

[*From the Proceedings of the Linnæan Society of New South Wales,
1898, Part 3, August 31st.*]

AUSTRALIAN FREE-LIVING MARINE NEMATODES.

By N. A. COBB, Ph.D.

(Read June 29th, 1898.)

Proc. Linn. Soc. N.S.W. (91) 23 (3): 383-407.

JKSUNIVERSITEIT GENT
STITUUT voor DIERKUNDE
BORATORIA voor MORFOLOGIE
en SYSTEMATIEK

[From the Proceedings of the Linnean Society of New South Wales,
1898, Part 3, August 31st.]

AUSTRALIAN FREE-LIVING MARINE NEMATODES.

BY N. A. COBB, PH.D.

(Read June 29th, 1898.)

ANTICOMA, Bastian.

ANTICOMA SIMILIS, n.sp. $\frac{.4}{.7} \frac{9.6}{2.4} \frac{19.}{2.9} \frac{.51^{20}}{2.7} \frac{85.}{2.}$ 1.78 mm. This worm resembles *Anticoma acuminata*, Eb., to such an extent that I hesitated for some time to call it distinct. The differences are as follows:— (1) *porus* farther forward; (2) pectoral hairs six; (3) oesophagus at first cylindrical and narrow then widening rather suddenly behind the nerve-ring; (4) narrower; (5) other minor differences.

The perfectly plain cuticle bears only very short hairs. The pectoral hairs are closely approximated, and are arranged in longitudinal rows of six at a distance from the anterior extremity equal to one-sixth of the distance from the anterior extremity to the somewhat oblique nerve-ring. The conoid neck terminates in a head somewhat rounded in front and bearing ten setæ, each having a length nearly equal to the depth of the pharynx, and all placed opposite the middle of the pharynx. The three obscure lips are destitute of papillæ. The lateral organs (slits) occur near the ventral excretory pore, which is as far behind the cephalic setæ as the latter are behind the anterior extremity. There are no eyes. The wider anterior part of the conoid pharynx is four micromillimètres deep; thence the pharynx tapers more rapidly and ceases at eight micromillimètres. The brownish and rather thin-walled intestine is composed of cells of such a size that about ten of them are required to build a circumference; the numerous granules contained in these cells are so arranged as to give rise to

a distinct tessellation. The rectum is equal in length to the anal body-diameter. The ventral gland is situated in front of the cardiac collum; the duct is narrow and the ampulla elongated. The lateral fields are one-fourth as wide as the body. The anterior half of the tail is conoid; thence to the naked, somewhat swollen terminus it is cylindroid and an eighth as wide as at the anus. The caudal glands appear to be situated in front of the inconspicuous anus. The vulva is depressed; the vagina is one-half as long as the body is wide. The reflexed ovaries reach nearly the whole distance back to the vulva.

Found in sand near low-tide mark, Port Jackson, New South Wales, Australia.

ANTICOMA LATA, n.sp.—I have not seen the female of this species, which seems to be simply "one more,"—another tiresome addition. $\frac{3}{6} \frac{10}{2.4} \frac{21}{3.3} \frac{M}{3.7} \frac{88}{2.1} 2.6$ mm. The cuticle is not marked by striæ, but bears short and inconspicuous hairs throughout. The convex-conoid neck ends in a truncate head bearing ten setæ each one-third as long as the head is wide and all arranged opposite the middle of the pharynx. The two longitudinal rows of four closely approximated pectoral hairs occur on the neck at a distance from the anterior extremity equal to one-fourth the distance from the anterior extremity to the excretory pore. The obscure lips seem destitute of papillæ. Lateral organs, in the form of transverse slits one-half as long as the head is wide, occur on the head at a point as far behind the setæ as the latter are behind the anterior extremity. Eyes are lacking. The pharynx is very small and simple, being conoid in shape and in its widest part not above three micromillimètres wide. The cylindrical anterior half of the œsophagus is one-half as wide as the corresponding part of the neck; behind the nerve-ring, however, the œsophagus begins to expand in size and becomes in its posterior part one-half as wide as the base of the neck. When the œsophagus is viewed in optical section its lining is distinctly to be seen. The intestine, which is two-thirds as wide as the body, is separated from the œsophagus by a shallow but distinct constriction; the granules con-

tained in its cells are so arranged as to give rise to a tessellation. The ventral gland is situated in front of the cardiac collum, the ventral pore through which it empties being situated half-way between the anterior extremity and the nerve-ring. The latter encircles the œsophagus squarely. The lateral fields are only one-fifth as wide as the body. The anterior half of the tail is conoid from the rather inconspicuous anus; thence to the barely swollen terminus, where the outlet for the secretion of the caudal glands occurs, the tail is cylindroid and one-eighth as wide as at the anus. The two equal, arcuate, acute spicula are of the usual form, *i.e.*, are wider in the proximal part, and are one and one-half times longer than the anal body-diameter. The two accessory pieces are parallel to the spicula and two-fifths as long as they. The two testicles are of the usual form, that is to say, both extend forward and are arranged one in front of the other, the anterior being accordingly connected with the ejaculatory duct by a longer vas deferens. I could not make out whether or not the anterior end of the posterior testicle was reflexed. A tubular supplementary organ of the usual size was situated in front of the spicula at a distance equal to one-half the length of those organs.

This species, which is closely allied to *A. acuminata*, Eb., was found in sand, near low-tide mark, Port Jackson, New South Wales, Australia.

ANTICOMA TRICHURA, n.sp. $\frac{2}{3} \frac{6.5}{1.8} \frac{13.4}{2.2} \frac{39.30}{2.4} \frac{78}{1.6} 3.51$ mm. The skin of this well defined species is destitute of striæ, and bears for the most part none but most inconspicuous hairs. Four short closely approximated pectoral hairs occur on each side of the head at a distance from the anterior extremity equal to twice the width of the head. The neck is conoid and ends in a rounded head bearing six equal setæ, each three-fourths as long as the head is wide. The three confluent lips are surmounted by six papillæ, two on each lip. The lateral organs, in the form of transverse slits, are situated just behind the cephalic setæ. There are no eyes. Through the simple conoid pharynx the food passes into a conoid œsophagus, one-half as wide as the neck, the lining of which is not very

clearly to be seen. Thence the food passes through the small cardia into the intestine. This latter is one-half as wide as the body and composed of cells closely packed with granules. The ventral gland is situated in front of the cardiac collum; its duct is narrow, the ampulla being sub-spherical and one third as wide as the neck. The excretory pore is situated just in front of the somewhat oblique nerve-ring. The lateral fields are only one-fifth as wide as the body. The tail is setaceous onward from its conoid anterior fourth. The slightly expanded terminus gives exit to the secretion of the caudal glands. The depressed vulva leads to a vagina one-half as long as the body is wide. The eggs are a little more than one-half as wide as the body and are three times as long as wide. The broad, reflexed part of the ovaries reach two-thirds to three-fourths the way back to the vulva and contain numerous developing ova arranged in several rows.

