MARINE FREELIVING NEMATODES FROM SOUTH AUSTRALIA

PART 1

by P. M. MAWSON*

With text figures 1-26

[Read 12 July 1956]

SUMMARY

A full account is given of *Anticoma similis* Cobb, hitherto insufficiently described; *Prooncholaimus megastoma* (Eberth) is re-described; new records and additional descriptions are given of *Polygastrophora hexabulba* (Filipjev), *Halichoanolaimus robustus* (Bastian), *H. ovalis* Ditlevsen, and *Spiliphera dolichura* de Man; new species proposed are *Metoncholaimus brevispiculum* and *Steineria pulchra.*

The marine freeliving nematodes of Australia have hardly been investigated up to the present. The only records are those by Cobb (1890, 1893, 1898) and Allgen (1929, 1951), apart from a short recent paper by the present author (1953). It is proposed to describe the local species from time to time as sufficient specimens of each become available. The majority of those described below are from inter-tidal levels, a few from material washed up by storms. All the places mentioned are in St. Vincent's Gulf, with the exception of Encounter Bay, which is on the South Coast.

Anticoma similis Cobb

Figs. 1-4

Cobb, 1898, 383, Sydney.
de Man, 1904, 13, Tierra del Fuego.
Allgen, 1930, 248, Staten Island (Tierra del Fuego).
Micoletzky, 1930, 24, Sundra Island.
Allgen, 1951, 330, Port Juckson.

In South Australia, from the Outer Harbour, on wharf piles (sublittoral), and Brighton beach, on sponges, etc., cast up by the tide after a storm.

♀ (5×) L 1·5-1·8 mm.; α 30·7-34·8; β 4·3-5·1; γ 5·9-7·5; V 42-45·5 p.c.

♂ (2×) L 1·5-1·65 mm.; α 31·7-47; β 4·7; γ 7·5-7·8.

In spite of the list of records given above, this species is not well known. The descriptions given by Cobb and by Micoletsky are unfigured and of females only; that of de Man is of a juvenile of which only the tail is drawn; Allgen describes briefly females and juveniles from Staten Island, and records without drawing or description males and females from Port Jackson in Australia (Type locality).

It was suggested by Wieser (1953, 16) that the species may be a synonym of *A. acuminata.* It is certainly very close to that species and to *A. profunda,* differing from the former in the shorter absolute length of the spicule, the longer tail (measured in anal diameters), and rather shorter cephalic setae, and from the latter in the position of the preanal organ, in the more forward position of the excretory pore and amphid, and in the slightly shorter cephalic setae (measured in cephalic diameters). These differences are all very slight, and it is probable that when further data is to hand the two species, and probably some others, may be synonymised.

* University of Adelaide.

The lips are quite distinct, but labial papillae were not seen. The cephalic setae are all of nearly equal length, a little less than the head breadth. The slit-like amphids are wider in male than in female (a third and a quarter of the head breadth respectively). The cephalic setae are half a head breadth from the anterior end, and the amphid one head breadth. The row of five to six cervical setae extends for 6-10μ, and the most anterior is about 2·8-3 head breadths from the anterior end; the setae are not all of the same length, the longest being 4μ.

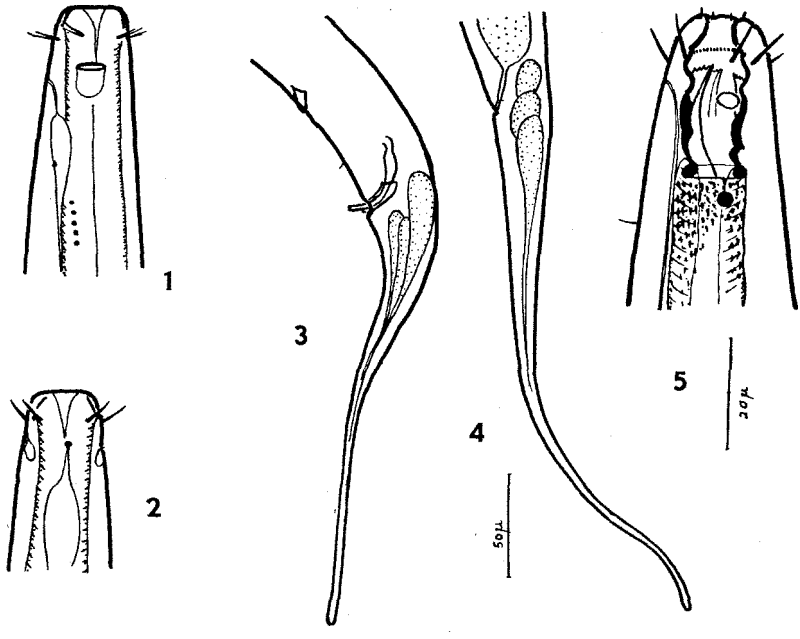

Plate 1.

