A NEW CHARACTER WITH SYSTEMATIC VALUE IN *EUCHIRELLA* (COPEPODA, CALANOIDA)

by

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With 5 text-figures and 6 plates

INTRODUCTION

The present paper deals with some morphological features found in the species of the genus *Euchirella* Giesbrecht, 1888, family Aetideidae. In the course of my studies on the genus, I noted that the structures situated on the anterior surface of the endopodites of the first pair of swimming legs, which will be described below, have never been given the attention they obviously deserve.

In none of the principal works on Calanoida, e.g., Scott (1909), Sars (1924-25), Rose (1933), and Brodskii (1950) these structures are dealt with in the text. The same holds for the important reviews by Vervoort (1957, 1963), and Tanaka & Omori (1969). Although most authors somehow figure a row of spinules on the tubercle of the endopodite, their drawings are invariably too small to allow one to observe the proper situation on this segment. To my knowledge, Park (1968: 549) is the only recent author who mentions the row of spinules with a few lines in the text, namely in his description of *Euchirella unispina* Park.

An exception in this respect should be made for the work by Giesbrecht (1892), who depicts, albeit also in rather small figures, the central hairs and the hairbrush (see below) in two of his drawings (Giesbrecht, 1892: pl. 15 figs. 11, 30). In his description of *Euchirella* females the same author refers to *Undeuchaeta* Giesbrecht, 1888, where he mentions the terminal brush of hairs, and from here to *Aetideus* Brady, 1883, where he devotes one line to the row of spinules on the tubercle (Giesbrecht, 1892: 239, 232, 218). Giesbrecht (1892) always describes the legs very carefully, mentioning all structures he observes. However, he only goes into details for the first basipodite of the fourth leg, which is always described and figured in detail. He also mentions characteristics of this basipodite in his short diagnoses of every species. On the other hand, the endopodite of the first leg is never mentioned in the diagnoses, at least not for *Euchirella* spp., and he seems not to give the structures found on this particular segment more attention than he gives the other morphological features of the legs.

Below, these structures will be described in extenso, their taxonomic value will be discussed, and a comparison of the situation in a number of *Euchirella* species and one species of *Pseudochirella* G. O. Sars, 1920, will be made.

Description

The endopodite of the first pair of swimming legs of *Euchirella* males as well as females, when seen in anterior view (fig. 4a), appears as only one, slightly elongated segment, which is usually somewhat more slender in the male than it is in the female. There is a rather broad and rounded tubercle on its external side.

This tubercle shares its base with the segment and only in its distal part it becomes clearly outlined against the rest of the endopodite. The tubercle reaches about one-third to one-half along the length of the segment. There are a varying number of rather small, subterminal spinules, arranged in one or more transverse rows or in an irregular group or circle, which extends around the tubercle's lateral edge. The spinules are sharp and rather straight in anterior view, being more or less curved in lateral view. Their base is supported by a circular pedestal, which is an outgrowth of the tubercle, while the base itself may be produced as an annular swelling. The spinules rarely reach the end of the tubercle. Extremely thin, interspinular hairs may occasionally be observed between and around the spinules.

The terminal part of the tubercle is of an irregular shape, often with warts, pores, and wrinkles, the integument in this area being comparatively thin (pls. 2a, 3d).

A specialized, curved seta (fig. 4a) originates from the second basipodal segment of the same leg, i.e. near the very base of the endopodite and at its medial side. In the intact animal, this seta runs through a very shallow depression across the endopodite (pls. 1a, 4d), fitting the inner limitation of the tubercle, up to the free inner edge of the latter. The shape of the curved seta is very peculiar: gradually tapering from its base to the more or less abruptly bent distal part, it is definitely swollen just opposite the subterminal spinules of the tubercle. The swelling ends rather suddenly and the terminal portion of the seta is curved again like a flagellum. The seta is covered with hairs only along the inner surface of its curve, beginning at approximately one-third to one-half of its straight basal portion and continuing to the end of its swelling. The basalmost hairs are rather short whereas the more distal hairs become gradually longer; these are placed in only a few rows and directed in such a fashion that they reach to more or less the same point, their tips meeting just at the row of spinules.

