

SCAPHOCALANUS AND SCOLECITHRICELLA (COPEPODA, CALANOIDA,  
SCOLECITHRICIDAE) FROM THE EPIPELAGIAL OFF SOUTHERN  
BRAZIL: A TAXONOMIC AND DISTRIBUTIONAL SURVEY

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RESUMO - Foram estudadas, taxonômica e quantitativamente, duas espécies de *Scaphocalanus*, *S. curtus* e *S. echinatus*, e cinco de *Scolecithricella*, *S. tenuiserrata*, *S. vittata*, *S. dentata*, *S. ovata* e *S. profunda*, provenientes de amostras de plâncton coletadas no epipelágial nerítico e oceânico, ao largo do SE-S do Brasil. *Scolecithricella abyssalis*, coletada no Pacífico e Atlântico ao largo da América do Sul, foi igualmente analisada e, então, comparada à sua similar, *S. profunda*. Forneceu-se uma chave de classificação para as fêmeas das espécies de *Scolecithricella* estudadas e propôs-se novos sinônimos para *Scaphocalanus curtus*, *Scolecithricella vittata* e *S. ovata*. Os dados de ocorrência e densidade foram somados aos da distribuição mundial, conhecida para cada espécie. Foram feitas, finalmente, algumas considerações sobre os padrões de distribuição e a importância relativa das características morfológicas das espécies, no sentido de facilitar a taxonomia desses gêneros.

ABSTRACT - Two species of *Scaphocalanus*, *S. curtus* and *S. echinatus*, and five of *Scolecithricella*, *S. tenuiserrata*, *S. vittata*, *S. dentata*, *S. ovata* and *S. profunda* were taxonomically and quantitatively studied from plankton samples collected in the neritic and oceanic epipelágial off southern Brazil. *Scolecithricella abyssalis* from SE Pacific and SW Atlantic is also similarly analysed and then compared with *S. profunda*. A key is given for the *Scolecithricella* (females) species and new synonyms are proposed for *Scaphocalanus curtus*, *Scolecithricella vittata* and *S. ovata*. Present data on occurrence and density are added to the known world distribution of each species. Some considerations about the distributional patterns and relative importance of the morphological structures are made to facilitate the taxonomy of these genera.

## INTRODUCTION

The scolecithricid copepods of the genera *Scaphocalanus* and *Scolecithricella* were taxonomically reviewed by Bradford (1973) and Park (1980, 1982), who also reported occurrence and distribution in antarctic and subantarctic waters. Most of these aspects were summarized by Björnberg (1981) for the SW Atlantic.

From 1975 to 1979, the R/V "Prof. W. Besnard" of the University of São Paulo performed seven cruises off southern Brazil fulfilling a research project referred to as FINEP / IOUSP. The copepods collected have been qualitatively and quantitatively studied, with emphasis on some species and genera which are not well known.

The two genera contain, together with *Scolecithrix danae* and *S. bradyi*, the most frequent and/or abundant scolecithricid species found in the samples analysed until now. Besides these distributional aspects, the possibility of examining well-preserved material led me to a taxonomic survey, the results of which are also described and discussed.

The plankton samples studied here were collected with a BONGO net 0.333 mm mesh in all stations of transects I to IV (Fig. 1) of cruises I (Nov./Dec., 1975) and III (May, 1976). Tows were made obliquely from 5 m above the bottom to the surface and from 200 m to the surface in neritic and oceanic waters, respectively. Density is expressed as numbers of individuals in the volume of water filtered ( $m^3$ ); this volume is calculated from flowmeter data. The epipelagic is referred to as the upper 200 m, and the mesopelagic as the zone from 200 to 1000 m depth.

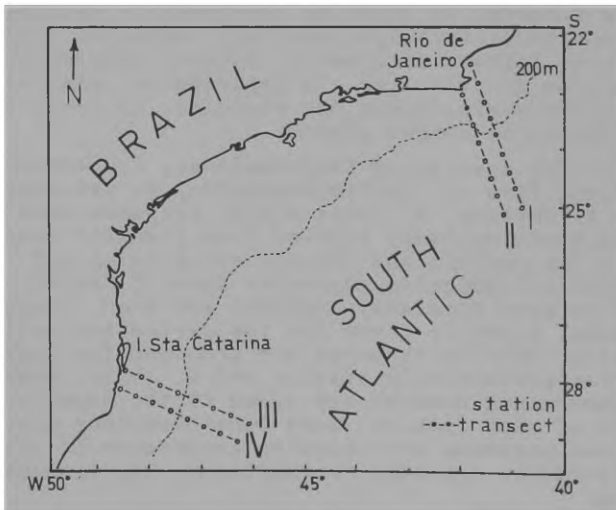


Fig. 1 - Transect and station positions in the sampling area.

Von Vaupel Klein's (1982) morphological terminology and appendage abbreviations were almost totally adopted here. The only two changes are indicated in the following list: C - cephalosome (instead of cephalon), Pr - prosome (instead of cephalothorax), Ur - urosome, Th1 to Th5 - thoracic somites 1 to 5, Gn som - genital somite, A1 - antennula, A2 - antenna, Md - mandible, Mx1 - maxillula, Max - maxilla, Mxp - maxilliped, P1 to P5 - legs 1 to 5, Bal to Ba2 - basipodal segments 1 to 2, Rel to Re3 - exopodal segments 1 to 3, Ril to Ri3 - endopodal segments 1 to 3. The British Museum (Natural History) is referred to as BMNH.

#### TAXONOMY AND DISTRIBUTION

*Scaphocalanus* Sars, 1900

*Scaphocalanus curtus* (Farran, 1926)

Fig. 2a-d

*Scolecithrix curta* Farran, 1926: 259-60, pl. 7, figs 1-6.

*Scaphocalanus curtus*. - Farran, 1929: 250. - Tanaka, 1961: 183-5, fig. 124 (♀ only). - Björnberg, 1963: 41-2, fig. 22. - Vervoort, 1965: 64-5. - Hure and Scotto di Carlo, 1968: 153-57, figs 1-2. - Björnberg, 1973: 331-3.

*Scaphocalanus temporalis* ♂ Tanaka, 1953: 132.

*Scaphocalanus glacialis* ♂ Tanaka, 1953: 132.

*Scaphocalanus longifurca* Giesbrecht ♂. - Tanaka, 1961: 178, fig. 121.

*Scaphocalanus similis* Hure and Scotto di Carlo, 1968: 157-61, figs 3-4. - Park, 1982: 122-3, fig. 29. (new synonymy)

*Scaphocalanus subcurtus* Park, 1970: 499, figs 113-9

Material examined. - Type material: ♀ holotype 1.30 mm long, BMNH slide n° 1926.12.6.45, examined by Dr. G. A. Boxshall (Curator, BMNH); paratypes (3 damaged ♀♀), BMNH reg. n° 1926.12.6.28, not examined. - FINEP/IOUSP collection: 10 ♀♀, oblique tows from 200-41 m to surface in oceanic waters and South Atlantic central water over the shelf off the States of Rio de Janeiro (Trans. II, May 76) and Santa Catarina (Trans. III - Nov./Dec. 75 and IV - Nov./Dec. 75 and May 76), SW Atlantic, Brazil.

Type locality. - Bay of Biscay, W coast of Ireland, Lat. 47° 29' to 46° 43' N, Long. 8° 18' to 7° 15' W.

Remarks (♀). - Length: total, 0.93-1.05 mm (10 specimens); Pr 0.76-0.96 mm (average 0.82) and Ur 0.15-0.19 mm (average 0.18). Proportional lengths of Ur-somites plus furca 17.8:12.6:11.8:7.2:10.6 = 60.0. P1 Re2 (Fig. 2a) with an external terminal lobe bearing a very hyaline spine, sometimes absent (Fig. 2a1); P1 Ri with 3 inner marginal and 2 terminal setae. P4 Bal (Fig. 2d) with ca. 5 long inner marginal setiform spines, of which at least 3 directed outward. Large terminal spine of P2-4 (Figs 2b-d) with serrate outer margin composed of sharp denticles with lateral flanges. P5 absent.