Figs. 1-4.—*Anticoma similis.* 1 and 2, head, lateral and ventral views. 3, male tail. 4, female tail. Fig. 5.—*Polygastrophora hexabulba,* head. Figs. 1, 2 and 5 to same scale. Figs. 3 and 4 to same scale.

The excretory pore lies at the same level as the amphid or slightly behind it, and opens on a slight elevation of the cuticle. The ventral gland reaches to the posterior end of the oesophagus. The female tail tapers very gradually, the posterior half is cylindrical and the whole length 8·4-9 anal breadths. The male tail tapers rapidly just behind the anus then more gradually, its whole length 6-6·6 anal breadths; there is a very slight terminal swelling in both sexes. The spicules are 30-38μ long (equal to the anal breadth), with narrowed proximal ends. The gubernaculum is 15-20μ long; the preanal organ is 10μ long, and lies about 1·3 anal breadths in front of the anus.

Polygastrophora hexabulba (Filipjev, 1918)
Fig. 5

From wharf pile at Outer Harbour, jetty pile at Brighton, and among algae, etc., from reefs at Pt. Willunga and Pt. Noarlunga, and in algae washed up on beach at Brighton.

♀ L 3·8-6 mm.; α 45-58; β 5-5·7; γ 24-28; V 52-56 p.c.

The species agrees in all essentials with earlier descriptions. The main

dimensions are as follows: the cephalic setae are nearly half of the cephalic diameter and the amphids a sixth of the corresponding body breadth. The labial papillae are setiform. The buccal capsule is 23-26μ long, and the teeth extend to within a third of this from the mouth. The ocular pigment is formed of six longitudinal components and is most strongly developed at the anterior end of the oesophagus, near which are the lenticulate bodies.

The excretory pore is at about the same level, or anterior to, the amphids, although the "ampulla" lies more than twice the length of the buccal capsule behind the anterior end. The eggs are 160-200μ by 80-90μ. The tail is 4·2-5·2 times the anal breadth.

Prooncholaimus megastoma (Eberth)

Figs. 6-8

From wharf piles, Outer Harbour, sublittoral.

♂ (2×) L 2·7 mm.; α 27; β 5·7-6·3; γ 21.

♀ (2×) L 3·1-4·2 mm.; α 29-35; β 7-8·7; γ 17-21; V 74-77 p.c.

Prooncholaimus megastoma, originally described by Eberth (1863, 26) was partly re-described, without drawings, by Micoletsky from various places in the Mediterranean Sea and the Red Sea. Schuurmans Stekhoven (1943, 6; 1943, 343) proposed a new species, *P. mediterraneus*, for his own specimens from Alexandria, and placed Micoletsky's *P. megastoma* as a synonym of this, giving as the distinction from Eberth's types a greater size in the new species. A copy of Eberth's paper is not available to me. Micoletsky quotes the length of Eberth's specimen as 5-6 mm.; Schuurmans Stekhoven quotes them as 5-9 mm.

P. aransis Chitwood (1951, 626) is very close to *P. megastoma* and is separated from it by the shortness of the gubernaculum.

The proportions given by Micoletsky, Chitwood and Stekhoven are close together, and those of the South Australian specimens agree in some points with one, in some with another. The main points are given in the table below. Spicule length and anal breadth are expressed as percentages of the tail length, the width at end of the tail as percentage of anal breadth, and the gubernaculum as a fraction of the spicule length. In the South Australian specimens the proximal part of the gubernaculum is thinner than the distal part, so that it was only after close inspection that its total length was realised.

TABLE 1.

Species Authority Locality	*P. megastoma* Micoletsky			*P. mediterraneus* Stekhoven Alexandria	*P. aransas* Chitwood Texas	*P. megastoma* Mawson South Australia
	Medit.	Naples	Suez			
Length ♂ (♀)	2·9(3·3)	3·6(—)	2·26(—)	3·28(3·8)	2·5(2·8)	2·7(3·1-4·2)
α ♂ (♀)	25(27)			41(34·5)	24·7	27(29-35)
β ♂ (♀)	6·5(6·9)			6·55(7·6)	6·3	5·7-6·3(7-8·7)
γ ♂ (♀)	20·6(18)			23·5(19)	21(18)	21(17-21)
V	75%			75·2%	22%	74-77%
spicule length	88-100%			100%	70%	72-76%
anal br. ♂ (♀)	19-22%(—)			19%(22%)	16·5(33%)	19-20(22-25%)
br. tip tail ♂ (♀)	23-42%(—)			43·5%(27%)	—	38%(30%)
gubernaculum	1/4-1/5			1/6	1/6	1/4

Metoncholaimus brevispiculum n. sp.

