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SCIENTIFIC REPORT  
ON THE BELGIAN EXPEDITION  
TO THE GREAT BARRIER REEF IN 1967  
NEMATODES I : DESMOSCOLEX-SPECIES  
(NEMATODA — DESMOSCOLECIDA)  
FROM YONGE REEF, LIZARD ISLAND  
AND NYMPHE ISLAND  
WITH GENERAL CHARACTERISTICS  
OF THE GENUS DESMOSCOLEX

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ABSTRACT

Hundred and thirteen specimens of *Desmoscolex*, belonging to fourteen species, were found in samples from Yonge Reef, Nympe Island and Lizard Island (Great Barrier Reef, Australia). Among them *D. granulatus* n. sp., *D. laevis* Kreis, 1926 and *D. minutus* Claparède, 1863 are described.

A new name, *D. paralaevis* n. sp. is proposed for the specimens described as *D. laevis* by Lorenzen (1971). The diagnosis of the genus is emended by considering the internal structures such as the oesophagus and oesophago-intestinal junction.

INTRODUCTION

Since Schepotieff (1907), the author of the family Desmoscolecidae, all the other nematologists, including recent workers as Timm (1970) characterise the different genera in this family by the striking structure of the body rings.

The genus *Desmoscolex* Claparède, 1863 is characterised by the presence of prominent outstanding cuticular annules, covered with concretion particles and separated by clear annulated interzones; the presence of subdorsal and subventral setae and by a terminal ring bearing a pair of setae.

According to Lorenzen (1969) the structure of the body rings

alone is not sufficient for establishing the relationships among the genera. He considers the arrangement of the somatic setae as more important. In the typical species (with 17 annules) 8 pairs of subventral and 9 subdorsal pairs of somatic setae are present, arranged in a characteristic and constant way. In the other species, however, this pattern varies according to the species. The constant occurrence of a pair of subdorsal setae on the terminal ring is considered to be of phylogenetic importance (Lorenzen, 1969).

Until now the genus *Desmoscolex* has been diagnosed exclusively on the basis of external and cuticular structures. In this study an attempt is made to improve this situation by including internal structures considered to be of major importance such as the oesophagus and oesophago-intestinal junction.

#### MATERIALS AND METHODS

Among a large number of samples collected from The Great Barrier Reef, the following contained specimens of *Desmoscolex* :

1. Nympe Island : shallow gully among Cyanophyceae and Foraminifera, under and between stones and among the fine coral debris around *Halimeda*, on 24 September 1967 :

Sample 1 : algae on stones

Sample 2 : among fine coral debris around *Halimeda*

Sample 3 : between algae and Foraminifera.

The three samples were only few meters apart and were all fixed with cold formalin 5 %; 71 individuals were found, belonging to 7 different species.

2. Yonge Reef : sandy patch on the reef flat, 2 September 1967 (4 specimens belonging to 1 species) and channel, 1 km behind Yonge Reef at a depth of 35 m on 28 September 1967 (27 specimens belonging to 7 species).

Samples from reef flat (fixed with hot FA4 : 1 or cold formalin 5 %).

Samples from channel (fixed with T A F or cold formalin 5 %).

### 3. Lizard Island :

- a) 800 m westward from the island, 21.5 m deep, sandy bottom covered with a layer of silt and rich in Foraminifera on 12 September 1967. Specimens fixed with hot FA4 : 1.
- b) sand between *Halimeda*, 20 m deep on 14 September 1967, fixed in toto with formalin 5 %.

Together eleven specimens, belonging to 5 different species. Altogether 113 specimens belonging to 14 different species.

Nematodes were either extracted immediately after sampling and fixed with hot fixative (Formalin 5 %, FA4 : 1, TAF) or bulk samples were fixed in toto with cold formalin 5 %. Nematodes from the bulk samples were extracted in the laboratory by decantation method or by the centrifugal-flotation technique (Jenkins, 1964; De Grisse, 1969). The specimens were mounted in dehydrated glycerin by the short method of De Grisse (1965).

## Genus DESMOSCOLEX Claparède, 1863

### MORPHOLOGY

#### *Annulation*

The cuticle bears large annules, commonly called concretion annules or main rings, which protude outward from the body. This pseudosegmentation caused Claparède (1863) to relate *Desmoscolex* to annelids.

In counting the number of rings it is customary to exclude the head, even when it is as darkened or concretized as the body rings, but to include the tailcone or endring.

The large concretion rings are separated by interzones bearing smaller annules. The relative distance between main rings is considered a specific character, but also depends to some extent on the contraction of the body, as may be seen in ventrally bent specimens. The number of inter-ring annules is in *Desmoscolex* also a specific character, but it varies in different parts of the body, being smaller in the anterior and posterior parts of

the body. These last two characters are only of secondary importance.

The cuticle continues at the level of the concretion rings as 2 or 3 somewhat deformed annules, similar to those of the interzone; they are distinct in those species where the main rings are composed of fine granular material and have a regular outline. Due to the granular inclusions within the large rings and the concretion particles of varying sizes adhering to the outside, the body is often very opaque. In specimens in which one or more of the rings have partially peeled off from the body, a median row of pegs (e.g. *D. laevis*; *D. granulatus* n. sp.) or two transverse rows of tiny spines bordering the main ring anteriorly and posteriorly, are visible. In *D. vanoyei* De Coninck, 1943, the author interprets them as pores, whose probable function is to discharge a cementing fluid to the outside of the body. In some *Desmoscolex* species (e.g. *D. laevis*), fine spines can be seen as a band in the center of the interzone annules, and in many cases they are obscured by fine granular or concretion bands which have developed around them; they may be present only on annules of the extreme anterior and posterior regions (e.g. *D. velifer*).

According to Timm (1970) concretion rings are not built up solely of concretion particles but the main substance is an internal granular component which is typical for each species. The cuticle consists of two main layers separated by a cavity which is considerably wider at the main rings than between them (Chitwood & Chitwood, 1950).

Whether the nature of the concretions on the outside of the rings changes with different kinds of sediment or whether they are characteristic for a species is difficult to determine without experimentation. According to Timm (1970) a few species from widely separated geographical areas show a remarkable uniformity of appearance. On the other hand specimens of the same species found in Lizard Island and Yonge Reef, show a great difference in the amount, coarseness and colour of the concretion particles.

