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A NEW RECORD AND A REDESCRIPTION OF « *BRANIA SUBTERRANEA* » (POLYCHAETA, SYLLIDAE)

Léopold III Biological Station, Laing Island. Contribution n° 18

Une nouvelle station et une rédescription de « *Brania subterranea* » (Polychaeta, Syllidae)

Station Biologique Léopold III, Ile de Laing. Contribution n° 18

by

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SUMMARY

Brania subterranea (HARTMANN-SCHROEDER, 1956) is newly found on the West Pacific coasts (Papua New Guinea). A description with the aid of the SEM technique is given, and special attention is drawn to the fine structures of the prostomium and the bristles. A well developed nuchal organ, carrying cilia with disk-like enlargements is present, a feature hitherto unknown for the genus *Brania*. The entrance of the proboscis too shows a complex structure of ordinary cilia and papillae.

RÉSUMÉ

Brania subterranea (HARTMANN-SCHROEDER, 1956) a été trouvée pour la première fois sur les côtes de l'Océan Pacifique occidental (Papouasie-Nouvelle-Guinée). Une description détaillée à l'aide du microscope électronique à balayage est donnée. La présence d'un organe nucal portant des cils à dilatations en forme de disque, inconnue chez le genre *Brania*, est démontrée, ainsi que des papilles et d'une couronne ciliée à l'entrée du pharynx.

ABSTRACT

Brania subterranea (HARTMANN-SCHROEDER, 1956), recorded for the first time from the West Pacific coasts, is studied by scanning electron microscopy. A well developed nuchal organ with cilia bearing disk-like enlargements could be demonstrated. The entrance of the pharynx carries ten papillae and a circlet of ordinary cilia. The fine structure of the simple and compound bristles and also their distribution in correlation with the length of the specimens is given in detail.

INTRODUCTION

During an expedition, sponsored by the Léopold III-Foundation, to Laing Island (Madang province, Papua New Guinea) several benthos samples, sublittoral as well as littoral, were taken. In one, sampled in a permanent pool on an exposed beach, about hundred specimens of *Brania subterranea* (HARTMANN-SCHROEDER, 1956) have been found. This means a first record of this species for the Western Pacific coasts.

MATERIAL AND METHODS

The material was collected by Dr J. VAN GOETHEM on the 24th of June 1977, North of Bogia, near Podbielsky Point (Madang province) (Fig. 1); sample nº PNG 77/193. A plastic bag was filled with coarse coral sand from an intertidal pool in fossil corals, and the whole preserved in 5 % buffered formalin. About a hundred specimens of *Brania subterranea* were picked out of a sediment volume of ± 2 litres.

Some specimens were processed for examination by scanning electron microscopy (SEM). The formaldehyde-preserved material was washed with distilled water and dehydrated by passing them through an ethanol/distilled water series and transferred to an amylacetate/ethanol series. The specimens were then critical point dried from liquid carbon dioxide, they were mounted on specimen-stubs, coated with 300 Å of gold and examined with a Philips SEM 501 scanning electron microscope (at the Koninklijk Belgisch Instituut voor Natuurwetenschappen), at accelerating voltages of 15 kV and 30 kV.

DESCRIPTION

Brania subterranea (HARTMANN-SCHROEDER, 1956)

Pionosyllis subterranea : HARTMANN-SCHROEDER (1956), p. 89, TENERELLI (1964), p. 234, TENERELLI (1966), p. 233, RAO and GANAPATI (1967), p. 13; *Brania subterranea :* WESTHEIDE (1974a), p. 10, WESTHEIDE (1974b), p. 87.

Reference material : *Brania subterranea*, Brasilia (Ubatuba and São Sebastião), det. Dr W. WESTHEIDE.

Total length 0.5 mm — 2.4 mm (urites not included), more than 50 % of the specimens 1.5 mm to 1.8 mm long (total measured : 55). Width without parapodia 80 µm — 200 µm, 130 µm — 160 µm in 50 % of the individuals (on a total of 41). The smallest specimen has 7 setigerous segments, the longest one 28.

Prostomium : two times as wide as long. Four reddish eyes (colour fainted in formaldehyde) arranged trapezoidly. Palps ± 84 µm long, bluntly ending, dorsally over 2/3 of their length fused with a membrane (Fig. 2a), the latter nearly as thick as the distal ends of the palps. Palps ventrally not fused (Fig. 2b).

