

BATHYAL AND ABYSSAL POLYCHAETES (SEDENTARY SPECIES I)

J. B. KIRKEGAARD

*Zoological Museum, University of Copenhagen
Universitetsparken 15, DK-2100 Copenhagen Ø, Denmark*

ABSTRACT

The present paper describes 28 species from nine sedentary families of polychaetes obtained by the Galathea Expedition 1950-52. These families are: Orbiniidae, Paraonidae, Magelonidae, Flabelligeridae, Scalibregmatidae, Opheliidae, Sternaspidae, Sabellariidae, and Pectinariidae. Two species, *Therochaeta antoni* and *Asclerocheilus tasmanius*, are new to science. Sixteen of the species were obtained from the abyssal zone, and twelve of

these were also recorded from the bathyal and littoral zones. The known distribution of many of the species is extended. Some well known species from the North Atlantic, i.e., *Ammotrypanella arctica* and *Ophelina aulogastrella*, were recorded from areas around New Zealand. This can probably be explained by a newly described, deep salty current from the North Atlantic through the Indian Ocean to the Pacific.

CONTENTS

Introduction	57	Scalibregmatidae	67
Systematic Part	58	Opheliidae	68
Orbiniidae	58	Sternaspidae	71
Paraonidae	60	Sabellariidae	72
Magelonidae	62	Pectinariidae	74
Flabelligeridae	63	Zoogeography	75
		References	76

INTRODUCTION

Nine families of polychaetes are treated, being some of the sedentary families obtained by the Galathea Expedition 1950-52. The remaining fami-

lies will be described by specialists concerned with these families in later publications.

The present paper comprises 28 species, two

of which are new to science, obtained from stations in the South East Atlantic, Indian, and southern Pacific Oceans (see station charts on Figs. 1 and 2, Kirkegaard 1995). Of the 28 species, 16 were found at abyssal depths (2000-6000 m) and 12 at bathyal depths (not deeper than 2000 m). Many of them were also present in the littoral zone.

Material and methods

References to good figures and descriptions are given for each species. Lists of stations and abbreviations of the collecting gear used are found in Bruun 1958. All specimens were measured, and

length and width in mm are given (length first). When a specimen is complete, this is also mentioned, sometimes with the number of setigers. All material, including type material, is deposited in the collection of the Zoological Museum, University of Copenhagen (ZMUC).

Acknowledgements

Figures were drawn by the artist Birgitte Rubæk; the manuscript was carefully corrected by my colleagues Danny Eibye-Jacobsen and Mary E. Petersen and typed by Else Højgaard (all ZMUC), to all of whom I extend my most cordial thanks.

SYSTEMATIC PART

Family ORBINIIDAE Hartman, 1942

Haploscoloplos kerguelensis (McIntosh, 1885)

(Day 1967, fig. 23.4 a-d)

Records: Hartman 1957 p. 275, 1966 p. 9; Day 1967 p. 547; Monro 1936 p. 160, 1939 p. 124. ?*Scoloplos kerguelensis* Fauvel 1953 p. 307.

Material:

St. 110, off Angola, 12°05'S 13°08'E, 975 m, bottom temp. 4.1°C, PG 0,2, 1 specimen: 10x1 mm (anterior part). - St. 626, off New Zealand, 42°10'S 170°10'E, 610 m, bottom temp. 7.6°C, PGI 0.2, 2 specimens: 12x1, 10x1 mm (anterior parts).

Remarks: In this species there appears to be some variation in the number of thoracic setigerous segments, from 9 to 14, and the setiger on which the first branchiae appear, from 11 to 20, probably in accordance with the age and the size of the body. The small specimen from off Angola has 14 thoracic setigers like those described by Day (1967) from South Africa. The branchiae are not present on this somewhat damaged specimen. The two specimens from New Zealand have 14 thoracic setigers, and the first branchiae appear on setiger 16, like those described by Monro (1939) from Australia.

Distribution: California; southern South America, South Georgia, South Orkney Is., Antarctic; western South Africa, Kerguelen Is.; India; Australia, New Zealand; 10-4099 m.

Nainereis quadricuspida (Fabricius, 1780)

(Fauvel 1927, fig. 8 a-g)

Fig. 1

Records: Fauvel 1927 p. 23; Ditlevsen 1937 p. 55; Wesenberg-Lund 1950a p. 74, 1950b p. 29; Hartman 1965 p. 130.

Material:

St. 408, South China Sea, 12°47'N 116°24'E, 4330 m, PG 0,2, 1 specimen: 28x3 mm (anterior part).

Remarks: This is a remarkable find, so far away from the species' main area of distribution in the North Atlantic and the Arctic. However, I have compared the specimen with arctic specimens from the Zoological Museum collections and they are quite alike, including the shape of the parapodia and setae.

Distribution: Arctic: West Greenland, Jan Mayen, Spitzbergen, Murmansk, White Sea; Scandinavia, Scotland, England; off Bermuda; South China Sea; 2-4330 m.

Phylo norvegicus (Sars, 1872)

(Fauvel 1927, fig. 5 m-p)

Fig. 2

Records: Kirkegaard 1959 p. 13; Hartman 1965 p. 130. *Aricia norvegica* Fauvel 1927 p. 17; Wesen-

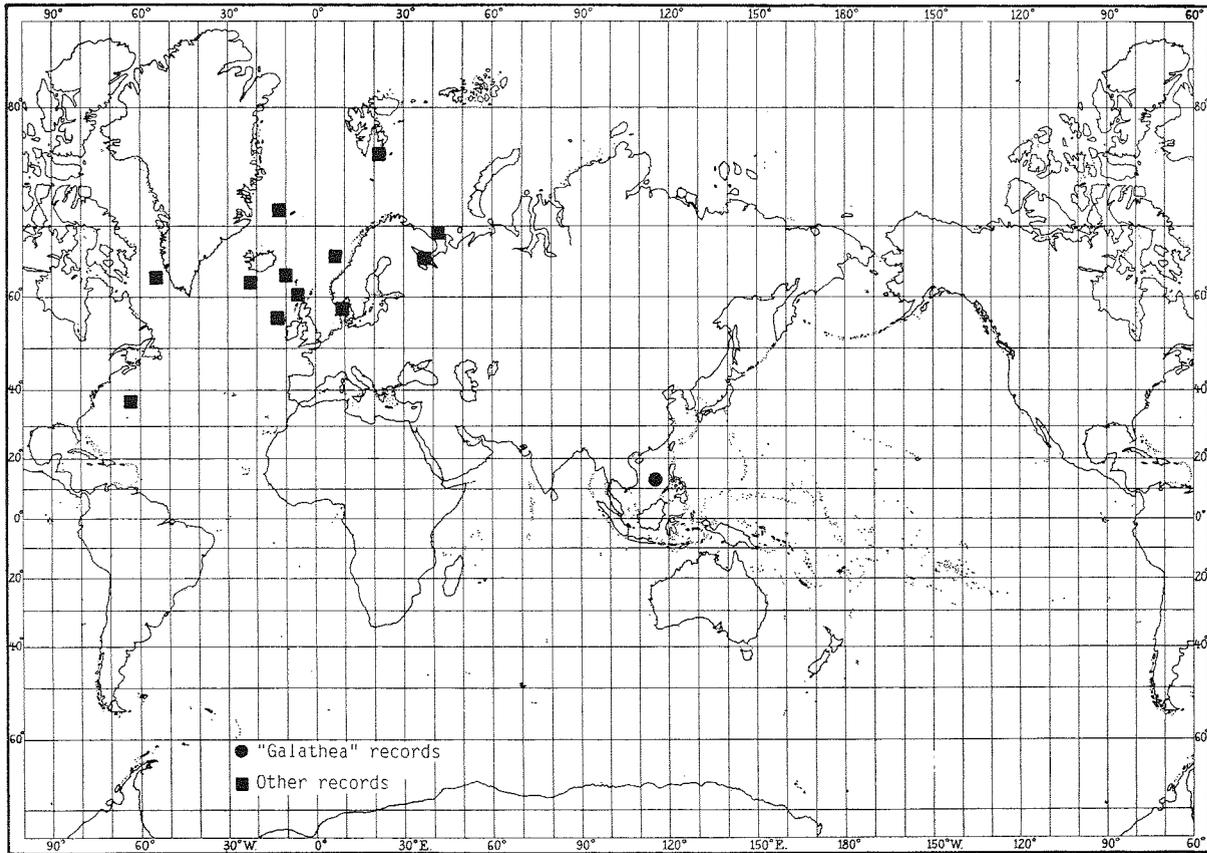


Fig. 1. *Nainereis quadricuspida* (Fabricius, 1780); 2-4330 m.

berg-Lund 1950a p. 75; Uschakov 1965 p. 235.
Orbinia (Phylo) norvegica Pettibone 1963 p. 281.
Phylo nudus Hartman 1957 p. 268.

Material:

St. 101, off Angola, 8°50'S 12°32'E, 990 m, ST300, 1 specimen: 8x2 mm (anterior part). - St. 110, off Angola, 12°05'S 13°08'E, 975 m, bottom temp. 4.1°C, PG 0.2, 1 specimen: 18x4 mm (anterior part).

Remarks: This species was also obtained from more shallow water (398 m) at St. 113, nearly the same position as St. 110. The two specimens from more than 900 m are similar to European specimens of the same species. Pettibone (1963) regards *P. nudus* (Moore, 1911) as a synonym of *P. norvegicus*. If this is correct, then *P. norvegicus* is also recorded from Burma and Southern California (included on Fig. 2).

Distribution: Arctic; both sides of the North and

South Atlantic; both sides of the North Pacific; Indian Ocean; 10-2900 m.

***Scoloplos (Leodamas) marginatus* (Ehlers, 1897)**

(Fauvel 1916, pl. 8 figs 26-33)

Fig. 3

Records: Hartman 1966 p. 11, 1967 p. 108, pl. II figs 6-7. *Nainereis marginata* Fauvel 1916 p. 445.

Material:

St. 477, off Bali, 9°01'S 114°48'E, 780 m, PG 0.2, 1 specimen: 26x1 mm (anterior part).

Remarks: The present specimen has 13 thoracic setigers; branchiae are present from setiger 5 and it is thus most similar to the subspecies *Scoloplos marginatus macleani* (Benham, 1921), since this also has 3-6 fine spines behind the third row of thoracic neuropodial uncini.