### Head

The head is well off set from the body. It is usually rounded in lateral view but assumes a different form dorsoventrally due to a slight lateral flattening. Cuticularization of the head may be very thick. The anterior region sometimes protudes (*D. n.sp.1* will be described in a following paper); its shape is truncate or rounded, bearing 6 distinct lips, each with one labial papilla (e. g. *D. laevis*). There are rugae or short pegs at the extreme anterior end in some species (e.g. *D. laevis*).

### Cephalic setae

Most species of Desmoscolecidae have four pedunculate or non-pedunculate submedian cephalic setae; but these are lacking in *D. nematoides* Greeff, 1869, *D. rostratus* Timm, 1970, *D. n.sp.1*. Sometimes the setae are located at the extreme anterior end (e.g. *D. leptus*).

The cephalic setae may or may not be of the same construction as the somatic setae. Often they are of the hollow tubular type and jointed.

### Somatic setae

All the somatic setae of the different *Desmoscolex* species we found, were of the hollow tubular type. They consist of a larger shaft inserted on a protuberance of the cuticle of the main ring. This base is hollow and contains a narrow central canal which extends throughout the shaft and continues beyond it for a short distance. In the subventral setae the central canal ends in an acute tip; in the subdorsal ones the tip is spatulate and sometimes bent caudally. There can be a probably extensible narrow neck-part between the shaft and the terminal part (e.g. *D. laevis*).

Stauffer (1929) surmised that these setae are connected with glands; Chitwood & Chitwood (1950) illustrated unicellular gland cells connected with the setae of *D. americanus*. In several species studied these gland cells could be observed at the base of the somatic and the cephalic setae; they are most distinct at

the subdorsal setae, accountable when considering the dorsal side as the walking side. At the base of the distinctly elongated, subventral so called copulatory setae on the 8th main ring in females of *D. laevis* Kreis, 1926, those gland cells can be very prominent.

According to Timm, (1970), the arrangement of the somatic setae has not been emphasized as a specific character, even in the many species of *Desmoscolex* composed of 17 rings. He has found that in *Desmoscolex* the members of each pair of subdorsal and subventral setae are born on the same ring. Therefore he considers that setal patterns can be used as a primary diagnostic character in species of *Desmoscolex* and he established a typical setal pattern for 17-ring species of *Desmoscolex* in agreement with the characteristic scheme of Lorenzen (1969).

#### *Amphids*

The amphids have a membranous or vesiculate structure, basically circular to oval in shape. Their anterior margin can extend to near the mouth opening (e.g. *D. laevis*). The posterior extent of the raised membrane of the amphids is highly variable from species to species but is fixed for each species; these sac-like structures may extend as far back as the first or the second main ring (e.g. *D. n.sp.1*).

The amphidial canal connects with the pouch through a small circular pore or a groove. Amphidial glands have not been detected or described.

#### *Phasmata*

It are paired, lateral circular pores, situated at the base of the ventrally bent, sometimes swollen cone of the terminal ring; they are surrounded by foreign particles. So far no glands have been reported in association with these structures.

#### *Pigment spots*

Pigment spots or « ocelli » have been described for most species of *Desmoscolex*. They are never accompanied by lenslike cuticularized bodies as in other nematodes. The pigment spots are



not found in the oesophageal region as usual but just behind i.e. in the ventricular part of the intestine. The pigment spots may be circular or elliptical; they may differ greatly in size or even may be lacking in the same species.

#### *Digestive system*

In most species the stoma is a very short funnel and the oesophageal tissue extends nearly to the very anterior of the body. The oesophagus is short, cylindrical; in most species slightly swollen near the head end; extending till the posterior end of the 2nd or anterior end of the 3rd main ring, independent of the number of main rings or the body-length. Intestine, consisting of a finely granular or ventricular part and a coarsely granular proper intestine, mostly prominent due to the presence of large pale globules; the intestine often overlaps the rectum. The distal part of the rectum connects with a pale thick-walled tube, that protudes from the body, both in male and female. In the female the anal tube protudes at the posterior end of the corresponding main ring, whereas in the male the cloacal tube occurs in the middle of the ring. The main ring bearing the cloacal tube is often more expanded on the ventral side.

#### *Nerve ring*

The nerve ring is mostly bent ventro-caudally and is situated at the level of the 2nd concretion ring, just anterior to the oesophago-intestinal junction.

#### *Glands*

Three caudal glands are located postanally in the tail; they are mostly very obscure. Questionable excretory glands have been reported by Schepotieff (1908) in *D. laevis*.

#### *Reproductive system*

The female reproductive system is didelphic-amphidelphic, lacking flexures in most species. The vulva is rather small, situated at the posterior end of the 10th main ring or in the

following interzone in all 17-ring species. Four muscles, attached to the vagina can be seen in ventral view (Timm, 1970). The uteri contain no more than one ovum at the time and the number of oöcytes in the ovaries is few. Two rounded spermatheca with small globular sperms are lying near the vulva in most species we have examined. Sometimes a highly nucleated area is found opposite to the vulva (e.g. *D. n.sp.1*). The ova are thin-shelled and rounded. They may be attached to the body and carried by the female by mean of e.g. a pair of elongated subventral setae on the 8th main ring (*D. laevis*).

The male has a single, usually outstretched testis. The spermatocytes are large and few in number. There is a short and narrow van deferens, consisting of 8 finely granular cells in circumference in *D. laevis*. Two oblong granular organs — probably ejaculatory glands — were found in *D. laevis*, each one lying laterally from the vas deferens. In this same species a smaller organ, with finer granulae is situated only at the right side along the terminal part of the vas deferens.

The male copulatory apparatus consists of a gubernaculum (often difficult to observe) and two equal, cephalated or non-cephalated spicules. No preanal supplements or specialized genital papillae or setae are present.