Three antennae; two inserted laterally at the anterior border of the prostomium (length ± 140 µm, greatest width ± 28 µm), one occipital antenna (length ± 250 µm, greatest width ± 32 µm) (see also Table 1) behind the last two eye-spots at the posterior border of the prostomium (Fig. 2a & 3a). At the most posterior border of the prostomium two depressions are dorsally visible (width ± 10 µm, length ± 20 µm), wherein the nuchal organ lies (Fig. 2a & 3a). This organ consists of a mass of long cilia (± 10 µm long) the shafts of these bearing flattened disk-like enlargements. The nuchal slits are hardly visible with a light-microscope as the whole structure is then obscured by underlying tissues.

TABLE 1

Measurements of palps and cirri for specimens of 21 tot 25 setigerous segments length (n = number of observations, $\bar{x}$ = mean, s = standard deviation)

Lengths (μm)

	min.	max.	n	$\bar{x}$	s
palps	73	95	9	84	8
frontal antennae	119	152	12	141	11
occipital antenna	255	291	5	248	26
dorsal tentacular cirrus	160	203	11	189	13
ventral tentacular cirrus	105	139	11	118	10
dorsal cirrus 1st setiger	226	270	9	246	13
» » 2nd »	85	126	9	111	13
» » 3rd »	99	163	11	132	21
» » 4th »	113	189	9	151	23
» » 5th »	122	156	9	143	13
» » 6th »	147	203	6	184	22
» » 7th to 10th	132	186	23	153	15
» » 11th to 15th	105	223	21	160	29
» » 16th to 20th	115	178	13	131	16
» » 21th to last	99	175	12	127	24
urites	194	257	10	210	21

Widths (μm)

	min.	max.	n	$\bar{x}$	s
frontal antennae	24	33	3	27	5
occipital antenna	28	35	2	32	5
dorsal tentacular cirrus	24	36	4	28	6
ventral tentacular cirrus	23	29	5	26	3
dorsal cirrus 1st setiger	24	36	4	30	5
» » 2nd to last	18	36	29	22	4
urites	24	33	3	27	5

An achaetous tentacular segment, not half as long as the following segments, is separated from the prostomium middorsally by a faint groove (not visible with light-microscope) (Fig. 3a). Dorsal tentacular cirri much longer than the ventral ones (respectively ± 190 μm and 120 μm long, greatest width ± 28 μm and 26 μm).

