structures represent lateral organs. At any rate they are not all alike. They are indistinct, and, furthermore, exceedingly small, and therefore escape accurate observation. The tail is elongated and slender, and its slightly swollen terminus gives exit to the secretion of caudal glands. In the single known species the female organs are double and symmetrically reflexed. The worm has the general appearance of an attenuated *Oncholaimus*; still, the mouth is so peculiar that I do not venture to class it as a member of that genus.

P. SIMPLEX, n.sp. $\frac{\cdot6}{\cdot6}\ \frac{9\cdot8}{1\cdot1}\ \frac{21\cdot}{1\cdot4}\ \frac{\cdot58}{2\cdot2}\ \frac{19}{\ }\ \frac{92\cdot5}{\cdot9}$ 2·mm. The cuticula is apparently non-striated. No hairs of any kind were seen. The conoid neck terminates in a rounded head, with lips resembling those of *Oncholaimus*. The simple elongated pharynx is one-half as wide as long. Opposite its lower part occur structures about one-half as wide as the pharynx itself, bodies which may be the lateral organs. There are no eyes. The lateral fields are

one-tenth as wide as the body. The œsophagus is anteriorly one-fourth to one-third as wide as the neck; posteriorly it is three-fourths as wide as the neck. This change in relative diameter takes place gradually behind the nerve-ring. The latter is three times as wide as the œsophagus at the point encircled and is in all cases oblique. The excretory pore is situated just behind the nerve-ring. There is a distinct cardiac collum. The anterior half of the tail is conoid from in front of the inconspicuous anus. The posterior half of the tail is nearly cylindrical, having a diameter one-fourth as great as the body-diameter at the anus, but expands at the naked terminus into a bulb nearly twice as wide. The reflexed portions of the ovaries reach about half-way to the vulva and contain several developing ova. One or two thin-shelled unsegmented eggs nearly twice as long as the body is wide and about half as wide as long are commonly to be seen in each uterus. Male unknown.

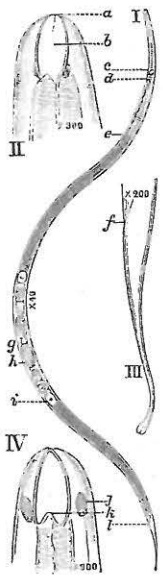


FIG. 4. — I, female of *Pelagonema simplex*. II, lateral view of head of same worm more highly magnified. III, tail of the same worm. IV, ventral view of head of same worm.

*a*, mouth.
*b*, pharynx.
*c*, nerve-ring.
*d*, excretory pore.
*e*, cardiac constriction.
*f*, anus.
*g*, vulva.
*h*, egg.
*i*, fold in ovary.
*j*, nucleus.
*k*, rudimentary tooth at base of pharynx.
*l*, anus.

*Hab.*—The females of this species were common among algæ on the coast of Ceylon in the month of March, 1889.

## III. DEMONEMA, new genus.

The genus *Demonema* belongs to the *Enoplus* family. Three apophyses extend backward from the mouth, but the distinct teeth characteristic of *Enoplus* are absent. Nevertheless, the mouth opens after the manner of a three-jawed chuck as in *Enoplus* and the three lips are here armed with numerous powerful teeth. Spiral lateral organs occur near the mouth. The female sexual



organs are symmetrical. Like the *Enopli*, these worms are carnivorous.

D. RAPAX, n.sp. $\frac{1{\cdot}5\ \ 7{\cdot}4\ \ 14{\cdot}\ \ {}^{22}50'\ \ 94{\cdot}}{2{\cdot}2\ \ 2{\cdot}7\ \ 3{\cdot}\ \ 4{\cdot}4\ \ 2{\cdot}6}$ 1·25—2 mm. The rather thin cuticle bears papilla-like hairs throughout and is traversed by about one thousand transverse striæ, 2·2$\mu$ apart, and composed of dots also about 2$\mu$ apart. The neck tapers but little; the head is rounded. The spiral lateral organs are one-third as wide as the head and are situated opposite the middle of the pharynx; the the left hand organ is a right-handed spiral, and the right hand one, of course, a left-handed spiral. The six very short cephalic setæ are seen with difficulty; two are lateral and four are submedian. A second row of four (?) submedian setæ occurs immediately behind the lateral organs. When the lips are closed the pharynx appears as a central chitinous line accompanied by three apophyses, one of which is ventral and two of which are dorsally submedian. The three "apophyses" are the optical expression of three deep folds in the closed pharynx. When the mouth is opened to seize the prey, the three parts of the pharynx corresponding to the three lips spring outward, being moved by powerful muscles. The mouth closes after the manner of a chuck, and the prey is held firmly by means of numerous large horny teeth on the inside of the anterior part of each jaw. The œsophagus is phalangiform and muscular; in the narrowest part it is half

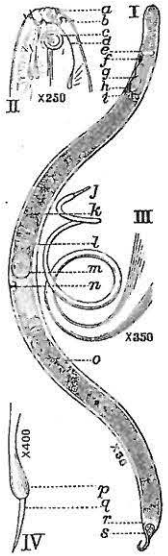


FIG. 5.—*Demonema rapax*.

I, female. II, head of same. III, tail, spirally wound, showing its use as a prehensile organ. IV, terminus, showing the elongated outlet for the caudal glands.

*a*, lips.
*b*, cephalic setæ.
*c*, lateral organ.
*d*, ventral apophysis.
*e*, nerve-ring.
*f*, ampulla of duct of ventral gland.
*g*, (?).
*h*, ventral gland (black).
*i*, intestine.
*j*, terminus.
*k*, bend in ovary.
*l*, uterus.
*m*, egg.
*n*, vulva.
*o*, cells of intestine.
*p*, swelling at terminus.
*q*, slender terminus.
*r*, anus.
*s*, three caudal glands.

as wide as the neck, in its widest parts three-fourths as wide as the neck. The cardiac collum is broad but distinct. The intestine is three-fourths as wide as the body, and is composed of rather transparent cells of such a size that three or four of them build the circumference. The intestine of this little worm often contains two or three other Nematodes two-thirds as long as the worm itself, which have been swallowed whole, a fact which sufficiently attests the rapacity of the species. The ventral excretory pore is situated just behind the nerve-ring. The gland lies in the cardiac region; its duct is rather narrow, but the ampulla is distinct. The indistinct lateral fields appear to be one-fifth as wide as the body. The anterior fourth of the tail is conoid; the remainder is very narrow, flexible, and prehensile. The terminus is slightly swollen and tipped with a much elongated outlet for the caudal glands; these latter, three in number, are situated in the anterior part of the tail, just behind the anus. The vulva is rather conspicuous. Vaginal glands are present. Each uterus usually contains a thin-shelled unsegmented egg as long as the body is wide and two-thirds as wide as long. The ovaries reach from one-half to two-thirds the way back to the vulva and contain half-a-dozen developing ova. The male remains unknown.

*Hab.*—Coral bank, Bay of Naples, 1888, at a depth of thirty-five metres.

## IV. Chromadora, Bastian.

I cannot attempt to say what will be the final definition of *Chromadora*. It is now known that a large number of forms exist which must be reckoned either as belonging to *Chromadora* or to closely allied genera, and already much has been accomplished towards unravelling their relationships, notably by Dr. de Man in a series of admirable memoirs; but much remains to be done before our knowledge of these worms can claim to be thorough. I deal here with a species which I believe will be reckoned a *Chromadora*.