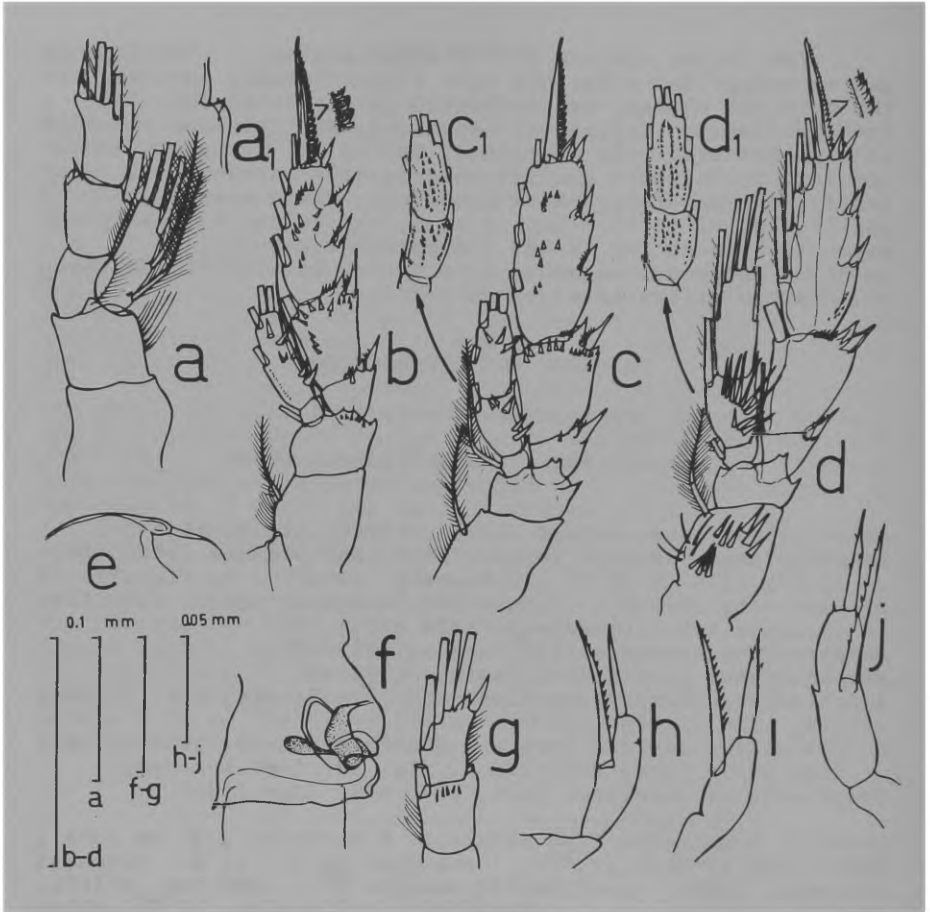


Fig. 2 - *Scaphocalanus curtus*, ♀. a, P1, anterior; a1, Spine less outer terminal lobe on P1 Ba2, another specimen; b, P2, posterior; c, P3, posterior; c1, P3 Ri, anterior; d, P4, posterior; d1, P4 Ri, anterior. *Scaphocalanus echinatus*, ♀. e, Rostrum, lateral; f, Gn som, lateral; g, P1 Re2-3, posterior; h, P5 of 1.75 mm specimen; i, P5 of 1.85 mm specimen; j, P5 of 2.19 mm specimen.

In the original description of the female (Farran, 1926), the total length ranged from 1.06 (a paratype) to 1.30 mm (the holotype); the Pr and Ur of a paratype were 0.86 and 0.28 mm long, the proportional length of Ur-somites plus furca  $18:12:12:7:11 = 60$ , and the number of outer and terminal setae of P1 Ri were 4 in a paratype and 5 in the holotype.

Dr. G. A. Boxshall kindly sent me his drawings of the dissected P1, P4 and Ur from the holotype slide. In these,

Tab. I - Comparison of species of *Scaphocalanus* (♀) according to probable diagnostic features

Species	Body length (mm)	Relation Pr:Ur length	External spine on P1 Re2	Setae on P1 Ri	Facial spines on P2-P4 (posterior)	Inner marginal setiform spines on P4 Bal	Proportional length of Ur-somites plus furca
<i>S. curtus</i> (F), holotype	1.30 <sup>*1</sup>	?	not seen <sup>*2</sup>	5	?	present	
<i>S. curtus</i> (F), paratype	1.06 <sup>*1</sup>	3 X	absent	4	?	?	
<i>S. curtus</i> (F).- Park, 1970	1.22-1.30	3 X	absent	5	numerous	absent	
<i>S. curtus</i> (F).- Tanaka, 1961	1.45-1.76	3 X	present	?	numerous	?	
<i>S. curtus</i> (F).- Hure and S. di Carlo, 1968	0.99-1.16	3 X	absent	4	few	present	
<i>S. subcurtus</i> Park, 1970	0.96-1.06	4 X	absent	4	few	present	
<i>S. similis</i> H. and S. di Carlo, 1968	0.93-1.08	4 X	present	5	few	present	
<i>S. curtus</i> (F).- Campaner, —	0.93-1.05	4 X	present or not	5	few	present	

\*1 From Farran's (1926) data; the specimens are now entirely dissected.

\*2 Except for a minute 3-pointed denticle instead.

Almost the same in all of them

the P1 has 5 setae on Ri and an external terminal lobe on Re2, but no spine could be seen on it except for a minute 3-pointed denticle (Boxshall, personal communication), which might be the same ornament which I observed in the spineless lobe of one specimen (Fig. 2al); the P4 Bal has the long inner marginal setiform spines shown in Fig. 2d and the proportional lengths of Ur-somites plus furca is 17.2:12.5:12.6:8.2 : 9.5 = 60.0 These are very similar to the proportions of *S. similis* (recalculated from Hure and Scotto di Carlo's data, 1968:157) and of *S. subcurtus* (deduced from Park's drawings, 1970: figs 113 and 115)

Comparing the descriptions of these species, available in the literature, with the BMNH type material (Tab. I), it is impossible to define the specific characters of each species. Until new information is added, *S. subcurtus* and *S. similis* seem to be synonyms of *S. curtus*. Bradford (1973) had already considered *S. subcurtus* as a synonym, but without remarks.

Habitat and distribution.- Mesopelagial and epipelagial in the NE and SE Atlantic, and Pacific off New Zealand and Japan (Vervoort, 1965). Additional records: SW Atlantic off Brazil (Björnberg, 1963, 1965, 1981), Bay of Naples and South Adriatic (Hure and Scotto di Carlo, 1968), Caribbean Sea and Gulf of Mexico (Park, 1970) and SW coast of Australia (Park, 1982) It occurred off southern Brazil (present study) with density varying from 0.01 to 0.74 m<sup>-3</sup> and from 0.01 to 0.20 m<sup>-3</sup> in neritic and oceanic waters, respectively.

*Scaphocalanus echinatus* (Farran, 1905)

Fig. 2e-j

*Scolecithrix echinata* Farran, 1905:37-8, pl. 4, figs 15-8 , pl. 5, figs 12-7

*Scaphocalanus echinatus*.- Farran, 1926:258.- Farran, 1929 : 250, fig. 17.- Rose, 1933:149, fig. 153.- Wilson, 1950 : 326-7, pl. 34, figs 510-1.- Tanaka, 1961:181-3, fig.123.- Grice, 1962:213, pl. 19, figs. 6-7.- Björnberg, 1973:331-3.- Björnberg, 1981:637-8, fig. 213.- Park, 1982: 101-4 , figs 15-6.

Material examined.- FINEP/IOUSP collection: 20 ♀♀, oblique tows from 200 m to surface in oceanic waters off the States of Rio de Janeiro (Trans. II, May 76) and Santa Catarina (Trans. III - Nov./Dec. 75 and IV - May 76), SW Atlantic , Brazil.