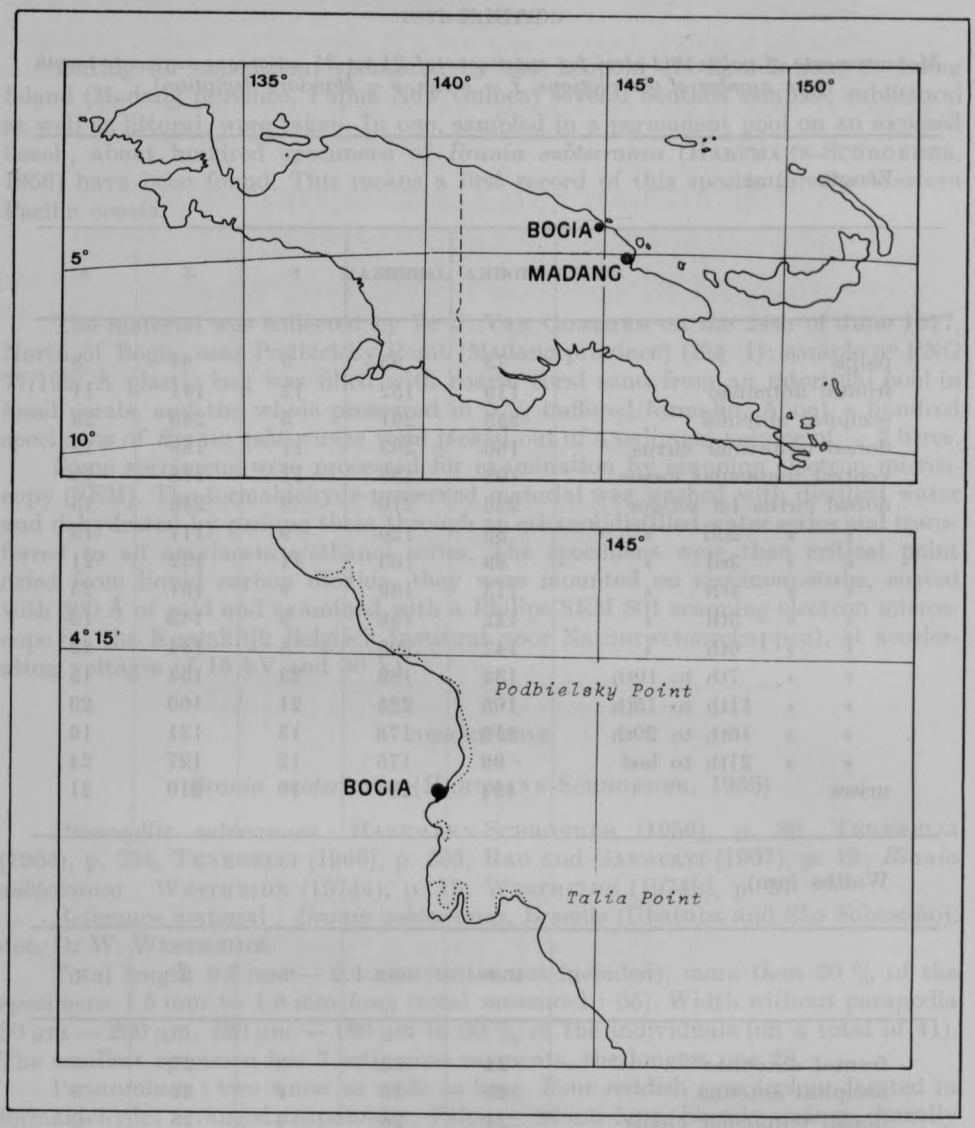

Fig. 1 : Location of the sampling site.

Following segments bearing uniramous parapodia with a long dorsal cirrus, the latter inserted clearly demarcated from the neuropodium. A short ventral cirrus depasses slightly the acicular lobe (Fig. 4i). The dorsal cirri of the first setigerous segment are the longest of all (± 250 μm), while the second dorsal cirri are the shortest (± 111 μm). Those of the third setiger (± 132 μm) are longer than those of the second one; those of the fourth setigerous segment reach a length of ± 151 μm, while those of the fifth setiger are somewhat shorter (mean length 143 μm) than the preceding one. The dorsal cirrus of the first setiger thus has about the same