C. minor, n.sp. $\frac{\cdot6}{1\cdot7}\ \frac{9\cdot}{3\cdot2}\ \frac{15\cdot}{3\cdot7}\ \frac{'48''}{4\cdot8}\ \frac{86\cdot}{2\cdot8}$ 1·mm. The cuticle is traversed by transverse striæ resolvable with high powers into



rows of alternating light and dark, uniform, rectangular, elongated markings. This is a feature common to *Chromadora* and a few other genera. Whether these markings are always uniform in *Chromadora* is open to question. It has been proposed that where the markings are not uniform, that is to say are different on the lateral fields, the species should be reckoned as a *Spilophora*, provided of course that the worm presents the other features characteristic of *Spilophora*. The idea is a good one, but certain differences in the markings on the lateral fields are to be found even in *Chromadora*, and it remains to be seen to what extent this difference may develop in the genus. The cuticle of *C. minor* bears in general none but most inconspicuous hairs, the cephalic and subcephalic setæ of course excepted. The neck is conoid to the truncate head, which bears, opposite the pharyngeal tooth, a seta on each submedian line, four in all; these setæ are acute, arcuate, and about half as long as the head is wide. Farther back, namely, opposite the eye-spots soon to be described, occur eight subcephalic setæ, a pair being arranged one in front of the other on each submedian line. The lip region is transparent and the arrangement of the lips is difficult to make out. I believe, however, that three obscure confluent lips exist and that each presents about four longitudinal striations, and furthermore that these striations are the optical expression of a dozen chitinous processes which might almost be denominated teeth, or at least biting organs. Each lip presents two papillæ on its anterior surface. The pharynx may be said to extend almost as far back as opposite the eye-spots; in the formula, however, I have measured only to the tooth which exists on the dorsal side of the pharynx. This small tooth is hook-shaped and points forward; it serves to give the worm a grip on its food by acting in opposition to the lips and their chitinous processes. The position of this tooth is, as already stated, dorsal. I emphasise this because I have seen specimens in which this tooth appeared to be ventral. In fact, I was very near describing one such specimen as a *Hypodontolaimus* of de Man. The appearance is highly deceptive, and therefore worthy of description. The worm by an exact

half turn in the middle part of its body presents the whole of the head and neck reversed,—what is dorsal appearing ventral. The only way of discovering this distortion is by carefully following up the lateral fields; the twist in the body will then be discovered. In all cases, therefore, where *such an anomaly* as a *ventral tooth* appears, care should be exercised before coming to a decision as to the actual facts of the case. I did not discover the position or nature of the lateral organs. The eyes, or rather eye-spots, are situated in the œsophagus at a distance from the anterior extremity twice as great as the width of the head. There is a distinct tendency toward a dorsal agglomeration of the yellowish-brown pigment of which the spots are composed, and to a dorso-ventral division of the dorsal part into halves. The ventral pigment consists of a narrow yellowish streak of the same length as the large dorsal mass, namely, a length equal to half the width of the head. There is no distinct refractive body connected with the eye-spots. The œsophagus expands slightly to receive the pharynx, and thence to the posterior bulb measures one-third as wide as the neck; the bulb is prolate, measures four-fifths as wide as the base of the neck, and presents a distinct and extensive internal chitinous lining for the attachment of its powerful radial muscles. These latter are very effectual in exerting suction. I remember to have seen a *Chromadora* seize on to the surface of one of my glass object-slides with its mouth and move its tail up near to the head, when the caudal spinneret came into play and secured a hold; then, releasing the head, the little animal proceeded to execute a movement similar to that made by the larvæ of the Geometrid moths, by reaching forward and again seizing on to the face of the glass with its mouth and again drawing forward its tail. Of course nothing but suction could have so attached the mouth of the worm to the smooth surface of glass. The œsophagus is separated from the intestine by a deep and conspicuous constriction. The granular intestine is two-thirds as wide as the body and is of a yellowish colour, being composed of cells of such a size that nine of them make up a circumference. The rectum is situated at an angle of forty-five degrees with the axis of



the body, and has a length equal to that of the anal body-diameter. The narrow unicellular ventral gland lies just behind the cardiac constriction, and is two to three times as long as the body is wide. Immediately behind it occurs an organ about one-fourth as long, which, however, stains differently. This organ is ventral and contains two large and peculiar nuclei arranged on opposite sides of the ventral line. What is this organ? Before answering let us call attention to two cells near the cardiac bulb in *Plectus*, another genus of free-living Nematodes. If I am not mistaken the first to see these cells in *Plectus* intelligently was Joseph. He suggested that they were nerve-cells. They are joined by a commissure, are subventral in position, and are near the ventral gland, which in *Plectus*, contrary to the general rule, is situated in the neck in front of the cardiac bulb. What I wish to emphasize is the proximity of the ventral gland and these two supposed nerve-cells. In my little *Chromadora minor* a similar proximity occurs—two cells, which, judging from their situation and structure, may be nerve-cells, are ranged close behind the ventral gland. We may not be wrong, I think, in calling these two cells nerve-cells; it is with more hesitation that I suggest them to be parts of a sympathetic nervous system, traces of which have hitherto, I believe, escaped observation among Nematodes. The nerve-ring in *C. minor* is placed at an angle of forty-five degrees with the body axis. The lateral fields are one-fourth as wide as the body. The tail is conoid to the terminus, which is one-third as wide as the base of the tail and presents a small outlet for the secretion of the three caudal glands. These latter seem to be confined to the tail. The slightly projecting vulva leads into a vagina reaching half-way across the body. Each of the uteri often contains a roundish egg, which is deposited before segmentation begins. The ovaries reach fully three-fourths of the way back to the vulva, and each contains about a dozen developing ova arranged in single file.

$$\frac{\cdot 6 \quad 8\cdot 3 \quad 14\cdot \quad -M \quad 89\cdot}{1\cdot 3 \quad 2\cdot 7 \quad 3\cdot 1 \quad 3\cdot 8 \quad 2\cdot 7}$$ 1·13 mm.

The male tail is like that of the female, except that the anus projects slightly. Hairs occur both in front of and behind the anus. Notable for their larger size are

two ventrally submedian hairs situated opposite each other just in front of the anus. A row of from fourteen to twenty ventral accessory sexual organs, occupying a space twice as long as the tail, occur in front of the anus. The distance between any two adjacent components of this series of organs gradually increases anteriorly, as does the size of the organs. As to the structure and function of these organs, I have been able to form satisfactory conclusions. I have already pointed out the existence in the male of *Monhystera mas-papallatus* of a ventral row of minute unicellular glands, and also the existence in the male of *Dorylaimus Langii* of a ventral row of innervated papillæ. In my little *Chromadora*, however, I have clearly seen that each of these ventral accessory organs is supplied with both a nerve and a unicellular gland. The nature and position of the details will be best understood by consulting the figures. One now sees clearly how these accessory organs may serve the male during copulation. The sensitive nerve-end coming in contact with the female acts either in a reflex manner on the gland, or through the voluntary nervous system, and causes it to pour out its secretion. Concerning the function of the secretion, we must judge from other genera, such as *Rhabditis*, where the male is known to cement himself firmly to the female during copulation. We may therefore suppose the secretion of the glands to serve also in *Chromadora* the function of cementing the male to his mate, although, so far as I know, the act of copulation has

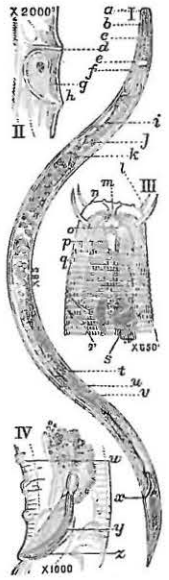


FIG. 6.—I, male of *Chromadora minor*. II, one of the ventral accessory organs of the same worm. III and IV, head and anal region of the same worm.

*a*, pharynx.
*b*, eye-spots.
*c*, œsophagus.
*d*, *h*, ventral accessory organ.
*e*, nerve-ring.
*f*, excretory pore.
*g*, gland of accessory organ.
*i*, ventral gland.
*j*, organ of unknown nature.
*k*, blind end of testicle.
*l*, cephalic seta.
*m*, ribs of pharyngeal opening.
*n*, papilla.
*o*, dorsal tooth.
*p*, pharynx.
*q*, stria.
*r*, sub-cephalic seta.
*s*, dorsal eye-spot.
*t*, intestine.
*u*, one of the ventral male accessory organs.
*v*, ejaculatory duct.
*w*, one of the accessory organs.
*x*, anus.
*y*, left spiculum.
*z*, accessory piece.



never been seen in *Chromadora*. In some members of *Monhystera* the male coils himself around the female once or twice, so that in that genus the ventral row of minute glands may serve to keep him from slipping. The same is almost equally probable in *Chromadora*. These statements are necessarily cautiously made, but I believe they rest on a firmer basis of observed fact than any previous remarks on the same subject. The two equal spicula are apparently of uniform size throughout, but are not so in reality. There is an anterior thin and less conspicuous part, which easily escapes observation, and which, taken together with the more conspicuous shaft, causes the organ to have somewhat the form, when seen in profile, of a segment of a circle. The distal three-fifths of the more conspicuous part, *i.e.*, the shaft, is slightly arcuate. The proximæ are not expanded. The entire length of each spiculum is considerably greater than the anal body-diameter. Arranged parallel to the spicula are two accessory pieces, two-thirds as long as the spicula themselves. The blind end of the single straight testicle is situated as far behind the cardiac constriction as the latter is behind the anterior extremity. The ejaculatory duct begins somewhat anterior to the row of supplementary organs. The spermatozoa are of such a size that six side by side would reach across the œsophagus.