Figs. 9-12

Brighton, on jetty piles among *Galleolaria caespitosa* and algae.

♂ (6×) L 2·8-3·3 mm.; α 34-48; β 5·3-6·3; γ 17-19.

♀ (7×) L 3·4-7·4 mm.; α 33-39; β 5·5-6·4; γ 17·5-19; V 66-71 p.c.

The six lips are deeply separated, each with a small labial papilla. The ten cephalic setae are short, about 1/6-1/7 of the head breadth. The amphid is between a quarter and a fifth of the corresponding body diameter, and lies

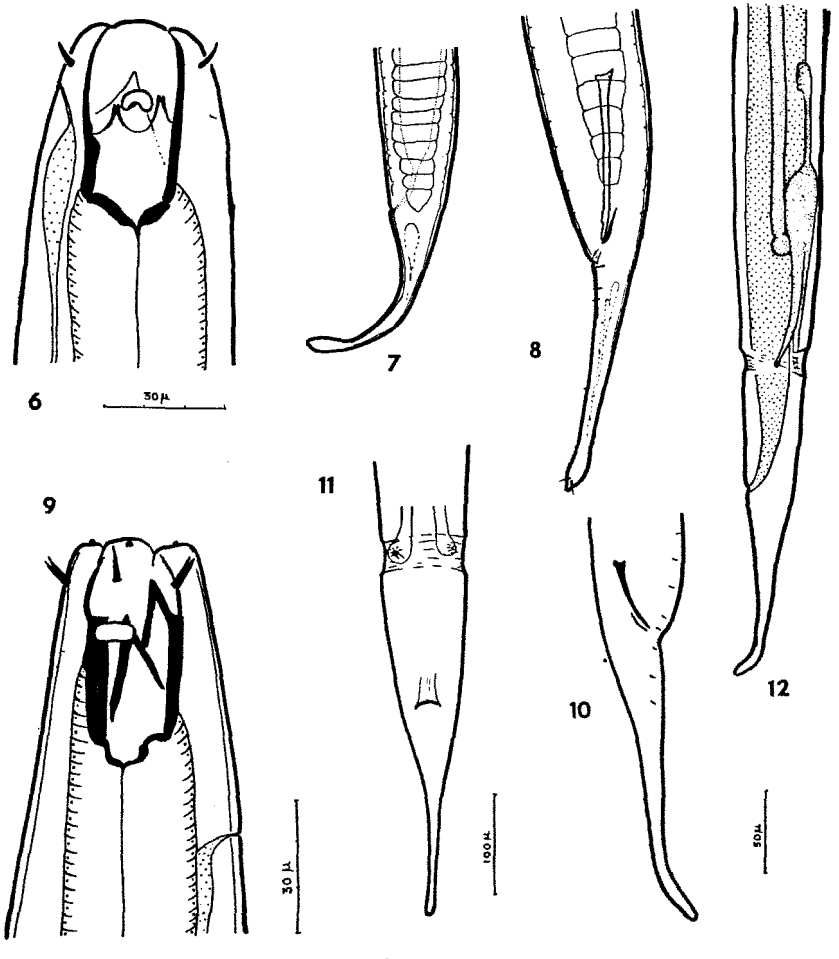

Plate 2.

Figs. 6-8.—*Prooncholaimus megastoma.* 6, head, lateral view. 7, female tail. 8, male tail. Figs. 9-12.—*Metoncholaimus brevispiculum.* 9, head, lateral view. 10, male tail. 11, female tail. 12, posterior end of female. Figs. 7, 11 and 12 to same scale; Figs. 8 and 10 to same scale.

level with the midlength of the buccal capsule. The buccal capsule, more heavily chitinised and somewhat narrower in the posterior half, is 35-40μ long and 20-25μ wide in the anterior part. The dorsal tooth and one subventral reach

just anterior to the middle, and the other subventral to about three-quarters, of the length of the buccal capsule. The excretory pore lies between 1·5-2 times the length of the buccal capsule from the anterior end.

The unshelled eggs are 110 × 50μ, the shelled ones 120-150μ × 60-70μ. The two external openings of the demanian system are somewhat dorsal, 130-140μ in front of the anus, in which region the body is distinctly constricted; the uvette (or rosette organ) about twice this distance from the anus, is an ampulla, as figured by Cobb (1930) for *Oncholaimium appendiculatum*, and simpler than that of *Metoncholaimus pristiurus*; the osmosium is about 400μ from the anus. Cobb (*loc. cit.*) observed that a demanian system is apparently less prevalent among Oncholaims living in thoroughly oxygenated water; this species is an exception to this, as the worms occurred on the part of the piles exposed only at low spring tides and below this, in clear unpolluted water on a sandy bottom.