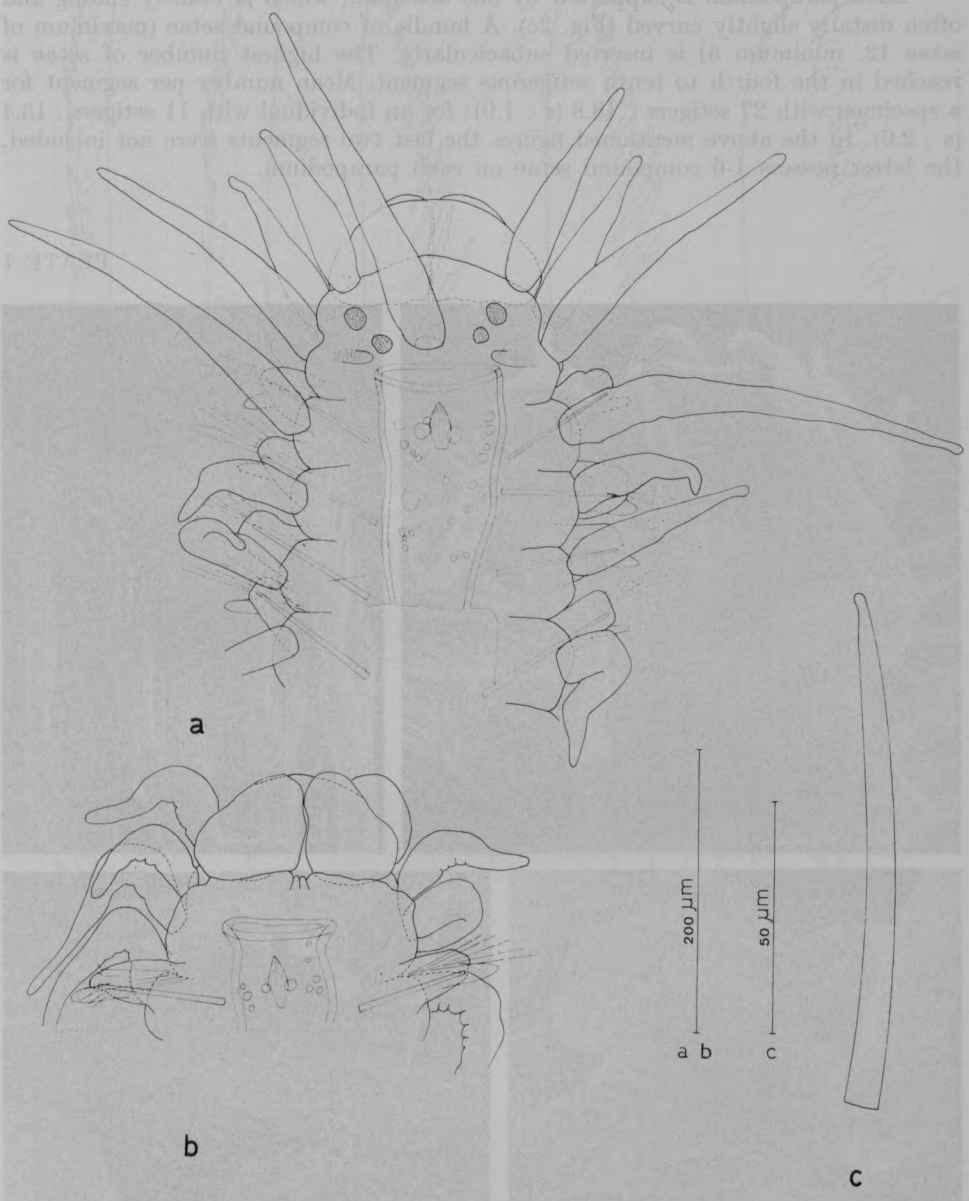

Fig. 2 : *a*, dorsal view of the head region and first segments (palps slightly bent downwards); *b*, ventral view of the head; *c*, aciculum.

length as the occipital antenna and even becomes in some specimens the longest appendage of all (Table 1). From the sixth setiger on the dorsal cirri are about equal in length and width, although in the last segments the cirri look smaller and tinier (see also Table 1).

Each parapodium is supported by one aciculum, which is bluntly ending and often distally slightly curved (Fig. 2c). A bundle of compound setae (maximum of setae 12, minimum 5) is inserted subacicularly. The highest number of setae is reached in the fourth to tenth setigerous segment. Mean number per segment for a specimen with 27 setigers : 18.8 (s : 1.9); for an individual with 11 setigers : 15.4 (s : 2.0). In the above mentioned figures the last two segments were not included, the latter possess 1-6 compound setae on each parapodium.