Found in sand near low-tide mark, Port Jackson, New South Wales, Australia.

COMESOMA, Bastian.

COMESOMA HETERURA, n.sp. It is barely possible that this species is not a *Comesoma*, for while the head is precisely like that of *Comesoma*, the spicula are decidedly different; however, we have *Oncholaimi* with short spicula and also with setaceous spicula, and why should not the same occur in *Comesoma*? I have not seen the female.

$\frac{.2}{.8} \frac{5.6}{2.3} \frac{10.}{3.} \frac{-M-40}{3.7} \frac{87.}{2.6}$ 2.26 mm. The thickish striated cuticle is closely and finely punctate, but not so finely as in *C. similis*. Short hairs occur on the body. The conoid neck ends in a subtruncate head bearing, nearly opposite the base of the pharynx, four spreading submedian setæ and two short papilla-like lateral ones; the submedian ones are one-half as long as the diameter of the head. I could not ascertain whether or not the three flat and obscure lips bore papillæ; none but very small and inconspicuous papillæ could have escaped the scrutiny. The anterior margin of each lateral organ is as far behind the base of the pharynx as the

latter is behind the anterior extremity; the right organ is a left-handed spiral of three winds, whilst the left one is a similar right-handed spiral. The simple toothless cup-shaped pharynx is one-third as wide as the head. The anterior part of the conoid œsophagus is one-half, and the posterior part two-thirds, as wide as the corresponding part of the neck. The lining of the œsophagus is distinctly to be seen when the organ is viewed in optical section. The thick-walled intestine, which is one-half as wide as the body, is separated from the œsophagus by a deep and distinct constriction; the cells of which the intestine is composed are closely packed with fine granules. The ventral gland, lying in the cardiac region, empties by means of a wide duct and sub-spherical ampulla, through the pore situated just behind the oblique nerve-ring. The lateral fields are one-fourth as wide as the body. The anterior half of the tail is conoid from the slightly depressed anus; thence to the barely swollen three-haired terminus it is cylindroid, with a width equal to that of the spicula. The tail bears numerous short hairs; caudal glands are present. A pre-anal ventral row of fifteen small gland-outlets occupies a distance one and one-fourth times as great as the length of the tail; four of them occur opposite the spicula, but the interval between each two successive outlets increases anteriorly. The hairs immediately in front of and behind the anus are better developed than those more remote, as is usually the case. The two equal, linear, very acute, arcuate spicula are widest in the middle, the proximal half being composed of four pieces of chitin; the proximæ can hardly be said to be cephalated. The two accessory pieces have spike-shaped processes extending backward parallel to the body axis, a distance equal to half the anal body-diameter. The ejaculatory duct has a length twice as great as the length of the tail. The junction of the two testicles is near the beginning of the middle third of the body.

Found in sand at a depth of four to five fathoms, Port Jackson, New South Wales, Australia.

COMESOMA SIMILIS, n.sp. $\frac{.2}{.8} \frac{6.2}{2.1} \frac{10.}{2.5} \frac{-48-80}{3.7} \frac{92.}{2.}$ 3.3 mm. The cuticle of this species is very closely and finely punctate, and at

the same time transversely annulated, the annules being easily seen with moderate powers. The body bears short hairs; on the neck, not far behind the lateral organs, I observed two opposite rows of pectoral hairs, consisting each of four equidistant hairs so arranged that the whole row was two-thirds as long as the diameter of the adjacent part of the neck. These hairs remind one of the similar hairs occurring on the neck of *Anticomma*, and when taken in conjunction with other points of resemblance, suggest a not distant relationship between *Comesoma* and *Anticomma*; it should be observed that the pectoral hairs are here not of so pronounced a character as in *Anticomma*. The conoid neck becomes convex-conoid anteriorly and ends in a truncate head, bearing, opposite the base of the pharynx, a circle of ten spreading cephalic setæ arranged in the usual manner; these setæ on the whole are as long as the head is wide, but one of each of the four submedian pairs has only half that length. The lips are confluent and obscure, and bear no prominent papillæ; the pharynx is simple, cyathiform, two-fifths as wide as the head, as deep as wide, and contains at its base a small and weak dorsal tooth pointing inward and forward after the manner of the similar tooth found in the throat of *Chromadora*, *Cyatholaimus* and related genera. Of the two spiral lateral organs which occur just behind the pharynx and are two-thirds as wide as the neck, the right is a left-handed spiral of about two winds, while the left is a similar right-handed spiral. In its anterior part the œsophagus is one-half as wide as the neck; in the posterior part, however, it becomes two-thirds as wide as the neck, this part being almost entitled to be called a bulb. The lining of the œsophagus is distinctly to be seen when the organ is viewed in optical section. The intestine, which is four-fifths as wide as the body and is separated from the œsophagus by a shallow but distinct cardiac constriction, is composed of cells whose granules are so arranged as to give rise to an obscure tessellation. The rectum is as long as the anal body-diameter. The ventral gland is conspicuous, being situated behind the cardiac collum, and emptying, by means of a wide duct and large ellipsoidal ampulla one-third

as wide as the neck, through the excretory pore situated close behind the slightly oblique nerve-ring. The tail is conoid from the inconspicuous anus, but tapers more rapidly in the middle three-fifths than elsewhere. The terminus, where the caudal glands empty, is very slightly swollen and bears three short hairs. The vulva is neither raised nor depressed; the vagina is one-third as long as the body is wide. The eggs are a little longer than the body is wide and four-fifths as wide as long.