The tail of the female is about 4·2-5 times the anal breadth, tapering in the proximal half, cylindrical in the distal, with a slightly enlarged tip. The male tail is 4·4-5 times the anal breadth; the body narrows sharply at the anus, the proximal third of the tail is tapering, and the rest cylindrical with slightly swollen tip as in the female. There is a slight papilliform thickening of the cuticle of the anterior lip of the anus, associated with some subcuticular development, but without setae. The two rows of small submedian setae, 5 preanal and 3 postanal, are not seen except under high power. The spicules are 40-45μ long, only a little more than the anal breadth. They are straight and tapering. A small gubernaculum 12μ long is seen in some specimens.

This new species is the Enoploid found in the greatest numbers on the Brighton jetty piles. Only females with eggs in the uterus (not necessarily shelled), but males of varying development, were measured. The species is assigned to the genus *Metoncholaimus* because of the presence of a single ovary associated with a complex demanian system, and the type of tooth arrangement, one subventral and the dorsal being equal in length and shorter than the other ventral. The spicules, however, are shorter than in other species, reaching only a quarter of the tail length. In this character and in the form of the demanian system, the species resembles those of the genus *Oncholaimium*, from which, however, it is sharply differentiated by the absence of a mid-ventral caudal papillae in the male. It is distinguished from other *Metoncholaimus* spp. by the shortness of the spicules.

Genus Steineria Micoletsky, 1921

Micoletsky proposed *Steineria* as a subgenus of *Monhystera* to include *M. polychaeta* Steiner 1915, *M. pilosa* Cobb 1914, and *M. horrida* Steiner 1915. His diagnosis of the genus is brief, little more distinction being made than that there are very numerous setae (36-40) at the anterior end. No species is selected as the type of the subgenus, the three being quoted in the order given above. Stekhoven and Coninck in 1933 elevated *Steineria* to the level of a genus, and added *S. setosissima* (Cobb), syn. *Monhystera setosissima* Cobb 1893, and a new species, *S. mirabilis*. They stated that *Steineria* is "characterised" by its distinct 8-fold symmetry in the distribution of labial and cephalic setae", and therefore exclude *Monhystera horrida* Steiner as it possesses a 6-fold symmetry. They also stated that *Steineria setosissima* becomes the type species of the genus, presumably as it was described earlier than any of the others ascribed to the genus. The validity of this is, however, doubtful, as the species was not mentioned by Micoletsky in his account of *Steineria*. More recently, Gerlach (1951) re-described *S. mirabilis*, from fresh material and finds that the labial and cephalic setae are a symmetry of six while those further back, nuchal setae, are in one of eight. Gerlach added at the same time a new species, *S. polychaetoides*, and in 1955 (pp. 294, 296), two more new species, *S. paramirabilis* and *S. punctata*, and in all of these a similar condition is present.

In descriptions of all the species, if labial papillae are mentioned, there are six, setiform or papilliform. In most descriptions the cephalic and nuchal setae are collectively referred to as cephalic setae, and usually as occurring in a symmetry of eight. However, in the figures given of *S. pilosa* and *S. polychaeta* there is a ring of setae which are anterior to or on a level with the anterior most nuchal setae, or which are out of line, in a longitudinal sense, with these, one set being distinctly lateral instead of sublateral; it seems at least possible that these are the true cephalic setae and that they are in six groups. These species would then agree with *S. horrida, S. mirabilis, S. polychaetoides, S. paramirabilis, S. punctata,* and *S. pulchra* n. sp.*

S. polychaeta was the first in the list given by Micoletsky of species belonging to his subgenus, and so might strictly be regarded as being the type species. No figure is given by Cobb of *S. setosissima,* and the description of the setae at the anterior end is ambiguous.

B. G. Chitwood (1950, 65, fig. 60, 11, JJ) describes *Steineria* as having an internal circle of 6 papillae and an external circle of 10 or 12 setae according to the species, as well as numerous somatic setae grouped anteriorly in eight longitudinal rows, 4 submedian and 4 sublateral. Chitwood's original drawings are of "*Steineria* sp.", locality not given.

Gerlach (1955) describes additional cephalic setae in the male (as in the new species described below), and his figures show these arranged somewhat as in Chitwood's figure of *Steineria* sp.

A key to the species so far allotted to the genus is given. In it the question of symmetry is ignored, distinctions being made on other characters. For convenience the labial sense organs are referred to as lso, the nuchal setae as ns, the body setae as bs, caphalic setae as cs, and cephalic diameter as cd.