*Hab.*—This little worm was very common among algæ in Port Jackson, New South Wales, Australia, 1893.

## V. PLATYCOMA, new genus.

P. CEPHALATA, n.sp. Female unknown.

$$\frac{\cdot8\ 4\cdot\ 15\cdot\ -M-^{20}\ 97\cdot6}{\cdot4\ \ \cdot6\ \ \cdot6\ \ \cdot6\ \ \cdot7}$$ 9·7 mm. The smooth and rather thin skin bears hairs throughout the length of the animal, but these are inconspicuous except on the head and anterior part of the neck, where they are long and slender. The neck is cylindroid, diminishing suddenly at the head. The latter is rounded in front, and is set off from the neck by a broad and shallow constriction. There are ten cephalic setæ of equal size arranged in the usual manner, one being situated on each lateral line and two on each submedian

line. Their average length is equal to the width of the head. The lateral organs are roundish, but are slightly broader than long; they are one-third as wide as the head. Two flat hairs of unequal length grow from the inner margin of the anterior border of each lateral organ. The larger of these hairs, the dorsal, is equal in length to the cephalic setæ. It is from these peculiar hairs that I have named the genus. The lips are three in number and apparently of large size; each is surmounted by a low mammillate conical papilla. The pharynx is narrow, almost tubular, but expands very slightly half-way back, and ends opposite the anterior border of the lateral organs. There are no eyes. The cylindrical œsophagus is one-half as wide as the neck, and is separated from the intestine by a distinct constriction. The cardia is rather large. The intestine is two-thirds as wide as the body, and is composed of large cells, only four to five being required to build the circumference. I could discover no ventral gland in the only specimen examined. The longitudinal fields are one-fourth as wide as the body. Large cells occur at frequent intervals between the intestine and the body wall. The tail is arcuate, conical, and apparently destitute of caudal glands. The two equal linear slightly arcuate spicula have a length equal to that of the anal body-diameter, and when seen in profile make an angle of forty-five degrees with the axis of the body. The proximal ends are slightly expanded. There are no papillæ before or behind the anus. Two low ventral swellings occur in front of the anus; that nearest the anus is removed a distance twice as great

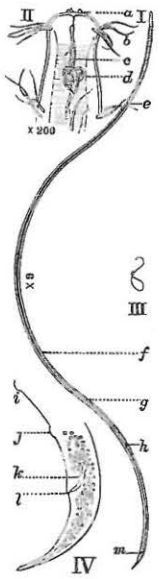


Fig. 7.—I, male *Platycoma cephalata*. II, head of same more highly magnified. III, the same worm natural size. IV, tail end of same worm highly magnified.

*a*, one of the three labial papillæ.
*b*, cephalic setæ.
*c*, pharynx.
*d*, lateral organ.
*e*, posterior end of œsophagus.
*f*, blind end anterior testicle.
*g*, junction of testicles.
*h*, blind end posterior testicle.
*i*, *j*, ventral accessory organs (?).
*k*, left spiculum.
*l*, anus.
*m*, anus.



as the length of the spicula, and the second is twice as far from the anus as the first. These are probably accessory sexual organs, and a secretion appears to have flowed from each of them. I could make out nothing concerning the internal structures connected with these swellings, and cannot state positively that they are not slight breaks in the skin caused by the hot sublimate in which the specimen was plunged for fixation. The testicles are situated in the third fourth of the body.

*Hab.*—Marine sand, Bay of Naples, 1888.

## VI. Monhystera, Bastian.

1. Monhystera diplops, n.sp. $\frac{1\cdot}{2\cdot2}$ $\frac{10\cdot}{3\cdot4}$ $\frac{17\cdot}{3\cdot5}$ $-62\cdot\frac{34}{4\cdot2}$ $\frac{84\cdot}{3\cdot}$ ·9 mm. I have had great interest in examining this beautiful and active little animal. It is so small that all its organs can be examined without difficulty, and yet, notwithstanding its small size, it is one of the most perfectly developed of all the Monhysteras. Its transparent skin seems quite destitute of markings, but bears short inconspicuous hairs throughout the length of the body. The neck is conoid, and terminates anteriorly in a sub-truncate head, whose setæ, six in number, are about one-fourth as long as the diameter of the anterior part of the neck, though they are somewhat longer on the male. Each of the six lips bears a papilla. The distance of the circular lateral organs from the anterior extremity of the worm is about equal to the width of the head; the organs themselves are only one-fifth as wide as the head. Two reddish-brown spherical eyes are situated in the dorsal submedian region, just behind the bottom of the pharynx, nearly opposite the lateral organs. The simple conoid pharynx extends to nearly opposite the lateral organs. The anterior three-fourths of the cylindroid œsophagus is only one-half as wide as the neck; in the remaining part, however, it gradually expands to two-thirds the width of the neck. The lining of the œsophagus, when seen in optical section, is conspicuously crenate. The slightly brownish intestine, separated from the œsophagus by a deep and distinct constriction, is three-fourths as wide as the body. The transparency of the cardiac region renders it possible to see the relatively large and deep cardia very plainly. The food seems to

consist largely, if not exclusively, of diatoms, several species of diatom-shells being nearly always discoverable in the digestive canal. The rectum is equal in length, in the female, to the anal body-diameter. The elongated post-cardiac ventral gland empties its excretion through a ventral pore situated opposite the lateral organs. The tail is conoid from the depressed anus; the secretion of the caudal glands finds exit at the slightly expanded naked and apiculate terminus. The depressed vulva leads to a vagina one-half as long as the body is wide. The uterus rarely contains more than a single egg,—unsegmented,—about as long as the body is wide and one-half as wide as long. The blind end of the ovary lies about as far behind the cardiac constriction as the nerve-ring is in front of it.

$\frac{1\cdot\ \ 7\cdot\ \ 15\cdot\ \ -M\ \ 85\cdot3}{1\cdot8\ \ 3\cdot\ \ 3\cdot3\ \ 4\cdot\ \ 3\cdot}$ ·8 mm. The tail of the male is precisely like that of the female, if we except its tendency to be ventrally arcuate. The two equal linear almost uniformly arcuate spicula, twice as long as the anal body-diameter, are of uniform size, the proximæ being remarkable, not on account of any expansion or contraction as is often the case, but on account of the rather sudden straightening of those parts of the spicula; finally it is to be noticed that the middle parts of the spicula are situated well toward the dorsal side of the body. The accessory pieces are one-fourth as long as the spicula, and when seen in profile are somewhat

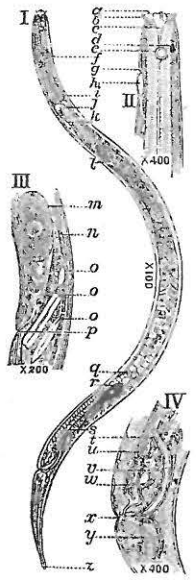


FIG. 8.—*Monhystera diplops.*

I, male worm. II, and IV, head and anal region of the same worm more highly magnified. III, portion of the body of a female, showing the vulva.

*a*, lip.
*b*, cephalic seta.
*c*, pharynx.
*d*, eye.
*e*, lateral organ.
*f*, nerve-ring.
*g*, excretory pore.
*h*, ampulla.
*i*, posterior end œsophagus.
*j*, cardia.
*k*, ventral gland.
*l*, blind end of testicle.
*m*, egg.
*n*, intestine.
*o*, *o*, *o*, diatoms in intestine.
*p*, vulva.
*q*, junction of vas deferens and ejaculatory duct.
*r*, one of the caudal glands.
*s*, ejaculatory duct.
*t*, proximal end left spiculum.
*u*, posterior part of ejaculatory duct.
*v*, shaft, left spiculum.
*w*, rectum.
*x*, anus.
*y*, accessory piece.
*z*, terminus.



hammer-shaped, being of the sort that possess a backward pointing process, which is here arcuate. The ejaculatory duct begins at a distance from the anus equal to twice the length of the tail. It is possible that a pre-anal row of gland-outlets exists on the male, but I could make out nothing very definite. The caudal glands are three in number, and are situated, one behind another, some distance in front of the anus.