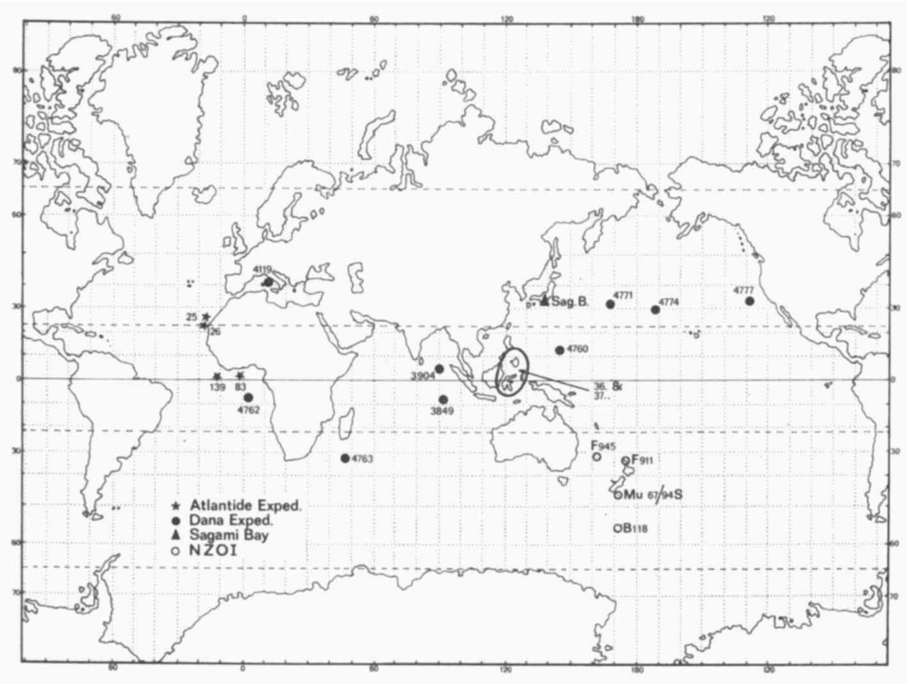

Fig. 1. Localities from which material has been examined (see also table 1).

The inner edge of the endopodite bears three long, plumose setae, the most proximal one being smoothly curved, the others being straight. The hairs on the proximal seta are more densely placed and also more robust than those on the other setae. Moreover, there are two terminal setae, which are also long and more or less covered with hairs; the median one of these may be called subterminal.

On the lateral edge of the endopodite, distally to the tubercle, a single row of densely placed hairs is present, which ends just before the terminal seta. Furthermore, a more or less semicircular hairbrush may usually be observed near the distal end of the segment; the brush is composed of multiple rows of hairs (e.g., fig. 4a).

A varying number of stronger hairs is most commonly found in the central area of the endopodite, directed more or less obliquely to its distal end (e.g., fig. 4a). Although the shape, number, and arrangement of these hairs may vary considerably in the various species, they always have thicker walls and are more robust than the hairs in the above-mentioned rows, which, on the contrary, are composed of definitely more thin-walled hairs (pl. 5a-d). All three types of hairs are more or less flattened, with a wide base, tapering to a pointed tip.

I have never met with an appropriate description in calanoid literature of either the above-mentioned spinules, hairs, or curved seta.

Material and methods

In order to examine and figure the endopodites of the various species, preparations — on slides — of the first legs were made in Berlese's Medium, for examination with the compound microscope. Drawings have been made with the aid of a camera lucida. This procedure has been followed for all available species.

In addition, the first legs of many species were prepared for examination by means of a scanning electron microscope (SEM). In this case, the curved seta of one leg was removed and the pair of legs was transferred from alcohol 70% into alcohol 96%, after which it was taken out and allowed to dry. It was then placed on a stub, which had already been covered with double-sided adhesive tape. These preparations were covered with one layer of gold only and were examined in the SEM immediately afterwards, at magnifications ranging from 550× up to and including 5500×. The photographs (pls. 1-6) have been obtained from the SEM-screen.