1. Setae other than ns, absent on body.....2
   Body setae present.....3
2. Length cs less than half cd; lso papilliform.....*S. horrida*
   Length cs nearly equal to cd; lso setiform.....*S. pulchra*
3. Length bs more than 4 × body width.....*S. mirabilis*
   Length bs less than 2 × body width.....4
4. Centre of amphid about 2 × cd from anterior end.....5
   Centre of amphid 1·5 × cd or less from anterior end.....6
5. β 6·2; spic. 56μ long: gub. 2/3 spic. L.....*S. setosissima*
   β 3·9-4·3; spic. 23-24μ; gub. about ½ spic. L.....*S. paramirabilis*
6. Longest ns 2·5-3 × cd; lso setiform.....*S. pilosa*
   Longest ns 1·5-2 × cd; lso papilliform.....6
7. Cuticle with transverse rows of punctations.....*S. punctata*
   Cuticle finely striated.....8
8. Amphids 1/2·3 of cd.....*S. polychaeta*
   Amphids ¼ cd.....*S. polychaetoides*

Steineria pulchra n. sp.

Figs. 13-16

From weeds on a jetty pile, Outer Harbour, and among holdfasts of *Hormosira* sp. and *Ulva* sp., Encounter Bay.

♂ (2×) L 1·9 mm.; α 19, 24; β 5·1, 4·2; γ 6·6, 8·2.

♀ (2×) L 1·5, 2·17 mm.; α 23, 31; β 3·8, 4·3; γ 6·2, 7·4; V 66 p.c., 67 p.c.

J (3×) L 0·85-1·85 mm.; α 28·3; β 6·3-6·8; γ 4·15-4·6 (?).

* When this paper was read the author had not seen the description of *S. parapolychaeta* Gerlach 1953, nor a discussion of the genus *Steineria* by Wieser 1953, 74, in which two new species *S. cobbi* and *S. pectinata* are added; Wieser considers the genus should be redefined and exludes *S. horrida* and *S. mirabilis.* Wieser also, erroneously, quotes *S. setosissima* as the type.

The cuticle is ringed, without setae except near head, at tip of tail and on male tail. The head bears six lips each with a 4μ long setiform papilla, and six pairs of cephalic setae, the longer of each pair 20μ, the shorter about 2/3 this length. Behind this are nuchal setae arranged in eight longitudinal rows, in sublateral and submedian positions. In each of these rows the three (submedian) or four (sublateral) setae are long and stout, and increase in length from before backwards, the anterior ones being about 50-60μ, the posterior 75-80μ. Behind these in each row are two more shorter setae separated from them by a short distance in the sub-median rows and a rather longer space in the sublateral. In the two male specimens there is also a short, slender seta in each row in front of the stout setae. Submedian and sublateral setae are of similar lengths in corresponding positions.

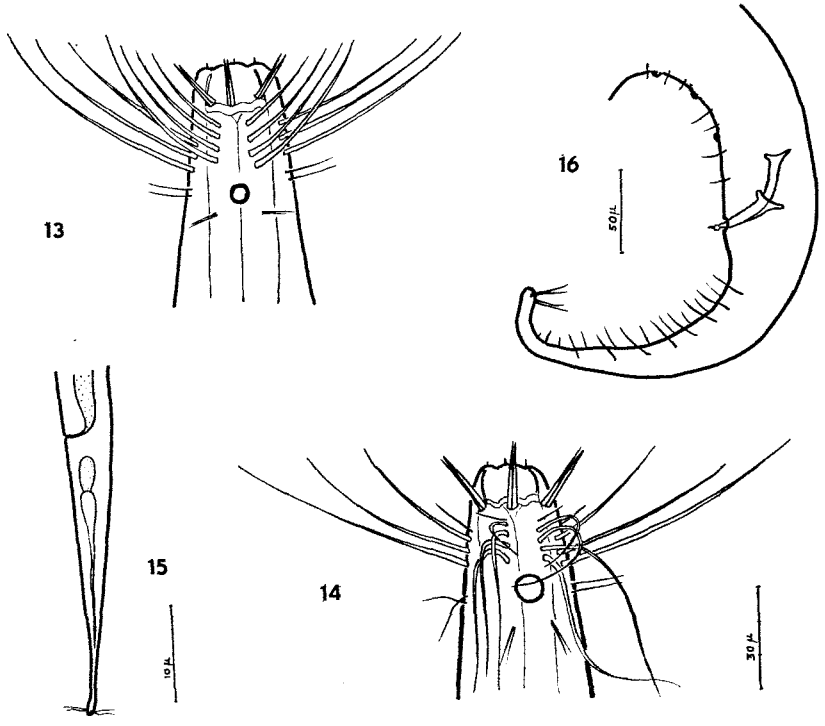

Plate 3.