This vivacious little worm is common in Port Jackson, New South Wales, Australia (1892), on marine algæ and in sea-sand at their base wherever the water is not foul. Its movements are of the most active kind; for a time it will wriggle so rapidly as to be almost invisible, then, without an instant's notice, come to a perfect standstill with lightning-like rapidity, lie for some time as if dead, then suddenly resume activities. It seems to be almost wholly diatomivorous, and is able to swallow with ease a diatom nearly half as long as its own neck and one-fourth as wide—a veritable sword-swallower. The frustules of the diatoms appear never to be digested.

2. M. BREVICOLLIS, n.sp. $\frac{\cdot2\ \ 5\cdot\ \ 9\cdot\ \ -59\cdot^{25}\ \ 76\cdot}{1\cdot\ \ 1\cdot5\ \ 1\cdot9\ \ 2\cdot\ \ 1\cdot4}$ 1·7 mm. This is a species that needs further study before its character will be sufficiently known to settle its affinities. The cuticle is transversely striated and bears short and inconspicuous hairs. The neck is conoid and the head is somewhat rounded. The cephalic setæ are ten in number, those of each submedian pair being of unequal size; in addition there are numerous subcephalic setæ, prominent among them being four long and slender submedian ones, situated as far behind the lateral organs as the latter are behind the anterior extremity of the body. There are three pairs of transparent confluent lips. The circular lateral organs are one-third as wide as the neck. The simple pharynx is excessively small. The œsophagus is one-half as wide as the neck and is separated from the intestine by a shallow but distinct constriction. The intestine, whose contents are manifestly of vegetable origin, is composed of cells packed closely with granules without a tessellated arrangement. The ventral excretory pore appears to

be situated near the broad and oblique nerve-ring. The anterior half of the tail is conoid; thence it is narrow and cylindrical, being about one-eighth as wide as at the slightly elevated anus. The terminus, which is only very slightly swollen, bears three long hairs near the outlet of the caudal glands. The region about the vulva is slightly elevated. The vagina is four times as long as the body is wide. The eggs, which are three times as long as the body is wide and only one-fourth as wide as long, are deposited before segmentation begins. The spermatozoa seen in the uterus appeared to be spherical and one-fourth as wide as the body of the female.

*Hab.*—Found in sea-sand near low-tide mark, Port Jackson, New South Wales, Australia, 1893.

3. M. LATA, n.sp. $\frac{1\cdot\ 9\cdot\ 24\cdot\ -65\cdot\ 82\cdot}{2{\cdot}2\ 3{\cdot}3\ 4\cdot\ 5\cdot\ 3\cdot}$ 1·64 mm. The transversely striated cuticle of this plump and graceful little worm bears throughout the length of the body none but short and inconspicuous hairs. The truncate head surmounts a conoid neck, from which it is set off by slight expansion. The circle of cephalic setæ is arranged somewhat behind the anterior margin of the head, each seta being about two-thirds as long as the head is wide. The mouth is surrounded by six large transparent confluent lips, each of which bears a papilla. Circular lateral organs, one-fourth as wide as the head, are placed on the neck at a distance from the anterior extremity equalling their own width four times over. The oblate anterior and larger part of the pharynx has a depth half as great as the diameter of the head; thence the pharynx tapers abruptly. The œsophagus, which is one-half as wide as the neck, and whose lining when seen in optical section presents a sinuous appearance, is separated from the brownish intestine by a distinct cardiac constriction. The cardiac region being transparent, the large cardia can be distinctly seen, and behind it a rather distinct cardiac cavity. The intestine, whose cells are packed with granules giving rise to a rather dense tessellation, often contains among other vegetable matter a quantity of diatoms. From the depressed anus the tail, which bears a



considerable number of hairs, especially ventrally submedian ones, is conoid to the slightly expanded three-haired terminus, where the very sticky secretion of the caudal glands finds exit.

$\frac{1\cdot\ 10\cdot\ 23\cdot\ -M\ 84\cdot}{1{\cdot}9\ 2{\cdot}9\ 3{\cdot}6\ 4{\cdot}2\ 2{\cdot}9}$ 1·6 mm. Except for being somewhat shorter and arcuate, and possessing a rather prominent anus, the tail of the male is precisely like that of the female. The two equal linear spicula are of uniform size, being curved in the middle and having a length one and a half times as great as the anal body-diameter; their proximæ are cephalated by expansion. The accessory pieces are one-half as long as the spicula and have their proximal ends expanded. Two long submedian hairs occur opposite each other just in front of the anus.

*Hab.*—This Nematode is not uncommon in marine sand and mud, Port Jackson, New South Wales, Australia, 1893.

4. M. SETOSISSIMA, n.sp. $\frac{\cdot8\ 6{\cdot}7\ 17\cdot\ -57\cdot^{20}\ 81\cdot}{1{\cdot}9\ 3{\cdot}4\ 3{\cdot}9\ 3{\cdot}8\ 2{\cdot}8}$ 1·41 mm. This remarkable form presents simple transverse striæ, resolvable with moderate powers. Throughout the length of the body the cuticle bears numerous slender hairs, whose length is about equal to three-fourths the width of the body. The cephalic setæ are particularly numerous, the larger ones being much stouter and longer even than those found on the body. The cephalic row of setæ is situated near the anterior margin of the head, and must not be confounded with the four pairs of subcephalic setæ growing close by; these latter are only half as long as the largest of the true cephalic hairs. The longest hairs in the true cephalic row are, as usual, the submedian ones; of these there are eight, all of equal length, growing in pairs, one pair on each submedian line. Next in size to these, and almost as long, are four sublateral hairs; these grow one on either side of each lateral line. Alternating with these and with the submedian pairs are eight very much shorter hairs. Thus it will be seen that the full complement is twenty hairs. Add to these the four pairs of subcephalic setæ, and we have in all twenty-eight hairs. To what end, one naturally asks, has this armature been developed? Most probably these hairs are tactile and serve to guide the worm in its peregrinations

among the particles of the sand in which it lives. The great length of the cephalic hairs is a frequent characteristic of sand-inhabiting species. I am uncertain about the nature of the lips, but the mouth is capacious and in form like that of other species of *Monhystera*. The distance of the circular lateral organs from the anterior extremity is about equal to twice the width of the head; they have a central fleck and are one-third as wide as the forward part of the neck. The œsophagus, which is two-thirds as wide as the neck, presents a distinct chitinous lining and is separated from the intestine by a shallow but distinct constriction. The rather thick-walled intestine is two-thirds as wide as the body. The ventral excretory pore is situated somewhat behind the oblique nerve-ring; the unicellular gland, for which it serves as the outlet, lies behind the cardiac region. The lateral fields are one-third as wide as the body. The anterior half of the tail is conoid; thence it is cylindrical and one-fourth as wide as at the anus. The terminus is scarcely expanded and bears two hairs, each one-half as long as the tail. Caudal glands are present. Both the anus and the vulva are slightly depressed. The eggs are one-half as wide as the body, and somewhat longer than wide; they are deposited before segmentation begins.

$\frac{\cdot7\ \ 7{\cdot}4\ \ 16{\cdot}\ \ -M\ \ 84{\cdot}}{1{\cdot}6\ \ 3{\cdot}1\ \ 3{\cdot}2\ \ 3{\cdot}7\ \ 2{\cdot}9}$ 1·5 mm. The two equal linear spicula are of nearly uniform size throughout, their proximæ being scarcely cephalated; they are slightly bent near the middle and are one and one-third times as long as the anal body-diameter. The obscurely sigmoid accessory pieces are two-thirds as long as the spicula, the plane in which they may be said to lie being perpendicular to the body axis. In the distal half they are parallel to the spicula; thence they curve away from the spicula. The blind end of the testicle lies as far behind the cardia as the latter is behind the nerve-ring. The anal region is elevated.

*Hab.*—This worm is not uncommon about Port Jackson, New South Wales, Australia, 1893, in marine mud and sand.