#### SYSTEMATICS

*Diagnosis* (emended) : Desmoscolecinae with large raised granular rings, usually bearing concretion particles; separated by clear annulated interzones. Paired subdorsal and subventral setae. Terminal setae subdorsally on the last main ring. Oesophagus short, cylindrical; in most species slightly swollen near head end; extending till the posterior end of the 2nd or anterior end of the 3rd main ring, except for a large number of bodyrings (larger than 17-18). Nerve ring situated at the level of the 2nd concretion ring, just anterior to the oesophago-intestinal junction. Intestine anteriorly differentiated into a ventricular area. Somatic setae jointed, of the hollow tubular type.

Remark : The soil nematode *D. vinealis* Weischer, 1962 stands apart in that its oesophagus extends till the 4th main ring and



that terminal subdorsal setae are lacking. Therefore this species can be considered as an intermediate form between *Desmoscolex* and *Tricoma*, but closer to the former genus.

## EXPLANATION OF ABBREVIATIONS USED

- L = length of the body  
 hd = maximum head diameter (width  $\times$  length)  
 cs = length of cephalic setae  
 sd<sub>1</sub> = length of subdorsal setae on the first main ring  
 sl<sub>2</sub> = length of sublateral setae on the 2nd main ring  
 sv<sub>4</sub> = length of subventral setae on the 4th main ring  
 t = tail length  
 tmr = length of the terminal main ring + naked end-part with spinneret  
 tmrw = width of the terminal main ring devoided from foreign material  
 spic. = length of spicules, measured along the submedian line  
 gub. = length of gubernaculum  
 oes. = length of the oesophagus  
 oes. till 1st conc. = length oesophagus till first concentration of dark coloured granules  
 bd. vulva = body diameter at the level of the vulva  
 mbd = maximum body diameter  
 (mbd) = maximum body diameter devoided from foreign material.

All measurements are in microns.

*Desmoscolex granulatus* n.sp. Fig. 1*Measurements*

Holotype ♀ : L = 275, hd = 18  $\times$  12, cs = 15, sd<sub>1</sub> = 17, sd<sub>3</sub> = 13, sd<sub>13</sub> = 14, sd<sub>17</sub> = 20, sd<sub>18</sub> = 22, sl<sub>2</sub> = 7, sl<sub>16</sub> = 9, sv<sub>4</sub> = 9, t = 45, tmr = 38, oes = 29, oes. till 1st conc. = 23, bd vulva = 30.

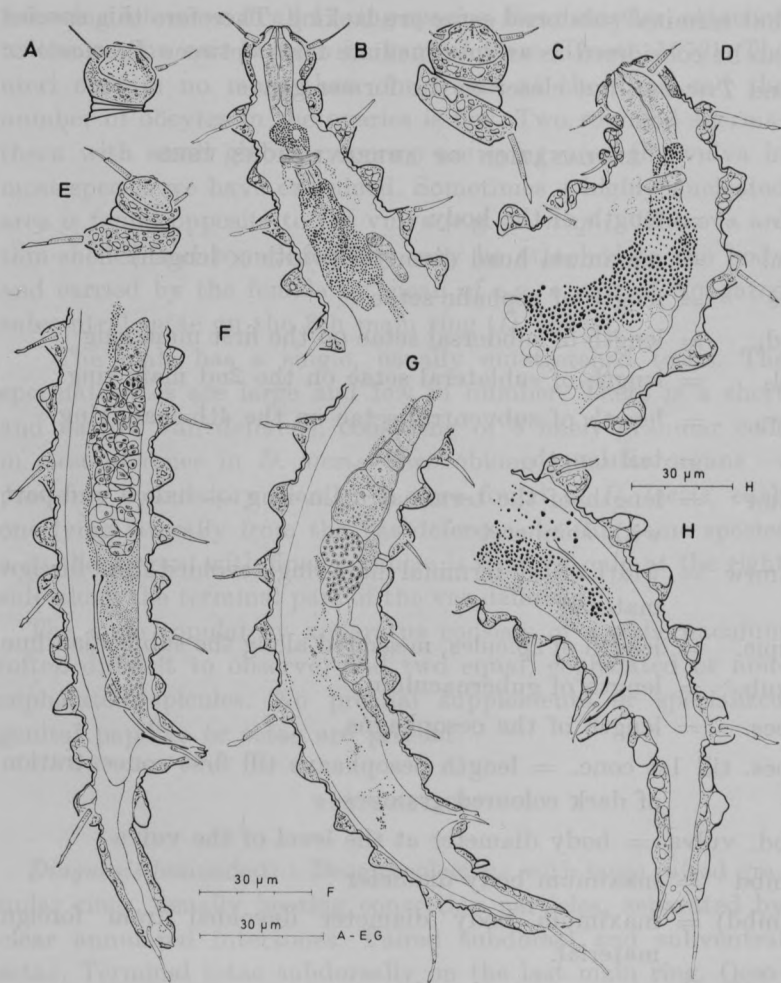


Fig. 1. — *Desmoscolex granulatus* n. sp.

- A surface view of head male (holotype)
- B anterior region and oesophago-intestinal junction (holotype ♂)
- C surface view of head male
- D anterior region and oesophago-intestinal junction of female
- E surface view of head female (allotype)
- F male reproductive system and tail region (holotype)
- G female reproductive system and tail region (allotype)
- H male reproductive system and tail region

Allotype ♂ : L = 300, hd = 20 × 17, cs = 14, sd<sub>1</sub> = 17, sd<sub>3</sub> = 15, sd<sub>13</sub> = 16, sd<sub>17</sub> = 19, sd<sub>18</sub> = 23, sl<sub>2</sub> = 8, sl<sub>16</sub> = 10, sv<sub>4</sub> = 11, sv<sub>14</sub> = 12, t = 57, tmr = 35, tmrw = 6.5, spic. = 55, gub = 16, oes = 38, oes. till 1st conc. = 30, (mbd) = 27.

Paratype ♂ (n = 1) : L = 335, hd = 19 × 15, cs = 13, sd<sub>1</sub> = 18, sd<sub>3</sub> = 16, sd<sub>13</sub> = 16, sd<sub>17</sub> = 21, sd<sub>18</sub> = 30, sl<sub>2</sub> = 10, sl<sub>16</sub> = 15, sv<sub>4</sub> = 11, sv<sub>14</sub> = 13, t = 78, tmr = 49, tmrw = 7, spic. = 63, gub = 18, oes = 42, oes. till 1st conc. = 21, mbd = 54, (mbd) = 42.