Figs. 13-16.—*Steineria pulchra*. 13 and 14, lateral views of heads of female and male respectively. 15, female tail. 16, male tail. Figs. 13 and 14 to same scale.

The buccal capsule is wide and unarmed, with a narrow undulating cuticularised ring around its base. The circular amphid is 9-10μ in diameter in the male, 7μ in the female, these being a quarter and a fifth of the corresponding head width respectively. It lies just behind the longest nuchal setae, except in one male in which it is a little more anterior.

The nerve rings surrounds the oesophagus at a third of its length from the anterior end. The excretory pore was not seen.

The tail tapers in the anterior 2/3, the distal third is cylindrical with a swollen tip bearing two pairs of strong setae. The tail is 4·6-5·2 $\times$ the anal breadth in the male, 5·8-6 $\times$ in the female. The male tail bears on the subventral surface numerous long, slender hairs. In front of the anus are three

median papilliform preanal organs, between them several slender setae. The stoutly built spicules are 60μ long, with expanded proximal ends; the gubernacular pieces are rather more than half this length, and are of similar shape. This form of the gubernacula differs from that described for most other *Steineria* spp., as there is no backward prolongation.

The species is closest to *S. horrida*, from which it differs in several small features. As *S. horrida* is known from females only, a complete comparison is not possible. The South Australian specimens are now considered as representing a new species. The collection of more material of both species may widen the diagnosis of each and bridge the gap between them.

Spiliphera dolichura de Man, 1893

Figs. 17-21

From Port Willunga among coralline algae (lower littoral) and Brighton among algae washed up after storm.

♂ (4×) L 1·4-1·7 mm.; α 26·6-35; β 7-8·2; γ 2·7-3·6 (?).

♀ (5×) L 0·85-1·9 mm.; α 28·3-33·3; β 6·5-8·5; γ 3·4-4·6 (?); V 39·4-53 p.c.

These specimens are small, stout worms with a long filiform tail. The cuticle bears coarse punctations; slender setae are borne in submedian positions throughout the body length, and are more numerous, and longer, in the oesophageal region and on the male tail. Labial papillae were not observed. The six setae in the first cephalic ring are about 3μ long, the four submedian setae just behind these are 30μ long. Just behind the amphids are four pairs of slightly shorter setae (25μ) in submedian positions, the most anterior of the body setae. The amphids are transversely oval, in 1½ turns.

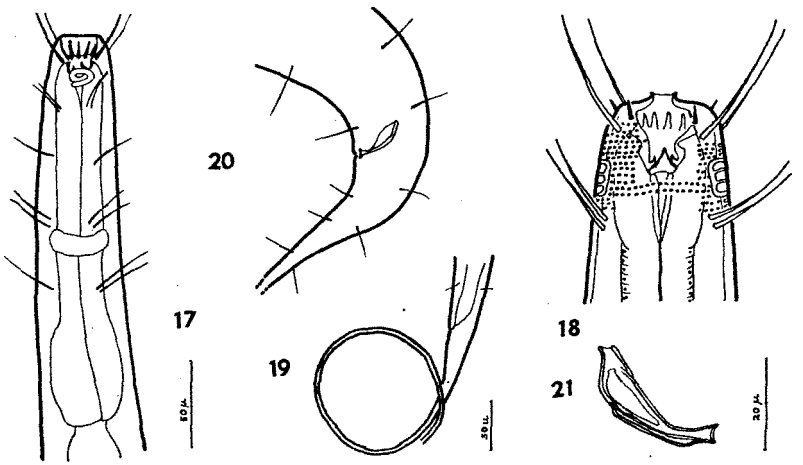

Plate 4.

Figs. 17-21.—*Spilifera dolichura*. 17, oesophageal region. 18, head, dorsal view. 19, female tail. 20, male tail. 21, spicule. Figs. 17 and 20 to same scale; Figs. 18 and 21 to same scale.

The anterior cup-shaped part of the buccal capsule is 12μ in diameter, 7μ deep, and is followed by a strongly chitinised more or less funnel-shaped part embedded in the anterior end of the oesophagus, and with one large dorsal and two shorter lateral, teeth at its base. The anterior slightly wider part of the oesophagus in which the structure is more homogenous, has a strong cuticular lining.

The anal breadth of the male is 40-45μ, the spicule length 30-35μ. Close examination of these males, in which the spicules are very clear does not bear out de Man's interpretation of the shape of the spicular apparatus. What he called the gubernaculum, a lateral flange ending distally in an enlarged half funnel, appears to be a part of the spicule itself. It was not possible, however, to get a ventral view of the apparatus.