Type locality.- Porcupine Bank, W coast of County Galway, Ireland, Lat. 52°24'N, Long. 13°34'W.

Remarks (♀).- Total length (20 specimens) 1.58 to 2.19 mm , average 1.76 mm. Rostrum (Fig. 2e) and Gn som (Fig. 2f) as described by Park (1982: figs 15a,c) P1 Re2 (Fig. 2g) with tiny spine. P5 varies (Figs 2h-j), armed with inner spine with serrate lateral margins or row of spinules; terminal

spine spinulated or not; and 2 more smaller spines, which may be absent.

Habitat and distribution.- Tropical and temperate regions of the world oceans (Park, 1982:103-4) Additional references to SW Atlantic off Brazil in Björnberg (1965:225;1981:637) It occurred with 0.01 to 0.24 m<sup>-3</sup> density in oceanic waters off southern Brazil (present study)

*Scolecithricella* Sars, 1902

Key to females of *Scolecithricella* species in the SW Atlantic off Brazil

1. Posterior-lateral corner of last prosomal somite indented (Fig. 7b) . . . . . 2
- Posterior-lateral corner of last prosomal somite smoothly curved (Fig. 3b) . . . . . 3
2. Pl Rel with one outer terminal spine; inner margin of P4 Bal nude; P5 with basal segment, distal two-thirds of terminal segment semi-ovally outlined. . . . . *S. ovata*
- Pl Rel without outer terminal spine; inner margin of P4 Bal with short stout setules; P5 arising directly from intercoxal plate . . . . . *S. dentata*
3. Body length less than 1.20 mm; Mx1 Ba2 with 3 setae; P5 outer margin spineless . . . . . *S. tenuiserrata*
- Body length above 1.35 mm; Mx1 Ba2 with 5 setae; P5 outer margin with tiny spine. . . . . 4
4. One of the two terminal spines of P5 more than 1.5 X length of inner marginal spine . . . . . *S. vittata*
- The two terminal spines of P5 smaller than inner marginal spine. . . . . 5
5. Inner marginal spine of P5 spinulated; Mx1 Ri with 8 setae. . . . . *S. profunda*
- Inner marginal spine of P5 denticled; Mx1 Ri with 7 setae. . . . . *S. abyssalis*

*Scolecithricella tenuiserrata* (Giesbrecht, 1892)

Figs 3-5

*Scolecithrix tenuiserrata* Giesbrecht, 1892:266-84, pl. 13, figs 13, 16, 24-5, 39, pl. 37, figs 4, 12. - Giesbrecht and Schmeil, 1898:43.

*Scolecithricella tenuiserrata*. - Grice, 1962:208, 211, pl. 17, figs 9-21 (♀ only). - Tanaka, 1962: 48-50, fig. 133. - Björnberg, 1963:122-3. - Vervoort, 1965:83-4. - Owre and Foyo, 1967:24, 60, figs 107, 382-3. - Björnberg, 1973:333.

?*Scolecithricella tenuiserrata* Ó.- Grice, 1962:208, 211, pl. 18, fig. 1.

non *Amallothrix tenuiserrata* Ó.- Rose, 1942:163-6, figs 56-8.

Material examined.- FINEP/IOUSP collection: 40 ♀♀, oblique tows from 200-23 m to surface in oceanic waters and South Atlantic central water over the shelf off the States of Rio

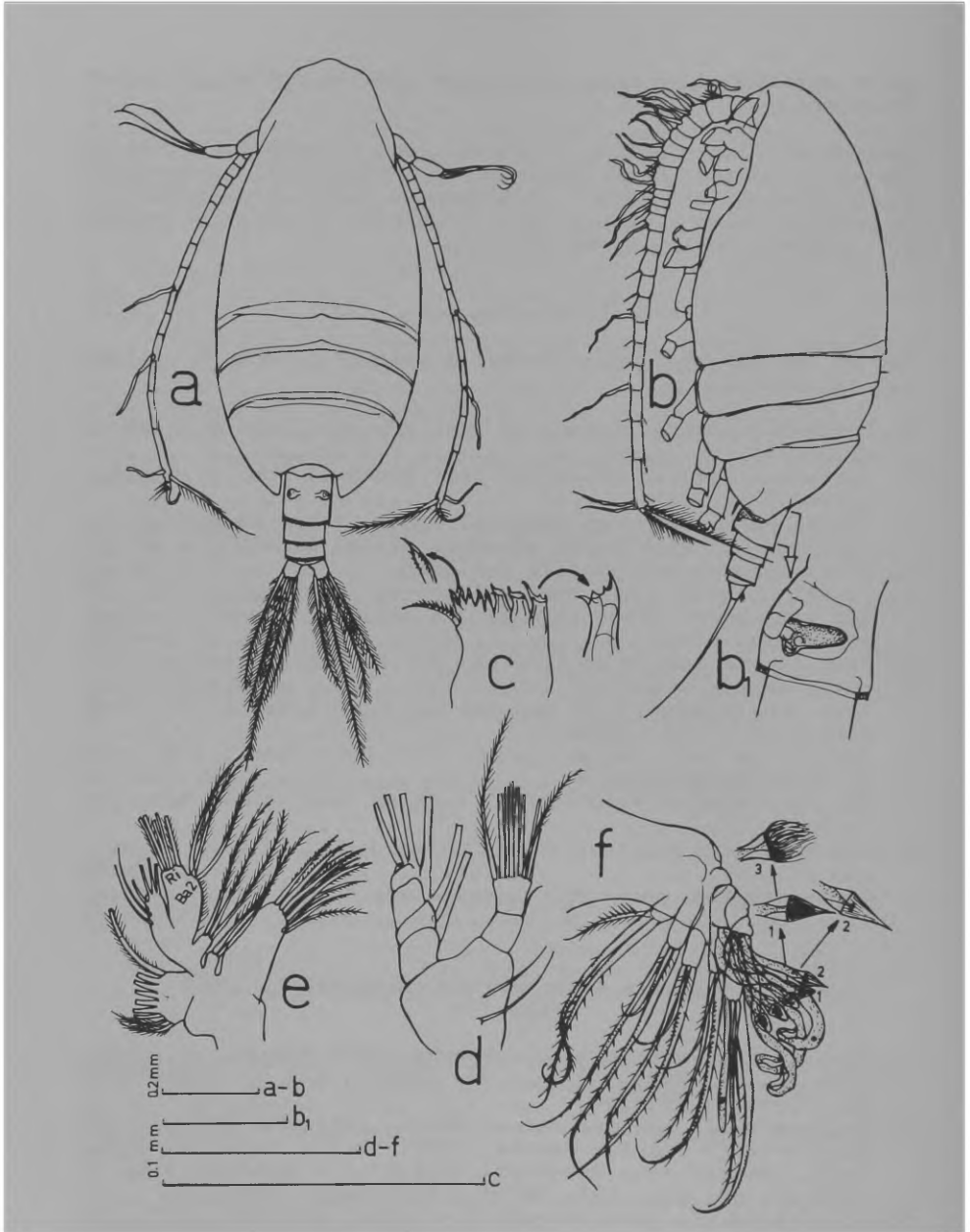


Fig. 3 - *Scolecithricella tenuiserrata*, ♀. a, Habitus, dorsal; b, Habitus, lateral; b1, Gn som enlarged; c, Gnathobasis of Md; d, Palp of Md; e, Mx1; f, Max:1-2, types of brush-like sensory setae; 3, variety of type 1.



de Janeiro (Trans. I and II, Nov./Dec. 75 and May 76) and Santa Catarina (Trans. III and IV, Nov./Dec. 75 and May 76), SW Atlantic, Brazil.- 1600, oblique tows from 122 m to surface in South Atlantic central water over the shelf off the States of Rio de Janeiro (Trans. I - May 76 and II - Nov. / Dec. 75) and Santa Catarina (Trans. III and IV - May 76), SW Atlantic, Brazil.