Paratype ♀♀ (n = 2) : L = 265-350, hd = 19-21 × 14, cs = 10-13, sd<sub>1</sub> = 17, sd<sub>3</sub> = 12-15, sd<sub>13</sub> = 16, sd<sub>17</sub> = 19-21, sd<sub>18</sub> = 27, sl<sub>2</sub> = 8-9, sl<sub>16</sub> = 11-14, sv<sub>4</sub> = 9-10, sv<sub>14</sub> = 8-12, t = 60-72, tmr = 42-44, tmrw = 6, oes = 30-36, oes. till 1st conc. = 21, bd vulva = 38-50.

*Female* : Body slender, tapering towards the extremities, with 18 prominent raised rings, covered by coarse concretion particles. In the specimen from Lizard Island, the main rings bear larger quantities of dark, coarse foreign particles, partly extending on the annulated interzones. In one individual, the main part of concretion occurs on the anterior end of the anterior main rings, giving a triangular posteriorly sloping outline. The concretion rings are separated by narrower interzones, composed of 2 or 3 secondary rings. A transverse row of short pegs becomes visible in the middle of the main rings upon removal of the concretion particles.

The somatic setae are arranged as follows :

subdorsal :  $\frac{1, 3, 5, 7, 9, 11, 13, 17, 18 = 9}{1, 3, 5, 7, 9, 11, 13, 17, 18 = 9}$   
 subventral :  $\frac{2, 4, 6, 8, 10, 12, 14, 16 = 8}{2, 4, 6, 8, 10, 12, 14, 16 = 8}$  with pair 2 and 16 in  
 sublateral position.

This scheme can be compared with the typical pattern of 17-ring species assuming the presence of an extra ring between the 14th and 15th main rings. The subdorsal setae are longer than the subventral. The subdorsal setae on the 3rd main ring are the shortest; these on the 1st main ring are longer; posteriorly

the subdorsal setae become gradually longer. The terminal setae are somewhat elongated in the specimens from Yonge Reef, but more in the specimen from Lizard Island.

The head is broad, rounded, tapering to a truncate anterior end. It is, with exception of the extreme anterior, completely covered by many coarse concretion particles.

The four submedian cephalic setae are situated at 1/3rd from the anterior end. They consist of a basal shaft occupying 73 % (61-65 %) of the total setal length. The central canal of the setae ends in an acute tip.

The large, swollen, rounded amphids extend till the very anterior end and cover the main part of the head, partly lying on naked cuticle. They have a small constriction at the level of the insertion of the cephalic setae. The amphidial pore is small, circular and situated posterior to the insertion of the cephalic setae.

The stoma is a short funnel. The oesophagus is slightly swollen in the region of the head, having a distinct lumen. Inside the 1st main ring the oesophagus narrows, the lumen opens and becomes less distinct. The oesophagus is partly obscured by a concentration of small, dark red-brown granules from the end of the 1st till the beginning of the 2nd main ring. Immediately posterior to this mass of granules, lies the ventro-caudally sloping nerve ring. A second concentration of such granules occurs just behind the nerve ring and obscures the oesophago-intestinal junction. These two concentrations are connected by means of two narrow strands with few granulae. The second concentration extends over two main rings varying according to the individual, between the 2nd and 5th concretion ring. Posteriorly, these granulae are situated in a narrow irregular longitudinal strand of epidermal tissue, presumably lying in the pseudocoel, partly on the left and partly on the right side of the reproductive system and extending as far as the 16th main ring. The intestine overlaps the rectum dorsally and extends till the interzone following the 16th main ring. The 16th main ring is expanded at the ventral side, where the anal tube projects from the body.

The reproductive system is didelphic-amphidelphic, with out-

stretched ovaries. The ovaries are long, narrow and contain several immature and growing oöcytes. Two rounded spermatheca, containing large globular sperms, are situated near and opposite the vulva. The latter is situated in the interzone between the 10th and 11th main ring.

The tail with 2 concretion rings. Terminal ring elongated, cylindrical till the insertion of the subdorsal setae, then slightly swollen, ending in a very short spinneret. Phasmata obscure.

*Male* : Similar to female in most details. In the specimen found, the concretion rings have a triangular, posteriorly sloping outline. The cephalic setae consist of a basal shaft occupying 28 % (61 %) of the total setal length.

Reproductive system with a single outstretched testis, composed of a short germinal zone with capcell and a long differentiation zone with large spermatocytes. The vas deferens tapers posteriorly.

Spicules slender and arcuate, about as long as the tail and distinctly cephalated. Gubernaculum narrow and short (16  $\mu$ m long), parallel with the spicula.

*Type locality and habitat* : Sandy bottom from the channel 1 km behind Yonge Reef at — 35 m, collected on 28-9-67 by Prof. Dr. A. Coomans.

*Other locality and habitat* : Sandy bottom covered with a layer of silt and rich in Foraminifera, 800 m westward from Lizard Island at — 21.5 m, collected on 12-9-67 by Prof. Dr. A. Coomans.

*Holotype* ♀ : Yonge Reef, slide nr. 146.

*Allotype* ♂ : Yonge Reef, slide nr. 147.

*Paratype* ♀♀ : (slide nrs. C<sub>2</sub>, IV<sub>1</sub>) and ♂ (slide nr. C<sub>2</sub>), Lizard Island.

*Differential diagnosis* : Our specimens are closest to *Desmoscolex californicus* Timm, 1970 in having 18 main rings and large red pigment globules extending from ring 1 to the anus as in females of this species. It differs, however, by the absence of sexual dimorphism (22-23 main rings present and pigment globules absent in males of *D. californicus*), by the rounded head-shape (against broad triangular in *D. californicus*), by the shorter

amphids (not extending over ring 1), by the absence of red ocelli and by the absence of subventral setae on main ring 8 in 18-ring females. Timm (1970) found, however, a single female from Canada having 18 rings, red pigment globules, subventral setae on main ring 8, but somewhat shorter cephalic setae and tail setae. After revision of the type material, it was obvious that male and female described as *D. californicus* belong to different species. The females are completely similar to the females of *D. granulatus*; in contradiction with Timm (1970) they do have subventral setae on main ring 8, but lack red pigment spots. Consequently *D. californicus* is known only by males (1 holotype, 1 paratype).