Male not seen.

This worm was found in sand near low-tide mark, Port Jackson, New South Wales, Australia.

COMESOMA JUBATA, n.sp. The thin, transparent cuticle of this striking species is very finely transversely striated and bears hairs throughout, though those on the body are very much smaller than those found on the neck. Most conspicuous among these latter are four submedian rows, of about twenty-five hairs each, situated opposite each other on the anterior half of the neck. These hairs, which are nearly as large as the cephalic setæ, do not grow perpendicularly upon the cuticle but at an angle, and each row is divided into two sets, those of one set sloping in one direction from the submedian line, while the alternate hairs belonging to the other set slope in the opposite direction. The conoid neck terminates anteriorly in a small truncate head, which bears near its anterior margin four submedian cephalic setæ, each somewhat longer than the head is wide. The inconspicuous lips are armed with two rows of small papillæ, each row consisting of six members; the outer row is half way between the cephalic setæ and the anterior border of the head, while the second is placed close round the mouth. Three-wind spiral lateral organs one-half as wide as the head occur close behind the lip-region, their anterior margins, in fact, being a little in front of the circlet of cephalic setæ; as usual, the right one is a left-handed spiral and the left a right-handed spiral. The worm is destitute of eyes. The small and simple conoid pharynx is in its widest part only one-third as wide as the head. The conoid œsophagus, at first only one-half as wide as the neck, becomes, in the posterior fifth,

two-thirds as wide; its lining is distinctly to be seen in optical section. The thick-walled intestine, which is separated from the œsophagus by a deep and distinct constriction, is two-thirds as wide as the body and terminates in a rectum shorter than the anal body-diameter. The ventral gland, situated close behind the cardiac region, empties through a pore opposite the ventral part of the oblique nerve-ring. The ampulla is large and ellipsoidal. The lateral fields are one-third as wide as the body.

The anterior half of the tail is convex-conoid from the depressed anus; thence it continues cylindrical and one-fourth as wide as at the anus, with occasional short hairs, to the barely expanded terminus, which is armed with three hairs and gives exit to the secretion of the caudal glands. The depressed vulva leads into a vagina one-half as wide as the body. The uteri often contain large pyriform spermatozoa two-fifths as long as the body is wide. The eggs are one-half to two-thirds as wide as the body and three times as long as they are wide. Each of the outstretched ovaries is about three times as long as the œsophagus.

$\frac{3}{9} \frac{6}{2.2} \frac{10.6}{2.4} \frac{M}{2.9} \frac{91}{2}$. 2.7 to 3.8 mm. The male tail is like that of the female, except that the anus is slightly elevated. The two equal, linear, acute, nearly uniformly arcuate spicula are somewhat narrower in the proximal third, where they are composed of three pieces of chitin, although the proximæ are not cephalated; the length of the spicula is twice as great as that of the anal body-diameter. The accessory pieces are parallel to the distal fifth of the spicula; thence they extend backward parallel to the lateral plane of the body. There seem to be two testicles. The inconspicuous pre-anal row of sixteen equidistant ventral gland-outlets is as long as the tail.

This species is very common in sea-sand near low-tide mark, Port Jackson, New South Wales, Australia.

SPIRA, Bastian.

SPIRA SIMILIS, n.sp. $\frac{3}{8} \frac{2.8}{1.1} \frac{5.8}{1.4} \frac{M}{1.8} \frac{93.8}{1.5}$ 3.2 mm. This is a species very closely resembling *S. parasitifera*, Bast.; in fact it is not impos-

sible that it may be identical with it. However, the female has yet to be seen, and that sex may present differences greater than any I can find in the male. It will be observed that the spicula are in form and proportions different from those of *parasitifera*. The transversely striated cuticle bears slender hairs throughout. The conoid neck ends in a truncate head bearing four (?) submedian setæ. The lips are obscure. At the first glance the lateral organs would be supposed to be circular; closer observation shows them to be broken circles, the break occurring on the dorsal margin. These organs are one-third as wide as the head and are removed from the anterior extremity a distance equal to their own diameter; the central "fleck" is a small spiral. There are no eyes. The concave-conoid pharynx ends opposite the centres of the lateral organs, and bears at its base a tiny dorsal tooth. The œsophagus is cylindrical to the prolate cardiac bulb, the latter being five-sixths as wide as the corresponding part of the neck, while the tube leading to it is only two-fifths as wide as the neck. The lining of the œsophagus when seen in optical section appears as a distinct double line. The cardiac constriction is shallow but distinct. The intestine is at its beginning only one third as wide as the body, but soon doubles in size; the contents seem to consist almost entirely of greenish vegetable matter. The cardia is very small. The cells of the intestine contain loose granules having no visibly definite arrangement. The ventral excretory pore is situated just behind the oblique nerve-ring; the duct is narrow, the ampulla ellipsoidal and one-half as wide as the œsophagus. The tail is conoid to the acute conical terminus; caudal glands seem to be present. I saw no supplementary organs. Two sub-dorsal hairs occur somewhat behind the pieces accessory to the spicula. These latter are equal, linear, uniformly arcuate, widened in the proximal half and strongly cephalated, their length being equal to twice the anal body-diameter. The two accessory pieces are one-third as long as the spicula and obscurely sigmoid, on the whole appearing to be perpendicular to the ventral surface of the body. There appeared to be two testicles extending in opposite directions, but I was not certain about that.

Found in sand, near low-tide mark, Port Jackson, New South Wales, Australia.

TERSCHELLINGIA, De Man.

TERSCHILLINGIA EXILIS, n.sp. $\frac{0 \ 3.3 \ 5.5 \ -46-50 \ 82}{-9 \ 1.5 \ 1.5 \ 1.6 \ 1.2}$ 2.90 mm.