Type locality.- Mediterranean Sea, Gulf of Naples, Lat.41°N.

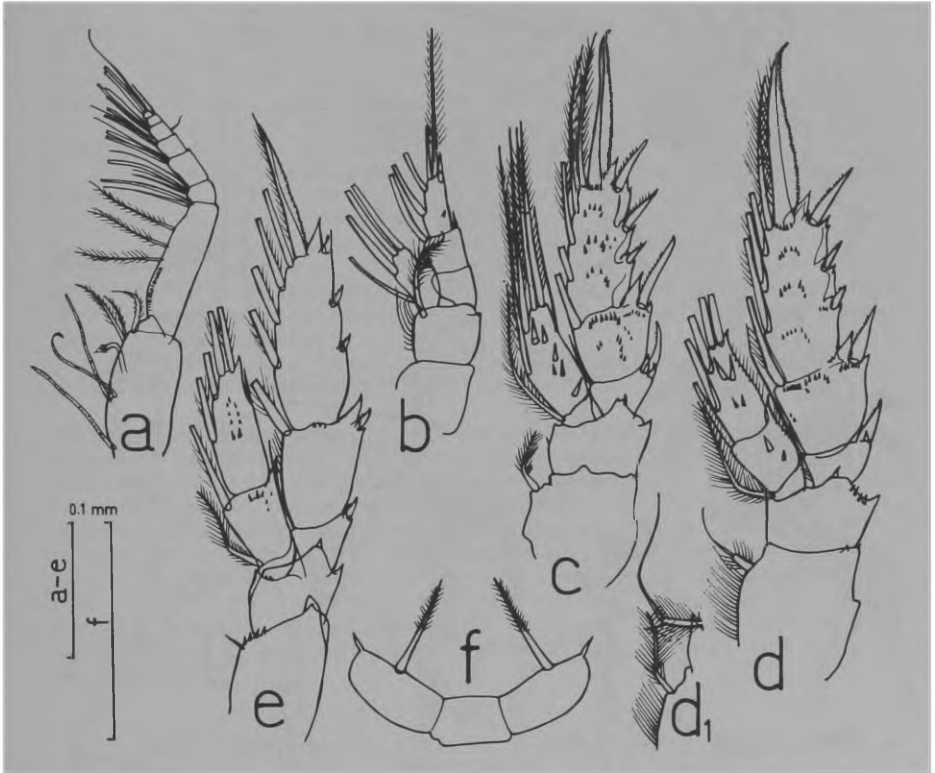


Fig. 4 - *Scolecithricella tenuiserrata*, ♀ a, Mxp; b, P1, posterior; c, P2, posterior; d, P3, posterior; d1, varieties of inner seta on P3 Bal and Ril; e, P4; f, P5, pair.

Description.- ♀: Total length (40 specimens) 1.00-1.15 mm, average 1.07 mm. Pr ovally outlined (Fig. 3a) with postero-lateral corners slightly pointed (Fig. 3b). Seminal receptacles (Fig. 3bl) straight and directed dorsally. Structure of Md palp (Fig. 3d), Max (Fig. 3f) and Mxp (Fig. 4a) common to the genus. Masticatory edge of Md gnathobasis (Fig. 3c) with a stout setulose dorsal seta, 5 small bicusped teeth

with one cusp strongly denticulated toward tip (see also Fig. 8b), and 3 large multicusped teeth. Ba2 and Ri of Mx1 coalesced (Fig. 3e) with 3 and 5 setae, respectively. Brush-like sensory setae of Max with types 1 and 2 and the variety 3 of type 1 in Fig. 3f. Structure and armature of P1-5 as in Figs 4b-f.

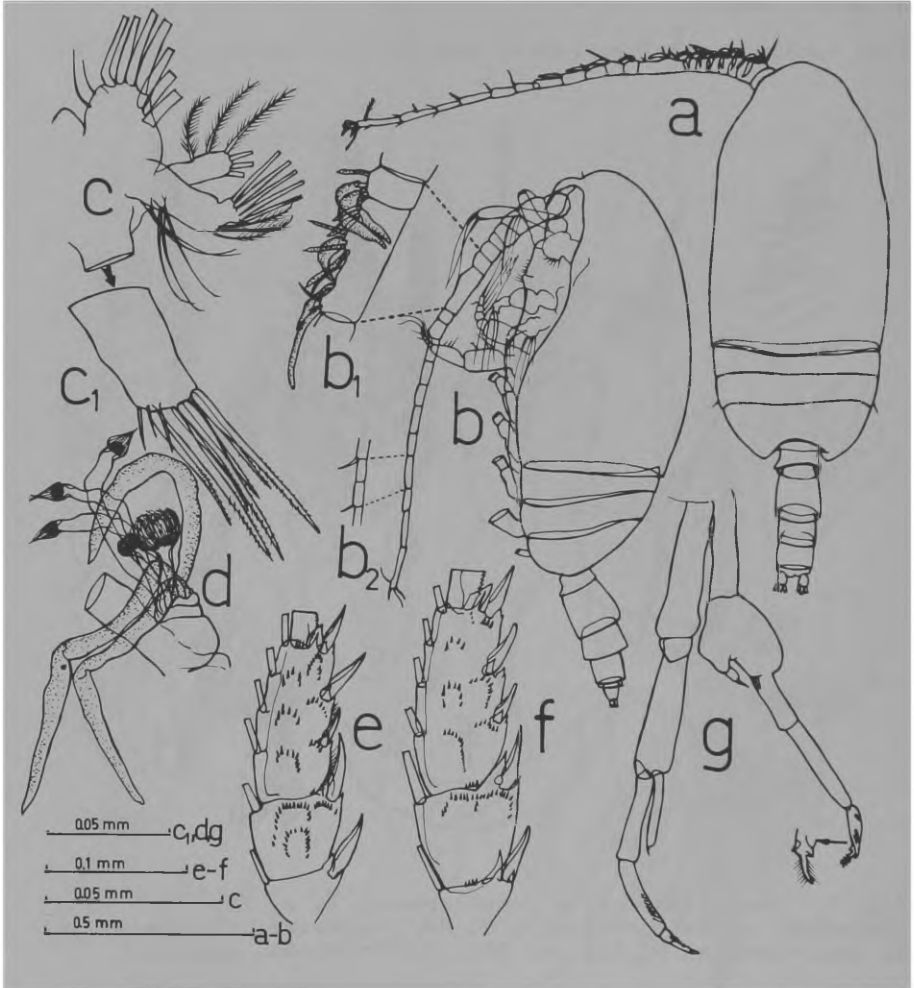


Fig. 5 - *Scolecithricella tenuiserrata*, ♂. a, Habitus, dorsal; b, Habitus, lateral; b1, Al armature of segments 7-8; b2, Segment 16 of right Al of another specimen; c, Mx1, inner lobe 1 removed; c1, Inner lobe 1 of Mx1; d, Max Ri; e, P2 Re, posterior; f, P3 Re, posterior; g, P5, pair.

♂: Total length (16 specimens) 1.19-1.33 mm, average 1.26 mm. Pr (Fig. 5a) laterally compressed relative to female. A1 19-segmented, segment 16 of right A1 divided into 2 separate segments on one specimen (Fig. 5b2) Other prosomal appendages structurally similar to female's, except for (1) smaller length of 3 innermost setae on Mx1 inner lobe 1 (Fig. 5c1) and 2 brush-like sensory setae on Max Ri (Fig. 5d), (2) greater number and different arrangement of spines on Re surfaces of P2 and P3 (Figs 5e-f), and (3) structure and development of P5 (Fig. 5g)

Remarks.- The species description agrees in general with those of Owre and Foyo (1967) for both sexes, Grice (1962) for female and Tanaka (1962) for male. The male right P5 Re3 was drawn differently by Grice, it is uncertain if he simplified the drawing or if his specimens are *Scolecithrix dubia* Giesbrecht, 1892 (pl. 13, fig. 29), considered by Park (1980:42) as the male of *Scolecithricella dentata* (for comparison see also Tanaka, 1937:260-1, fig. 11, and Owre and Foyo, 1967:23, fig. 94) As the majority of the P5 of my specimens are partially damaged, I cannot decide upon the possibility of a structural variation. The male described by Rose (1942) as *Amallothrix tenuiserrata* is according to the characteristics of P5 (compare with Park, 1980:40, fig. 6h-i) that of *Scolecithricella vittata*.