*Desmoscolex laevis* Kreis, 1926. Fig. 2-4

#### Measurements

♂ (n = 25) : L = 290-495, hd = 21-30 × 15-21, cs = 21-31, sd<sub>1</sub> = 23-29, sd<sub>3</sub> = 19-24, sd<sub>16</sub> = 27-34, sd<sub>17</sub> = 28-37, sl<sub>2</sub> = 11-20, sl<sub>15</sub> = 13-18, sv<sub>4</sub> = 16-23, t = 45-73, tmr = 25-39, spic = 38-56, gub = 20-29, oes = 38-44, mbd = 55-71, (mbd) = 36-49.

♀ (n = 21) : L = 360-480, hd = 23-33 × 17-21, cs = 25-31, sd<sub>1</sub> = 21-32, sd<sub>3</sub> = 24-28, sd<sub>16</sub> = 33-40, sd<sub>17</sub> = 34-40, sl<sub>2</sub> = 17-23, sl<sub>15</sub> = 18-24, sv<sub>4</sub> = 20-26, sv<sub>8</sub> = 48-73, t = 55-81, tmr = 29-43, oes = 40-46, bd vulva = 36-57, mbd = 47-75.

*Males* : Body relatively broad, tapering towards the extremities. Cuticle with 17 large raised rings, covered with many dark, coarse concretion particles. By removing these foreign particles, one transverse row of short tubes become visible. Probably, these tubes are outlets of the glands that produce the adhesive substance to which the concretion particles adhere. The main rings are separated from each other by interzones, composed of 2 or 3 secondary rings. These zones are maximally as wide as the corresponding main rings. The secondary rings mostly bear fine, short spines (3-5 μm), which are not always distinct.



The somatic setae are arranged as follows :

$$\begin{array}{l} \text{subdorsal : } \frac{1, 3, 5, 7, 9, 11, 13, 16, 17}{1, 3, 5, 7, 9, 11, 13, 16, 17} = 9 \\ \text{subventral : } \frac{2, 4, 6, 8, \text{---}, 12, \text{---}, 15}{2, 4, 6, 8, \text{---}, 12, \text{---}, 15} = 6 \end{array} \quad \begin{array}{l} \\ \text{with pair 2 and 15 in} \\ \text{sublateral position.} \end{array}$$

This arrangement differs from the typical pattern of 17-ring species (Timm, 1970) by the absence of subventral setae on the 10th and 14th main ring. The subdorsal setae on the 1st main ring are longer than those more posteriorly. Up to the 11th main ring, the latter are about equal in length. The setae on the 13th ring are again longer; those on the tail are distinctly elongated. The subventral setae have all about the same length; they are shorter and a little slenderer than the subdorsal setae.

Head posteriorly rounded, tapering towards a truncate anterior end. It is wider than long i.e. 1.2 times in specimens from Yonge Reef and 1.4 times in specimens from Nympe Island. Except for the anterior part, the head cuticle is relatively thin and covered by a thick layer of rather coarse concretion particles. Anteriorly, in the region of the buccal cavity, the cuticle is sclerotized.

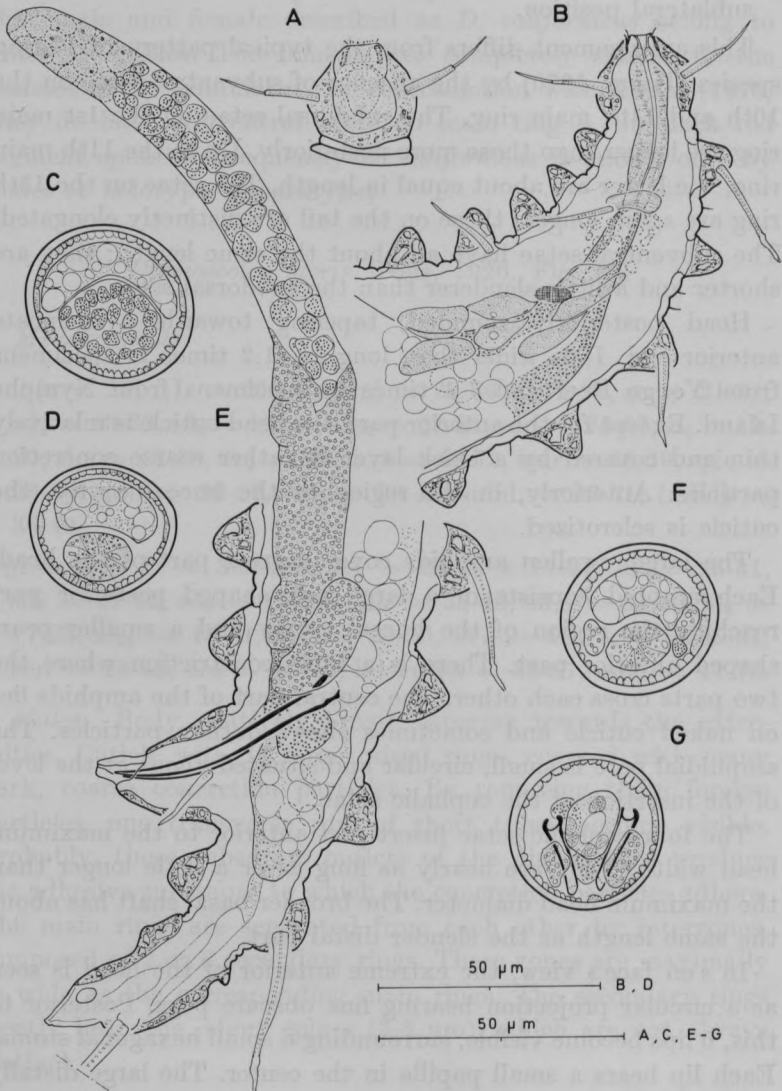
The large, swollen amphids cover a great part of the head. Each amphid consists of a large pear-shaped posterior part reaching the region of the buccal cavity and a smaller pear-shaped anterior part. There is a little constriction where the two parts cross each other. The central part of the amphids lies on naked cuticle and sometimes shows dotlike particles. The amphidial pore is small, circular and situated about at the level of the insertion of the cephalic setae.