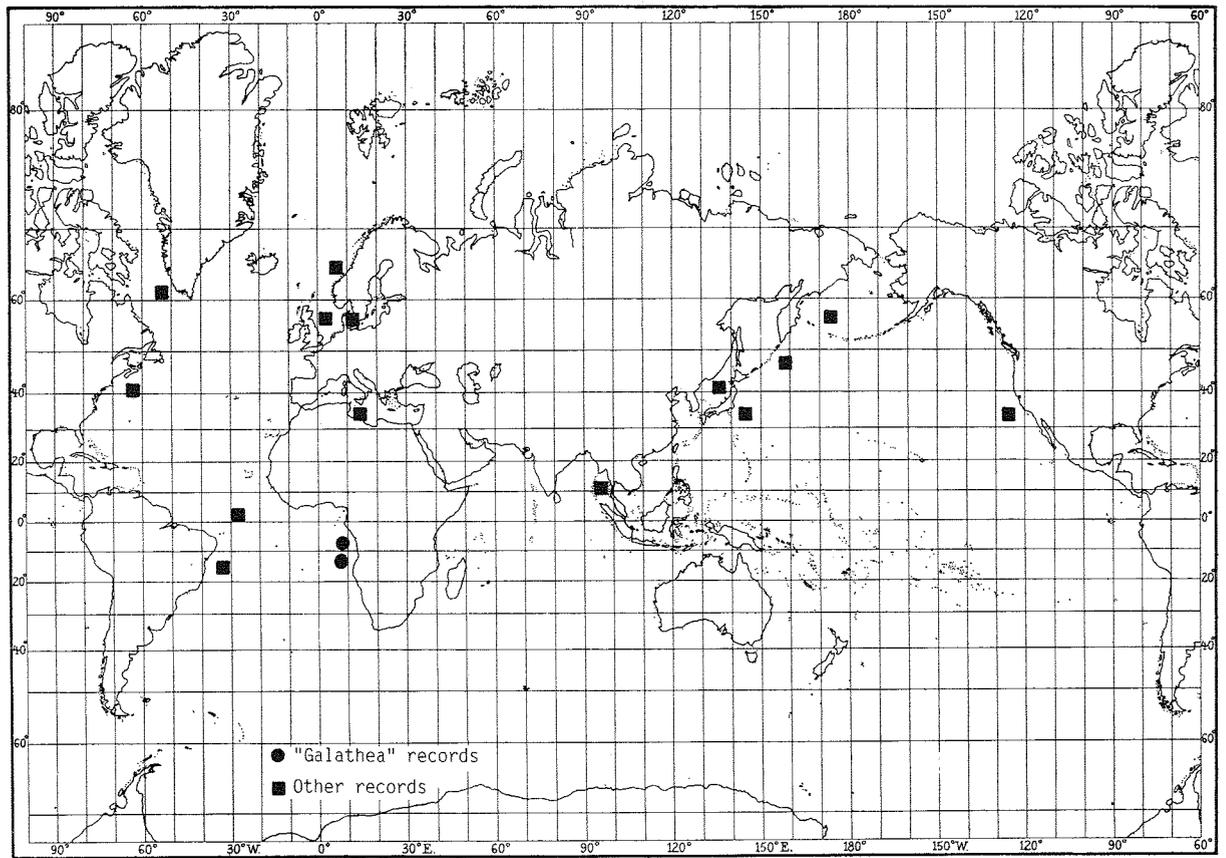


Fig. 2. *Phylloporus norvegicus* (Sars, 1872); 10-2900 m.

Distribution: Antarctic and subantarctic islands: Falkland, South Georgia, South Shetland, South Orkney, Kerguelen; Bali; 25-3816 m.

?*Scoloplos (Leodamas) rubra* (Webster, 1879)

(Hartman 1957, pl. 32 figs 1-6)

Records: Hartman 1957 p. 291, figs 1-6. *Scoloplos (Leodamas) rubra orientalis* Gallardo, 1968 p. 94, pl. 41 figs 1-5. *Scoloplos (Leodamas) rubra australis* Hartmann-Schröder, 1979 p. 131, figs 276-282.

Material:

St. 555, S of Adelaide, 37°21'S 138°44'E, 875 m, PG I 0.2, 1 specimen: 2x1/2 mm.

Remarks: There is only one small specimen present, with 23 thoracic setigers and branchiae from setiger 9. However, the specimen has probably lost some branchiae, since it is slightly dam-

aged on the dorsum. The subspecies from NW Australia has a very curved acicula, but this is not the case with this specimen, which is mostly like the figure of Hartman (1957).

Distribution: Virginia, North Carolina, Florida, Mexican Gulf; Vietnam; N.W. and S. Australia; 1-875 m.

Family PARAONIDAE Cerruti, 1909

***Aricidea (Allia) albatrossae* Pettibone, 1957**

(Pettibone 1963, fig. 81)

Records: Pettibone 1957 p. 354, 1963 p. 305; Strelzov 1979 p. 76, fig. 26; Hartley 1981 p. 136. *Aedicira belgica* Day 1967 p. 563.

Material:

St. 65, off Gabon, 2°17'S 8°10'E, 2770 m, bottom temp. 3.0°C, ST300, 2 specimens: 12x2 mm, 7x2 mm (anterior part with short antenna). - St.

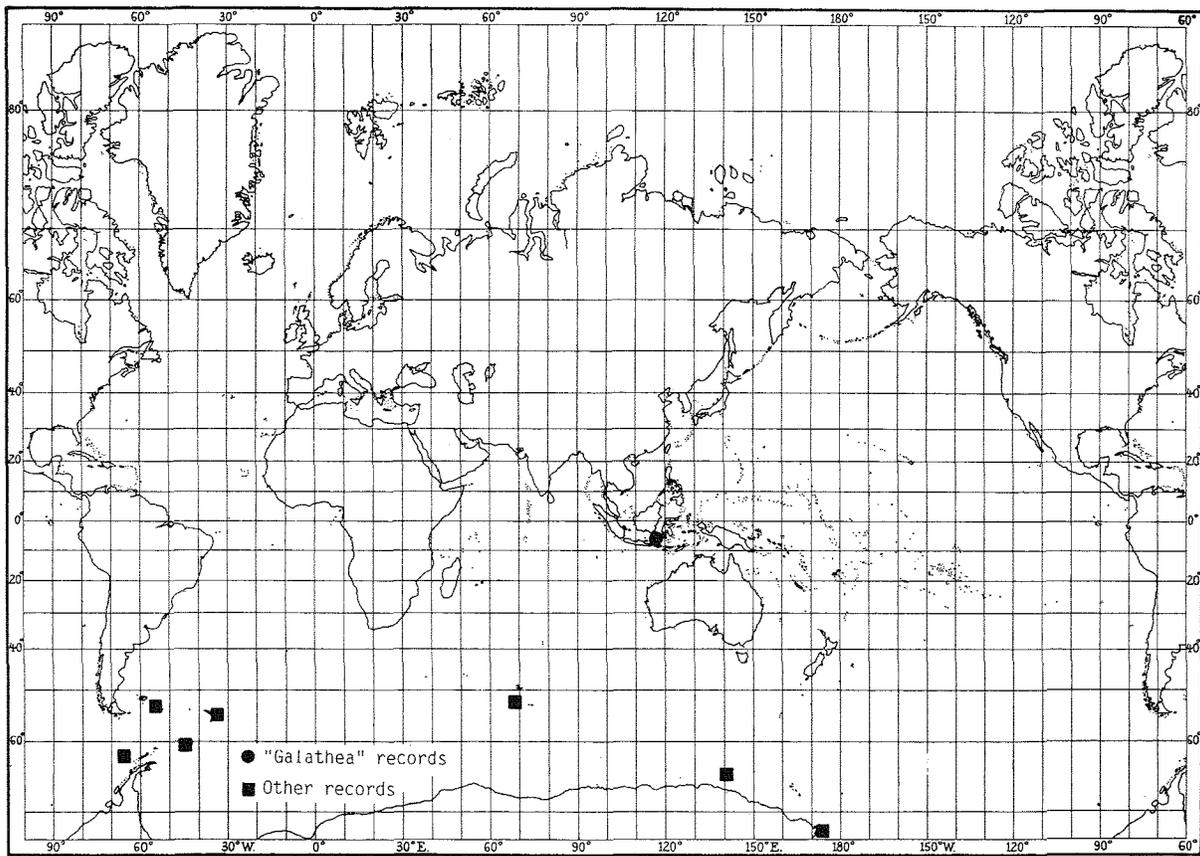


Fig. 3. *Scoloplos (Leodamas) marginatus* (Ehlers, 1897); 25-3816 m.

101, off Angola, 8°50'S 12°32'E, 990 m, ST300, 2 specimens: 3x1 mm, 7x1 mm (anterior part with short antenna). - St. 112, off Angola, 12°16'S 13°17'E, 715 m, PG 0.2, 1 specimen: 5x1 mm (anterior part with long antenna).

Description: Prostomium with broad, rounded anterior margin, as in figure of Strelzov (1979, fig. 26 A). Broad nuchal grooves. No eyes. Unpaired prostomial antenna short; in one specimen, however, long and thin, reaching setiger 2. Branchiae broad with thin tip; 15-17 pairs, beginning on setiger 4. Notopodia, are long, slender, becoming very thin in posterior part of body. Neuropodia as a short knob. Between these there is a rounded outgrowth in the branchial portion of the body (Strelzov 1979, fig. 26 F). Many capillary noto- and neurosetae, in broad fans. Neurosetae markedly thicker than notosetae. Posterior part of body with only a few notosetae.

Remarks: Day's description of *Aedicira belgica*

from off the Cape fits well with the present material of *A. albatrossae*. Strelzov (1979) refers Day's *A. belgica* to *A. albatrossae*, however with a question mark. The specimen with the long prostomial antenna probably belongs to another species. However, it is similar to all the other specimens in all other characters, so it may be a result of conservation. It is much longer and thinner than by the other specimens.

Distribution: North Atlantic (England, Massachusetts); Africa (Gabon, Angola, Cape); Pacific (Caroline Isl.); 145-2900 m.

Aricidea (Allia) ramosa Annenkova, 1934

(Strelzov 1979, fig. 34)

Records: Strelzov 1979 p. 92. *Aricidea (Aedicira) ramosa* Hartman 1963 p. 37. *Aedicira ramosa* Hartman 1965 p. 50, 1969 p. 55. *Aricidea (Aricidea) ramosa* Banse & Hobson 1968 p. 21.

Material:

St. 109, off Angola, 12°06'S 13°08'E, 1170 m, PG 0.2, 1 specimen: 20x1/2 mm (anterior part).

Remarks: This is the only species of *Aricidea* with a branched, unpaired, prostomial antenna. The unpaired antenna on the present specimen is branched, and it also fits with the description of other characters, although the record is far from earlier records, all of which are in the North Pacific.

Distribution: West Africa; North Pacific: Japan, off Vladivostok, Puget Sound, California; 44-2400 m.

***Aricidea (Acesta) simplex* (Day, 1963)**

(Strelzov 1979, fig. 43 A-C)

Records: *Aricidea suecica simplex* Day 1967 p. 538, fig. 24.1 f-i. *Aricidea uschakovi* Levenstein, 1966 p. 39. *Aricidea (Acesta) simplex* Strelzov 1979 p. 115.

Material:

St. 108, off Angola, 12°00'S 13°00'E, 1470 m, PG 0.2, 1 specimen: 18x1 mm (anterior part). St. 626, W of New Zealand, 42°10'S 170°10'E, 610 m, bottom temp. 7.6°C, PG I 0.2, 1 specimen: 7x1/2 mm (anterior part). St. 638, off Wellington, 37°33'S 175°57'E, 660 m, PG I 0.2, 2 specimens: 10x1/2 mm, 12x1 mm (anterior parts).

Remarks: Prostomium with short, club-shaped, median antenna, branchiae starting at setiger 4, 10-20 pairs. Shape of modified setae is just like those figured by Day (1967) and Strelzov (1979).

Distribution: East coast of southern South America, southern Africa (Angola, Cape), Antarctic, Bering Sea, Kurile Is., Sea of Japan, east coast of Japan, Caroline Isl., New Zealand; 35-5540 m.

***Paradoneis lyra* (Southern, 1914)**

(Mackie 1991, figs 1 + 3A)

Records: Mackie 1991 p. 148. *Paraonis (Paranonides) lyra* Fauvel 1927 p. 72, fig. 24 a-f. ?*Paranonides lyra lyra* Day 1967 p. 568, fig. 24.4 c-g. ?*Paradoneis lyra* Hartman 1965 p. 140; Gallardo

1968 p. 96, pl. 42 fig. 7, pl. 43 fig. 1. Not *Cirrophorus lyra* Strelzov 1979 p. 137.

Material:

St. 626, off New Zealand, 42°10'S 170°10'E, 610 m, bottom temp. 7.6°C, PG I 0.2, 1 specimen: 5x1/4 mm, 44 anterior segments.