The cuticle of this slender species, of which I have seen only the female, is marked with transverse striæ resolvable with high powers into rows of dots. The hairs on the body are very small. The short cylindroid neck terminates anteriorly in a rounded head bearing on its front four submedian setæ, each nearly as long as the diameter of the neck, and, a little farther back, two somewhat shorter sub-cephalic setæ. Lips and papillæ of the usual form are lacking. The distance from the anterior extremity to the front margin of the circular lateral organs is about equal to the width of one of these organs, or to half the width of the head. There are no eyes. About the nature of the pharynx I am uncertain. The casual observer would deny its existence altogether. If, however, one examines the lumen of what appears to be the beginning of the œsophagus, he will soon discover, at a point opposite the anterior margins of the lateral organs, certain obliquely radial markings due to chitinous formations. These appear to be the optical expression of foldings of the lining of the œsophagus. Their position leads one to suspect that all that part of the tube in front of them is capable of being thrust forward and turned outward with a view to seizing food. The anterior tubular part of the œsophagus is less than one-half as wide as the neck; posteriorly the œsophagus expands in to a broadly pyriform bulb which completely fills the base of the neck. The lining of the œsophagus is distinct, and the cardia is, relatively speaking, very large. The transparent intestine, which is four-fifths as wide as the body and composed of cells containing a few granules, is separated from the œsophagus by a very shallow but distinct constriction. The rectum is equal in length to the anal body-diameter. The ventral gland is situated just behind the cardia; its pore, apparently, just behind the nerve-ring. The lateral fields are two-fifths as wide as the body. The tail is

conoid from the depressed anus to the barely swollen apiculate and naked terminus, which gives exit to the secretion of the caudal glands. The vulva is inconspicuous. The eggs are four-fifths as wide as the body and twice as long as wide.

Found in sand, near low-tide mark, Port Jackson, New South Wales, Australia.

SPHAEROLAIMUS, Bastian.

SPHAEROLAIMUS HIRTICOLLIS, n.sp. $\frac{1.8 \ ? \ 17. \ -55.38 \ 83}{2.5 \ ? \ 4.2 \ 4.6 \ 3.2}$ 1.71 mm.

The transparent cuticle is traversed by transverse striæ 1.2μ apart, composed of dots resolvable only with high powers; these dots have also a tendency to an arrangement in longitudinal lines. The anterior half of the neck bears numerous slender hairs three-fourths as long as the body of the worm is wide; the remainder of the body nevertheless bears only short and very inconspicuous hairs. The cylindroid neck becomes convex-conoid anteriorly and ends in a sub-truncate head bearing opposite the middle of the capacious pharynx a circlet of twelve rather uniform and comparatively stout bristles having a length half as great as the long cervical hairs and being arranged in pairs, one pair occurring on each median and submedian line. The lips, probably six in number, bear six setose papillæ, one on each lip. The structure of the lips seems to be similar to that found in *Oncholaimus*, where each lip approximates in shape to a spherical triangle, the six together forming a kind of dome over the pharynx; needless to say they can be separated wide apart and used in seizing hold of food. The lateral organs are situated opposite the posterior part of the pharynx; they are of the sort found on all species of *Monhystera*, but are, I think, instead of being exactly circular, somewhat longest in the transverse direction. Their longest diameter is not far from one-fourth as long as the width of the head. There are no eyes. The triquetrous pharynx is one-half to two-fifths as wide as the head and about twice as deep as wide; anteriorly its walls are transparent, posteriorly they are less so, the change occurring suddenly near the middle. The pharynx contains no teeth or other biting arma-

ture. The cylindroid œsophagus is two-thirds as wide as the neck and its distinct chitinous lining appears crenate, when seen in optical section. The cells of the thick-walled intestine, which is three-fifths as wide as the body and is separated from the œsophagus by a shallow but distinct constriction, are closely packed with granules. I learned nothing concerning the nature of the ventral gland or the lateral fields. The anterior half of the tail bears short hairs here and there, and is conoid from the inconspicuous anus; thence to the barely swollen terminus, which bears two hairs, it is cylindroid and one-fourth as wide as at the anus. The eggs are two-thirds as wide as the body and twice as long as wide.

$\frac{2.1}{2.2} \frac{?}{3.4} \frac{20}{3.6} \frac{M}{3.6} \frac{85}{2.4}$ 1.7 mm. The tail of the male is much like that of the female. The two equal setaceous spicula, two-thirds as long as the tail, are straight except near the distal extremity, being arranged through the greater part of their length parallel to the axis of the body; their proximæ are not cephalated. The two trough-shaped accessory pieces in which the spicula glide are one-third as long as the spicula themselves. I saw no supplementary organs, but, as usual, the hairs both before and behind the anus of the male were specially developed.

This handsome microscopic worm is common among sea-sand near low-tide mark, Port Jackson, New South Wales, Australia.

ONCHOLAIMUS, Bastian.

ONCHOLAIMUS PELLUCIDUS, n.sp. $\frac{1.3}{1.5} \frac{9.6}{2.1} \frac{18}{2.3} \frac{48^{25}}{2.4} \frac{82}{1.5}$ 2.18 mm. The cuticle of this species is quite destitute of striæ and bears none but very inconspicuous hairs. Surmounting the conoid neck is a truncate head whose setæ are reduced to a circle of six nerve points situated opposite the anterior part of the pharynx. The lips are arranged as is usual in *Oncholaimus*; I saw no labial papillæ. The ellipsoidal lateral organs are one-third as wide as the head and are arranged opposite the middle of the pharynx so that their longest axis lies transversely on the body. There are no eyes. The triquetrous pharynx is about one-third as wide as the

head, and is armed with three teeth of which the left ventral submedian reaches to the lips, the others projecting but little into the pharynx and reaching only three-fourths the way to the lips. The œsophagus is at first only one-half as wide as the neck, but becomes in the posterior part two-thirds as wide as the neck; being very transparent its lining is distinctly to be seen. The intestine, which is two-thirds as wide as the body, is separated from the œsophagus by a shallow but distinct constriction; its cells contain granules so arranged as to give rise to an irregular tessellation. The rectum is a little longer than the anal body-diameter. The ventral gland empties through a narrow duct and an elongated ampulla; the pore is situated just behind the oblique nerve-ring. The lateral fields are one-fourth as wide as the body. The conoid tail tapers more rapidly in the anterior part, the posterior part being one-fifth as wide as the base of the tail. The caudal glands empty at the barely expanded terminus. The inconspicuous vulva leads into a vagina one-third as long as the body is wide. The eggs are two-thirds as wide as the body and four times as long as wide. The reflexed parts of the ovaries extend three-fourths the way back to the vulva.