The four cephalic setae insert just anterior to the maximum head width. They are nearly as long as or a little longer than the maximum head diameter. The broader basal shaft has about the same length as the slender distal part.

In « en face » view, the extreme anterior of the head is seen as a circular projection bearing fine obscure pegs. Posterior to this, 6 lips become visible, surrounding a small hexagonal stoma. Each lip bears a small papilla in the center. The large distally

swollen amphids taper towards the connection with the cuticular wall. In transverse section at this level, the head is dorso-ventrally flattened, bearing concretion particles on the dorsal and ventral side.

The transition or change from hexaradial to triradial sym-



metry occurs rapidly i.e. at the level of the insertion of the cephalic setae. The anteriormost part of the oesophagus is surrounded by the posterior part of the thickened sclerotized cuticular wall in which the hexaradial symmetry can still be recognized. At this level the head is square-shaped in transverse section with the protuberant insertion places of the cephalic setae on the four corners. Laterally, the amphids are visible as two oval organs, partly lying on naked cuticle and each leading to a small pore.

The stoma is a short funnel. The oesophagus is of the general type, i.e. slightly swollen in the head region and ending in the 2nd main ring. The ventro-caudally sloping nerve-ring surrounds the narrowed terminal portion of the oesophagus. The intestine overlaps the rectum dorsally.

The triradial lumen of the oesophagus becomes oval at the oesophageal junction. The anteriormost part of the ventricular intestine is very thin-walled and contains only few granules, further back the wall thickens and becomes highly granular, especially at the ventral and dorsal side. The lumen of the ventricular part is wide and irregular in outline. In this area several large cells are visible in the pseudocoel. At the level of the 5th main ring, the intestine becomes filled up with large pale globules, whereas the small (secretory?) granules diminish and disappear; here the intestine proper begins.

Red oval pigment spots lie between the 3rd and the 5th concretion rings. Mostly the pigment is concentrated in the center.

Reproductive system with single outstretched testis. There

Fig. 2. — *Desmoscolex laevis* Kreis, 1926.

Male from Yonge Reef :

- A surface view of head
- B anterior region and oesophago-intestinal junction
- C reproductive system and tail region

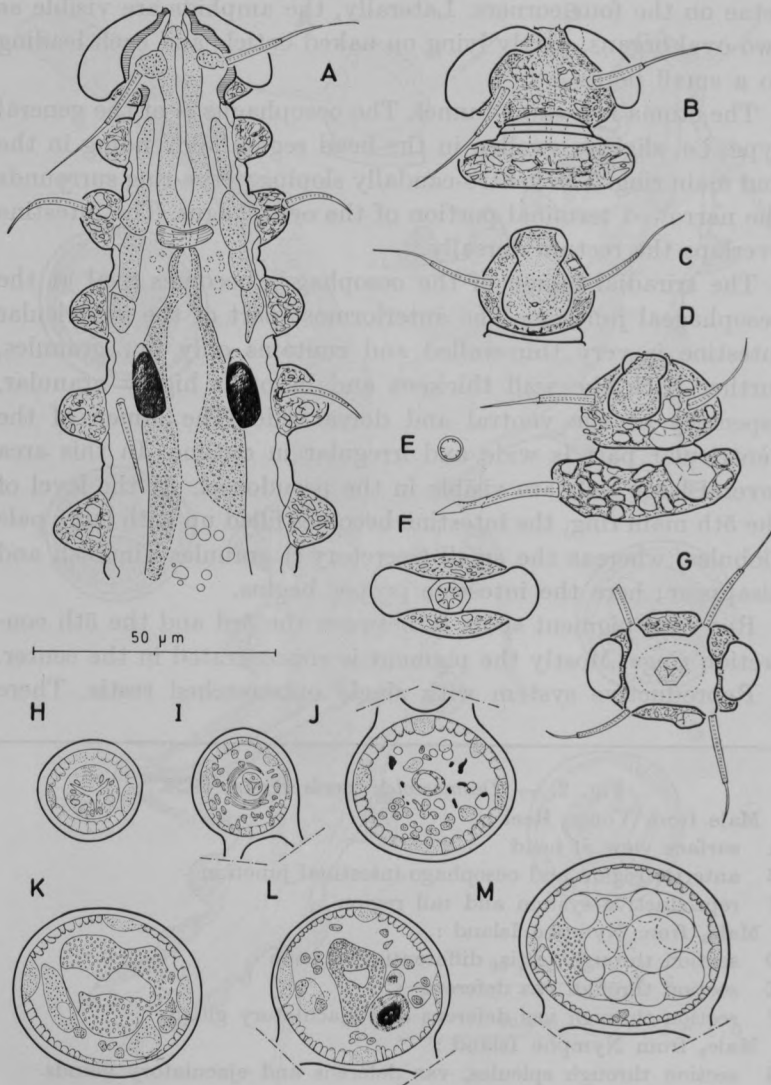
Male<sub>1</sub> from Nymphe Island :

- D section through testis, differentiation cone
- E section through vas deferens
- F section through vas deferens and ejaculatory glands

Male<sub>2</sub> from Nymphe Island :

- G section through spicules, vas deferens and ejaculatory glands

is a short germinal zone followed by a long, large differentiation zone with large spermatocytes. A vas deferens connects the testis with the ejaculatory duct. Cross sections show it to be oval and build up of 8 cells filled with small granules, indicating glandular activity. Two oblong granular organs, the ejaculatory



glands (cf. Schepotieff, 1908) occur laterally from the vas deferens and may reach up to the 13th main ring. Apart from these, another organ, probably also glandular, but filled with very fine granules is situated at the right side along the terminal part of the vas deferens. Those structures may be obscure, especially the last type.