According to Bradford's (1973) generic definition, this is definitely a *Scolecithricella* species.

Habitat and distribution.- *Scolecithricella tenuiserrata* seems to be the most characteristic epipelagic *Scolecithricella* species in the tropical and subtropical N and S Atlantic. Verwoort (1965) furnished distributional data for the Indo-Pacific and Mediterranean, Owre and Foyo (1967) and Grice and Hulsemann (1965) for the NW and NE Atlantic, respectively. It occurred (present study) frequently and ranged from 0.02 to 3.71 m<sup>-3</sup> and from 0.02 to 1.77 m<sup>-3</sup> density in neritic and oceanic epipelagial off southern Brazil, where the South Atlantic central water spreads under shelf and tropical waters.

*Scolecithricella vittata* (Giesbrecht, 1892)  
Fig. 6a-e

- Scolecithrix vittata* Giesbrecht, 1892:266-86, pl. 13, figs 2, 23, 32, 34, 35, pl. 37, figs 5, 8.- Giesbrecht and Schmeil, 1898:43, fig. 6.- Sars, 1924: pl. 52, figs 15-20.  
*Scolecithricella vittata*. - Sars, 1925:190-1.- Farran, 1926: 259.- Farran, 1929: 247.- Rose, 1933:158, fig. 173.- Rose, 1942:140-2, figs 31-4.- Wilson, 1950:335, pl. 18, figs 233-4.- Grice, 1962:208, pl. 17, figs 1-8.- Tanaka, 1962: 41-2, fig. 129.- Grice and Hulsemann, 1965:221, 224.- Owre and Foyo, 1967: 61, figs 385-8.- Park, 1980:37, 39-42, figs 5-6.- Björnberg, 1981:638-9, fig. 213.  
*Scolecithricella sub-vittata* Rose, 1942:142-4, figs 35-7 (new synonymy)

*Amalothrix tenuiserrata* ♂.- Rose, 1942:163-6, figs 56-8.  
non *Scolecithricella vittata* ♂.- Rose, 1942:159-62, figs 53-5.

Material examined.- FINEP/IOUSP collection: 20 ♀♀, oblique tows from 200 m to surface in oceanic waters off Rio de Janeiro State (Trans I - Nov./Dec. 75), SW Atlantic, Brazil.

Type locality.- Mediterranean Sea, Gulf of Naples, Lat.41°N.

Remarks. - Total length (20 specimens) 1.40-1.65 mm, average 1.55 mm. Body (Fig. 6a) and prosomal appendages similarly shaped and structured to those already described (see synonymy). Few differences are observed in number and arrangement of spines on posterior surface of P2-3 Re (Figs 6c-d)

*Scolecithricella sub-vittata* is a variation instead of a separate species, as Rose (1942:144) had suggested in the original description; therefore it is included here in the synonymy.

Habitat and distribution.- Tropical and subtropical regions of the Atlantic, Pacific, Indian and Mediterranean (Park, 1980:40-2) Off southern Brazil (present study) it occurred with 0.11 to 0.23 m<sup>-3</sup> density in the oceanic epipelagial off Rio de Janeiro State during Nov./Dec. and very seldom with 0.01 to 0.04 m<sup>-3</sup> density off the States of Rio de Janeiro and Santa Catarina in May.

*Scolecithricella dentata* (Giesbrecht, 1892)  
Fig. 6f-k

*Scolecithrix dentata* Giesbrecht, 1892:266-86, pl. 13, figs 12, 20, 33, pl. 37, figs 13-4.- Giesbrecht and Schmeil, 1898:44.- Sars, 1924: pl. 52, figs 21-3.

*Scolecithricella dentata*. - Farran, 1908:69.- Sars, 1925 : 191-2.- Farran, 1926:259.- Farran, 1929:247.- Rose, 1933: 158, fig. 174.- Rose, 1942:144-7, figs 38-41 (♀), 154-6, figs 46-8 (♂).- Wilson, 1950:333-4, pl. 18, fig. 231 (♀).- Tanaka, 1962:42-4, fig. 130.- Grice and Hulsemann, 1965 : 221, 224.- Owre and Foyo, 1967:23, 60-1, figs 34, 379-81.- Park, 1968:555, pl. 8, figs 13-6.- Björnberg, 1973:332. - Park, 1980:42-3, fig. 7.- Björnberg, 1981:638-9, fig.213.

non *Scolecithrix dentata* ♂.- Wilson, 1950: 333-4, pl. 18, figs 230, 232.

*Scolecithrix dubia* Giesbrecht, 1892:266-86, pl. 13, fig. 29. - Tanaka, 1937:260-1, fig. 11.

Material examined.- FINEP/IOUSP collection: 45 ♀♀, oblique tows from 200-90 m to surface in oceanic waters and South Atlantic central water over the shelf, off the States of Rio de Janeiro (Trans. I and II - Nov./Dec. 75 and May 76) and Santa Catarina (Trans. III and IV - Nov./Dec. 75 and May 76), SW Atlantic, Brazil.