Once recognised, a preliminary survey of the variability of the endopodal structures in various *Euchirella* species was made, the results of which are presented below. Individual variation was studied in a series of 22 females of *E. messinensis indica* Vervoort from a single sample taken in the Malay Archipelago. An investigation on geographical variation was carried out in *E. messinensis indica* females from the Malay Archipelago, Japan, the Central Pacific and the Indian Ocean. For the same purpose, females of *E. pulchra* (Lubbock) from the Atlantic Ocean, the Malay Archipelago and the Central and Eastern Pacific were studied, as well as *E. curticauda* Giesbrecht females from the Atlantic, the Malay Archipelago, the Central and the Southwestern Pacific. Both males and females of *E. bella* Giesbrecht, *E. bitumida* With, *E. curticauda* Giesbrecht, *E. maxima* Wolfenden, *E. messinensis* (Claus), and *E. amoena* Giesbrecht have been examined, while of *E. amoena* a male stage V copepodid has also been included.

An impression of intergeneric variability was gained by adding one species of the closely related genus *Pseudochirella* G. O. Sars, 1920. The material examined has been listed in table 1.

TABLE 1
Material examined (see also fig. 1)

species	locality	specimens	observed by microscope	observed by SEM
E. amoena Giesbrecht, 1888	Atlantide Exp. sta. 25	1 ♂ stage V		+
	26°57′N, 17°10′W			
	Atlantide Exp. sta. 26	1 ♀	+	
	25°34′N, 18°24′W			
	Dana Exp. sta. 3683	1 ♀, 1 ♂		+
	4°03′N, 123°26′E	1 ♂	+	
	NZOI sta. F 945	1 ♂	+	
	31°19.5′S, 165°19′E			
E. bella Giesbrecht, 1888	Dana Exp. sta. 3683	1 ♀, 1 ♂	+	
	4°03′N, 123°26′E	1 ♀		+
	Dana Exp. sta. 3904^{ii}	1 ♀		+
	5°18′N, 90°55′E			
E. bitumida With, 1915	Dana Exp. sta. 3683	1 ♀	+	
	4°03′N, 123°26′E			
	Dana Exp. sta. 3786^{viii}	1 ♀		+
	4°38′N, 126°51′E			
	NZOI sta. F 911	1 ♂	+	
	34°38′S, 174°36′E			
E. curticauda Giesbrecht, 1888	Atlantide Exp. sta. 139	1 ♀		+
	1°30′N, 10°10′W			
	Dana Exp. sta. 3683	1 ♀, 1 ♂		+
	4°03′N, 123°26′E			
	Dana Exp. sta. 4771	1 ♀	+	
	37°05′N, 160°08′E			
	NZOI sta. Mu 67/94 s	1 ♂	+	
	45°55′S, 171°05′E			
E. galeata Giesbrecht, 1888	Dana Exp. sta. 3686^{vii}	1 ♀	+	
	8°34′N, 119°55′E			
	Dana Exp. sta. 3904^{ii}	1 ♀		+
	5°18′N, 90°55′E			
E. maxima Wolfenden, 1905	Dana Exp. sta. 3683	1 ♀	+	
	4°03′N, 123°26′E	1 ♀, 1 ♂		+
	Dana Exp. sta. 3904^{ii}	1 ♀	+	
	5°18′N, 90°55′E			
E. messinensis (Claus, 1863)	Atlantide Exp. sta. 139	1 ♂	+	
	1°30′N, 10°10′W			
	Dana Exp. sta. 4119^{x}	1 ♀	+	
	40°13′N, 12°16′E			
	Dana Exp. sta. 4119^{xii}	1 ♂		+
	and 4119^{xx}, both:	1 ♀		+
	40°13′N, 12°16′E			
E. messinensis indica Vervoort, 1949	Dana Exp. sta. 3682^{ii}	5 ♀♀	+	
	1°42′N, 124°29′E			
	Dana Exp. sta. 3683	22 ♀♀		+
	4°03′N, 123°26′E	1 ♀	+	
	Dana Exp. sta. 3849^{i}	1 ♀	+	
	8°11′S, 92°41.5′E			