The females contained but a single egg, the largest of these was 60 × 26μ.

The measurements and morphology of these South Australian specimens are comparable with those described by de Man; the greatest difference is in the greater length of the first paired post-amphidial setae; this is the main difference also between them and those recorded by Wieser from the coast of Chile (Wieser 1954, 117). The species is widespread, having been recorded from the North Sea (de Man 1893, 94); the Mediterranean (de Rouville 1903, ?; Allgen 1942, 48); Pacific coast of Chile (Wieser 1954, 117); Tierra del Fuego (Allgen 1930, 29), Campbell Is. (Allgen 1932, 126), Kerguelen Is. (private record, unpublished), South Australia (above).

Halichoanolaimus robustus (Bastian)

Figs. 22-23

From wharf piles, Outer Harbour, among weeds, etc. Sublittoral.

♀ (6×) L 2·2-3·3 mm.; a 25-30; β 5-7·7; γ 17-30 (?); V (5×) 44-52 p.c.; (1×) 68 p.c.

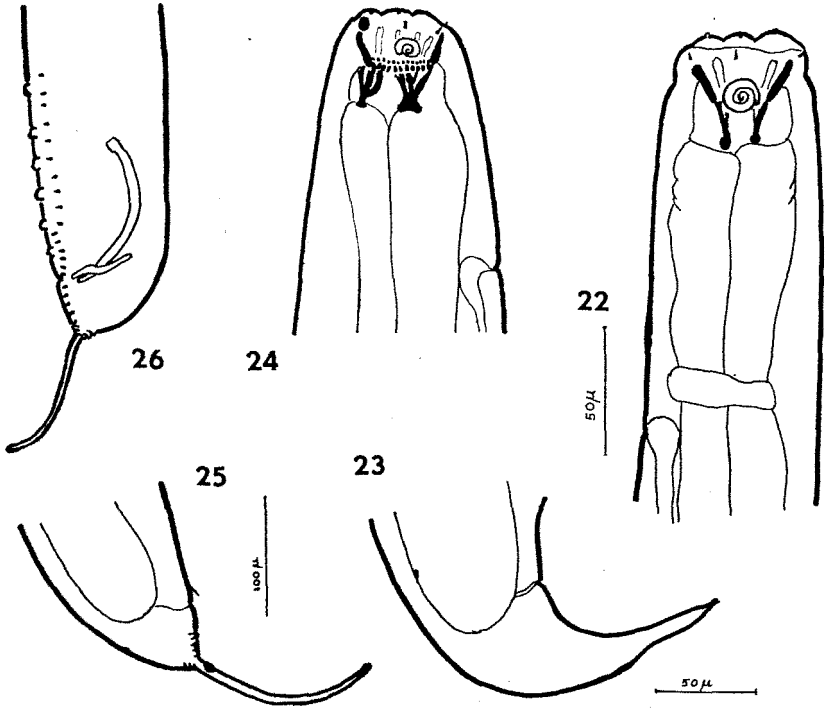

Plate 5.

Figs. 22-23.—*Halichoanolaimus robustus*. 22, anterior end, lateral view. 23, female tail. Figs. 24-26.—*H. ovalis*. 24, head, lateral view. 25, female tail. 26, male tail. Figs. 24, 25 and 26 to same scale.

Six female worms are referred to this cosmopolitan species; the measurements and appearance correspond with those assigned to the species by other authors. There is also a close resemblance to *H. hinemoae* Ditlevsen 1930 from New Zealand, and it is possible that this species is a synonym of *H. robustus*.

The exact position of the anus is in doubt in many of the specimens. The oesophagus and anterior part of the intestine are heavily pigmented. The habit of the worms is to lie in one or two coils, so they are readily picked out, living or in pickle, by their appearance. This pigment was mentioned by Bastian.

Halichoanolaimus ovalis Ditlevsen, 1921

Figs. 24-26

From limestone reef near Edithburg, in sand pockets among *Zostera* sp.
♂ (7×) L 3·35-4·2 mm.; a 21·2-28; β 6·3-7; γ 20-28.
♀ (2×) L 3·6-4·35 mm.; a 24-24·1; β 6·7-6·8; γ 18-25·6; V 51-52.
Ditlevsen 1921, 8 (Auckland Island):
(2×) L 1·8 mm.; a 18; β 7·5; γ ?.
Allgen 1928, 271 (Campbell Island):
(2×) L 1·3 mm.; a 17·3; β 5·2; γ 7·2.