Remarks: Fits well with Mackie's description and figures. However, there are 4 prebranchial setigers instead of 3, no eyes are visible, and no unpaired antenna is present. 14 pairs of branchiae. The shape of the branchiae and notopodia are just as described by Mackie.

Distribution: N. E. Atlantic, New Zealand. ?Off New England, Massachusetts, California, Venezuela, western Mexico, southern Africa and Vietnam; 5-1000 m.

**Family MAGELONIDAE
Cunningham & Ramage, 1888**

***Magelona cornuta* Wesenberg-Lund, 1949**

(Wesenberg-Lund 1949, fig. 36)

Records: *Magellone cornuta* Wesenberg-Lund, 1949 p. 328. *Magelona cornuta* Kirkegaard 1959 p. 26.

Material:

St. 72, off Congo River, 5°39'S 11°19'E, 735 m, PG 0.2, 1 specimen: 8x1 mm (anterior part).

Remarks: This species was recorded from more shallow water (27-308 m) at several localities along the west coast of Africa (Kirkegaard 1959). The present specimen has been compared with specimens from these stations and with the type specimen from the Iranian Gulf. They are all alike.

Distribution: Iranian Gulf, Nigeria, Zaire, Angola; 27-735 m.

***Magelona pacifica* Monro, 1933**

(Monro 1933, fig. 2 A-H)

Records: Monro 1933 p. 1048; Hartman 1969 p. 193.

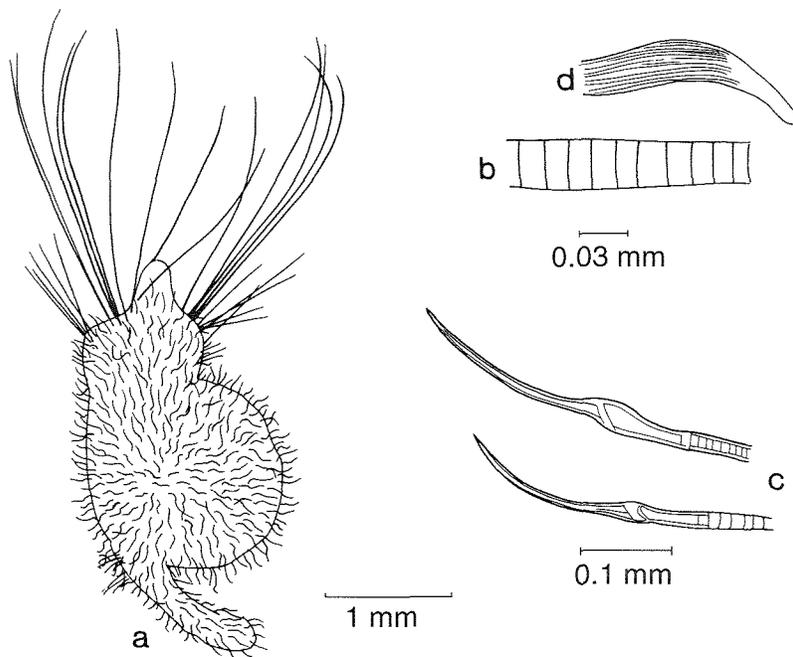


Fig. 4. *Pherusa curvisetis* (Caullery, 1944); a, dorsal view; b, part of long capillary seta; c, pseudoarticulate hooks; d, posterior ventral hook.

Material:

St. 421, W of Philippine Trench, 10°26'N 126°05'E, 1000 m, PG I 0.2, 1 specimen: 12x1 mm.

Description: With frontal horns, without notopodial and neuropodial medial lamellae in posterior region. Anterior region with lateral lamella of notopodium larger than that of neuropodium. Hooded hooks of posterior region are bidentate.

Remarks: The only specimen present fits with the description and figures of Monro (1933). The new record is from the western part of the Pacific, while it was earlier known only from the eastern part.

Distribution: Southern California, Panama Bight, east of the Philippines; 1-1000 m.

***Magelona* sp.**

Material:

St. 477, S of Bali, 9°01'S 114°48'E, 780 m, bottom temp. 6.0°C, PG 0.2, 3 posterior parts.

Description: No medial lamellae, lateral lamel-

lae on posterior part of equal size. Hooded hooks bidentate.

Remarks: Since the anterior ends are missing it is impossible to identify the species.

**Family FLABELLIGERIDAE
Saint-Joseph, 1894**

***Brada talehsapensis* Fauvel, 1932**

(Fauvel 1932, fig. 32, pl. 7 fig. 17)

Records: Fauvel 1932 p. 184; 1953 p. 351.

Material:

St. 471, Sunda Trench, 10°26'S 114°15'E, 2810-2990 m, bottom temp. 1.7°C, ST300, 1 specimen: 35x5 mm (anterior part, 24 segments).

Description: Anterior end rounded, with small knob in front. Body long, cylindrical, same breadth throughout. Few slender, articulate setae of setiger 1 directed forwards, separated in two groups on either side (dorsal and ventral). Setiger 2 with much shorter dorsal, capillary setae and 2 short, unidentate, thicker, ringed ventral setae. Following

segments with short, ringed dorsal capillary setae and 4-5 thicker, ringed, unidentate ventral hooks. Prostomium with a bundle of central thin branchiae on either side. Small papillae cover the whole body, but there is no sand adhering to them. Posterior part missing.

Distribution: Taleh-Sap, Gulf of Siam; Sunda Trench; 1-2810 m.

***Pherusa curvisetis* (Caullery, 1944)**

(Caullery 1944, fig. 25 A-F)

Fig. 4

Records: Gallardo 1968 p. 108, pl. 50 figs 5-7. *Stylarioides curvisetis* Caullery, 1944 p. 34, fig. 25 A-F.

Material:

St. 477, S of Bali, 9°01'S 114°48'E, 780 m, bottom temp. 6.0°C, PG 0.2, 1 specimen: 8x3 mm.

Description: Anterior part of body swollen, posterior part thinner, like a tail (Fig. 4a). Body covered with long, threadlike papillae. The cephalic cage consists of long capillary setae placed on the 2 first setigers (Fig. 4b). Following 54 segments with capillary dorsal setae and 3 ventral hooks. Hooks from anterior 3-7 segments are pseudoarticulate and ringed basally (Fig. 4c). More posteriorly the ventral hooks are less curved and simple (Fig. 4d).

Remarks: Very similar to Gallardo's and Caullery's descriptions and figures. However, neither mention the very long papillae.

Distribution: South Vietnam, Flores, Bali, Sulu Sea; 23-780 m.

***Pherusa* sp. 1**

Material:

St. 668, Kermadec Trench, 36°23'S 177°41'E, 2640 m, bottom temp. 2.0°C, HOT, anterior fragment with long capillary setae.

Remarks: This fragment is similar in some ways to *Stylarioides hamocarens* (Monro, 1937) from the North Arabian Sea. However, this species has a

very characteristic branchial membrane, which is not present in the specimen reported here.

***Pherusa* sp. 2**

Material:

St. 716, East Pacific off Costa Rica, 9°23'N 89°32'W, 3570 m, bottom temp. 1.9°C, HOT, several medial and posterior fragments. No anterior parts.

Remarks: All fragments with ringed, capillary notosetae and 2-3 ventral hooks with curved, unidentate tip and ringed basis. Small, round papillae in circular rings.

***Piromis congoense* (Grube, 1877)**

(Monro 1930, fig. 65)

Records: *Pycnoderma congoense* Monro 1930 p. 162; Augener 1918 p. 451, text fig. 58. *Stylarioides congoense* Fauvel 1939 p. 17; Kirkegaard 1959 p. 39.

Material:

St. 72, off Congo River, 5°39'S 11°19'E, 735 m, PG 0.2, 1 specimen: 33x1 mm. - St. 94, off Congo River, 6°48'S 11°19'E, 960 m, PG 0.2, 1 specimen: 45x1 mm. - St. 101, off Angola, 8°50'S 12°32'E, 990 m, ST300, 4 specimens: 5x1, 10x1, 10x1, 10x1 mm (anterior parts) 4 posterior parts: 15-8x1 mm. - St. 110, off Angola, 12°5'S 13°8'E, 975 m, bottom temp. 4.1°C, PG 0.2, 5 specimens: 8x1, 15x1, 21x1, 21x1, 21x1 mm (anterior parts).

Remarks: This species appears to be common along the tropical coast of West Africa from Senegal to northern Angola.

Distribution: West Africa; 12-990 m.

***Therochaeta antoni* n.sp.**

Fig. 5

Material:

St. 311, off Ganges Delta, 20°49'N 88°40'E, 445 m, PG 0.2, 1 specimen: 23x3 mm (holotype, ZMUC-POL-852).

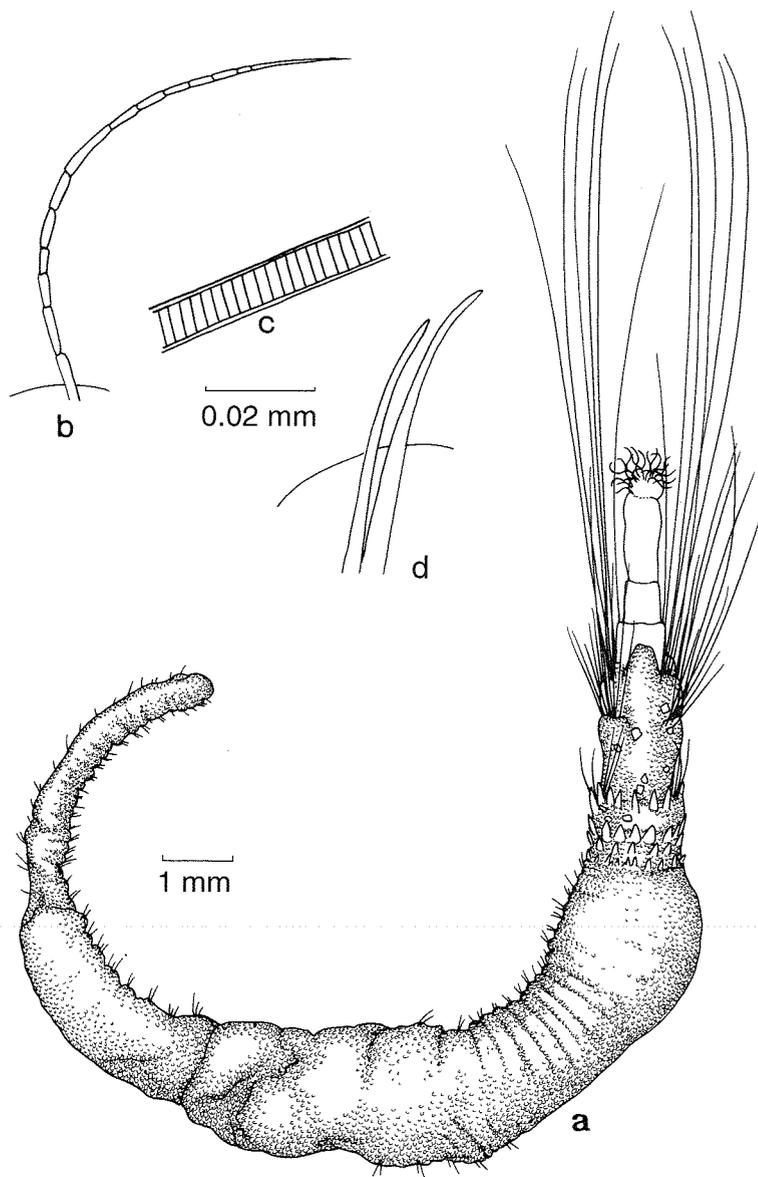


Fig. 5. *Therochaeta antoni* n.sp. holotype; a, dorsal view; b, pseudoarticulate capillary seta; c, enlarged part of same; d, ventral hooks.