5. M. GRACILLIMA, n.sp. $\frac{1{\cdot}\ \ 7{\cdot}4\ \ 19{\cdot}\ \ -68{\cdot}^{33}\ \ 86{\cdot}}{1{\cdot}5\ \ 2{\cdot}1\ \ 2{\cdot}5\ \ 3{\cdot}\ \ 2{\cdot}}$ 1·7 mm. This exceedingly graceful and fascinating species is characterised by



the numerous long and delicate hairs that occur throughout the length of the body; these hairs are about three-fourths as long as the greatest diameter of the body. The thin cuticle is transversely striated. The neck is conoid, and ends in a slightly expanded truncate head, which bears ten setæ, each about one-third as long as the head is wide, those of the submedian pairs being a little unequal in size. Each of the six large confluent lips bears a single minute papilla. The circular lateral organs, one-third as wide as the head, are situated at a distance from the anterior extremity equal to twice the width of the head. Eyes are lacking. The large pharynx is pretty nearly balloon-shaped. The cylindroid œsophagus is one-half to two-thirds as wide as the neck, the lining appearing sinuous when seen in optical section. The brownish intestine is two-thirds as wide as the body, and the cells of which it is composed contain granules which are so arranged as to give rise to an obscure tessellation. The length of the curved rectum is equal in the female to the anal body-diameter. The nature of the ventral gland remains unknown, but the ventral pore, its outlet, is situated opposite the posterior border of the lateral organs. The tail is conoid from the depressed anus, and ends in a rounded outlet for the secretion of the caudal glands. The vulva is large, and near it lies a large transparent organ, most likely a glandular structure; the oblique vagina is one-half as long as the body is wide. The eggs are elongated,—somewhat longer than the body is wide, and less than half as wide as long. There appears to be no posterior branch to the female sexual apparatus.

$\frac{\cdot8\ \ 8{\cdot}\ \ 20{\cdot}{\cdot}\ \ -M\ \ 90{\cdot}}{1{\cdot}5\ \ 2{\cdot}\ \ 2{\cdot}4\ \ 2{\cdot}6\ \ 2{\cdot}2}$ 1·5 mm. The male tail resembles that of the female, except that the anus is elevated; the whole posterior part of the male is inclined to be ventrally arcuate or even coiled. The two equal pointed linear spicula are arcuate in the middle, and present proximal ends cephaloid by expansion and bent dorsally; they are somewhat less than twice as long as the anal body-diameter. The accessory pieces are of the kind presenting a backward pointing process, which here seems, when seen in profile, to lie at an angle of forty-five degrees with the body axis, and to extend somewhat more than half-way across the body.

Apparently there exists a ventral row of pre-anal supplementary organs of small size, but they were only to be seen dimly.

*Hab.*—I found this species inhabiting mud and sand at Neutral Bay, Port Jackson, New South Wales, Australia. 1893. It appeared to be common.

6. M. AUSTRALIS, n.sp. $\frac{1\cdot\ 7{\cdot}8\ 20\cdot\ -58-\ ^{38}\ 78\cdot}{2\cdot\ 2{\cdot}8\ 3{\cdot}1\ 3{\cdot}1\ 2{\cdot}1}$ 1·32 mm. The thin transparent cuticle presents faint and fine transverse striæ, and bears inconspicuous hairs throughout the length of the body. The conoid neck terminates in a somewhat rounded head bearing ten setæ arranged in the usual manner. The lip-region is transparent and the lips themselves are one-half as high as the head is wide, and are destitute of papillæ. The circular lateral organs are one-third as wide as the head, and are removed from the anterior extremity a distance twice as great as the width of the head. The pharynx, broad opposite the lips, narrows thence, and ends half-way to the lateral organs, and is therefore comparatively large. The œsophagus in its anterior part is two-thirds as wide as the corresponding part of the neck; posteriorly the neck widens, and there the œsophagus is consequently only one-half as wide as the neck. The lining of the œsophagus is distinctly to be seen. The thick-walled intestine begins at once at the distinct cardiac collum to be wider than the œsophagus—namely, three-fourths as wide as the body. The cardia is not large, but is distinct. The cells of the intestine, as usual, contain numerous granules. The rectum in the female is as long as the anal body-diameter. The nature of the ventral gland is unknown to me. The nerve-ring encircles the œsophagus squarely. The tail is conoid from in front of the inconspicuous anus, and ends in a slight expansion bearing two hairs near where the secretion of the caudal glands is poured out. The length of the vagina is equal to half the width of the body, and it ends outwardly in an inconspicuous vulva. The eggs are half as wide as the body and three times as long as wide. The smaller posterior ovary reaches nearly half-way to the anus; the anterior ovary ends at three-fourths the distance from the vulva to the cardiac constriction. The male has not been seen.



*Hab.*—Found in sea-sand, near low-tide mark, Port Jackson, New South Wales, Australia, 1893.

## VII. BATHYLAIMUS, new genus.

This genus is apparently related to *Oncholaimus*. The mouth-cavity is large and two-chambered, the posterior chamber being much the smaller, but there is an entire absence of the teeth characteristic of *Oncholaimus*. The lips are converted into powerful grasping organs armed with tactile hairs. The three caudal glands are small, and are confined to the tail. The rather short equal spicula are enlarged at the distal extremity and slide in guides of unusual size. The ductus empties through a distinctly chitinous outlet. The testicle has a segmented appearance owing to the peculiar way in which the spermatozoa are developed.

B. AUSTRALIS, n.sp. $\frac{2{\cdot}5\ 6{\cdot}3\ 17\cdot\ {}^{\cdot}51^{\cdot 20}\ 94\cdot}{1{\cdot}4\ 1{\cdot}6\ 1{\cdot}8\ 2{\cdot}4\ \cdot 9}$ 2·mm. The thin transparent skin is destitute of striæ, but bears hairs throughout the length of the worm, those on the head and at the end of the tail being the more conspicuous on account of their greater length. The conoid neck terminates in a head somewhat rounded in front and bearing, somewhat in front of the middle of the anterior part of the pharynx, twelve setæ arranged as follows: one long one on each lateral line; a long one and a short one on each of the four submedian lines. The larger of these setæ are somewhat longer than the head is wide. Each of the three lips is bidentate at the extremity, and armed just below the summit with two curved hairs which project forward

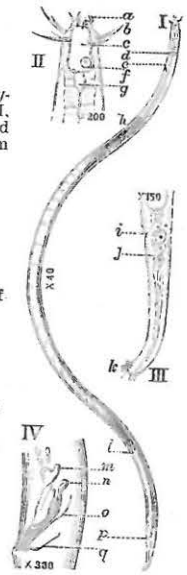


FIG. 9.—I, male of *Bathylaimus australis*. II, III, and IV, the head, tail, and anal region of the same worm more highly magnified.

*a*, labial setæ.
*b*, cephalic setæ.
*c*, pharynx.
*d*, nerve-ring.
*e*, excretory pore.
*f*, lateral organ.
*g*, posterior chamber of pharynx.
*h*, blind end of testicle.
*i*, anus.
*j*, three caudal glands.
*k*, hairs at terminus of tail.
*l*, posterior end of testicle.
*m*, beginning of cloaca or rectum.
*n*, proximal end of spiculum.
*o*, *q*, accessory piece.
*p*, anus.

and inward,—manifestly tactile hairs. The lateral organs are one-sixth as wide as the head; they appear to be circular with a central button, but are really spiral, and are situated as far behind the cephalic setæ as the latter are behind the mouth. There are no eye-spots. The pharynx is double, the anterior chamber being half as wide as the head and twice as long as wide, and the posterior chamber being half as wide and one-fourth as long as the anterior part. Both chambers are tolerably uniform in diameter, but the anterior expands a little in the region of the cephalic setæ. The conoid œsophagus is separated from the intestine by a distinct but not deep cardiac collum. The intestine is three-fourths as wide as the body, and its thin wall is built of small cells of such a size that about sixteen side by side make the circumference. The intestine commonly contains what appears to be vegetable matter. The length of the rectum equals that of the anal diameter of the body. There is a ventral gland. The nerve-ring is slightly oblique. The slightly incurved tail ends in a blunt rounded terminus one-third as wide as the base of the tail. The three small caudal glands are confined to the tail.