$\frac{1.3}{.8} \frac{10.6}{2.} \frac{17}{2.1} \frac{M}{2.3} \frac{85}{1.6}$ 2.22 mm. The tail of the male resembles that of the female in form. The two equal, simple, elongated, straight and acute spicula when seen in profile appear to make an angle of forty-five degrees with the axis of the body; they are of uniform size throughout, being hardly at all thickened at the proximal ends. The length of these organs, which is readily made out on account of the general transparency of the body, is somewhat less than that of the anal body-diameter. There are traces of accessory pieces one-third as long as the spicula. I could discover no supplementary glands or papillæ.

This nematode is to be found in sea-sand near low-tide mark, Port Jackson, New South Wales, Australia.

OXYSTOMA, Bütschli.

OXYSTOMA PELLUCIDA, n.sp. $\frac{1}{.3} \frac{9}{1.2} \frac{22}{1.6} \frac{29^{30}}{1.8} \frac{94.3}{1.}$ 2.54 mm. The glassy cuticle of this graceful species is not marked in any way

nor do any hairs grow on its surface, if we except those on the head. The neck is conoid to the truncate head, which bears opposite the base of the œsophagus a circler of six short setæ. Some distance behind the cephalic setæ, namely, at one-third the distance from the anterior extremity to the lateral organs, occurs another row of four similar setæ, all submedian. Neither lips nor papillæ are to be seen round the mouth. The lateral organs, which are one-third as wide as the part of the neck on which they occur, are oval in shape, their longer axis being placed parallel to the axis of the body; the distance from the anterior border of the head to these organs is one-fifth as great as from the head to the oblique nerve-ring. From the lateral organs a structure is plainly seen to pass inward and backward. The worm is eyeless. Through the simple cup-shaped pharynx the food passes into an œsophagus which at first is only one-half as wide as the corresponding part of the neck, but which gradually expands until in the posterior part it is three-fourths as wide as the base of the neck. The lining of the œsophagus is apparently much corrugated. Notwithstanding the fact that the cardiac constriction is very shallow and inconspicuous, the beginning of the intestine is plainly to be seen because of its marked difference of colour. The cardia is shallow. The thickness of the cells of which the intestine is composed is one-fourth as great as the diameter of the intestine, and the cells are of such a size and shape that twelve of them placed side by side build up a circumference. The granules to be found in the intestinal cells are not so arranged as to cause a tessellated appearance. The rectum is twice as long as the anal body-diameter. The ventral gland, situated just in front of the vulva, empties by means of a narrow duct and a much elongated and narrow ampulla, through a ventral pore situated a short distance in front of the nerve-ring. In the anterior two-thirds of its length the tail is conoid; thence to the naked, slightly expanded terminus it is cylindroid and one-fourth as wide as at the anus. The anus is inconspicuous; caudal glands are present. The inconspicuous vulva leads through a vagina one-third as long as the body is wide,

backward into a uterus ten times as long as the body is wide, and containing two segmenting eggs each four times as long as the body is wide and one-fifth as wide as long. In the uterus are granular spermatozoa of a spherical shape, and of such a size that eight of them placed side by side would reach across the body. The reflexed part of the ovary reached three-fourths the way back to the vulva and contained numerous developing ova arranged in single file.

This worm, of which I have seen only the female, was found in mud below low-tide mark, Port Jackson, New South Wales, Australia.

PLECTUS, Bastian.

P. PARIETINUS, Bast., var. *australis*. $\frac{1.5}{1.6} \frac{10.5}{3.7} \frac{20}{4.6} \frac{48^{.33}}{5.6} \frac{92}{2.9}$ 1.5 mm. The transparent cuticle is transversely striated, there being about seven hundred striæ in all on the worm. The body wall is nearly one-fourth as thick as the worm itself. Very inconspicuous papilla-like setæ occur throughout the body. The neck contracts more rapidly anteriorly where it is convex-conoid, ending in a somewhat truncate head bearing six distinct sub-spherical lips, each bearing at least two very inconspicuous papillæ. The lateral organs are unclosed ovals about as wide as the cephalic setæ are long, placed opposite the middle of the pharyngeal cavity. The cephalic setæ are of equal size and are four in number, and are arranged one on each submedian line at the base of the lips; they grow at right angles to the cuticle and have a length about equal to the diameter of one of the lips. There are no eye-spots. The compound pharynx is composed of two parts, of which the first is that referred to in the formula (as 1.5); this is again duplex in structure, being wider in the anterior half than in the posterior. A slight stricture in the outer contour of the pharyngeal tube marks the beginning of the posterior part of the pharynx which contains what appears to be a narrowly fusiform cavity as long as the duplex cavity just mentioned, the entire pharynx therefore occupying nearly one-fourth of the length of the neck. The cylindroid œsophagus, scarcely one-third as wide as the neck, ends

posteriorly in a prolate bulb more than half as wide as the base of the neck and containing a distinct chitinous valvular structure. A distinct but not deep constriction separates the œsophagus from the intestine, which is granular and greenish in colour and more than half as wide as the body. The cardia is more than half as long as the bulb. The rectum, which is equal in length to the anal body-diameter, is suddenly contracted at the middle; the pyloric collum is distinct. The narrow and tortuous chitinous duct of the ventral gland ends in a ventral pore just behind the nerve-ring. The distance between the wings of the cuticle is equal to one-third the width of the body. The conoid tail ends in a blunt apiculate terminus, the outlet for the secretion of the three caudal glands whose three ducts are plainly visible in the posterior part of the tail. The inconspicuous vulva leads to a broadly conical vagina one-third as long as the body is wide. The thin-shelled eggs are half as wide as the body and one and one-half times as long as wide. The ovaries reach three-fourths the distance back to the vulva. The eggs are deposited before segmentation begins.

On culms of grass and among the blanched parts of celery, Sydney, New South Wales, Australia; abundant.

P. AGILIOR, n.sp. $\frac{1.5}{1.4} \frac{11.8}{5} \frac{21.5}{3.4} \frac{49.25}{3.6} \frac{89.6}{1.8} 1.14$ mm. Like the preceding species, but narrower, and having the anterior chamber of the pharynx so divided that its narrower posterior part is twice as long as the anterior wider part. In all other respects almost exactly the same.