The spicules are slightly bent and provided with a capitulum. Their length varies between 38 and 52  $\mu\text{m}$ . Gubernaculum trough-shaped, parallel to the spicules, 24-29  $\mu\text{m}$  long. The ventral side of the 15th main ring is distinctly expanded, containing the protruding cloacal tube in its middle.

The tail bears two concretion rings. The terminal main ring is twice as long as the former and ends in a swollen cone, bent to the ventral side and bearing the spinneret. Distinct, slightly elevated circular phasmata surrounded by foreign particles are situated at the base of the terminal cone.

*Females* : Similar to males for most characteristics. Typical in females is the presence of a pair of elongated subventral setae on the 8th main ring (48-67  $\mu\text{m}$  in individuals of Yonge Reef, 60  $\mu\text{m}$  in a female of Lizard Island and 60-73  $\mu\text{m}$  in specimens from Nymphe Island). These setae reach till the posterior end of the 10th main ring and have the same construction as the

Fig. 3. — *Desmoscolex laevis* Kreis, 1926.

- A anterior region and oesophago-intestinal junction (female 1)  
 B surface view of ventral side of head ( $\text{♀}_1$ )  
 C surface view of lateral side of head ( $\text{♀}_2$ )  
 D surface view of head of female *D. minutus*  
*Desmoscolex laevis*  
 E « en face » view of head ( $\text{♀}$ )  
 F view of head at level of the lips ( $\text{♀}$ )  
 G section through head at level of es ( $\text{♀}$ )  
 H section through oesophagus opposite the 1st main ring ( $\text{♀}$ )  
 I section through oesophagus at the level of the nerve ring ( $\text{♂}_1$ )  
 J section through ventricular opposite the 3rd main ring ( $\text{♂}_2$ )  
 K section through ventricular opposite the 4th main ring ( $\text{♀}$ )  
 L section through ventricular and ocelli opposite the 4th main ring ( $\text{♂}_2$ )  
 M section through ventricular and intestine proper opposite the 6th main ring ( $\text{♀}$ )

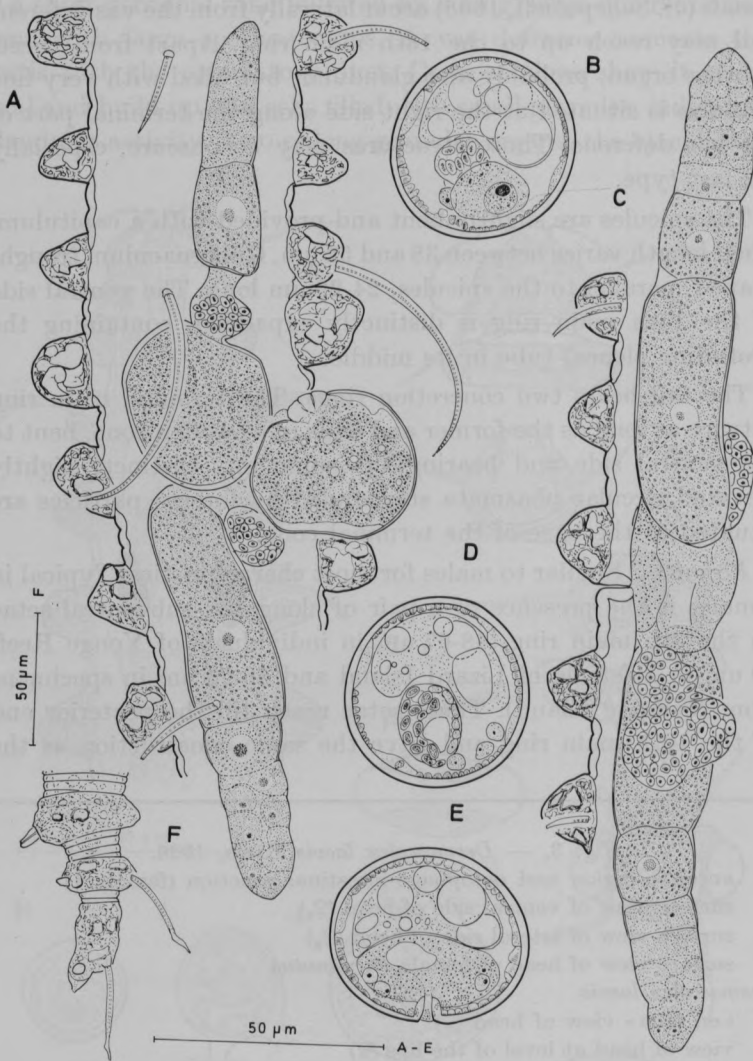


Fig. 4

- A *Desmoscolex laevis* : female reproductive system  
 B *Desmoscolex laevis* : section through ovary opposite the 9th main ring  
 C *D. minutus* : female reproductive system  
 D *D. laevis* : section through spermatheca opposite the 9th main ring  
 E *D. laevis* : section through the vulva  
 F tail region of female



other subventral setae. They were called copulatory setae (cf. Kreis, 1926) but no data are available about a possible function during copulation. In one individual, the gland cells situated at the base of those setae, were strongly developed.

Reproductive system with equally developed outstretched ovaries, containing several immature oöcytes. Each branch contains a spermatheca situated near the vulva. The spermathecae may be obscure but are usually visible; they are filled with rounded sperms and can become rather large. Uterus rather short with many small granules, clearly visible in transverse sections. The vulva is situated at the posterior end of the 10th main ring. Four pairs of vulval muscles visible in dorso-ventral view. In the individuals studied only one egg at the time was carried on the body surface, by means of the elongated subventral setae on the 8th main ring (cf. Timm, 1970).

*Localities and habitats* : Nymphé Island, shallow gully between algae and Foraminifera, collected on 24-9-67; Yonge Reef, sandy patch on reef flat, collected on 2-9-67; sandy bottom from channel 1 km behind Yonge Reef at — 35 m, collected on 28-9-67 and Lizard Island, in sand between *Halimeda* at — 20 m, collected on 14-9-67. All samples collected by Prof. Dr. A. Coomans.

### *Discussion*

*D. laevis* differs from all other species in the long subventral setae on ring 8 in females, in the absence of subventral setae on the 10th and 14th main ring, in the head-shape.