PLATE I

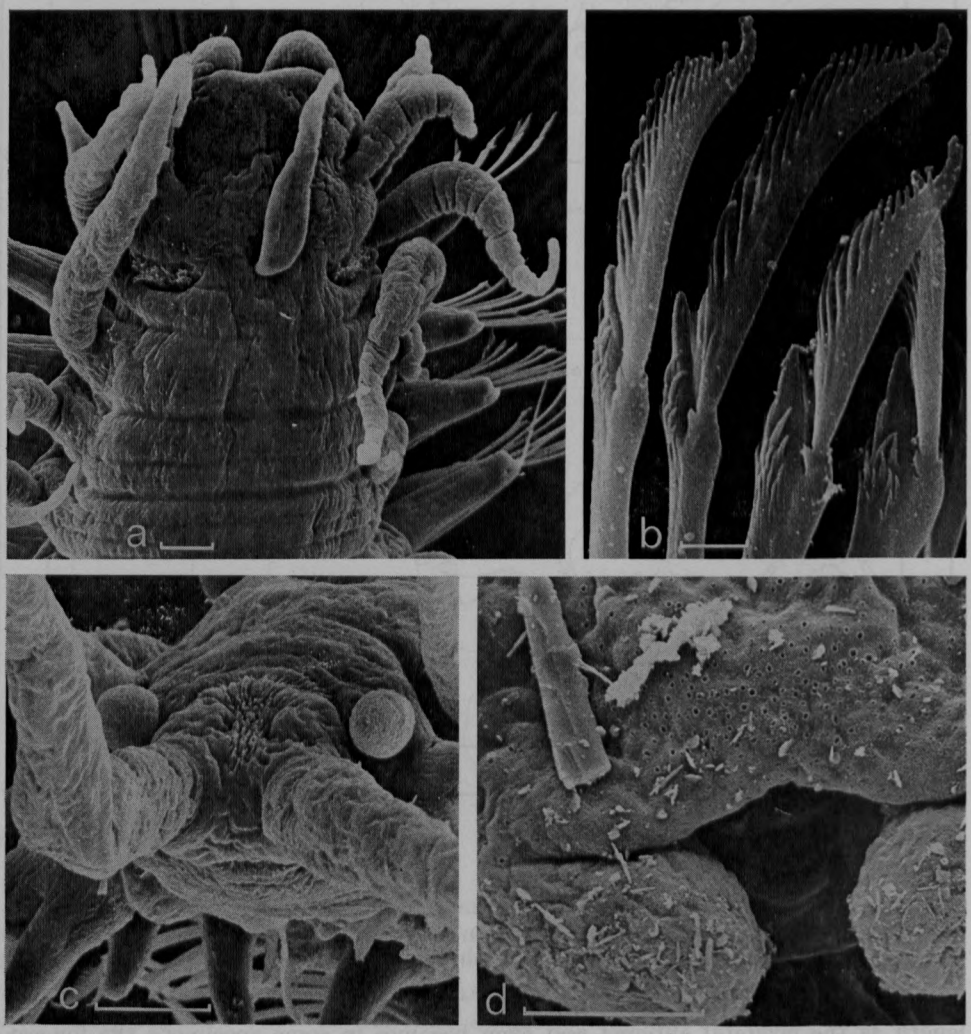

Fig. 3 : *a*, head and first segments dorsal view; *b*, compound setae in the upper part of setal bundle; *c*, pygidium with anus; *d*, membrane covering palps. (Bar *a*, *c* & *d* : 20 μm; *b* : 2 μm.)