Description: The only specimen with 64 setigers, 25x3 mm. Body with inflated anterior end and long, slim tail (Fig. 5a). Body covered with small, cone-shaped papillae and thin layer of sand grains. Anterior two setigers with long capillaries, forming a cage, and this part is separated from the rest of the body by a distinct constriction forming a long neck. Dorsal capillaries of setiger 1 are the longest, the ventral ones a little shorter. The dorsal and ventral setae of each side arise very close to each other. Dorsally on segment 1 is placed a small, triangular shield. The neuro- and notopodia

of setiger 2 are placed a little further apart. All the capillaries are transversely barred with a long, thin tip (Fig. 5b + c). From the mouth between the anterior capillaries projects a long tube with short, thin branchiae. Palps are not visible. The anterior margin of setiger 3 is provided with long, thin papillae and long, triangular teeth. Setiger 4 has a circular row of teeth at the anterior rim, on setigers 5 and 6 the teeth are shorter. From setiger 6 the dorsal setae are capillaries, but the 2 ventral ones are short, sigmoid, unidentate hooks (Fig. 5d). The number of hooks in the neuropodia increases from here on

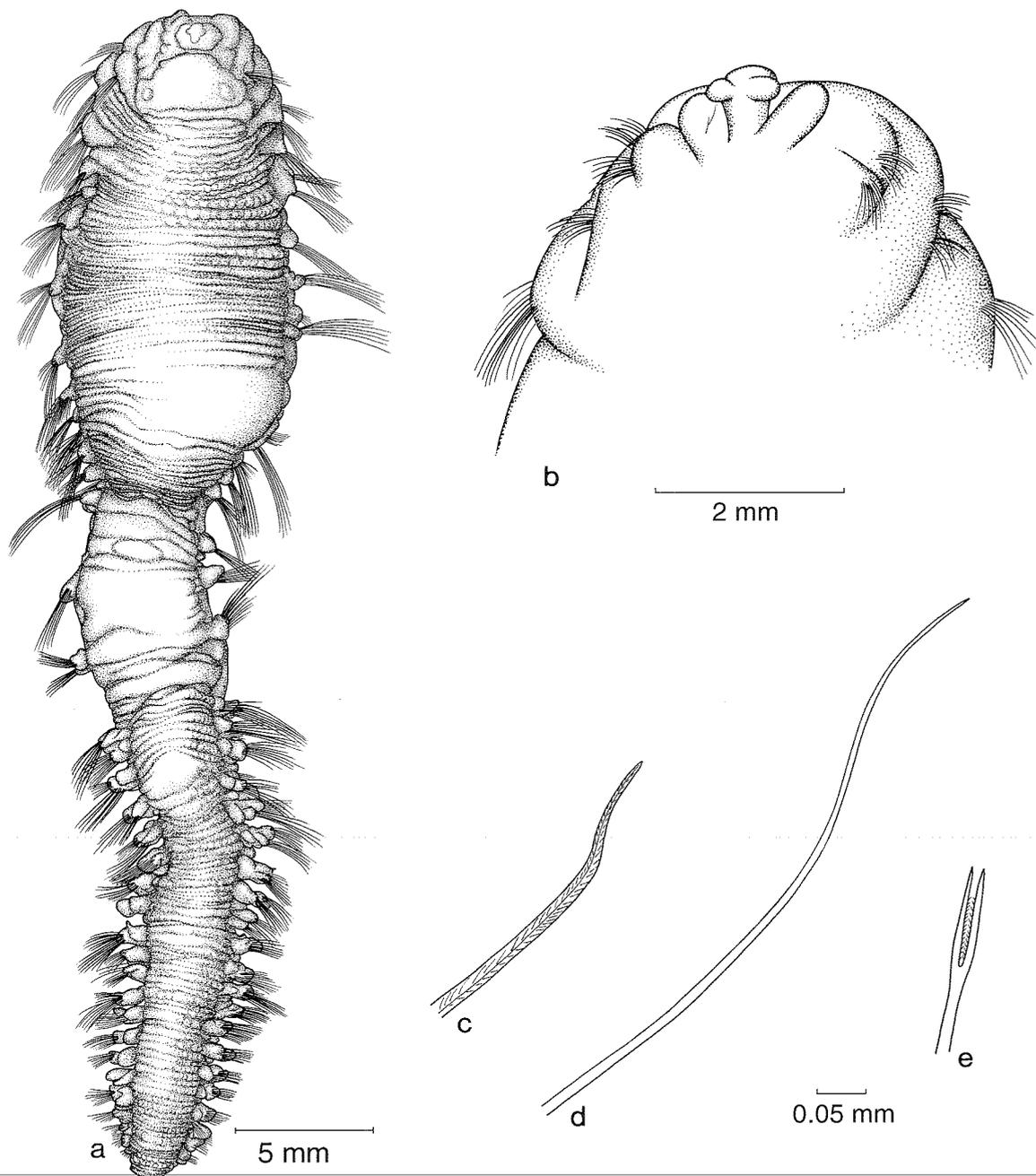


Fig. 6. *Asclerocheilus tasmanius* n.sp. (holotype); a, dorsal view; b, anterior part, dorsal view; c, acicular hook; d, capillary seta; e, furcate seta.

backwards, and there are especially many (up to 5) in each bundle on the tail.

Remarks: This species is very similar to Ehlers' description of *Stylarioides collarifer* from Florida (Ehlers, 1887), later transferred to the new genus *Therochaeta* by Chamberlin (1919). *T. antoni* differs from this species by not having the characteristic pseudocomb hooks on setigers 5, 6 and 7 and by

having a long, slim tail. *Therochaeta collarifer* has only 24 setigers.

Distribution: Bay of Bengal, off Calcutta; 445 m.

This species is named after Dr. Anton F. Bruun, the scientific leader of the Galathea Expedition.

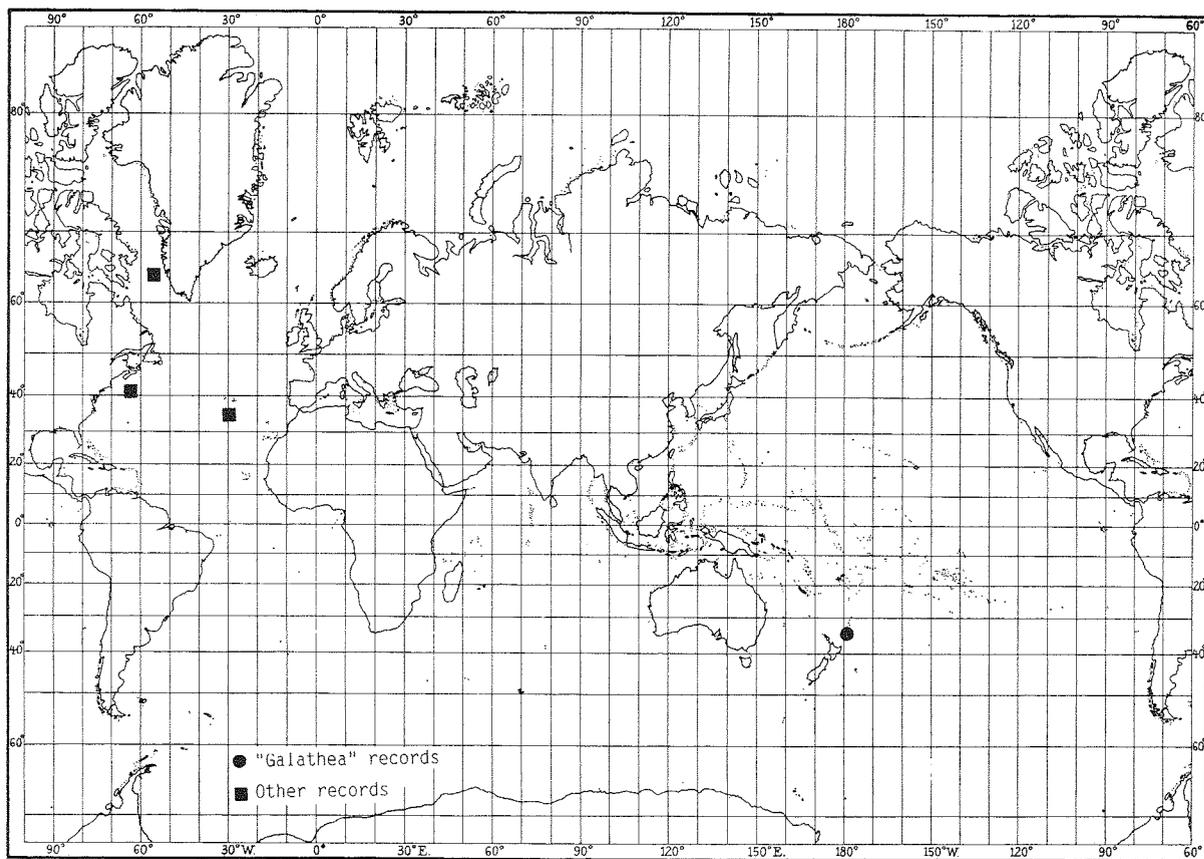


Fig. 7. *Ammotrypanella arctica* McIntosh, 1879; 2470-5900 m.

Family SCALIBREGMATIDAE
Malmgren, 1867

Asclerocheilus tasmanius n.sp.

Fig. 6

Material:

St. 575, W of New Zealand, Tasman Sea, 40°11'S 163°35'E, 3710 m, bottom temp. 1.1°C, SOT, 4 specimens: 40x10 mm (last segments missing), 46x10 (holotype, ZMUC-POL-853), 46x10, 58x12 mm (all complete specimens 3 Paratypes, ZMUC-POL-866). - St. 607, SW of New Zealand, 44°18'S 166°46'E, 3830 m, bottom temp. 1.3°C, VG 0.2, 1 specimen: 16x1 mm (paratype, ZMUC-POL-866).

Description: Holotype 46x10 mm, 39 setigers. Small, rounded prostomium with 2 fairly large, round tentacles (Fig. 6b). No eyes. Two anterior segments with sigmoid acicular hooks in 2 rows in both noto- and neuropodia, 8-12 hooks in each row (Fig. 6c). Third setiger with 1 row of hooks and 1

row of long capillaries in each parapodium. The following setigers with long capillaries and furcate setae (Fig. 6d, e). The body is inflated from setiger 4-10; the posterior part is a long, slim tail. Two preanal segments; anus central in a short funnel. No branchiae; no dorsal or ventral cirri.

Remarks: The species is similar to *Asclerocheilus intermedius* (Saint-Joseph, 1894) and *A. beringianus* Uschakov, 1955. The latter is also a deep-sea species, known from depths of 986-5018 m. The present species differs from it by having sigmoid hooks on the first three setigers, while these hooks are found only on the first two setigers in *A. beringianus*. Also *A. intermedius* has hooks on the first three setigers, but no capillaries in setiger 3. *A. californicus* Hartman, 1963 is characterized by having very long parapodial lobes on the posterior parapodia. There are also differences in the number of setigers. *A. intermedius* has 35 setigers, *A. tasmanius* has 39 and *A. beringianus* has 70 setigers. *A. californicus* has 78 setigers.