$\frac{2{\cdot}5\ \ 6{\cdot}\ \ 18{\cdot}\ \ -M\ \ 95{\cdot}}{1{\cdot}4\ \ 1{\cdot}6\ \ 1{\cdot}7\ \ 2{\cdot}\ \ 1{\cdot}5}$ 2·mm. The tail of the male closely resembles that of the female. There is no bursa or other supplementary organ, and apparently no papillæ. The two equal linear spicula are slightly bent near the middle, and are enlarged near the pointed distal extremity; they are one and one-third times as long as the anal body-diameter, or about one-third as long as the tail, and their proximæ are cephaloid by expansion. The large accessory pieces are three-fourths as long as the spicula and are in contact with them in the distal half. The narrow ejaculatory duct is three times as long as the tail, and has a chitinous outlet parallel with the spicula. The spermatozoa appear to develop in batches, and the testicles, therefore, present a peculiar appearance,—as if separated by thick transverse walls into a number of chambers, or as if in a manner segmented.

*Hab.*—Port Jackson, New South Wales, Australia, 1891.



## VIII. Synonchus, new genus.

The worms constituting this genus are also related to *Oncholaimus*. They have a pharynx armed with teeth of which the dorsal is prominent and the submedian rudimentary. The pharynx is so small that the teeth occupy most of the available space when the mouth is closed. The œsophagus contains the three glandular structures first seen by Marion in the œsophagus of *Enoplus*, and afterwards fully described and elucidated by de Man in *Oncholaimus*. In *Synonchus* the dorsal gland has the peculiarity of emptying into the lumen of the œsophagus at some distance from the mouth, a fact which adds weight to the opinion that these organs are salivary glands. The only other function that has occurred to me as possibly assignable to these organs is that of secreting a venomous fluid. The sexual organs, so far as known, are symmetrical in both sexes. The males possess a ventral accessory organ in front of the anus. I failed to find in the only female examined the tubular organs discovered by de Man in the females of *Oncholaimus*.

1. S. fasciculatus, n.sp. $\frac{2{\cdot}\ \ 5{\cdot}7\ \ 19{\cdot}\ \ {\cdot}60{\cdot}23\ \ 97{\cdot}}{{\cdot}6\ \ 1{\cdot}2\ \ 1{\cdot}3\ \ 1{\cdot}4\ \ {\cdot}9}$ 8·8mm. is the formula for the only female seen—probably a smallish one. The subcuticula is very finely transversely striated. Short hairs occur on all parts of the body, but near the head they are particularly abundant and are arranged in a fasciculate manner. The conoid neck terminates anteriorly in a truncate head, surrounded opposite the base of the narrow pharynx by the usual row of ten cephalic setæ, —one on each lateral line and two on each submedian line, all of about equal length, namely, one-third as long as the head is wide. The three lips are rather indistinct, but plainly they close together over the pharynx, which presents a single sharp dorsal tooth half-way up and two rudimentary teeth at the base. The dorsal salivary gland empties into the lumen of the œsophagus at one-fourth the distance from the mouth to the nerve-ring. The œsophagus is at first one-half as wide as the neck and gradually enlarges until finally it becomes two-thirds as wide as the neck. The cardiac collum is distinct. The thick-walled intestine is

one-half as wide as the body, and is composed of small cells of such a size that it takes about sixteen to build the circumference. I could discover no ventral gland. The lateral fields are one-third as wide as the body. The tail is conical in the anterior third, and continues thence, cylindrical—and one-third as wide as at the anus,—to the swollen terminus. The three elongated caudal glands are confined to the tail. The vulva is large and somewhat prominent. The eggs are thin-shelled and more than twice as long as the body is wide, and only one-fifth as wide as long. The ovaries extend three-fourths the way back to the vulva, and contain about a dozen developing ova.

$\frac{\cdot2\ \ 5\cdot\ \ 16\cdot\ \ -M-^{17}\ \ 97\cdot3}{\cdot4\ \ \cdot8\ \ 1\cdot\ \ 1\cdot\ \ \cdot8}$ 11·13 mm. The tail of the male resembles that of the female in form, but the caudal glands, instead of being confined to the tail, extend forward beyond the anus a distance equal to the length of the tail; like those of the female they are much elongated. There is an accessory sexual organ placed ventrally and opposite the proximal ends of the spicula. The latter are equal, linear, slightly and uniformly arcuate, and are slightly expanded at the proximal end; they are half as long as the tail and slide in accessory pieces nearly half as long as they themselves are. The accessory pieces are supported by a process which extends from the anus halfway across the body. Two irregular rows of submedian hairs become prominent opposite the spicula and on the tail; there are

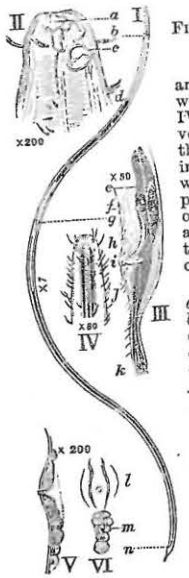


FIG. 10.—*Synonchus fasciculatus.*

I, male worm. II, head, and III, tail of the same worm more highly magnified. IV, head of a young worm, ventral view, to show the three glands (drawn black) inside the œsophagus, one of which empties into the œsophagus tube far behind the other two. V and VI, lateral and ventral views respectively of the male accessory organ.

*a*, pharynx.
*b*, nerve-ring.
*c*, lateral organ.
*d*, beginning of the intestine.
*e*, caudal glands.
*f*, accessory organ.
*g*, junction of the two testicles.
*h*, subventral hairs or papillæ.
*i*, anus.
*j*, hairs.
*k*, terminus.
*l*, ventral organ.
*m*, cells of same.
*n*, anus.



fifteen or twenty such hairs in each row, of which the larger and the larger number occur in front of the anus. The testicles are short, and occur in the second fourth of the body.

*Hab.*—Marine sand, Bay of Naples, 1888.

2. S. HIRSUTUS, n.sp. Female unknown.

$\frac{\cdot2\ \ 5\cdot\ \ 16\cdot\ \ -M-^{14}\ \ 97\cdot}{\cdot4\ \ \cdot7\ \ \cdot8\ \ \cdot8\ \ \cdot8}$ 12·8 mm. The subcuticula is very finely and obscurely striated. Long slender hairs occur throughout the length of the body, but are specially abundant on the anterior part of the neck. The ten cephalic setæ are arranged as in *fasciculatus*, but are here easily confounded with the hairs of the neck growing near by. The neck is cylindrical, and terminates in a truncate-conical head. The three lips surround a narrow mouth which leads into a short narrow pharynx containing a single small dorsal tooth. The circular lateral organs occur opposite the base of the pharynx, and are one-third as wide as the head. There are no organs of vision. The œsophagus is at first two-thirds as wide as the neck, but soon becomes reduced to one-half as wide as the neck and so continues. The two submedian salivary glands empty into the pharynx; I did not discover the outlet of the dorsal gland. The intestine is separated from the œsophagus by a distinct constriction, and is thick-walled and one-half as wide as the body. The cardia is very large and long. The cells of the intestine are of such a size that six build the circumference. I could find no ventral gland. The lateral fields were one-third as wide as the body. The tail constructed as in *fasciculatus*, but the elongated caudal glands are here confined to the tail, in the male at least. Supplementary organ and hairs situated precisely as in *fasciculatus*, but the hairs less conspicuous. The spicula are not so slender as in *fasciculatus*, and are one-third as long as the tail, and they are supported by accessory pieces having a more prominent posterior process.

*Hab.*—Marine sand, Bay of Naples, 1888.

## IX. LAXUS, new genus.

*Laxus* is a genus of short-necked, slender and flexible worms, inhabiting marine sand; they are usually much coiled and slow

of motion, and are, therefore, readily recognised. I have seen only the male of one species and the female of a second. The female of *L. contortus* has two symmetrically reflexed ovaries. The male of *L. longus* seems to have but a single testicle. There are no eyes.