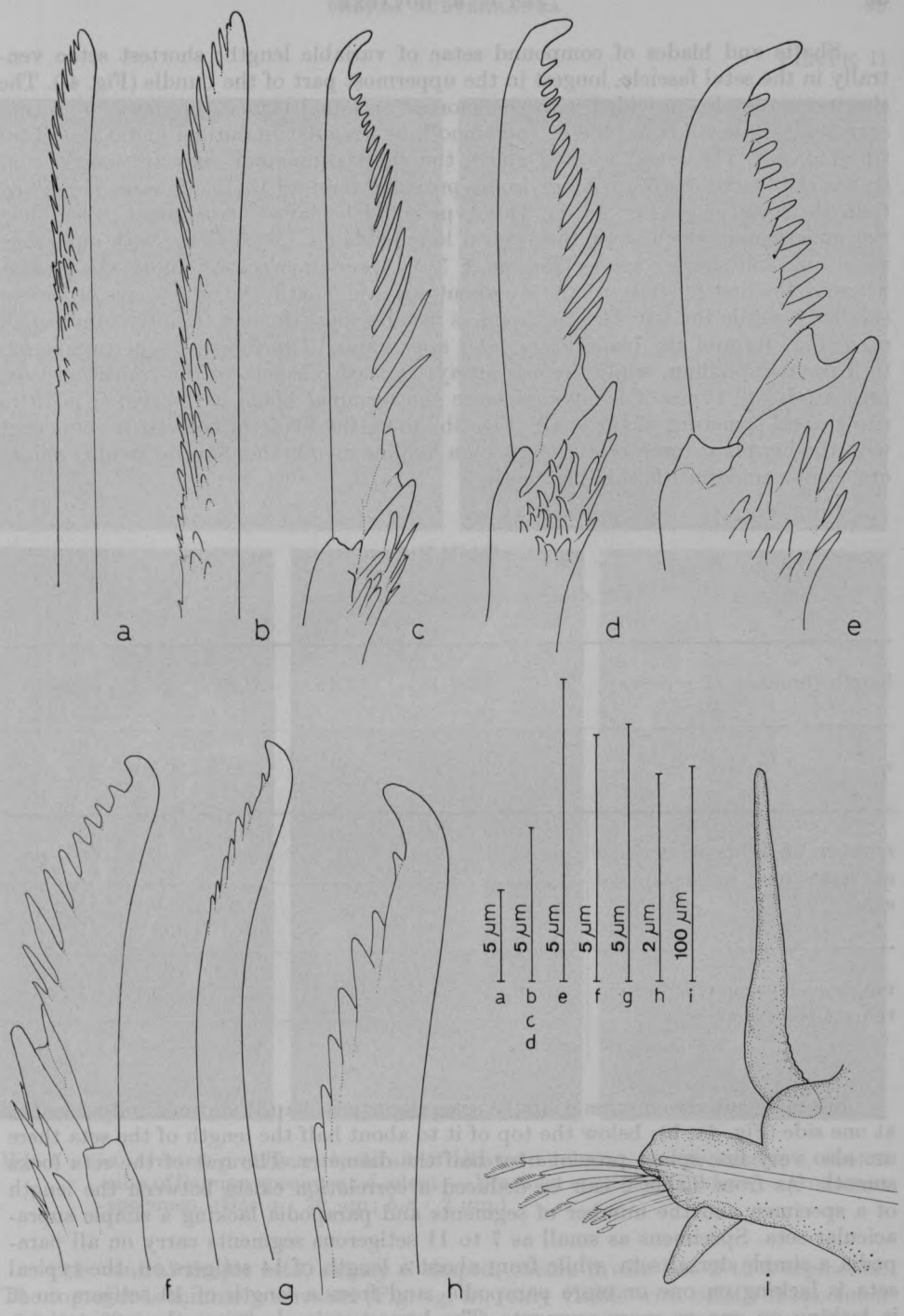

Fig. 4 : *a*, dorsal simple seta; *b*, dorsal simple seta — detail of the tip; *c-f*, compound setae; *g*, simple ventral seta of last segments; *h*, tip of simple ventral seta; *i*, frontal view of the 10th setigerous parapodium. (*a-h* : drawings after SEM micrographs.)

Shafts and blades of compound setae of variable length; shortest setae ventrally in the setal fascicle, longest in the uppermost part of the bundle (Fig. 4i). The shortest setae also provided with the shortest terminal blades (minimum ± 7 μm), carrying 8-10 small equal teeth, and smooth or irregular in outline under the distal tip (Fig. 4e). The setae inserted above the short compound ones are longer, and so are the blades (8-15 μm long); some proximal teeth of the blade more elongated than the distal ones (Fig. 4d, f). This type could be called transitional, resembling the upper setae which show the typical long blade (± 20 μm long) with numerous very long and slender spines (Fig. 4c & 3b). Approximately 20 spines are present whereby the first ten (lower half) are about equal in length, the upper ones becoming smaller towards the tip. The last spine is usually more distinct than the other small ones (Fig. 4c) and the blade has a bifid appearance. The shortest type numbers 0 to 3 per parapodium, while there is always at least one seta of the transition type present. In all types of compound setae the terminal blade is inserted in a little cup-shaped structure of the shaft (Fig. 3b, 4c f), the blade of the seta is connected with the big blunt tooth on the shaft by a hyaline membrane. Several smaller spines are visible underneath this big tooth.

TABLE 2

Absence of dorsal simple seta

length (number of setigers)		7-10	11-15	16-20	21-25	26-28
n		1	3	7	20	5
number of segments lacking at least one simple dorsal seta	mean	0	0	0.4	2.8	3.8
	range	—	—	0-2	0-9	2-6
number of parapodia lacking the simple dorsal seta	mean	0	1.0	2.6	9.1	11.4
	range	—	0-2	0-9	3-19	7-15

Supra-acicularly emerges a simple seta, slightly S-shaped and minutely serrated at one side (Fig. 4a, b); below the top of it to about half the length of the seta there are also very fine spines present over half the diameter. The rest of the seta looks smooth. As from Table 2 can be deduced a correlation exists between the length of a specimen and the number of segments and parapodia lacking a simple supra-acicular seta. Specimens as small as 7 to 11 setigerous segments carry on all parapodia a simple dorsal seta, while from about a length of 14 setigers on, the typical seta is lacking on one or more parapodia, and from a length of 19 setigers on it is lacking on one or more segments. The largest animals (more than 28 setigers long) have 2-6 anterior segments and on the average more than 11 parapodia lacking the seta.