Found with the preceding on grass, these being the only non-marine species here described.

CYATHOLAIMUS, Bastian.

CYATHOLAIMUS TRICHURUS, n.sp. $\frac{1}{1.2} \frac{6.7}{2.6} \frac{12.2}{2.9} \frac{M}{3.2} \frac{87}{2.4} 2.6$ mm. The cuticle of this species, as is the case with all *Cyatholaimi*, is traversed by transverse striæ composed of dots; on our present worm these striæ are from 2 to 2.5 μ apart, being somewhat closer together anteriorly than posteriorly. The dots also are about 2 μ apart. In the lateral regions these dots

are arranged also in longitudinal rows. Conspicuous among the dots are two longitudinal rows of circles arranged on either side of each of the lateral lines at a distance apart equal to one-third the width of the body. The neck becomes convex-conoid in front, and ends in a truncate head which bears near its anterior margin ten setæ one-half as long as the head is wide, arranged in the usual manner, the submedian pairs being of somewhat unequal size. The anterior part of the pharynx, one-half as deep as the head is wide and one-half as wide as deep, is cyathiform, its sides presenting twelve jointed ribs; at the base of this part of the pharynx occurs a small and pointed dorsal tooth behind which the pharynx narrows gradually, ceasing at 30 μ from the anterior extremity. The lateral organs are rather obscure spirals of five winds situated opposite the middle of the pharynx, the right being a left-handed spiral and the left a right-handed spiral, as usual; in size they are one-third to one-half as wide as the head. There are no eyes. The simple œsophagus, though at first only one-third, becomes finally one-half, as wide as the neck; there is no bulb. The cardiac collum is shallow but distinct, and the cardiac region rather transparent. The thick-walled intestine is one-half as wide as the body. The ventral excretory pore is situated just behind the nerve-ring. The lateral fields are one-third as wide as the body. The anterior half of the tail is slightly convex-conoid; thence it is setaceous to the barely swollen terminus, which gives exit to the secretion of the caudal gland. The anal region is slightly elevated. The two equal, linear spicula are of uniform size and are parallel to the lateral plane of the body in their proximal halves; thence they are arcuate. Their proximæ are prominently cephalated by a sudden flat expansion. The two accessory pieces are parallel to the spicula and are nearly as long as they; but are, however, not cephalated and are the wider distally. The blind end of the testicle is as far behind the cardia as the latter is behind the lips. No supplementary organs were seen.

It is possible that this is a member of an hitherto unrecognized genus, closely related to *Cyatholaimus*, &c.

The worm inhabits sea-sand near low-tide mark, Port Jackson, New South Wales, Australia.

CYATHOLAIMUS EXILIS, n.sp. $\frac{.7 \ 3.9 \ 9.7 \ .63^{.20} \ .92}{1.6 \ 2 \ 2 \ 2.7 \ 1.9}$ 2.44 mm. The cuticle of this species is traversed by transverse striæ easily resolvable with medium powers into rows of dots everywhere alike, —not differing on the lateral lines from those elsewhere, as is often the case. The body is destitute of hairs. The cylindroid neck ends in a truncate head bearing ten sub-equal cephalic setæ one-fourth as long as the head is wide and arranged in the usual manner. Each of the six lips bears two setose papillæ. The spiral lateral organs, situated opposite the base of the pharynx, are one-half as wide as the head. There are no eye-spots. The twelve-ribbed cyathiform pharynx is in its widest part two-thirds as wide as the head and bears a plainly visible pointed dorsal tooth somewhat behind the middle. The conoid œsophagus is anteriorly one-half and posteriorly two-thirds as wide as the corresponding part of the neck; its lining is not very distinctly to be seen. The intestine, which is separated from the œsophagus by a distinct cardiac constriction, is one-half as wide as the body and tessellated with coarse granules. The length of the rectum equals that of the anal body-diameter. The unicellular ventral gland lies behind the cardiac region and empties through a ventral pore situated near the nerve-ring; the ampulla is small and ellipsoidal. The tail is conoid from the inconspicuous anus and ends in a convex-conoid sub-apiculate terminus one-fourth as wide as the base. The large broad vulva lies in a somewhat depressed ventral area. The vagina is very broad and one-third as long as the body is wide; much chitin enters into its structure. The eggs are four-fifths as wide as the body and twice as long as wide. The uterus contained sub-spherical spermatozoa one-fourth as wide as the body. The reflexed part of the ovaries reached one-third the way back to the vulva.

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

CYATHOLAIMUS HETERURUS, n.sp. $\frac{.6 \ 5.2 \ 20.7 \ .46^{.4.30} \ .78}{1.5 \ 3.3 \ 4 \ 4.8 \ 2.8}$ 2.54 mm. The thin skin of this rather remarkable looking nematode is

marked by transverse striæ, 2.2μ apart, composed of rows of bead-like markings easily resolvable with medium powers. In addition, two longitudinal rows of circles occur in the lateral regions separated by a space equal to one-fourth the width of the body. Short hairs occur throughout the length of the body. The conoid neck terminates in a squarely truncate head. Opposite the base of the pharynx a circlet of ten cephalic setæ, one-half as long as the head is wide, are arranged in the usual manner. Each of the six lips bears a seta one-half as long as the cephalic setæ. Each of the lateral organs is a spiral of four winds, that on the right being a left-handed spiral and that on the left being a right handed spiral; they are situated opposite the base of the pharynx and are one-third as wide as the head. Backward from the strongly twelve-ribbed cyathiform pharynx, which is one-half as wide as the head and one-half as deep as wide, extend three indistinct chitinous structures which, doubtless, represent infoldings in the upper part of the œsophagus; if so then it is highly probable that the pharynx should be regarded as extending back as far as the posterior part of these structures. I wished much to ascertain what movements the back part of the pharynx was capable of, but could not satisfy myself. It seems to me likely that Dr. De Man's *Halichoanolaimus* gives some idea of the movements possible in *Cyatholaimus*, of which *Halichoanolaimus* is, so to speak, an exaggeration. The simple conoid œsophagus, at first only one-half as wide as the neck, enlarges gradually to two-thirds as wide; it has a distinct chitinous lining and is separated from the intestine by a distinct but rather shallow constriction. The short cardia leads to an intestine three-fourths as wide as the body, composed of cells containing loosely stationed granules having a tendency to a tessellated arrangement. The rectum has a length, in the female, equal to the anal body-diameter. The ventral gland, situated just behind the cardiac region, empties, by means of a narrow duct and a pyriform ampulla one-fourth as wide as the neck, through the ventral pore situated just behind the nerve-ring. The anterior fifth of the tail is conoid, tapering much; thence the tail is setaceous, being one-

eighth as wide as at the anus, to the naked and swollen terminus which gives exit to the secretions of the caudal glands. The rather inconspicuous vulva leads into a vagina one-third as long as the body is wide. The eggs are two-thirds as wide as long, and as long as the body is wide; they seem to remain unsegmented while in the uterus. The reflexed part of the ovaries reach three-fourths the way back to the vulva.