1. L. CONTORTUS, n.sp. $\frac{\cdot4\ \ 1{\cdot}3\ \ 2{\cdot}4\ \ {}^{\cdot37}_{\cdot50}\ \ 97{\cdot}8}{\cdot4\ \ \cdot4\ \ \cdot4\ \ \cdot5\ \ \cdot3}$ 4·7 mm. The cuticle, which bears very inconspicuous hairs throughout, is traversed by very fine plain transverse striæ. The cylindrical neck terminates in a truncate head whose anterior margin bears six slender setæ, each as long as the head is wide. The spiral lateral organs are circular in appearance; they are one-fourth as wide as the head, and their anterior margins are opposite the bases of the cephalic setæ. The mouth is a shallow depression in the middle of the front of the head, and leads to a straight closed pharynx, indistinguishable from the œsophagus but for an almost imperceptible pharyngeal swelling, which in its widest part is one-third as wide as the head. The œsophagus is a tube only one-fifth as wide as the neck, but it expands at the posterior end to form a powerful, nearly spherical, sucking bulb three-fourths as wide as the neck. The cardiac collum is distinct, and leads to an intestine whose diameter is at first very small, and nowhere exceeds one-third the width of the body. The cells of the intestine are large, two to three building the circumference, and contain numerous brown granules. The rectum is longer than the anal body-diameter. The nature of the ventral gland is unknown to me. The lateral fields are probably one-half as wide as the body. The nerve-ring is oblique. The three caudal glands are confined to the tail, and their secretion has exit at the blunt terminus. The tail is conoid, being about half as wide at the terminus as at the anus. The reflexed portion of the ovaries extends about one-third the way back to the vulva. The thin-shelled eggs are arranged in a single row and fill the body cavity well up; they are four to five times as long as wide, and are apparently deposited before segmentation begins. Male unknown.

*Hab.*—Marine sand, Bay of Naples, 1888.



2. L. LONGUS, n.sp. Female unknown.

$\frac{\cdot5\ \ 1{\cdot}2\ \ 2{\cdot}\ \ (?)\text{—}M\ \ 98{\cdot}4}{\cdot5\ \ \cdot6\ \ \cdot6\ \ \cdot7\ \ \cdot8}$ 6·4 mm. The finely and plainly striated cuticle bears hairs throughout. The neck and head closely resemble those of the preceding species, but the cephalic setæ number at least eight (possibly ten), there being two setæ of unequal size placed on each submedian line; the setæ are of the same long, slender and flexible structure found in *contortus*. The lateral organs are manifestly spiral, the left being a right-handed spiral and the right a left-handed spiral; they are one-third as wide as the head, and are situated opposite the cephalic setæ on the margin of the head. The mouth and pharynx are more pronounced than in *contortus*, the former being a conoid depression with transverse chitinous ridges, and the latter being situated in a swelling more than one-third as wide as the neck. The œsophagus is one-fourth as wide as the neck, and expands posteriorly into a spherical bulb three-fourths as wide as the neck. The cardiac collum is distinct. The intestine, one-half as wide as the body, is composed of cells of such a size that two to three build the circumference; as in *contortus*, the cells contain brown granules. The nature of the ventral gland is unknown to me. The lateral fields are one-third as wide as the body. The nerve-ring, as in *contortus*, is oblique. The ventrally-arcuate conoid tail has a blunt rounded terminus, and presents five pairs of equidistant hairs on the ventral surface of the middle part. At the same distance from the anus, but in front of it, occur also five or six similar pairs of hairs. The two equal linear spicula

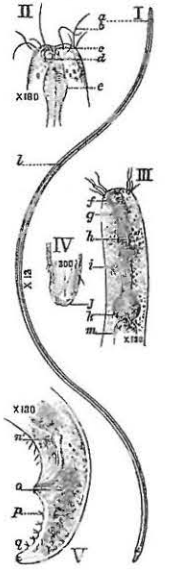


FIG. 11.—I, male of *Laxus longus*. II, III, IV, and V, the head, neck, tail-end, and anal region of the same more highly magnified.

*a*, hind end of œsophagus.
*b*, cephalic seta.
*c*, pharynx.
*d*, left lateral organ.
*e*, pharyngeal bulb.
*f*, lateral organ.
*g*, pharyngeal swelling.
*h*, œsophagus.
*i*, nerve-ring.
*j*, outlet for caudal glands.
*k*, cardiac bulb.
*l*, blind end of testicle.
*m*, intestine.
*n*, proximal end spiculum.
*o*, accessory piece.
*p*, *q*, postanal ventral papillæ.

are a little more than half as long as the tail, and are arcuate in the distal half; their proximal ends are cephaloid by expansion. The substantial accessory pieces are half as long as the spicula, and appear to be situated at right angles to the axis of the body.

*Hab.*—Marine sand, Port Jackson, New South Wales, Australia, 1890.

### X. Chromagaster, new genus.

The *Chromagasters* are slender slow-moving dark-coloured worms inhabiting marine mud and sand. They have a short neck, mitriform head, tubular pharynx, and very large circular lateral organs, and the sexual organs of both sexes are asymmetrical. The spicula of the males are supported by accessory pieces having a backward-pointing process.

1. C. nigricans, n.sp. Female unknown.

$\frac{\cdot4\ \ 2\cdot3\ \ 5\cdot\ \ -M\ \ 97\cdot7}{\cdot6\ \ \cdot8\ \ \cdot8\ \ 1\cdot\ \ \cdot9}$ 4·58 mm. The skin is traversed by about three thousand plain transverse striæ, and bears hairs throughout, but these latter are conspicuous only near the extremities. The cylindroid neck terminates in a mitriform head armed with two rows of slender and flexible setæ. The posterior row of six setæ encircles the head just in front of the large circular lateral organs; of the setæ in this row one seems to be dorsal, one ventral, and the other four submedian. The anterior row is situated half-way between the posterior row and the mouth, and appears to be composed of ten setæ arranged in the usual manner, that is, one on each lateral line, and two of unequal size on each submedian line. The largest of these cephalic setæ are as long as the head is wide. The projecting mouth is closely surrounded by six small pointed lips. The pharynx is unarmed and tubular and reaches as far back as the anterior border of the lateral organs. These latter are three-fourths as wide as the head and impart to the worm a peculiar appearance. There are no eyes. The tubular œsophagus is only one-third as wide as the neck, but expands in the posterior part to form an elongated bulb two-thirds as wide as the neck. The cardiac collum is distinct and narrow. The thick-walled intestine is three-fourths as wide as the body, and is composed of cells of such a size that about ten side by side make up the circumference.



These cells contain large dark-coloured granules, to which fact is due the blackish hue of the living worm. The ventral excretory pore is situated considerably behind the nerve-ring, the distance from the ring to the pore being about half as great as the distance from the pore to the cardiac region. There is a rather large ampulla and a widish duct; I could not make out the position of the gland of which they are the outlet. The tail is conical and slightly ventrally arcuate. I saw no caudal glands. There is no bursa or supplementary sexual organs other than several tactile hairs situated on the ventral side of the anterior half of the arcuate and conical tail. The two equal acute linear spicula are strongly arcuate and of nearly uniform diameter in the proximal half, but taper gradually to a point in the nearly straight distal half. They are twice as long as the anal body-diameter, or one-third as long as the tail, and are supported in action by accessory pieces having a process extending obliquely backward from near the anus.

*Hab.*—Marine sand, Bay of Naples, 1888.

2. C. purpurea, n.sp. $\frac{\cdot2\ \ 1\cdot2\ \ 2\cdot3\ \ -78\cdot^{43}\ \ 99\cdot7}{\cdot3\ \ \cdot4\ \ \cdot6\ \ \cdot9\ \ \cdot4}$ 7·46 mm. The striæ if present are excessively fine. Hairs occur throughout the length of the body, but are conspicuous only near the extremities. The neck tapers a little more than in *nigricans*, and ends in a somewhat more distinct mitriform head, the constriction behind the lateral organs being quite noticeable. The cephalic setæ are arranged in two rows, the posterior row of four submedian setæ surrounding the head just in front of the large circular lateral organs, and the anterior row of eight being much nearer the mouth, and being placed so that two of unequal size occur together on each submedian line. The setæ are shorter, stouter and stiffer than in *nigricans*, the largest of them being only half as long as the head is wide. The lateral organs are four-fifths as wide as the head. The mouth does not project, and the lips are very inconspicuous. The apparently unarmed tubular pharynx extends back as far as the posterior margins of the lateral organs. There are no eyes. The tubular œsophagus is only one-fourth as wide as the neck, but gradually expands in its posterior fourth so as to form

a bulb three-fourths as wide as the base of the neck. The cardiac collum is narrow and distinct. The thick-walled intestine is three-fourths as wide as the body, and is composed of pigmented cells of such a size that about ten build the circumference. The intestine imparts a purple-madder colour to the living worm. The lateral fields are about one-third as wide as the body. The ventral excretory pore is situated just behind the nerve-ring. The duct is narrow, and the ampulla rather indistinct; I did not discover the location of the gland. The tail in young specimens is conical and arcuate, but in adults is nearly hemispherical. I saw no caudal glands. The vulva is not conspicuous. The uterus usually contains a row of eight to ten thin-shelled eggs, each about twice as long as the body is wide, and less than half as wide as long. They are evidently deposited before segmentation begins. The spermatozoa are of such a size that four side by side reach across the uterus. The eggs being white or translucent sometimes give the living worm a segmented appearance. The ovary usually contains a row of sixteen to twenty developing ova, besides the large number of very immature ova contained in the blind end.