PLATE II

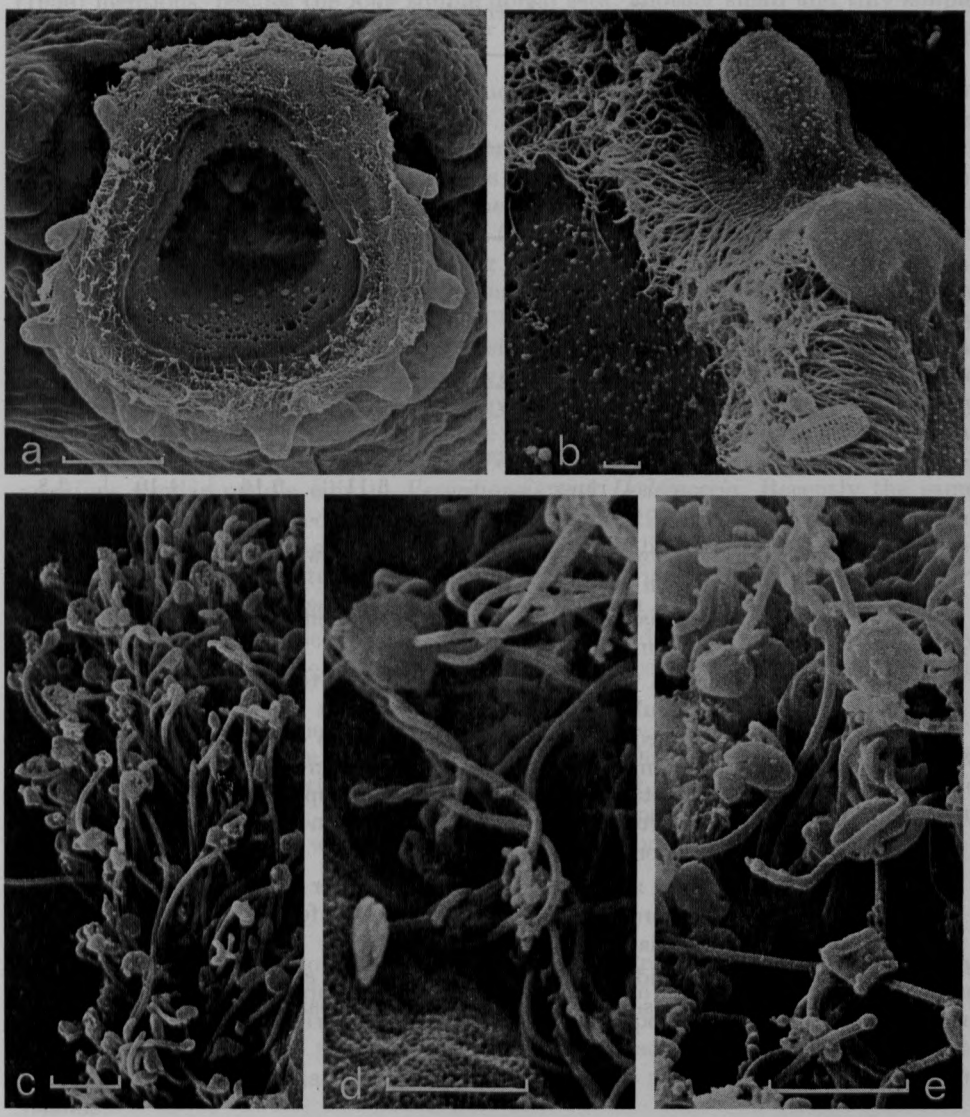

Fig. 5 : *a*, everted proboscis; *b*, detail of ciliated circlet on the proboscis; *c*, nuchal cilia of Papuan specimen; *d*, idem — Brasilian specimen; *e*, idem — Andaman specimen. (Bar *a* : 20 μm; *b-e* : 2 μm.)

One ventral simple seta, clearly S-shaped, occurs in the last 2 to 8 segments. The top of it is minutely serrated (Fig. 4g, h), (only visible with SEM). A specimen of 7 setigers had, on all parapodia, a simple dorsal as well as a simple ventral seta. The number of segments and parapodia where this ventral seta is present, diminishes as the specimens become longer (Table 3).