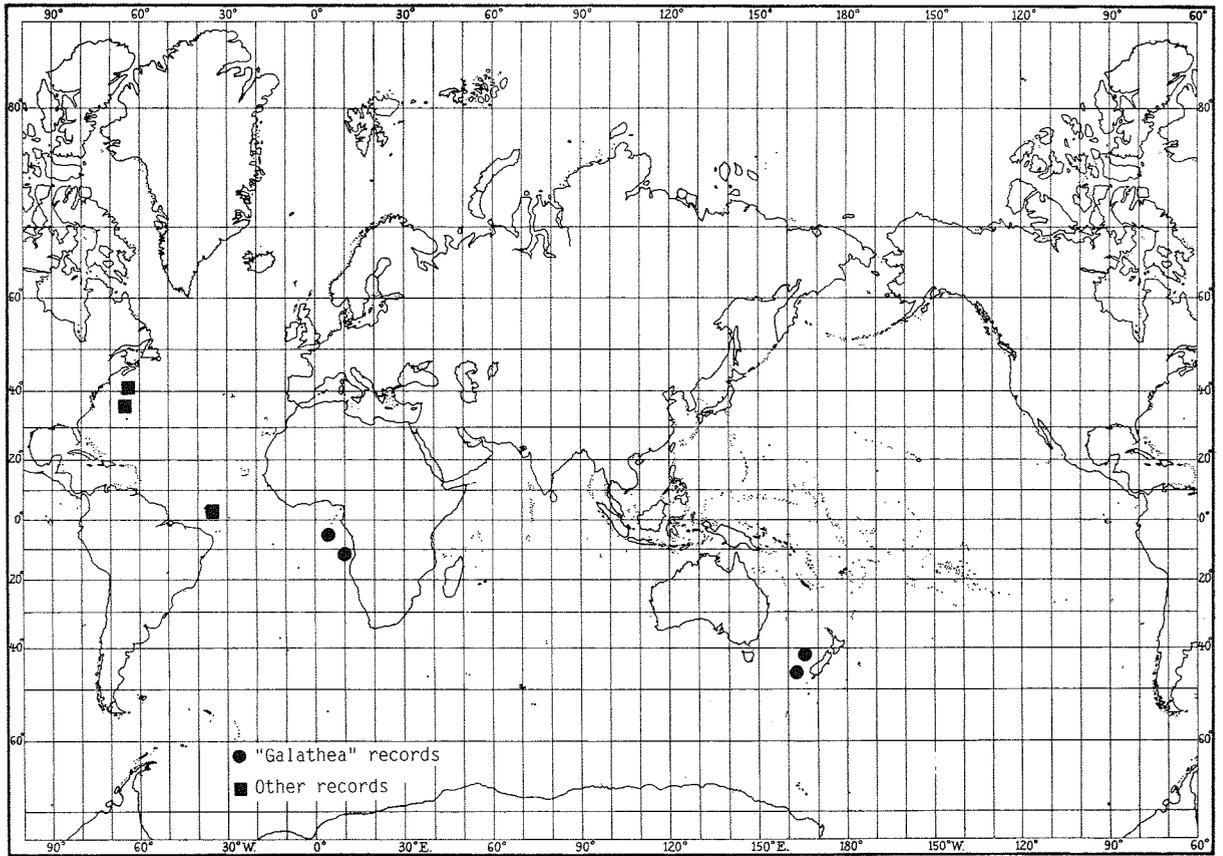


Fig. 8. *Ophelina aulogastrella* Hartman & Fauchald, 1971; 196-5023 m.

Distribution: Tasman Sea, SW of New Zealand; 3710-3830 m.

Indeterminable Scalibregmatidae

St. 65. Off Gabon, 2°17'S 8°10'E, 2770 m, bottom temp. 3.0°C, ST300, 2 specimens: 30x4 mm (anterior part), 15x5 mm (fragment). The anterior part of the prostomium is damaged, so it is impossible to determine its shape. The parapodia are short, with long capillaries and shorter furcate setae. The surface of the body is strongly areolated. No branchiae, acicular setae, dorsal or ventral cirri present.

St. 477. South of Bali, 9°01'S 114°48'E, 780 m, bottom temp. 6.0°C, PG 0.2, 1 specimen: 4x1 mm (16 setigers). The body is not maggot-like, but elongated, and has nearly parallel sides. Prostomium small, rounded, with two large, triangular antennae. Long capillaries and short furcate setae in all segments. No acicular setae. No branchiae. No dorsal or ventral cirri. Similar to *Hyposcolex pacificus* (Moore, 1909) from Monterey Bay, Cali-

fornia. Moore described it as *Sclerocheilus*, which was changed by Hartman (1969) to *Oncoscolex*. Fauchald (1977) considers *Oncoscolex* to be a synonym of *Hyboscolex*. This species is known from western Canada to western Mexico and from Japan to the Kurile Islands (Uschakov 1965). The present specimen, however, does not have the characteristic pairs of parallel rows of eye spots of *H. pacificus*.

Family OPHELIIDAE Malmgren, 1867

Ammotrypanella arctica McIntosh, 1879

(Fauvel 1914, pl. 22, figs 14-19)

Fig. 7

Records: McIntosh, 1879 p. 505, pl. 65 fig. 12; Fauvel 1914 p. 246; Hartman & Fauchald 1971 p. 132.

Material:

St. 654, Kermadec Trench, 32°10'S 175°54'W,

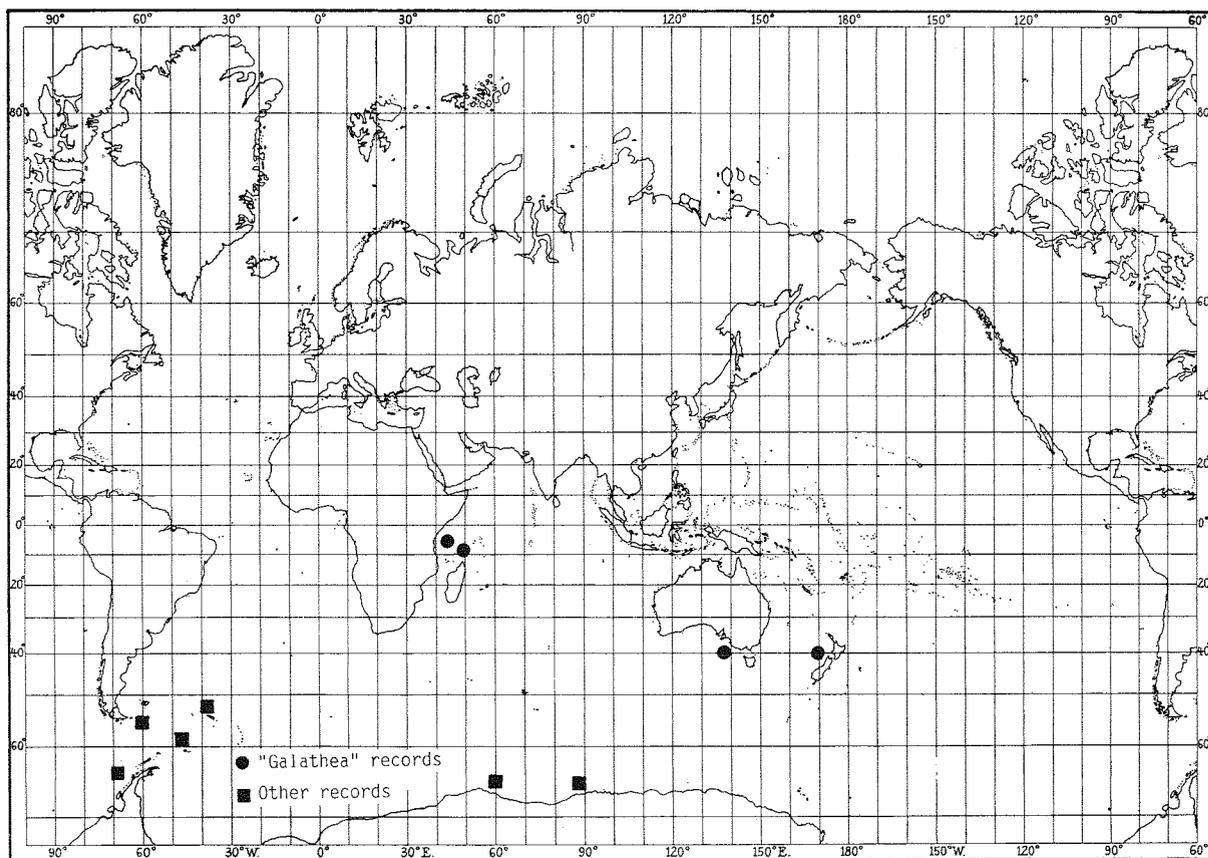


Fig. 9. *Ophelina breviata* (Ehlers, 1913); 20-4820 m.

5850-5900 m, bottom temp. 1.2°C, HOT, 1 incomplete specimen: 47x3 mm. - St. 665, Kermadec Trench, 36°38'S 178°21'E, 2470 m, bottom temp. 2.1°C, HOT, 1 specimen: 25x1 mm (complete). - St. 668, Kermadec Trench, 36°23'S 177°41'E, 2640 m, bottom temp. 2.0°C, HOT, 3 specimens: 42x2 mm (complete), 36x2 mm, 33x2 mm (last two specimens without anal funnel).

Description: The largest complete specimen measures 47x3 mm and has 48 setigers. It has two large, nuchal organs at the anterior end. Setiger 1 is short, with short setae, setiger 2 has short capillary branchiae, but branchiae become longer on the following setigers and are longest on setigers 25-29. Setigers 30-48 have no branchiae. The last ten segments are very short, with small parapodia with setae. Anal funnel long, cylindrical, with small folds and crossed by close annulations. It is not visible on some specimens, but on one it looks as if it is withdrawn into the anus.

Remarks: This is a very characteristic species and easy to recognize. The specimens are just like those described by Fauvel (1914) and McIntosh (1879). Their figures are also similar. However, the number of segments is 48, while McIntosh's only specimen has 30. It is a small specimen, only 15 mm long. Hartman & Fauchald (1971) have a large number of specimens, the largest one (50 mm) with 42 setigers and the smallest ones (6 mm) with 37 setigers.

Distribution: Davis Strait, Azores, New England-Bermuda, Kermadec Trench; 2470-5900 m.

Ophelina aulogastrella
Hartman & Fauchald, 1971

(Hartman & Fauchald, 1971, pl. 21, fig. a-c)

Fig. 8

Records: Hartman & Fauchald, 1971 p. 130;

Kirkegaard 1980 p. 80. *Ammotrypane* sp. A. Hartman 1965 p. 188.

Material:

St. 65, off Gabon, 2°17'S 8°10'E, 2770 m, bottom temp. 3.0°C, ST300, 1 specimen: 18x0.5 mm (complete). - St. 106, off Angola, 11°24'S 11°15'E, 3660 m, PG 0.2, 1 specimen: 28x1 mm (complete). - St. 601, SW of New Zealand, 45°51'S 164°32'E, 4400 m, bottom temp. 1.1°C, HOT, 2 specimens: 22x1, 22x2 mm (complete). - St. 607, SW of New Zealand, 44°18'S 166°46'E, 3830 m, bottom temp. 1.3°C, VG 0.2, 1 specimen: 24x1 mm (complete).

Description: Number of setigers is 28-30, branchiae from setiger 4 and on following seven setigers. Posterior part with incomplete anal tube, open ventrally, with small papillae around the edge.

Distribution: NW Atlantic, off Brazil, W Africa, SW of New Zealand; 196-5023 m.

***Ophelina breviata* (Ehlers, 1913)**

(Ehlers 1913, pl. 39, figs 1-7)

Fig. 9

Records: Augener 1932 p. 42. *Ammotrypane breviata* Ehlers 1913 p. 523; Monro 1930 p. 165, 1936 p. 165; Hartman 1966 p. 47, pl. 15 figs 1-3.