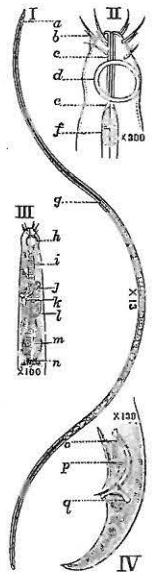


Fig. 12.—I, female *Chromagaster purpurea*. II, III, and IV, the head, neck, and anal region of the same worm more highly magnified.

*a*, posterior end of œsophagus.
*b*, cephalic setæ.
*c*, pharynx.
*d*, lateral organ.
*e*, beginning of œsophagus.
*f*, œsophagus.
*g*, blind end of ovary.
*h*, lateral organ.
*i*, œsophagus.
*j*, nerve-ring.
*k*, excretory pore.
*l*, unicellular gland (?).
*m*, cardiac bulb.
*n*, cardiac constriction.
*o*, proximal end left spiculum; also points out the vulva on the female.
*p*, shaft of spiculum.
*q*, accessory piece.

$\frac{\cdot3\ \ 1{\cdot}3\ \ 2{\cdot}8\ \ ?-M^{68}\ \ 98{\cdot}3}{\cdot4\ \ \cdot5\ \ \cdot6\ \ 1{\cdot}\ \ \cdot6}$ 6·41 mm. The tail of the male is conical and arcuate. There appear to be no caudal glands. There is no bursa or other supplementary sexual organ. The two equal slender spicula are uniformly arcuate, and are of nearly uniform size throughout; they are twice as long as the anal body-diameter and three-fourths as long as the tail. The accessory pieces are somewhat L-shaped.



*Hab.*—North Arm, Port Adelaide, South Australia, 1891.*

## XI. Solenolaimus, new genus.

The worms of this genus are short-necked and possess a narrow tubular pharynx. The anterior half of the œsophagus is narrow and weak, but the posterior half is large and muscular. The female sexual organs are asymmetrical.

S. obtusus, n.sp. $\frac{\cdot2\ \ \cdot8\ \ 1{\cdot}4\ \ -59^{49}\ \ 99{\cdot}4}{\cdot3\ \ \cdot4\ \ \cdot5\ \ \cdot8\ \ \cdot4}$ 21·5 mm. The thick transparent skin is destitute of striæ. The hairs are papilla-like and occur throughout the length of the worm. The neck is conoid, the head is rounded. The short spike-shaped cephalic setæ are all submedian in position and are arranged in two circles; the posterior row is half-way between the lateral organs and the mouth, while the anterior is much nearer the mouth. The minute lips are supplied with papillæ or teeth. The circular (?) lateral organs are about one-sixth as wide as the head and are situated opposite the posterior end of the pharynx. The anterior half of the œsophagus is spindle-shaped and in its widest part one-third as wide as the neck; the muscular posterior half is three-fourths as wide as the neck. The central constriction is surrounded by the nerve-ring. The cardiac collum is distinct and the cardia large and prominent. The

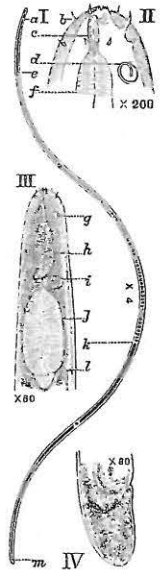


Fig. 13.—I, female of *Solenolaimus obtusus*. II, III, and IV, head, neck, and tail of the same worm more highly magnified.

*a*, posterior end of œsophagus.
*b*, cephalic setæ.
*c*, tubular pharynx.
*d*, lateral organ.
*e*, blind end of ovary.
*f*, œsophagus.
*g*, lateral organ.
*h*, œsophagus.
*i*, nerve-ring.
*j*, posterior swelling.
*k*, vulva.
*l*, cardiac collum.
*m*, anus.

* Since writing the above on *Chromagaster* (most of it in 1888), I have read Dr. de Man's description of his new genus *Siphonolaimus*. There is great resemblance in our species, but they are beyond doubt distinct. The genera will probably have to be united. I have failed to clearly see the spear-like structure mentioned by Dr. de Man and also the accessory organs on the tail-end of the male.

intestine is three-fourths as wide as the body and is built of cells of such a size that ten side by side make up the circumference. I could discover nothing concerning the ventral excretory gland. The longitudinal fields are one-fifth as wide as the body and are finely striated longitudinally. The tail is sub-cylindroid and is rounded at the terminus. There are no caudal glands. The eggs are arranged in a single row in the uterus; the ova, on the other hand, are in two or three parallel rows. Male unknown.

*Hab.*—Marine sand, Bay of Naples, 1888.

## XII. Fimbria, new genus.

F. tenuis, n.sp. Female unknown.

$$\frac{\cdot2\ \ 14{\cdot}5\ \ 24{\cdot}\ \ -M-\ \ 50\ \ 93{\cdot}}{\cdot3\ \ 1{\cdot}\ \ 1{\cdot}4\ \ 1{\cdot}6\ \ \cdot9}\ 1{\cdot}48\,\text{mm.}$$

The cuticle is not striated. Hairs abound on the tail, but are not conspicuous elsewhere. The neck is conoid to the slightly expanded naked head, which is rounded in front and contains a simple prismoid pharynx nearly half as wide as the head itself. The mouth is surrounded by minute bristles or bristle-bearing papillæ. The œsophagus, at first only one-half as wide as the neck, becomes in the cardiac region three-fourths as wide as the neck. The cardia is large and stains deeply with carmine; the cardiac constriction is deep. The intestine is three-fourths as wide as the body, and is composed of cells of such a size that six side by side build the circumference. The lateral fields contain scattered pigment granules. The ventral gland consists of a large elongated cell, situated as far behind the

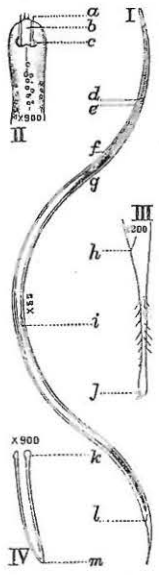


Fig. 14.—I, male of *Fimbria tenuis*. II, III, and IV, head, tail, and spiculum of the same worm more highly magnified.

*a*, cephalic setæ.
*b*, pharynx.
*c*, organ of unknown function.
*d*, nerve-ring.
*e*, excretory pore.
*f*, cardiac constriction.
*g*, ventral excretory gland.
*h*, anus.
*i*, junction of the two testicles.
*j*, terminus of tail.
*k*, proximal end of spiculum.
*l*, anus.
*m*, distal end of spiculum.



cardia as the nerve-ring is in front of it, and pouring its excretion through a long duct whose outlet is a large ampulla and ventral pore just behind the nerve-ring. This latter encircles the œsophagus squarely. The tail is conoid to the slightly swollen terminus, its posterior two-thirds being covered with hairs. The length of the two equal nearly straight pointed spicula is about equal to the anal body-diameter; their proximæ are barely cephaloid. The accessory pieces are nearly as long as the spicula, are joined distally, and are capable of being extruded along with the spicula. There is no supplementary organ or bursa. The point where the testicles join is somewhat behind the middle of the body. The food is vegetable.

*Hab.*—Seaweed, Island of Ceylon, 1889.

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# CONTRIBUTIONS TO A REVISION OF THE TASMANIAN LAND MOLLUSCA.

By Henry Suter, Christchurch, New Zealand.

*(Communicated by C. Hedley, F.L.S.)*