This worm inhabits sea-sand, near low-tide mark, Port Jackson, New South Wales, Australia,

CYATHOLAIMUS MINOR, n.sp. The female remains unknown. $\frac{9}{1.6} \frac{6.4}{3.2} \frac{16}{3.4} \frac{M}{3.5} \frac{87}{2.8} 1.22$ mm. The transparent cuticle is crenate when seen in optical section, this appearance arising from the presence of transverse striae, 2.6μ apart, resolvable with medium powers into rows of dots. On the lateral fields these dots are arranged longitudinally in four rows occupying a space one-fourth as wide as the body. Circular markings, of unknown significance, very considerably larger than the dots, also occur; these are arranged on the sides of the body right up to the head, in some parts as if in three irregular rows, in other parts as if in two, one of them irregularly double. I saw no hairs on the body. The neck is cylindroid posteriorly, but anteriorly it becomes convex-conoid and ends in a sub-truncate head, set off by a slight constriction. The ten sub-equal spreading cephalic setae are one-half as long as the head is wide, and are arranged in the usual manner; they encircle the head opposite the pharyngeal tooth and are so short as to be easily confounded with the six setose papillae which surmount the six lips. The lateral organs are one-half as wide as the head and are so placed that their anterior margins are opposite the pharyngeal tooth; the right organ is a left-handed spiral of three and one-half winds, while the left is a similar right-handed spiral. The pharynx is 12μ deep, with a dorsal tooth at 7μ ; the posterior part of the pharynx is very narrow and inconspicuous; the anterior part is of the form usual in *Cyatholaimus*, namely, cup-shaped presenting twelve jointed ribs. The oesophagus is conoid, being in its anterior part one-half, and in its posterior part two-thirds, as wide as the corresponding part of the

neck; its lining is distinctly to be seen. The intestine, which is separated from the oesophagus by a shallow but distinct constriction is one-half as wide as the body and is composed of cells containing coarse granules so arranged as to give rise to an obscure tessellation. The ventral gland is situated behind the cardiac constriction and empties through a ventral pore opposite the nerve-ring. The latter encircles the oesophagus squarely. The anterior half of the glabrous tail is suddenly conoid from the anus; thence to the barely swollen long-apiculate terminus it is cylindroid and one-eighth as wide as at the anus. Caudal glands are present as usual. A pre-anal ventral row of six small equidistant supplementary organs occupy a space twice as long as the length of the spicula. The two equal, linear, arcuate spicula are one and one-half times as long as the anal body-diameter; their proximal ends are not cephalated, but they are bent towards the ventral side of the body. The two equal narrow accessory pieces are three-fourths as long as the spicula, which they envelope at their apices.

Found in sand at the bottom of Port Jackson, New South Wales, Australia, at four to six fathoms depth.

CYATHOLAIMUS BREVICOLLIS, n.sp. I have seen but a single male of this handsome little species. The proportions of the head and neck remind one strongly of *Spilophora*, but the presence of spiral lateral organs on the head, and of a ventral row of pre-anal accessory organs in the male, make it a species of doubtful affinity. My measurements gave the formula $\frac{3}{1.4} \frac{6.8}{3.4} \frac{9.7}{3.5} \frac{M}{4} \frac{83}{2.8} 1.38$ mm. The transparent skin presents very inconspicuous hairs, if any, and is traversed by about six hundred transverse striae, two micromillimètres apart, and consisting of rows of circular dots which become larger as the lateral fields are approached; there they arrange themselves also in three longitudinal rows which become indefinite near the head and of which the middle one is exactly lateral. Just outside the three rows of dots I observed two chitinous wings, one on either side. The space occupied by the three lateral rows of dots is one-fourth as wide as the body of the worm. The neck of the worm is convex-conoid and terminates anteriorly

in a slightly swollen and transparent head, which is rounded in front and which bears several inconspicuous organs, among which I notice particularly spiral lateral organs one-half as wide as the head, situated near the anterior margin of the head, and at least four papilla-like cephalic setæ, and finally three obscure lips each apparently with four obscure papillæ. The right lateral organ is a left-handed spiral of two winds and the left organ is a similar right-handed spiral. There are no eyes. The pharynx is minute, cyathiform, obscurely ribbed, and contains a minute dorsal tooth situated near its base. The œsophagus is about one-third as wide as the neck, but expands in the posterior fifth to form an ellipsoidal bulb, not double as in *Spilophora*, but with a well developed chitinous lining. The cardiac constriction is deep and distinct. The intestine, which is two-thirds as wide as the body, is loosely granular. The ventral gland is situated behind the cardiac region, and empties its excretion by means of a wide duct and elongated ellipsoidal ampulla one-third as wide as the neck, through a pore situated just behind the oblique nerve-ring. The anterior half of the tail is conoid; thence it continues, cylindroid and one-eighth as wide as at the anus, to the elongated barely swollen sub-apiculate terminus. The two equal, arcuate, elongated spicula are widest in the middle and are not much curved; the full length of the spicula is twice as great as the anal body-diameter, and their proximal extremities are narrowed and recurved. The two simple accessory pieces are one-half as long as the spicula, and are arranged parallel to them. A ventral row of fifteen low, flat, almost confluent accessory organs occupy a space in front of the anus once and one-half as long as the tail.

It is possible that this worm belongs to a genus hitherto unrecognized; for the present, however, I would prefer to have it classed as a *Cyatholaimus* with a much reduced pharynx and distinct cardiac bulb. It occurs in sand near low-tide mark, Port Jackson, New South Wales.