Material:

St. 234, N of Madagascar, 5°25'S 47°09'E, 4820 m, bottom temp. 1.3°C, HOT, 1 specimen: 56x5 mm (somewhat damaged). - St. 241, off Kenya, 4°00'S 41°27'E, 1520 m, bottom temp. 4.3°C, PG 0.2, 1 specimen: 16x1 mm (28 setigers). - St. 555, S of Adelaide, 37°21'S 138°44'E, 875 m, PGI 0.2, 1 specimen: 19x1 mm (anal tube long, like the figure of Ehlers). - St. 626, W of New Zealand, 42°10'S 170°10'E, 610 m, bottom temp. 7.6°C, PGI 0.2, 1 specimen: 28x1 mm (28 setigers, anal tube with papillae).

Description: 28-29 setigers, branchiae from setiger 2 to 24, four short setigers anterior to the long, cylindrical anal funnel. Long branchiae at middle of body. Parapodia biramous, the upper part with long capillary setae, lower part with short ones.

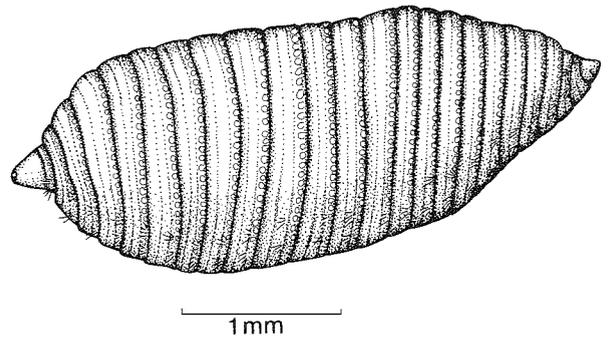


Fig. 10. *Trivisia gravieri* (McIntosh, 1908); dorsolateral view, anterior end at right

Distribution: Antarctic, Subantarctic Islands, Indian Ocean (N of Madagascar), S of Australia, W of New Zealand; 20-4820 m.

***Trivisia gravieri* McIntosh, 1908**

Fig. 10

Records: McIntosh 1908 p. 383, 1915 p. 29, pl. 95 fig. 8; Hartman 1965 p. 191. *Kesun gravieri* Hartman & Fauchald 1971 p. 134; Kirkegaard 1980 p. 91.

Material:

St. 108, off Angola, 12°00'S 13°00'E, 1470 m, PG 0.2, 1 specimen: 4x1½ mm.

Description: Body short, barrel-shaped, with 22 setigers (Fig. 10). Triangular prostomium, short cylindrical anal cone. Anterior segments with two rings, posterior ones with three. Dorsal and ventral parapodia are small, papilla-like, with a few thin, capillary setae. All segments with rings of small papillae. No branchiae.

Very similar to *Trivisia glandulosa* McIntosh, 1879 (earlier named *Kesun abyssorum* Monro, 1930, see Dauvin & Bellan 1994) but differs from this species by not having two lateral furrows at the posterior end and by the shape of the anal cone which has no longitudinal furrows.

Distribution: NE Atlantic (Porcupine Sea Bight, Bay of Biscay), NW Atlantic (off New England), Mid-Atlantic (off Brazil), West Africa (Angola); 539-7800 m.

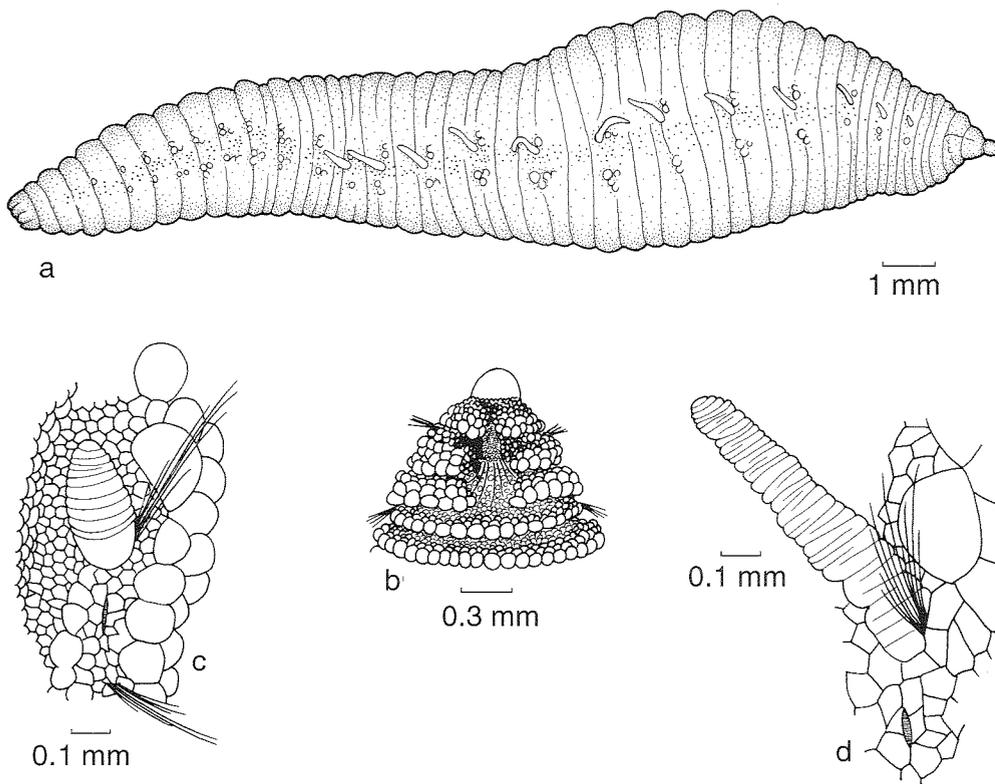


Fig. 11. *Trivisia profundus* Chamberlin, 1919; a, lateral view, right side; b, anterior end, ventral view; c, anterior segment with first branchia; d, setiger 8, with branchia.

***Trivisia profundus* Chamberlin, 1919**

Figs 11, 12

Records: Chamberlin, 1919 p. 387, pl. 67 figs 1-4; Uschakov 1965 p. 301; Kirkegaard 1956 p. 70; Hartman 1967 p. 140; Levenstein 1973 p. 129-130.

Material:

St. 110, off Angola, 12°05'S 13°08'E, 975 m, bottom temp. 4.1°C, PG 0.2, 1 specimen: 15x6 (complete). - St. 668, Kermadec Trench, 36°23'S 177°41'E, 2640 m, bottom temp. 2.0°C, HOT, 2 specimens: 20x4 mm (complete), 15x4 mm (anterior end). - St. 716, East Pacific off Costa Rica, 9°23'N 89°32'W, 3570 m, bottom temp. 1.9°C, HOT, 1 specimen: 30x8 mm (anterior end damaged). - St. 726, Gulf of Panama, 5°49'N 78°52'W, 3670 m, bottom temp. 2.0°C, HOT, 1 specimen: 30x6 mm (anterior end damaged).

Description: The body is pointed at both ends, conspicuously broadest in front of the middle (Fig.

11 a). The first setigers are deeply notched ventrally, bordering the mouth (Fig. 11 b). The first 2 segments are biannular, the following triannular, including the fifteenth; the sixteenth and seventeenth are biannular and from there the remaining are uniannular. The branchiae appear first on the third somite and occur on each one thereafter, till and including the fourteenth (Fig. 11 c-d). Capillary setae on all segments, arising from a small pit. Pygidium short, divided by longitudinal sulci into ten lobes.

Distribution: Aleutian, Japan and Izu-Bonin Trench, Bering Sea, off California, off Peru, Gulf of Panama, Banda Sea, Kermadec Trench, Atlantic (W Africa), Antarctic; 975-7250 m.

Family STERNASPIDAE Carus, 1863

***Sternaspis scutata* (Ranzani, 1817)**

(Fauvel 1927, fig. 76 a-g)

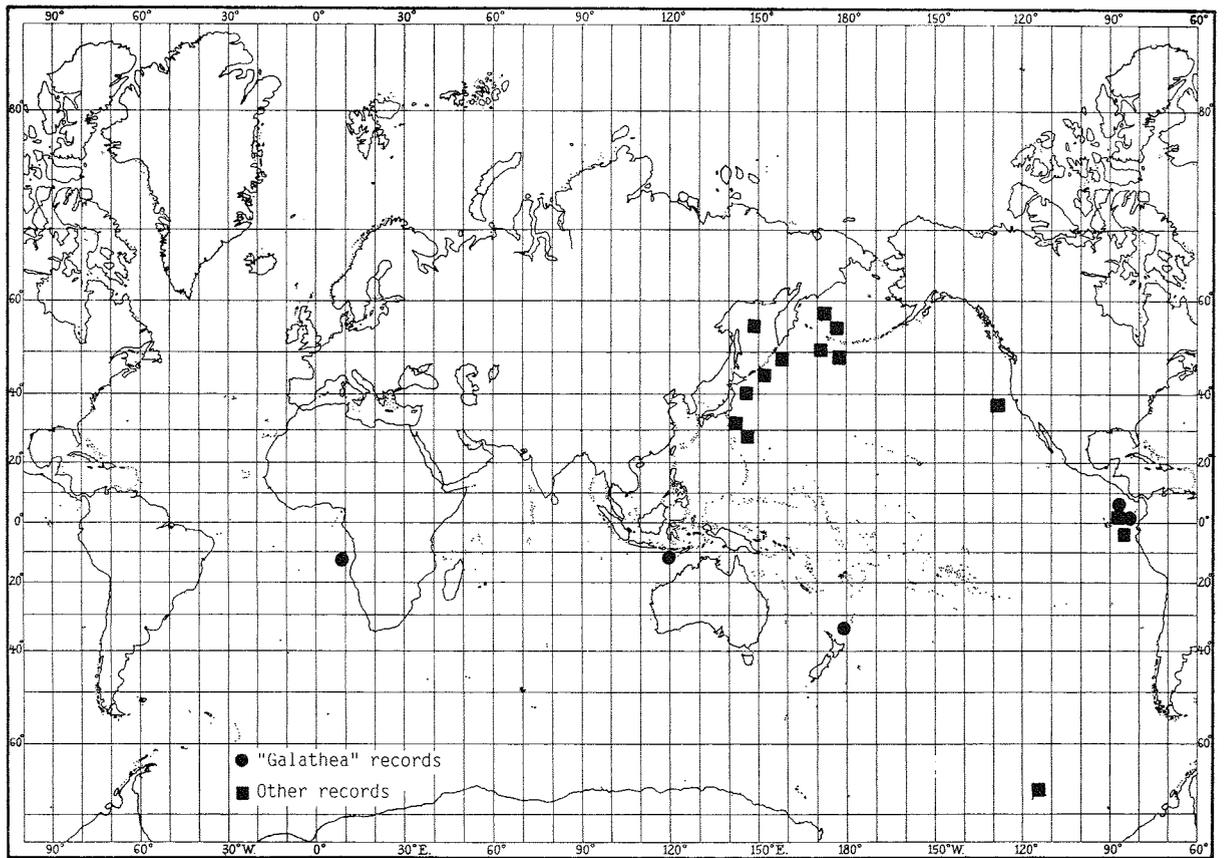


Fig. 12. *Trivisia profundus* Chamberlin, 1919; 975-7250 m.

Records: Fauvel 1927 p. 216; Augener 1926 p. 283; Day & Hutchings 1979 p. 133; Hartmann-Schröder 1979 p. 144.

Material:

St. 556, S of Adelaide, Australia, 37°18'S 138°43'E, 795 m, PG I 0.2, 1 specimen: 7x3 mm. - St. 607, W of New Zealand, 44°18'S 166°46'E, 3830 m, bottom temp. 1.3°C, VG 0.2, 1 specimen: 20x12 mm.

Remarks: I have compared the present specimens with specimens from Europe and cannot find any differences. Similarly, Augener (1926) could not find any differences between animals from Europe and western Australia.