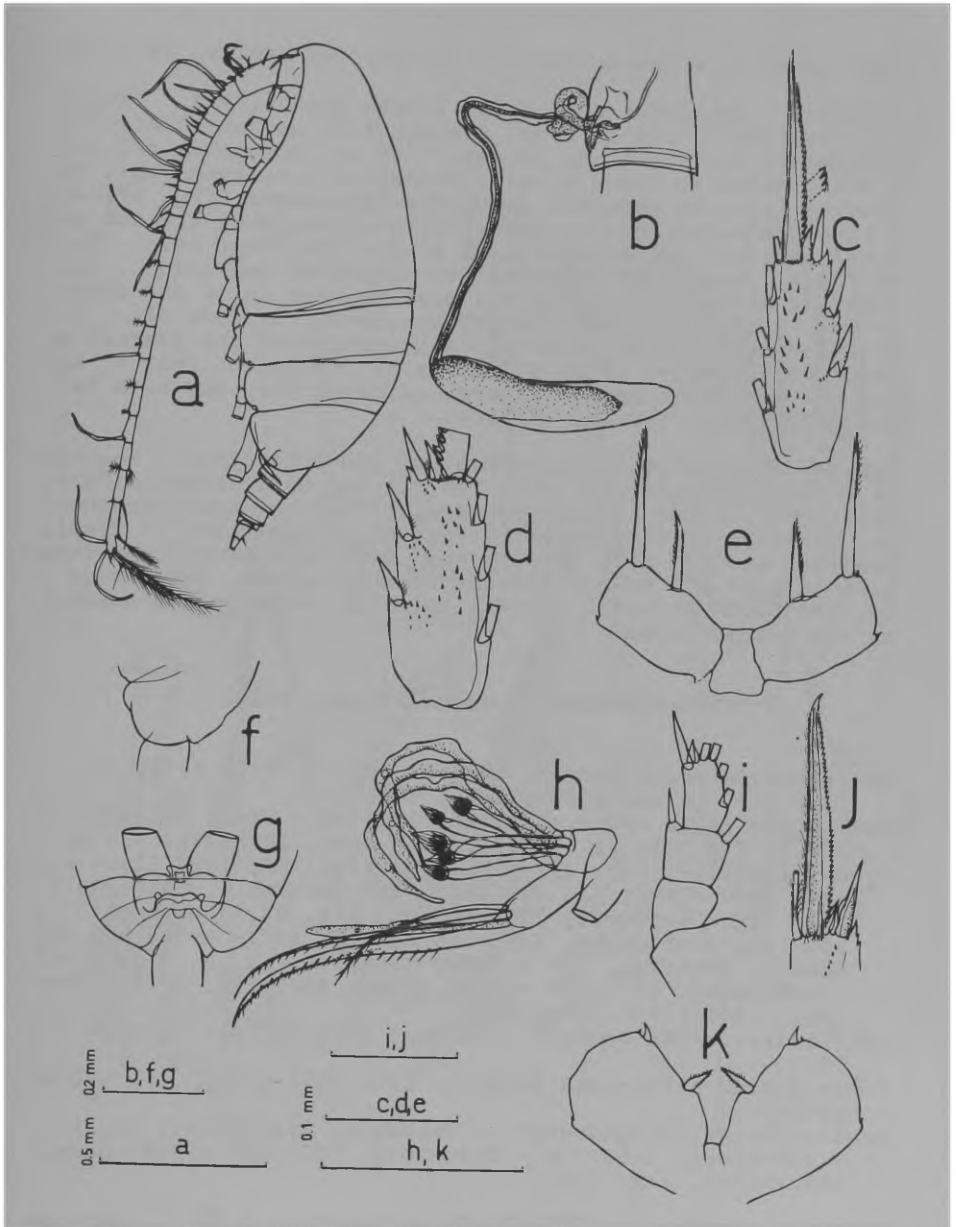


Fig. 6 - *Scolecithricella vittata*, ♀. a, Habitus, lateral ; b, Gn som with attached spermatophore; c, P2 Re3, posterior; d, P3 Re3, posterior; e, P5, pair. *Scolecithricella dentata*, ♀. f, Pr distal, lateral; g, Ditto, ventral; h, Max Ri and inner lobe 5; i, Pl1; j, P2 Re3, distal; k, P5, pair.

Type locality.- Mediterranean Sea, Gulf of Naples, Lat. 41°N.

Remarks - Specimens are of two length groups, viz. "small" (40 specimens) 1.21-1.40 mm, average 1.35 mm, and "large" (5 specimens) 1.62-1.68 mm, average 1.65 mm. Morphological features similar to those already described (see synonymy), including indented prosomal dorso-distal corners (Fig. 6f) and bi-incised outer pointed emarginations preceding the sub-terminal and terminal outer spines of P2-3 Re (Fig. 6j). From 80 "small" specimens examined (the above 40 measured plus other 40 sorted), P5 (Fig. 6k) were present in 36 and absent in 44; P5 absent in all "large" specimens. In some of the specimens lacking P5, careful examination of the sternal site of P5 formation (Fig. 6g) gives no indication that any leg had ever been present there, although they may have fallen off without leaving a trace.

Habitat and distribution.- Tropical and subtropical regions of N and S Atlantic, N and S Pacific and Mediterranean (Park, 1980:42-3) After *S. tenuiserrata*, it was the most frequent and abundant *Scolecithricella* species off southern Brazil (present study), with density from 0.03 to 0.27 m<sup>-3</sup> and from 0.01 to 0.47 m<sup>-3</sup> in neritic and oceanic waters, respectively. The South Atlantic central water is probably its habitat in the studied area.

*Scolecithricella ovata* (Farran, 1905)  
Fig. 7

- Scolecithrix ovata* Farran, 1905:37, pl. 6, figs 13-8, pl. 7, figs 1-5.- Sars, 1924:pl. 52, figs 1-6.  
*Scolecithricella ovata*.- Farran, 1908:69.- With, 1915:208-11, pl. 7, fig. 14, pl. 8, fig. 12.- Sars, 1925: 188-9.- Rose, 1933:157, fig. 171.- Wilson, 1942:208, fig. 125.- Wilson, 1950:334-5, pl. 35, fig. 527.- Brodskii, 1950:270-1, fig. 179.- Vervoort, 1951:99-101, fig. 53.- Vervoort, 1957:102-3.- Tanaka, 1962: 55-8, fig. 137.- Grice and Hulsemann, 1965:221, 224.- Park, 1968:555, pl. 8, figs 17-21.- Björnberg, 1973:332.- Park, 1980: 58-9, fig. 17.- Björnberg, 1981:638-9, fig. 213.  
 ?*Scolecithricella ovata* O.- Minoda, 1971:31, pl. 2, figs 1-10.  
*Scolecithrix subdentata* Esterly, 1905:167-8, fig. 29 (new synonymy)  
*Scolecithricella subdentata*.- Brodskii, 1950:271-2, fig. 182 - Björnberg, 1965:224.- Björnberg, 1973:332.- Björnberg, 1981:638-9, fig. 213.

Material examined.- FINEP/IOUSP collection: 3 ♀♀, oblique tows from 200 m to surface in oceanic waters off Rio de Janeiro State (Trans. II - Nov./Dec. 75 and May 76) at night, SW Atlantic, Brazil.

Type locality.- W of Achill Head, County Mayo, Ireland, Lat. 53°58' N, Long. 12°28' W.

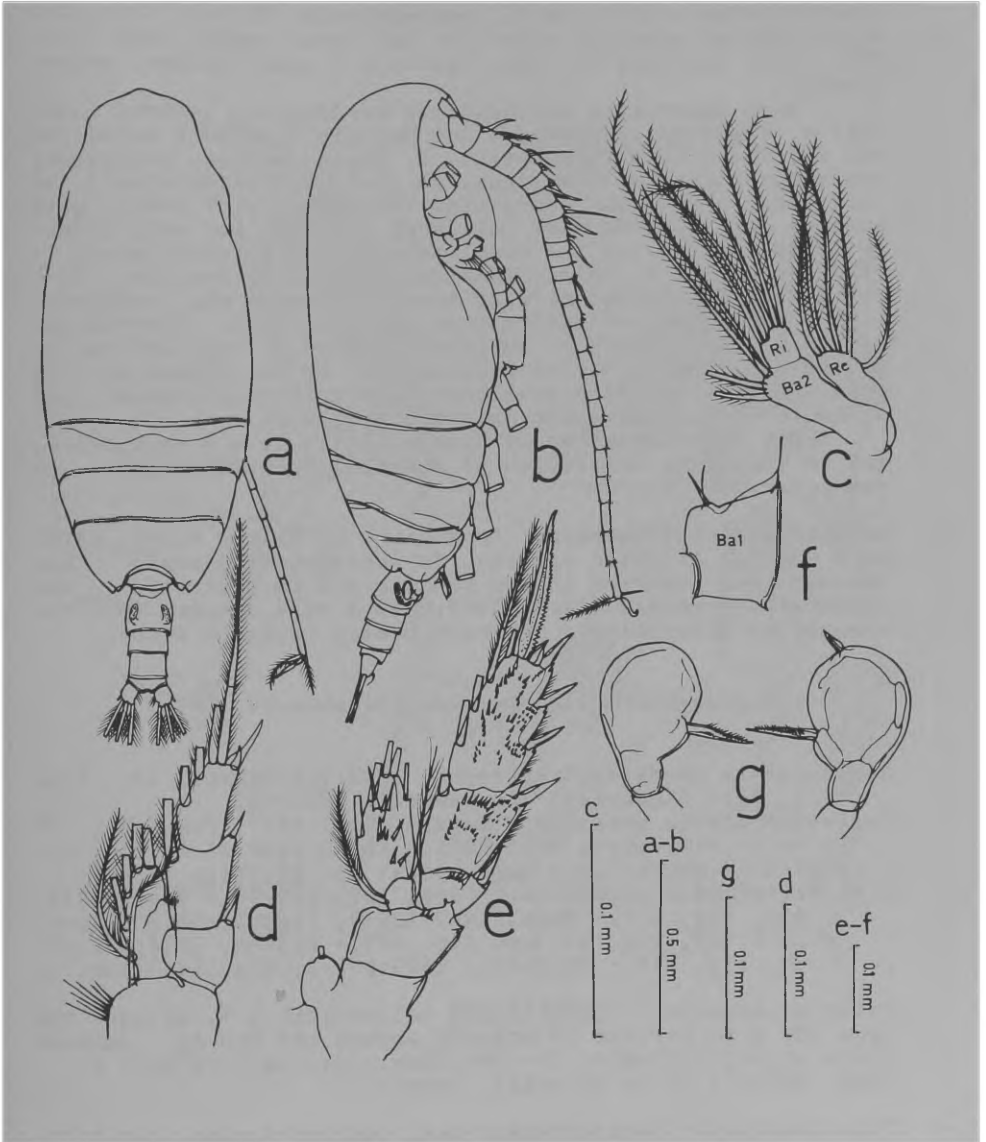


Fig. 7 - *Scolecithricella ovata*, ♀. a, Habitus, dorsal; b, Habitus, lateral; c, Mx1 Ba2, Ri and Re; d, P1, posterior; e, P2, posterior; f, P4 Ba1; g, P5, pair.