Table 1 (continued)

species	locality	specimens	observed by microscope	observed by SEM
	Dana Exp. sta. 4763 32°26'S, 47°49'E	1 ♀	+	
	Dana Exp. sta. 4774 31°10'N, 171°35'W	1 ♀	+	
	Sagami Bay, Japan	1 ♀	+	
E. orientalis Sewell, 1929	Dana Exp. sta. 3683 4°03'N, 123°26'E	1 ♀	+	
	Dana Exp. sta. 4760 13°28'N, 144°31'E	1 ♀	+	
	Dana Exp. sta. 4771	2 ♀♀	+	
	37°05'N, 160°08'E	1 ♀		+
E. pulchra (Lubbock, 1856)	Atlantide Exp. sta. 25 26°57'N, 17°10'W	1 ♀	+	
	Atlantide Exp. sta. 83 5°29'N, 0°20'E	1 ♀		+
	Dana Exp. sta. 3735 9°33'N, 122°19'E	1 ♀	+	
	Dana Exp. sta. 3797[ii] 2°30.5'S, 118°35.5'E	1 ♀		+
	Dana Exp. sta. 4771 37°05'N, 160°08'E	1 ♀		+
	Dana Exp. sta. 4777 35°59'N, 129°25'W	1 ♀		+
E. rostrata (Claus, 1866)	Dana Exp. sta. 4771 37°05'N, 160°08'E	1 ♀	+	
	Dana Exp. sta. 4774 31°10'N, 171°35'W	1 ♀		+
E. rostromagna Wolfenden, 1911	NZOI sta. B 118 55°34'S, 170°27'E	1 ♀	+	
E. splendens Vervoort, 1963	Atlantide Exp. sta. 139 1°30'N, 10°10'W	1 ♀		+
	Dana Exp. sta. 4762 8°13'S, 2°54'E	1 ♀	+	
E. truncata Esterly, 1911	Dana Exp. sta. 3683 4°03'N, 123°26'E	1 ♀	+	
	Dana Exp. sta. 4763 32°26'S, 47°49'E	1 ♀		+
E. unispina Park, 1968	Dana Exp. sta. 3789[viii] 1°48'N, 123°20.5'E	1 ♀	+	
	Dana Exp. sta. 3849[i] 8°11'S, 92°41.5'E	1 ♀		+
E. venusta Giesbrecht, 1888	Dana Exp. sta. 3683 4°03'N, 123°26'E	1 ♀		+
	Dana Exp. sta. 3686[vii] 8°34'N, 119°55'E	1 ♀	+	
Pseudochirella obtusa (G. O. Sars, 1905)	Atlantide Exp. sta. 139 1°30'N, 10°10'W	1 ♀		+

Legend: NZOI = New Zealand Oceanographic Institute.

RESULTS

The various ways in which the structures on the endopodite are represented in the various species are shown in table 2. Shape, number, and arrangement of the subterminal spinules on the tubercle and of the central hairs have been taken into account. The length of the latter in relation to the length of the entire segment has also been included. The morphology of the brushes of long, thin hairs on the anterior surface proper has been studied and mentioned. It is now possible to evaluate within the scope of this survey the taxonomic usefulness of these characters.