It will be seen from the measurements given above that the South Australian specimens assigned to *Halichoanolaimus ovalis* are larger than those from the Auckland and Campbell Islands. They also differ in having fewer spirals in the amphid, and the absence of any great degree of pigmentation in the alimentary canal. The male differs from that described by Allgen in the shape of the tail and γ value. In spite of these points, the similarity in shape and proportions between these and those described by Ditlevsen is so great that they are referred to the same species.

REFERENCES

Allgen, C., 1928. Freilebenden marin Nematoden von der Campbell und Staten Inseln. Nyt, Mag. f. Naturvidensk., **66**, pp. 249-309.

Allgen, C., 1930. Freilebende marine Nematoden von der Staten Inseln (Feuerlend Archipelago), Pt. 1, Zool. Anzeiger, **89**, pp. 246-258. Pt. 2, Zool. Anzeiger, **90**, pp. 27-38.

Allgen, C., 1951. Papers from Dr. Mortensen's Pacific Expedition 1914-16. 76. Pacific freeliving nematodes. Vidensk. Medd. naturh. Foren. Kbh., **113**, pp. 263-411.

Cobb, N. A., 1898. Australian freeliving nematodes, Proc. Linn. Soc. N.S.W., **13** (3), pp. 383-407.

Cobb, N. A., 1930. The demanian vessels in nemas of the genus Oncholaimus, with notes on four new oncholaims, J. Wash. Acad. Sci., **20**, pp. 159-161.

Chitwood, B. G., 1951. North American marine nematodes, Texas Journal Sci., **3**, pp. 627-672.

de Man, J. G., 1893. Cinquième note sur les nématodes libres de la mer du Nord et de la Manche, Mém. Soc. Zool. France, vol. **6**, pp. 81-125.

de Man, J. G., 1904. Némotodes libres. In Résultats du voyage du S.Y. Belgica en 1897-1899 sous le commandement de A. de Gerlache de Gomery, Zoologie, 55 pp., Anvers.

Ditlevsen, H., 1921. Papers from Dr. Mortensen's Pacific Expedition, 1914-16. 3. Marine freeliving nematodes from the Auckland and Campbell Islands, Vidensk. Medd. Dansk. naturh. Foren., **73**, pp. 2-32.

Ditlevsen, H., 1930. Marine freeliving nematodes of New Zealand. Papers from Dr. Mortensen's Pacific Expedition, 1914-16. 52. Vidensk. Medd. Dansk. naturh. Foren., **74**, pp. 201-240.

Filipjev, I. N., 1918. Freilebende Nematoden aus der Umgebung von Sebastopol, Trav. Labor. zool. et de la Stat. Biol. Sebastopol prés de l'academie des sciences de Russie (2), **4**, 614 pp. (Russian; German translation by H. A. Kreis in Arch. Naturges., **91**, pp. 94-180, 1925.)

Micoletsky, H., 1921. Die freilebende Erd-Nematoden, Arch. f. Naturges., A, **8**, 650 pp.

Micoletsky, H., 1924. Weitere Beitrage. Zur Kenntnis freilebender Nematoden aus Suez, Sitzungsber, Akad. Wissensch. Wien, Math.-naturwiss., **132** (7 and 8), pp. 225-261.

Micoletsky, H., 1930. Papers from Dr. Mortensen's Pacific Expedition, 1914-16. 53. Freilebende Nematoden von der Sunda Enseln (Kreis, H. A.). Vidensk. Medd. naturh. Foren., **87**, pp. 234-339.

SCHUURMANS STEKHOVEN, J. H., 1943. Einige neue freilebende marine Nematoden der fischereigrunde vor Alexandrien. Note 1st, Biol. mar. Rovigno, **25**, pp. 1-15.
SCHUURMANS STEKHOVEN, J. H., 1943. Freilebende marine Nematoden der Mittelmeeres. IV. Freilebende marine nematoden der Fischereigrunde bei Alexandrien, Zool. Jahrb. Jena. (Syst.), **76**, pp. 323-380.
SCHUURMANS STEKHOVEN, J. H., and CONNINCK, L., 1933. Diagnoses of new Belgian marine nemas, Bull. Musée Roy. d'Hist. nat. de Belgique, **9** (4), 13 pp.
STEINER, G., 1916. Freilebende Nematoden aus der Barentsee, Zool. Jahrb., **44**, pp. 195-226.
WIESER, W., 1954. Freeliving marine nematodes. II. Chromadoroidea. Chile Reports 17. Lunds Univ. Arsskrift, N. F. Avd. 2, 50, No. **16**, pp. 1-148.
WIESER, W., 1955. Freeliving marine nematodes. III. Axonolaimoidea and Monhysteroidea. Chile Reports 26. Lunds Univ. Arsskrift, N. F. Avd. 2, 52, No. **13**.