HALICHOANOLAIMUS, De Man.

HALICHOANOLAIMUS AUSTRALIS, n.sp. Having seen only young specimens of this animal, I cannot give its ultimate dimensions.

It is manifestly closely related to *H. robustus*. The tail is short and tapers suddenly from near the anus, soon becoming setaceous to the naked terminus which is not expanded, but has a peculiar cylindrical outlet for the secretion of the caudal glands. The cuticle is finely transversely striated with rows of fine dots, resolvable with moderate powers. Near the lateral lines the dots are larger, and are arranged also in longitudinal rows. On either side of the lateral line, separated by a distance equal to one-eighth of the width of the body, two such longitudinal rows are found, and clustered together between them three other more irregular rows. This longitudinal arrangement of the lateral dots ceases near the head and near the tail. The cylindroid neck terminates anteriorly in a squarely truncate head which bears on its margin ten papilla-like setæ, the only hairs to be seen on the whole body. Each of the six conoid transparent lips bears a papilla. The spiral lateral organs, consisting of three winds, are one-fourth as wide as the head and are situated opposite the middle of the pharynx; the right is a left-handed spiral and the left a right-handed spiral. There are no eyes. The pharynx is two-parted: the anterior cyathiform twelve-ribbed part is one-half as wide as the head and nearly as deep as wide; the posterior triquetrous part is as long as the anterior part, but only about one-half as wide, each of its angles being the location of a conspicuous longitudinal chitinous structure whose function is to furnish attachment for one end of the powerful pharyngeal muscles. The interior surface of the pharynx is supplied at its narrowest part, namely, between the two chambers of which it is composed, with numerous chitinous teeth whose function is, as Dr. de Man has suggested, doubtless masticatory. I noticed also a decided transverse striation, or rather file-like roughness, between the longitudinal ribs of the anterior part of the pharynx, designed, doubtless, to give a better grip on the food. It is noticeable that these ribs of the anterior chamber are the summits of ridges and are not conspicuously jointed as in *Cyatholaimus* and many species of *Chromadora*. The cylindroid œsophagus is slightly expanded both anteriorly and posteriorly, and measures

about two-thirds as wide as the neck. Its lining is conspicuously crenate in optical section. The intestine, which is separated from the œsophagus by a deep and narrow cardiac constriction, is three-fourths as wide as the body, and contains in its cells small granules with a tendency to a tessellated arrangement. The post-cardiac ventral gland empties through a pore just behind the nerve-ring; the sub-spherical ampulla is one-fourth as wide as the neck and often presses the skin outward in the region of the duct so as to form a conspicuous ventral elevation. The lateral fields are nearly one-fourth as wide as the body. The nerve-ring encircles the œsophagus squarely.

The young stages of this worm were found in sea-sand near low-tide mark, Port Jackson, New South Wales, Australia.

GRAPHONEMA, gen.nov.

GRAPHONEMA VULGARIS, n.sp. I have seen numerous specimens of this handsome and very common worm. It frequents algae and sea-sand along the coast of New South Wales and Victoria. Like *Graphonema pachyderma*, another species to be described later on, and to which it is closely related, it much resembles the species of *Chromadora*, but lacks the ventral row of preanal male accessory organs and possesses a simple œsophagus without a cardiac bulb. Female formula—

$\frac{.5 \quad 7 \quad 13 \quad .47^{.30} \quad 89}{1.2 \quad 2.1 \quad 2.1 \quad 3 \text{ to } 5 \quad 2}$ 1.6 to 1.8 mm. The middle diameter is very often notably greater in gravid females than in those otherwise equally large but containing no eggs in the uterus. The thick cuticle bears very inconspicuous hairs (if any) and is traversed by striæ similar to those in the case of *G. pachyderma*, except that in the present species the markings are not different on the lateral fields nor are the striæ so apparently the summits of transverse ridges. The conoid neck terminates in a truncate head, conspicuous because of a slight constriction behind it, and because of the sudden diminution in size on it of the cuticular markings, they being not more than half as large as similar markings near by on the neck. The six cephalic setæ opposite the apex of the dorsal tooth, and the four sub-cephalic setæ

opposite the base of the same tooth are so far forward and so small that they are easily confounded with the setose papillæ distributed on the lips. These papillæ are numerous, six larger being found on the front of the lips, one on each lip, and about eighteen others smaller, being found nearer the oral orifice. The lateral organs seem to be represented by what appears in the profile view to be a transverse lateral ridge opposite the sub-cephalic setæ. There are no eyes. The simple cyathiform twelve-ribbed pharynx is 8μ deep and contains, 3μ from its anterior border, a minute dorsal tooth. The ribs of the pharynx are jointed. Anteriorly the œsophagus is only one-third as wide as the neck in its anterior half, but behind the nerve-ring it gradually expands until it finally becomes two-thirds as wide as the base of the neck. The cardiac constriction is distinct and rather broad. The thin-walled intestine, at first narrow, becomes gradually three-fourths as wide as the body. The rectum in the female is equal in length to the anal body-diameter. The elongated ventral gland is situated behind the cardiac region, and empties its excretion by means of a duct and an ellipsoidal ampulla one-third as wide as the neck, through a ventral pore situated just behind the nerve-ring. The tail is conoid from the inconspicuous anus; the conoid terminus is one-third as wide as the base of the tail. Caudal glands are present. The elevated vulva leads to uteri, never containing more than three or four eggs each; these are unsegmented and three-fourths as wide as the body, and two-thirds as long as wide. The reflexed parts of the ovaries reach three-fourths the way back to the vulva.

$\frac{.4 \quad 7 \quad 12.5 \quad -M \quad 88}{1.1 \quad 2.1 \quad 2.2 \quad 3.3 \quad 2.2}$ 1.6 to 1.8 mm. The male tail is precisely like that of the female,—perhaps a little more arcuate. The two equal, linear, arcuate spicula appear to be of uniform size throughout, and are twice as long as the anal body-diameter. The two simple accessory pieces are one-half as long as the spicula and are arranged parallel to them. I saw no accessory organs either pre- or post-anal.

This worm is very common on Australian coasts, among algae and in sand.