Distribution: Cosmopolitan. Europe, Arctic, Antarctic, S Africa, Japan, California, Bering Sea, Sea of Bengal, S, W and E Australia, New Zealand; 10-4000 m.

Family SABELLARIIDAE Johnston, 1865

Gesaia fossae Kirtley, 1994

(Kirtley 1994, figs 10.3.1-4)

Records: Kirtley 1994 p. 173. *Phalacrostemma elegans* Day 1967 p. 669, fig. 33.1 a-g.

Material:

St.200, off Natal (Mocambique Channel), 29°39'S 37°01'E, 4880-5090 m, HOT, 4 specimens: 10x1 (fragments), 14x2, 18x2 (anterior parts).

Remarks: This species was described by Kirtley (1994) as a true abyssal species from the Mocambique Channel. The present material is quite similar to his description and figures.

Distribution: Mozambique Channel, off Natal (South Africa); 1829-5450 m.

***Lygdamis gilchristi* (McIntosh, 1922)**

(Day 1967, fig. 33.3.a-b)

Records: *Tetreres murata* var. *gilchristi* McIntosh, 1922 p. 7; 1925 p. 76, pl. 10 figs. 10-12. *Lygdamis murata gilchristi* Day 1967 p. 677, fig. 33.3 a-b. *Lygdamis gilchristi* Kirtley 1994 p. 127, fig. 27.8 a-b.

Material:

St. 197, off Durban, 29°57'S 31°26'E. 530, SOT, 2 specimens: 15x3, 35x5 mm (posterior part missing).

Remarks: Day (1967) refers specimens from deep water off South Africa to *Lygdamis murata*, subsp. *gilchristi*, described by McIntosh (1922). Kirtley regards the subspecies as a species.

Distribution: South Africa; 100-530 m.

***Lygdamis indicus* Kinberg, 1876**

(Caullery 1944, figs 49-50)

Records: *Lygdamis ehlersi* Caullery 1944 pars p. 62; *Lygdamis indicus* Kirtley 1994 p. 128, figs 7.9.1-2. Not Day 1967 p. 677.

Material:

St. 477, S. of Bali, 9°01'S 114°48' E, 780 m, PG 0.2, 3 specimens (all complete): 20x3, 20x1 mm (25 setigers), 28x2 mm (26 setigers).

Remarks: The material is similar to the description of Kirtley (1994) and the figures of Caullery (1944) of *L. ehlersi*. Kirtley regards some of Caullery's material from the Banda Sea as belonging to *L. indicus*. Day's description of *L. indicus* is not that species, but is described by Kirtley as a new species, *L. dayi*.

Distribution: Indian Ocean, Indonesia. 10-780 m.

***Tetreres varians* (Treadwell, 1901)**

(Kirtley 1994, fig. 12.10.1-4)

Records: Kirtley 1994 p. 197. *Hermella varians* Treadwell, 1901 p. 210. *Sabellaria (Pallasia)*

asteriformis Augener, 1906 p. 167, pl. 7, figs. 129-138. *Monorchos varians* Hartman & Fauchald 1971 p. 151.

Material:

St. 24, off Liberia, 3°54'N 8°22'W. 3200 m, bottom temp. 2.7°C, ST 300 1 specimen: 20x4 mm (anterior part). - St. 32, off Ghana, 4°05'N 2°13'W, 2100 m, SBT, 1 specimen: 25x5 mm (anterior part). - St. 52, off Cameroun, 1°42'N 7°51'E, 2550 m, bottom temp. 3.0°C, SOT, 3 specimens: 20x4, 20x4 (ant. part), 22x4 mm, tube. - St. 63, off Gabon, 2°00'N 9°14'E, 1520 m, bottom temp. 3.8°C, SOT, 2 specimens: 60x6, 70x8 mm. - St. 99, off Angola, 8°40'S 11°10'E, 2690 m, SOT, 1 tube like the one from St. 52, with overlapping shells of foraminiferans and with lateral keels.

Remarks: This species is redescribed by Kirtley (1994 p. 197), who figures the outer paleae of some specimens. However, there seems to be some variation in their shape, dependent on the size (age) of the animal.

Distribution: Western Atlantic, Caribbean Sea, Gulf of Mexico, West Africa; 180-4825 m.

***Tetreres philippinensis* (Treadwell, 1926)**

(Kirtley 1994, fig. 126)

Records: Kirtley 1994 p. 195. *Monorchos philippinensis* Treadwell, 1926 p. 191, figs 18-20. *Lygdamis philippinensis* Hartman 1944 p. 334; 1956 p. 255.

Material:

St. 443, Mindanao Sea, 8°48'N 124°09'E, 1500 m, ST300, 5 specimens: 35x7, 40x7, 40x7, 65x7, 70x7 mm (all anterior parts). - St. 489, Bali Sea, 7°38'S 116°08'E, 1160 m, ST300, 1 specimen: 35x8 mm (anterior part).

Remarks: This species is very close to *Tetreres varians*; there are only small differences in the shape of the outer paleae and the nuchal hooks. One of the stations in the Mindanao Sea is very close to Treadwell's stations off the Philippines.

Distribution: Indonesia, Philippines 10-1500 m.

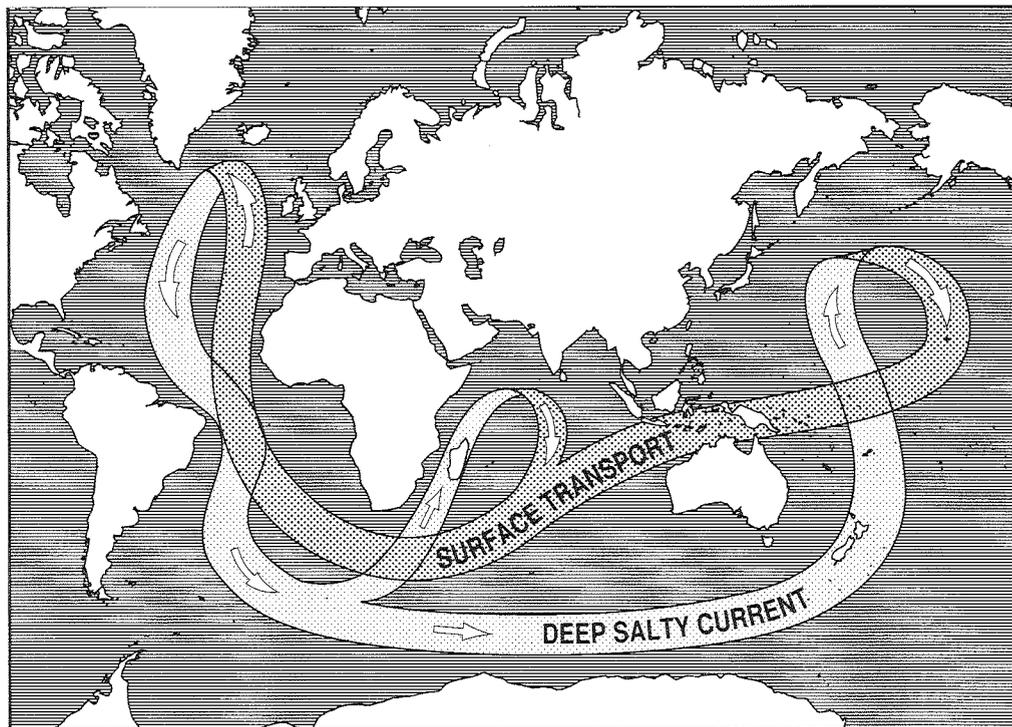


Fig. 13. A deep, salty current flows in 1000-2000 m depth from the arctic Atlantic Ocean through the Atlantic and Indian Oceans to the northern part of the Pacific. Redrawn after Broecker & Denton (1989).

Family PECTINARIIDAE Quatrefages, 1865

Pectinaria antipoda Schmarda, 1861

(Hartmann-Schröder 1979, figs 340-345)

Records: Fauvel 1953 p. 403, fig. 211 e-g; Wesenberg-Lund 1949 p. 346, fig. 42; Hartmann-Schröder 1979 p. 145. *Cistenides antipoda* Augener 1927 p. 231, fig. 13.

Material:

St. 443, Mindanao Sea, 8°48'N 124°09'E, 1500 m, ST300, 3 specimens: 15x5, 20x10, 60x9 mm (complete).

Description: 17 segments, three thoracic ones without uncini, 14 abdominal segments, last abdominal segment without uncini. 14 paleae on each side. Cephalic veil with wavy rim. Uncini with 6-7 large teeth in two rows and more small ones beneath. Scaphe with papillae along the edge.

Remarks: The specimens are similar to those described and figured by Hartmann-Schröder (1979). She was a little uncertain of the identifica-

tion (*P. cf. antipoda*), because her specimens have 11 paleae on each side, and they are pointed distally, whereas Augener's specimens from Australia only have ten paleae on each side, and they are rounded distally. The present specimens have 14 paleae which are pointed distally, as are those described by Wesenberg-Lund from the Iranian Gulf. I therefore agree with Hartmann-Schröder that these differences are too small to justify a new species.

Distribution: W and E Australia, New Caledonia, Gulf of Iran, the Philippines; 10-1500 m.

Indeterminable Pectinariidae

Cistenides sp.

Material:

St. 453, Makassar Strait, 3°56'S 118°26'E, 2000 m, bottom temp. 3.6°C, ST300, 1 specimen: 10x5 mm (anterior end).

Remarks: This is only a fragment of the anterior part. The cephalic veil is free from the operculum.

Uncini with only two teeth in one row. Opercular rim smooth.

Pectinaria sp.

Material:

St. 489, Bali Sea, 7°38'S 116°08'E, 1110 m,

ST300, 1 specimen: 8x5 mm (anterior end).

Remarks: Cephalic veil free from the operculum. Uncini with many teeth in two rows. Opercular rim smooth.

ZOOGEOGRAPHY

Geographical distribution

Many of the abyssal polychaetes have a very wide geographical distribution. Thus, *Phylo norvegicus* (Fig. 2) is fairly common in the North Atlantic, and now it is also known from the South Atlantic, where the "Galathea" found specimens at stations off Angola. Uschakov (1965) and Hartman (1957) recorded it from the northern Pacific and it has also been obtained in Antarctic waters (Hartman 1966). *Travisia profunda* also has a very wide distribution. It is recorded from a great number of deep-sea stations in the N.W. Pacific, off California and in the Gulf of Panama. The "Galathea" found this species in abyssal depths in the Kermadec Trench and the Gulf of Panama, at three hadal stations in the Banda Sea and off Angola at 975 m (Fig. 12).

Some abyssal species were recorded by the "Galathea" far from their earlier known area of distribution. *Ammotrypanella arctica* was described from the Arctic by McIntosh (1879) and later recorded by Hartman & Fauchald (1971) from off New England and by Fauvel (1914) off the Azores. The "Galathea" found it at three stations in the Kermadec Trench (Fig. 7). Similarly *Ophelina aulogastrella* was known from the Atlantic, off New England and Brazil. The "Galathea" recorded this species SW of New Zealand and also from off West Africa (Fig. 8). A find of *Nainereis quadricuspida* in Indonesia is also far from its original known area of distribution in the Atlantic (Fig. 1).

The strange distribution of these species and several others may probably be explained by a deep, salty current, newly described by Broecker & Denton (1989, fig. 13). They describe this current as follows: "A large scale salt transport system operating in today's ocean compensates for transport of water (as vapor) through the atmosphere from the Atlantic to the Pacific Ocean. Salt-laden deep water formed in the northern Atlantic flows

down the length of the Atlantic around the southern Indian Ocean and finally northwards in the deep Pacific Ocean. Some of this water upwells in the northern Pacific, bringing with it the salt left behind in the Atlantic due to vapor transport".