Remarks.- Total lengths 1.73, 1.76 and 1.80 mm. Prosomal postero-lateral corners indented (Fig. 7a-b). Mx1 (Fig. 7c) with 4 and 5 setae on Ba2 and Ri, respectively. P1 Rel (Fig. 7d) with an outer terminal spine. P4 Bal inner margin nude (Fig. 7f) Right and left P5 (Fig. 7g) with 1 and 2 spines, respectively.

When describing *Scolecithrix subdentata*, Esterly (1905:167-8, fig. 29c) recorded 5 but wrongly figured 6 setae on Mx1 Ri. Apart from this detail, *S. ovata* and *S. subdentata* are morphologically identical, so that the latter should be considered a synonym. Concerning the priority of name, both species descriptions were published in 1905, but only Esterly's publication has the complete date (14 October) specified. Mr. J. M. C. Holmes (National Museum of Ireland, Dublin) kindly informed me that Farran's report was submitted to the Department of Agriculture and Technical Instruction on 8 May 1905, passed by Dublin Castle on 13 May, and was received and stamped, after publication, by the Museum on 5 August. It was therefore published before Esterly's paper, and *S. ovata* Farran must have priority.

The male described by Minoda (1971) is a V copepodite, and is therefore considered of doubtful identification in the synonymy.

Habitat and distribution.- Considered by Wilson (1942, 1950) as a typical Atlantic species, *Scolecithricella ovata* has however been reported in the Pacific and in antarctic and subantarctic waters (Park, 1980:59) A rare species in the oceanic epipelagial off southern Brazil (present study).

*Scolecithricella profunda* (Giesbrecht, 1892)  
Fig. 8

- Scolecithrix profunda* Giesbrecht, 1892:266-86, pl. 13, figs 5, 26.- Giesbrecht and Schmeil, 1898:43.  
*Scolecithricella profunda*.- Tanaka, 1962:45-7, fig. 131 (♀ only).-Vervoort, 1965:80-1.- Park, 1980:36-8, fig. 4.  
*Scolecithrix abyssalis*.- Sars, 1924: pl. 52, figs 7-14.  
*Scolecithricella abyssalis*.- Sars, 1925:189-90.- Rose, 1933: 158, fig. 172.- Rose, 1942:136-9, figs 27-30.- Wilson, 1942:207, fig. 132 non fig. 120.- Wilson, 1950:331, pl. 34, fig. 519.- Brodskii, 1950:271-2, fig. 181 (part.).

Material examined.- FINEP/IOUSP collection: 1 ♀, oblique tow from 200 m to surface in oceanic waters off Rio de Janeiro State at night (Trans. I - Nov./Dec. 75), Lat. 23°46'7 S, Long. 41°24'1 W, SW Atlantic, Brazil.

Type locality.- Mediterranean Sea, Gulf of Naples, Lat. 41°N.

Remarks.- Total length 1.94 mm. Pr lengthened and dorso-ventrally compressed (Fig. 8a). Mx1 Ba2 and Ri (Fig. 8d) with 5 and 8 setae, respectively. P1 Rel (Fig. 8e) without outer terminal spine. P5 (Fig. 8f) symmetrical, inner marginal spine with a row of spinules; outer marginal articulated spine short.



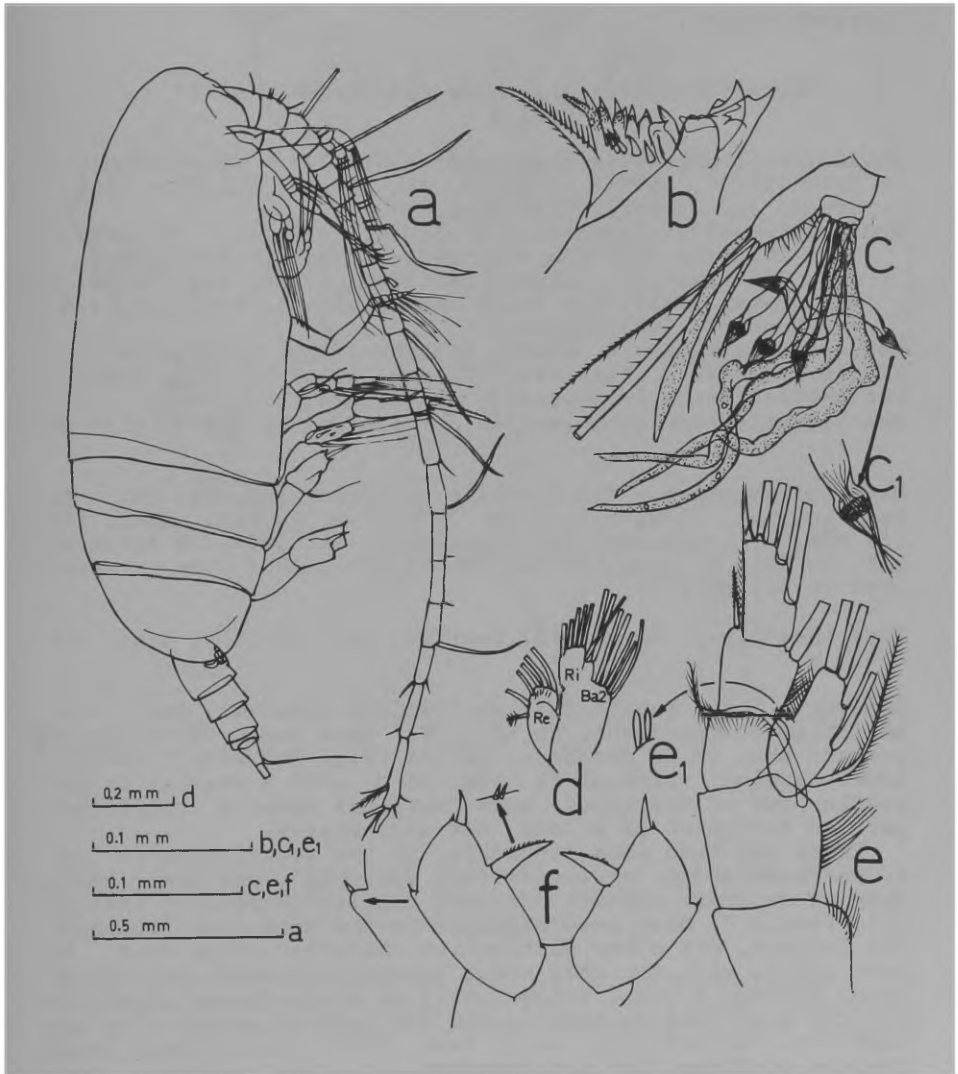


Fig. 8 - *Scolecithricella profunda*, ♀. a, Habitus, lateral ; b, Gnathobasis of Md, masticatory edge; c, Max inner lobe 5 and Ri; d, Mx1 Ba2, Ri and Re; e, P1, posterior; e1, Spines on outer lobe of P1 Ri, enlarged; f, P5, pair.

Habitat and distribution.- Mediterranean, Indo-Pacific, tropical Atlantic and subantarctic waters (Park, 1980:36-7). A rare species in the oceanic epipelagial off southern Brazil (present study).