So far, only few detailed studies of the head are available. Schepotieff (1908) first showed the head in frontal view. His drawing shows a circular terminal projection surrounded by a thick cuticular wall but in contradiction with our observations, he found triangular cuticular denticles around the mouth. Lips and papillae were not mentioned nor drawn. In an « en face » view by De Coninck (1942) 6 distinct papillae are visible lying on the head capsule around the mouth opening; according to him lips are absent.

Timm (1970) only mentions the presence of cheilorhabdia. Together with *D. americanus* Chitwood, 1936, *D. laevis* is one of

the few *Desmoscolex* species for which six labial papillae surrounding the mouth have been depicted.

Cross sections of the vas deferens show a distinct nucleus in the two lateral cells.

Lorenzen (1971) described some individuals from the North Sea as *D. laevis*. They resemble this species in having the same setal pattern with elongated subventral setae on the 8th main ring in females and in having a similar tail shape. They differ, however, by the shape of the head which is elongated, oval and anteriorly truncated, by the absence of a distinct sclerotized anterior cuticle and terminally situated short pegs as present in *D. laevis*. They are characterized by fine elongated labial appendages present in one female, but lacking in an other one. Lorenzen supposes that the appendages are withdrawn in the latter individual. However, the presence of a short stoma and an oesophagus extending almost until the anterior border does not leave enough space to store such withdrawn appendages. They also differ by the more elongated amphids corresponding with the more elongated shape of the head. Another difference lies in the narrower somatic setae and the presence of unequal ventral setae i.e. those nearest to the elongated subventral setae on the 8th main ring in females are also elongated (cf. Lorenzen, 1971).

In my opinion these differences are large enough to erect a new species *D. paralaevis* n.sp. (synonym : *D. laevis* apud Lorenzen, 1971).

*Holotype* ♀ : slide nr. 327 deposited in Nematodensammlung des Instituts für Meeresforschung in Bremerhaven (NSIMB).

*Type locality* : sublitoral from North Sea (57°47'N, 02°30'W), collected by Dr. Rachor on 8-1-68.

*Desmoscolex minutus* Claparède, 1863 Fig. 3-4

*Measurements* :

*Females* (n = 13) : L = 330-460, hd = 26-32 × 19-20, es = 27-30, sd<sub>1</sub> = 24-29, sd<sub>3</sub> = 20-23, sd<sub>13</sub> = 24-33, sd<sub>16</sub> = 28-33, sd<sub>17</sub> = 28-35, sl<sub>2</sub> = 15-20, sl<sub>15</sub> = 16-23, sv<sub>4</sub> = 19-23, sv<sub>8</sub> = 20-

25, t = 55-70, tnr = 28-34, oes = 40-44, bd vulva = 45-57, mbd = 55-75.

In the samples from Nymphé Island, female specimens were found identical with *D. laevis* Kreis, 1926 except for the absence of the elongated subventral setae on the 8th main ring. Their gonads are of the same type, having a spermatheca filled with rounded sperms. Females, transporting ripe oöcytes outside the body, were not found, probably because of the absence of elongated subventral setae. The presence of sperms in the spermatheca indicates that the species is bisexual. The females were found together with females of *D. laevis*. The males did not show differences that allowed a separation into two different groups.

It can be concluded that the only distinction between *D. laevis* and the former described specimens lies in the presence of shorter subventral setae on the 8th main ring in females.

#### *Discussion*

The somatic setae of *D. minutus* Claparède, 1863 are equal in length. According to Timm (1970) *D. minutus* of Greef (1868) and subsequent authors (Panceri, 1876; Schepotieff, 1907-1908; de Man, 1922; Filipjev, 1922; Nyholm, 1956 and Paladian & Andriescu, 1963), bearing long subventral setae in the female on ring 8, represent in fact *D. laevis* Kreis, 1926.

We have to consider the fact that Claparède didn't mention the sex of the type species. If he was dealing with a male specimen, it was evident that no elongated subventral setae were found. Consequently *D. minutus* and *D. laevis* represent the same species.

On account of the females with short subventral setae reported here, the possibility that Claparède was describing a female, has still to be considered. Therefore the females with short setae of Nymphé Island are identified as *D. minutus*, until more information becomes available on this species. It should be stressed that since *D. minutus* is the type species of the genus a redescription on the base of topotypes is highly desirable.

*Locality and habitat* : Nymphé Island, shallow gully Cyanophyceae and Foraminifera, under and between stones and among fine coral debris around *Halimeda*, collected on 24-9-67 by Prof. Dr. A. Coomans.

## SUMMARY

In a large number of samples collected from the Great Barrier Reef : Nympe Island, Lizard Island and Yonge Reef 113 specimens of *Desmoscolex*, belonging to 14 different species, were found.

Among them are described : *D. granulatus* n. sp. close to *D. californicus* Timm, 1970 in having 18 main rings and large red pigment globules extending from ring 1 to the anus as in females of *D. californicus*; *D. laevis* Kreis, 1926 and *D. minutus* Claparède, 1863.

The diagnosis of the genus *Desmoscolex*, until now exclusively based on external and cuticular structures, is emended by considering internal organs e.g. shape of oesophagus, position of nerve ring and oesophago-intestinal junction and the structure of the intestine.

A new name, *D. paralaevis* n. sp. is proposed for the specimens described as *D. laevis* by Lorenzen (1971).

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#### RÉSUMÉ

Cent treize spécimens de *Desmoscolex*, appartenant à quatorze espèces, ont été trouvés dans les échantillons de Yonge Reef, Nymphe Island et Lizard Island (La grande Barrière, Australie).

La nouvelle espèce *D. granulatus* sp. n. est décrite. Elle est proche de *D. californicus* Timm, 1970 par la présence de 18 anneaux, mais en diffère par la présence de grandes granules rouges étendues dès le premier anneau jusqu'à l'anus. *D. laevis* Kreis, 1926 et *D. minutus* Claparède, 1863 sont redécrites.

La diagnose du genre est élargie en considérant les structures internes comme l'oesophage et la jonction oesophago-intestinale.

Un nouveau nom, *D. paralaevis* sp. n. est proposé pour les spécimens décrits comme *D. laevis* par Lorenzen (1971).