Some abyssal species, earlier known only from the Antarctic and the sub-Antarctic islands, have now been recorded further north. *Ophelina breviata* has such a distribution, being now recorded by the "Galathea" from off Kenya, South Australia and west of New Zealand (Fig. 9). *Scoloplos marginatus*, previously found only in Antarctic waters, was recorded south of Bali by the Galathea (Fig. 3).

Vertical distribution

Of the 28 species mentioned in the present investigation, 16 were distributed in the abyssal zone. Twelve of these extend their distribution to both the bathyal and the littoral zones. Three, *Gesaia fossae*, *Travisia profunda* and *T. gravieri*, were recorded from the bathyal and the abyssal zones, the two *Travisia* species also from the hadal zone. So only two species, *Ammotrypanella arctica* and *Asclerocheilus tasmanius*, were recorded only from the abyssal zone.

In the Kermadec Trench, which was investigated with many stations by the "Galathea", *Travisia profunda* was earlier described from the hadal zone, 6490-7250 m (Kirkegaard 1956). This species as now also recorded from 2640 m in the same trench. *Ammotrypanella arctica* was recorded in the Kermadec Trench at 2470 m, 2640 m and 5900 m (close to hadal depth).

Twelve species were found in the bathyal zone (together with 14 which were also abyssal). Eleven of these extend their distribution also to the littoral zone, so only one species, *Therochaeta antoni*, is until now restricted to the bathyal zone.

REFERENCES

- Augener, H., 1906: Westindische Polychaeten. - Bull. Mus. Comp. Zool. **43** (4): 1-196.
- 1918: Polychaeta. - Beitr. Kennt. Meeresfauna Westaf. **2** (2): 67-625.
- 1926: Polychaeta III. Polychaeten von Neu Seeland I. Sedentaria. - Vidensk. Meddr dansk naturh. Foren. **75**: 157-294.
- 1927: Polychaeten von Südost- und Süd-Australien. - Vidensk. Meddr dansk naturh. Foren. **83**: 71-275.
- 1932: Antarktische und Antiboreale Polychaeten nebst einer Hirudinee. - Scientific Results Norwegian Antarctic Expedition, 1927-28. Norske Vidensk. Akad. Oslo **9**: 1-86.
- Banse, K. & K.D. Hobson, 1968: Benthic polychaetes from Puget Sound, Washington with remarks on four other species. - Proc. U.S. Nat. Mus. Washington **126**, 3667: 1-53.
- Broecker, W.S. & G.H. Denton, 1989: The role of ocean-atmosphere reorganizations in glacial cycles. - Geochim. cosmochim. Acta **53**: 2465-2501.
- Bruun, A.F., 1958: General introduction to the reports and list of deep-sea stations. - Galathea Rep. **1**: 7-48.
- Caullery, M., 1944: Polychètes sédentaire de l'Expedition du Siboga: Ariciidae, Spionidae, Chaetopteridae, Chlorhaemidae, Opheliidae, Oweniidae, Sabellariidae, Sternaspidae, Amphictenidae, Ampharetidae, Terebellidae. - Siboga Exped. **24** (2): 1-204.
- Chamberlin, R.V., 1919: The Annelida Polychaeta. - Mem. Mus. comp. Zool. Harv. **48**: 1-514.
- Dauvin, J.-C. & G. Bellan, 1994: Systematics, ecology and biogeographical relationships in the sub-family Traviinae (Polychaeta, Opheliidae). - Mem. Mus. natn Hist. nat. **162**: 169-184.
- Day, J.H., 1967: A Monograph on the Polychaeta of Southern Africa. - British Museum (Natural History), London. 878 pp.
- Day, J.H. & P.A. Hutchings, 1979: An annotated check-list of Australian and New Zealand Polychaeta, Archannelida and Myzostomida. - Rec. Aust. Mus. **32** (3): 80-161.
- Ditlevsen, H., 1937: Polychaeta. The Godthaab Expedition 1928. - Meddr Grønland **80** (4): 1-64.
- Ehlers, E., 1887: Report on the annelids of the dredging expedition of the U.S. Coast Survey Steamer Blake. - Mem. Mus. comp. Zool. Harv. **15**: 1-339.
- 1913: Die Polychaeten-Sammlungen der deutschen Südpolar-Expedition, 1901-1903. - Dt. Südpol.-Exped. **13** (4): 397-598.
- Fauchald, K., 1977: The polychaete worms. Definitions and keys to the orders, families and genera. - Nat. Hist. Mus. Los Angeles County, Science Series **28**: 1-190.
- Fauvel, P., 1914: Annélides polychètes non-pelagiques provenant des campagnes de l'Hirondelle et de la Princesse Alice (1885-1910). - Résult. Camp. scient. Prince Albert I, **46**: 1-432.
- 1916: Annélides polychètes des Iles Falkland recueillies par M. Rupert Vallentin Esqre (1902-1910). - Arch. zool. exp. gén. **55**: 417-482.
- 1927: Polychètes sédentaires. - Faune Fr. **16**: 1-494.
- 1932: Annelida Polychaeta of the Indian Museum, Calcutta. - Mem. Indian Mus. **12**: 1-262.
- 1939: Annelida Polychaeta. Resultats Scientifiques des Croisières du Navire-Ecole Belge Mercator II. - Mem. Mus. r. Hist. nat. Belg., Sér. 2, fasc. 15: 1-37.
- 1953: Annelida Polychaeta. - The Fauna of India Including Pakistan, Ceylon, Burma and Malaya. Allahabad. 507 pp.
- Gallardo, V.A., 1968: Polychaeta from the Bay of Nha Trang, South Viet Nam. - Naga Rep. **4** (3): 35-279.
- Hartley, J.P., 1981: The family Paraonidae (Polychaeta) in British waters: A new species and new records with a key to species. - J. mar. biol. Ass. U.K. **61**: 133-149.
- Hartman, O., 1944: Polychaetous annelids. Part 6. Paraonidae, Magelonidae, Longosomidae, Ctenodrilidae and Sabellariidae. - Allan Hancock Pac. Exped. **10**: 311-389.
- 1956: Polychetous annelids erected by Treadwell, 1891-1948. - Bull. Amer. Mus. nat. Hist. **109**: 245-310.
- 1957: Orbiniidae, Apistobranchidae, Paraonidae and Longosomidae. - Allan Hancock Pac. Exped. **15** (3): 211-393.
- 1963: Submarine canyons of Southern California. Part 3. Systematics: Polychaetes. - Allan Hancock Pac. Exped. **27** (3): 1-93.
- 1965: Deep-water benthic polychaetous annelids off New England to Bermuda and other North Atlantic areas. - Allan Hancock Fdn. Publ. Occ. Pap. **28**: 1378.
- 1966: Polychaeta Myzostomidae and Sedentaria of Antarctica. - Antarctic Res. Ser. **7**: 1-158.
- 1967: Polychaetous annelids collected by USNS "Eltanin" and "Staten Island" cruises, chiefly from Antarctic Seas. - Allan Hancock Monogr. mar. Biol. **2**: 1-387.
- 1969: Atlas of sedentary polychaetous annelids from California. - Allan Hancock Fdn., Los Angeles, 812 pp.
- Hartman, O. & K. Fauchald, 1971: Deep-water benthic polychaetous annelids off New England to Bermuda and other North Atlantic areas. Part II. - Allan Hancock Monogr. mar. Biol. **6**: 1-327.
- Hartmann-Schröder, G., 1979: Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden (Teil 2 und Teil 3). - Mitt. hamb. zool. Mus. Inst. **76**: 75-218.
- Kirkegaard, J.B., 1956: Benthic Polychaeta from depths exceeding 6000 metres. - Galathea Rep. **2**: 63-78.
- 1959: The Polychaeta of West Africa, Part I. Sedentary species. - Atlantide Rep. **5**: 7-117.
- 1980: Abyssal benthic polychaetes from the northeast Atlantic Ocean, southwest of the British Isles. - Steenstrupia **6**: 81-98.
- 1995: Bathyal and abyssal polychaetes (errant species). - Galathea Rep. **17**: 7-56.
- Kirtley, D. W., 1994: A review and taxonomic revision of the family Sabellariidae Johnston, 1865 (Annelida; Polychaeta). - SABECON Press - Science Series **1**: 1-223.
- Levenstein, R.Y., 1966: Polychaeta of the western part of the Bering Sea. - Trudy Inst. Okeanol. **81**. (In Russian).
- 1973: A contribution to the polychaete fauna of the Aleutian, Japan and Idzu-Bonin trenches of the Pacific Ocean. - Trudy Inst. Okeanol. **91**: 128-135. (In Russian).
- Mackie, A. S.Y., 1991: *Paradoneis eliasoni* sp.nov. (Polychaeta, Paraonidae) from northern European Waters, with a redescription of *Paradoneis lyra* (Southern, 1914). - Ophelia, Suppl **5**: 147-155.

- McIntosh, W.C., 1879: On the Annelida obtained during the cruise of H.M.S. Valorous to Davis Strait in 1875. - Linn. Soc. London, Trans., N.S. 1, Zool.: 499-511.
- 1908: Notes from the Gatty Marine Laboratory, St. Andrews, No. 29.2. - Ann. Mag. nat. Hist., ser. 8, 1: 373-387.
 - 1915: A monograph of the British marine annelids. Polychaeta. Opheliidae to Ammocharidae. - Ray Society, London 2 (2): 233-524.
 - 1922: A monograph of British marine animals. Polychaeta. Hermellidae to Sabellidae. - Ray Society, London 4 (1): 1-250.
 - 1925: A second contribution to the marine polychaetes of South Africa. - Rep. Fish. mar. biol. Surv. Un. S. Afr. 4: 1-93.
- Monro, C.C.A., 1930: Polychaete Worms, I. - Rep. "Discovery" Exped. 2: 1-122.
- 1933: The Polychaeta Sedentaria collected by Dr. C. Crossland at Colón, in the Panama Region and the Galapagos Islands during the expedition of the S.Y. "St. George". - Proc. Zool. Soc. London 4: 1039-1092.
 - 1936: Polychaete Worms, II. - Rep. "Discovery" Exped. 12: 59-198.
 - 1939: Polychaeta. - Rep. B.A.N.Z. Antarc. Res. Exped., 1929-1931. Adelaide. Ser. B 4 (4): 89-156.
- Pettibone, M.H., 1957: A new polychaetous annelid of the family Paraonidae from the North Atlantic. - J. Wash. Acad. Sci. 47 (10): 354-356.
- 1963: Marine polychaete worms of the New England region. 1. Aphroditidae through Trochochaetidae. - Bull. U.S. natn Mus. 227: 1-356.
- Strelzov, V.E., 1979: Polychaetous Worms of the Family Paraonidae Cerruti, 1909 (Polychaeta Sedentaria). - Akademia Nauk, USSR. (Translated from Russian by Oxonian Press Pvt. Ltd., Faridabad, India): 212 pp.
- Treadwell, A.L., 1901: The polychaetous annelids of Porto Rico. - Bull. U.S. Fish Commn 20: 181-210.
- 1926: Additions to the polychaetous annelids collected by the U.S. fisheries steamer Albatross 1907-1910, including one new genus and three new species. - Bull. U.S. natn Mus. 6 (2): 183-193.
- Uschakov, P.V., 1965: Polychaeta of the Far Eastern Seas of the U.S.S.R. - Akademia Naak USSR 56: 1-419. (Transl. from the Russian by Israel Program for Scientific Translation).
- Wesenberg-Lund, E., 1949: Polychaetes of the Iranian Gulf. - Dan. scient. Invest. Iran 4: 247-400.
- 1950: The Polychaeta of West Greenland. - Meddr Grønland 153 (2): 1-171.