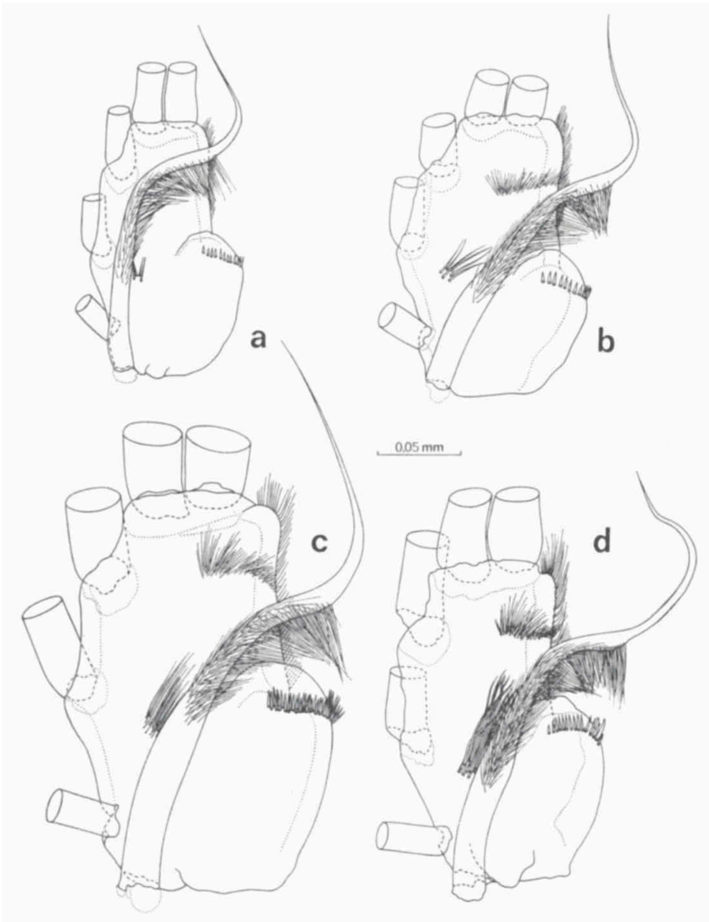

Fig. 2. Endopodite of the right first leg in anterior view. *Euchirella bella* Giesbrecht, a, ♂ and b, ♀, both from Dana Exp. sta. 3683. *Euchirella bitumida* With, c, ♀ from Dana Exp. sta. 3683; d, ♂ from NZOI sta. F911.

TABLE 2

Variation in structures on the endopodite of the first legs in some species of *Euchirella*

species	sex, locality	spinules number	spinules shape	spinules arrangement	central hairs number	central hairs shape	central hairs arrangement	1/1 enp	hairbrush	figs., pls.
E. amoena	♀ Atl.	12-14	short, sharp	irregular group	4-5	slender	one dense row	1/6	short, thin hairs, covering large part of enp.; free	
	♀ Mal. Arch.	8	,,	short row, ending in group	3	,,	one row	1/6	,,	pl. 4a
	♂ Mal. Arch.	6-9	,,	irregular group	3-5	short, slender	,,	1/12	as in ♀, but covering smaller part of enp.	pl. 4b
	♂ S. Pac.	10	,,	,,	3	,,	,,	1/12	,,	
	♂ st. V Atl.	7	,,	,,	3	as in ♀	,,	1/6	as in ♀	pl. 4c
E. bella	♀ Mal. Arch.	11-13	short, sharp	one regular row	3-5	slender	one dense brush	1/5	slender, elongated brush ending in larger brush; connected	fig. 2b
	♀ Ind.	11-12	,,	,,	5	,,	,,	1/5	,,	
	♂ Mal. Arch.	12-13	more slender than in ♀	,,	4-5	,,	,,	1/8-1/10	,,	fig. 2a
E. bitumida	♀ Mal. Arch.	28-36	long, straight	two rows	14-16	long, slender	one dense brush	1/3	elongated, slender brush; connected	fig. 2c pl. 5a
	♂ S. Pac.	16	,,	one dense row	11-13	,,	,,	1/3	more rows of hairs than ♀	fig. 2d
E. curticauda	♀ C. Pac.	20-24	long, sharp	various rows or irregular group	8	very short	one brush	1/20	broad, curved, elongated brush; connected	fig. 3a
	♀ Mal. Arch.	ca. 20	,,	,,	not observed			—	thin hairs covering large part of enp.	
	♀ Atl.	ca. 24	,,	,,	not observed			—	not observed	fig. 3b
	♂ Mal. Arch.	10-15	thin, fragile	as in ♀, but wider spaced	0-4	even shorter	one group	—	as in ♀ (Pac.); hardly connected	
	♂ S. Pac.	very similar to ♂ Mal. Arch.								
E. galeata	♀ Mal. Arch.	20-23	slender	one straight, dense row	4-6	slender	one group	1/8	only two rows of hairs; connected	fig. 3c
	♀ Ind.	21	,,	,,	4	,,	,,	1/9	,,	
E. maxima	♀ Mal. Arch.	30+10	short to very short, sharp	30 large ones in two rows and many small ones, scattered	7-11	rather short	one dense group	1/8-1/10	one wide brush, 8-10 rows of hairs; hardly connected	pl. 6a
	♀ Ind.	,,	,,	,,	7-11	,,	,,	1/8-1/10	,,	
	♂ Mal. Arch.	,,	,,	,,	6	short, robust	one row	1/12-1/15	,,	pls. 5c, 6b
E. messinensis	♀ Medit.	18-21	short, smooth	one row, partly alternating	3-5	slender	one dense brush	1/6	one slender, curved brush; hardly connected	
	♂ Medit.	18-21	,,	,,	3-4	,,	,,	1/5	brush smaller than in ♀	
	♂ Atl.	18-23	,,	one dense row	6-7	,,	,,	1/5	brush rather wide	fig. 4c