TABLE 3

Presence of ventral simple seta

length (number of setigers)		7	11-15	16-20	21-25	26-28
n		1	3	7	20	5
number of segments with at least one simple ventral seta	mean	7	5	4.6	3.5	2.6
	range	—	4-6	2-8	2-6	1-4
number of parapodia with a ventral simple seta	mean	14	9.0	8.7	6.3	5.2
	range	—	6-11	6-16	4-10	2-8

The pygidium carries two urites (length ± 210 μm, width at its base ± 27 μm). The anus opens dorsally on the pygidium (Fig. 3c).

Several small pores visible at the front of the membrane covering the palps (Fig. 3d — Brasilian specimen).

The pharynx is armed with one dorsal tooth, inserted in the first third of the foregut and the proventriculus extends usually from the fourth to the sixth setiger. The proboscis, when everted, reveals ten papillae at its distal end (Fig. 5a), under these papillae a circlet of long cilia, very well developed in some individuals (Fig. 5b). The inner surface of the distal part of the foregut looks spongy, the median tooth — which does not protrude from the proboscis, even when this is fully everted — is accompanied by two or more vesicles (Fig. 5a).

Most of the specimens studied had diatoms in their gut (sometimes they were clinged to the cilia of the proboscis — see also Fig. 5b), few ones had also remnants of Crustacea (Harpacticoida ?).

Sexually mature individuals carrying 4 to 7 eggs or embryos dorsally on setiger 12 to 21. The specimens seen with attached eggs measured 18 to 27 setigerous segments.

DISCUSSION

A detailed SEM study of the Brasilian specimens revealed no differences with the Papuan material. Length measurements of cirri, antennae and urites, as given by WESTHEIDE (1974a, 1974b) are in the same range as those mentioned here, or a little higher. The latter can be explained by the fact that here only preserved, and thus somewhat shrinked specimens could be studied, while WESTHEIDE (1974a, 1974b) used living material.

The blades of the compound setae are not bidentate ('schwer zu erkennen', sic WESTHEIDE 1974b), but unidentate as shown on the SEM micrographs and drawings. Although some teeth, especially the subdistal ones, may be obscured by

adhering moisture, and so the seta get a bifid appearance. HARTMANN-SCHROEDER (1956) mentions, besides the long simple dorsal seta, another small and tiny simple dorsal one; this could not be found in our material, nor is it described by any other author.

The presence of a well developed nuchal organ could not be proved hitherto, neither in this species nor in the genus *Brania*. The disk-like swellings (± 1 µm across) at the top of the nuchal cilia seem to be parallel to the shafts or perpendicular (artefact?) to these. The latter was visible in the Brasilian material (Fig. 5d), the first seems to be preponderating in the Papuan specimens (Fig. 5c). Some minor depressions in the center of the disks (Fig. 5c) are presumed, but these ultrastructures are beyond the capacity of the scanning electron microscope used. An individual with 24 setigers from the Andaman Islands (leg. G. C. RAO) — kindly put at my disposal by Prof. Dr W. WESTHEIDE — could be determined as *B. subterranea* by SEM inspection of the setal types and their arrangement, since all cirri were broken off. This specimen too shows the same type of nuchal ciliation (Fig. 5e). This type of cilia looks very similar in morphology to the 'club footed' cilia described by BERGQUIST et al. (1977) in Demospongiae larvae, and to the so called 'paddle cilia' in *Rhabdopleura*, studied by DILLY (1977a, b). The latter author (DILLY, 1977b) mentions similar paddle cilia in *Vermiliopsis* and *Dodecaceria*. Recently the same sort of cilia was described by STORCH & ALBERTI (1978, Fig. 1b), on the gills of several Polychaeta, and called 'cilia bearing paddle-like swellings'. They are predominant on the respiratory organs of *Malacoceros fuliginosus*, *Scoloplos armiger*, *Eunice torquata* and *Ammotrypane aulogaster* (STORCH & ALBERTI, 1978).

Noteworthy is the occurrence of ten papillae and ordinary cilia at the entry of the pharynx, undoubtedly are they functional in capturing and/or appreciating food items.

Until now the species is only known from the Mediterranean (HARTMANN-SCHROEDER, 1956; TENERELLI, 1964, 1965), Indian Ocean (Waltair coast) (RAO & GANAPATI, 1967), East Atlantic (Brasilia) (WESTHEIDE, 1974a) and the East Pacific (Galapagos) (WESTHEIDE, 1974b). This new record and the find in the Andaman Islands suggests a more widely distribution in the Indian and Pacific Ocean.

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