*Scolecithricella abyssalis* (Giesbrecht, 1888)

Fig. 9

*Scolecithrix abyssalis* Giesbrecht, 1888:338.- Giesbrecht, 1892:266-86, pl. 13, figs 15, 40, pl. 37, fig. 7.- Giesbrecht and Schmeil, 1898:43-4.

*Scolecithricella abyssalis*.- A. Scott, 1909:89.- Wilson, 1942:207, fig. 120 non fig. 132.- Brodskii, 1950:271-2 fig. 181 (part.).- Grice, 1962:208, pl. 16, figs 16-20.- Björnberg, 1965:225.- Grice and Hulsemann, 1965:221, 224.- Björnberg, 1973:332-4.

*Scolecithrix tumida* T. Scott, 1894:52-3, pl. 3, figs 33-8.

?*Scolecithricella abyssalis*.- Tanaka, 1937:260, fig. 10a-c.

non *Scolecithricella abyssalis* ♂.- Tanaka, 1962:44-5.

non *Scolecithricella abyssalis* ♂.- Rose, 1942:157-9, figs 49-52.

Material examined.- (1) MarChile I Expedition, St. 14, SE Pacific, Lat. 31°01'6 S, Long. 72°00'1 W, 24 Feb., 1960: 1♀; (2) R/S "M. Lomonosov" XII Expedition, St. 1058, SW Atlantic, Lat. 14°00'4 S, Long. 35°01'6 W, 27 Nov., 1962, tow from 1040 to 323 m: 1♀.

Type locality. - Equatorial Pacific, Lat. 11-14°N, Long. 124-132°W.

Remarks.- Total length 1.87 mm (Pacific specimen) and 1.92 mm (Atlantic specimen). Pr (Fig. 9a) less dorso-ventrally compressed than in *S. profunda*. Mx1 Ri (Fig. 9b) with 7 setae. Inner marginal spine of P5 (Fig. 9c-d) with a regular or irregular row of denticles; outer marginal spine a chitinized pointed extension of a lobe, not articulated.

There has been some difficulty in the identification of *S. profunda* and *S. abyssalis* (see synonymy), and their validity as separate species has been doubted (Vervoort, 1965:80). Female P5 have been regarded as the principal diagnostic feature, but other distinctive characteristics must be considered, viz. the body shape laterally viewed; the Mx1 Ri setal number, 8 and 7 respectively in *profunda* and *abyssalis*; and the shape and disposition of the seminal receptacles (compare Fig. 9a1 with fig. 4c in Park, 1980). Until these features are confirmed for both species, it is better to keep them taxonomically apart.

Tanaka (1937, 1962) described the male and female for *Scolecithricella profunda* and *S. abyssalis*. The female of *S. profunda* is correctly assignable, but that of *S. abyssalis* ought to have more additional characters to be separated from the former. The male attributed to *S. abyssalis* seems to be a misidentification, as may be deduced from his refer-

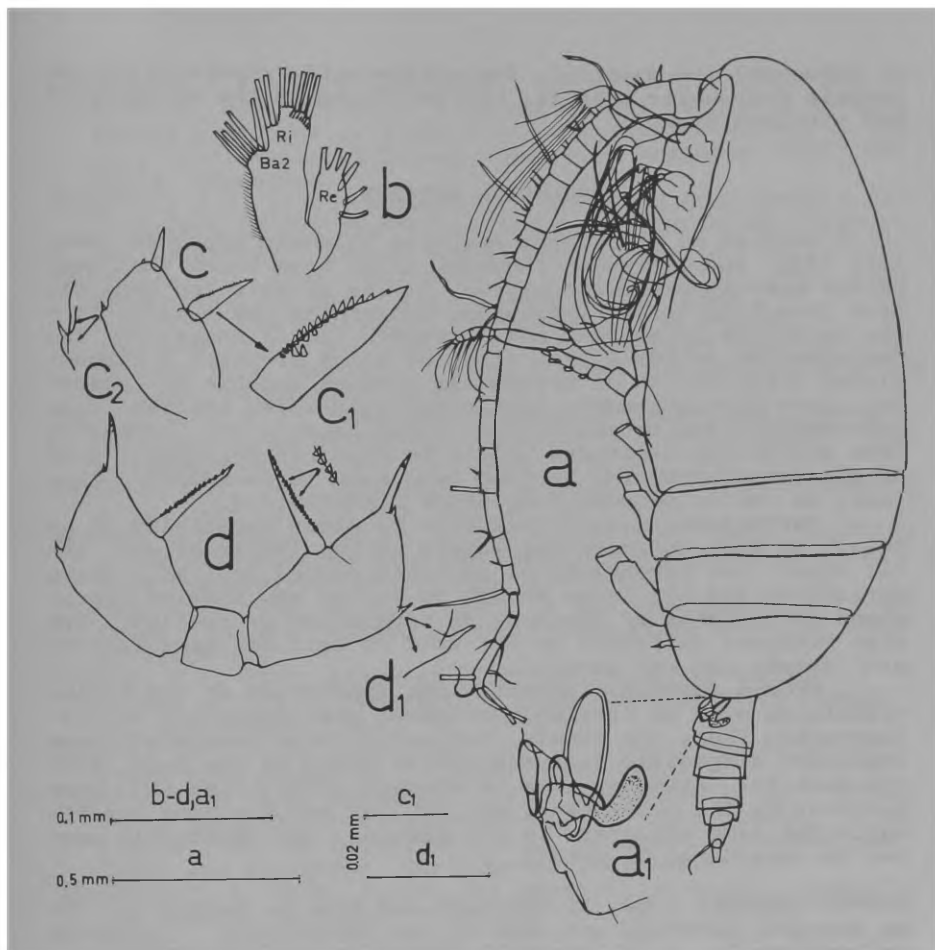


Fig. 9 - *Scolecithricella abyssalis*, ♀. a, Habitus, lateral; b, Mx1 Ba2, Ri and Re; c, P5; d, P5, pair. Note.- a,c: Pacific specimen; b,d: Atlantic specimen.

ring of the P5 (1962:45) to that of the male described by him as *S. dubia* (1937: fig. 11e); the other male identified as of *S. profunda* could therefore either be of this species or of *S. abyssalis*.

Rose (1942) attributed his "mâle n° 3" to what he supposed to be *S. abyssalis*, but it is similar to the male which he described as *Amallothrix tenuiserrata*, considered here as synonymous to *S. vittata*.

Habitat and distribution. - Pacific (Grice, 1962: Grice and Hulsemann, 1965; Björnberg, 1973) and S Atlantic (T. Scott, 1894; Björnberg, 1965) Mediterranean records (see *S. profun*

da synonymy) are doubtful. *Scolecithricella abyssalis* is an oceanic deep-water species, not yet found in the epipelagial off southern Brazil.

#### CONCLUDING REMARKS

Studies on planktonic deep-sea calanoid copepods (Wheeler, 1970) and ostracods (Deevey, 1983) have shown that most of the species are cosmopolitan, living in cold and cool waters from high to low latitudes. Concerning the epiplanktonic calanoids, Fleminger and Hulsemann (1973) suggested two distribution patterns, the first of which proposes a circumglobal distribution of warm-water species capable of breeding up to mid-latitudes. Similarly, cold-water species from intermediate and/or subtropical water capable of breeding from mid to low latitudes should be also circumglobal. Most of the scolecithricids studied here seem to exemplify this case, as can be deduced from their distribution.

Morphological varieties seem to occur especially in populations from near-coastal waters at low latitudes and, until other than morphological analyses can be applied, these variations are not large enough to define new species. Decisions about cases of synonymy or separation of species are also rendered difficult by the want of data for many important areas, not yet sampled.

From a taxonomic aspect, some appendages of the scolecithricids must be carefully observed when described and illustrated. Thus, the female Mx1 and P1 have furnished some important diagnostic features, which could be the case with the male Mx1, although this is strongly simplified in some species. On the other hand, A2, Md, Max and Mxp have practically the same structure in all species, and apparently need not be considered in detail.

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