E. m. indica	♀ Mal. Arch.	17-20 (16-22)	pointed, slender	one row, 5th-15th spinule alternating to varying degree	4-7 (3-8)	flat, slender	irregular group, occasionally disperse	1/4-1/6	curved, slender, transverse brush; 2, 3 or 4 rows wide; of varying extension; connected	pls. 1-2, pl. 5d
	♀ Ind.	13-15	,,	,,	3-4	,,	,,	1/7	,,	
	♀ Japan	14-16	,,	,,	3-4	,,	,,	1/4-1/6	,,	
	♀ C. Pac.	14-16	,,	,,	3	,,	,,	1/4-1/6	,,	
E. orientalis	♀ C. Pac.	21-23 or 16-17	short, robust	one slightly alternating row, or two complete rows	3-5	long, slender	one brush	1/5-1/6	two distinct brushes, or a complete one; connected	fig. 4b
	♀ Mal. Arch.	ca. 16	,,	one alternating row	3-5	,,	,,	1/5-1/6	one slender brush; connected	fig. 4a
E. pulchra	♀ Mal. Arch.	12-14	pointed, curved	one slightly alternating row	3-5	flat, slender	one dense group	1/3-1/4	one brush; free. scattered, short hairs covering rest of enp. surface, occasionally 2nd brush near central hairs	
	♀ Atl.	13-15	,,	one row, alternating from 6th-7th onward	6-7	,,	,,	1/3	,,	pl. 3a-c
	♀ C. Pac.	ca. 12	,,	one alternating row	3	,,	,,	1/3	,,	pl. 3d
	♀ E. Pac.	ca. 12	,,	,,	3	,,	,,	1/3	,,	
E. rostrata	♀ C. Pac.	12-13	sharp, straight	irregular group	3-4 +	flat, slender	dense group	1/5	no brush observed	fig. 5a
					4-5	spinule-like, small	disperse group	—		
E. rostromagna	♀ SW. Pac.	10	long, straight	widely spaced, irregular row	8	short, thin	one dense group	1/12	uncertain	fig. 5b
E. splendens	♀ Atl.	14-15	normal	one regular row	3-4	short, thick	one dense group	1/7-1/8	4-5 rows wide brush; connected	fig. 4d
E. truncata	♀ Mal. Arch. & Ind.	18-23	long, robust, sharp	two rows, eventually circle	6-8	short, robust	one dense group	1/7	one dense, elongated brush, placed rather terminally; may be incompletely divided in two; connected	pl. 5b fig. 5d
E. unispina	♀ Mal. Arch.	23-24	long, sharp	one dense group	3-4	short, thick	one dense group	1/8-1/10	as in *E. truncata*	fig. 5c
	♀ Ind.	14	stout	irregular circle	4	,,	one row	1/8	,,	
E. venusta	♀ Mal. Arch.	14-19	short	one regular row	3-4	short	one row	1/8-1/10	curved, elongated, slender brush; connected	pl. 4d

Legends: Atl. = Atlantic Ocean; Ind. = Indian Ocean; Pac. = Pacific Ocean; Mal. Arch. = Malay Archipelago; Medit. = Mediterranean; C, S, E, SW = Central, South, East, Southwest; (hairbrush) connected c.q. free = reaching c.q. not reaching lateral row of hairs; l/l enp = length of central hairs compared with that of endopodite.

In general, individual variation proved to be limited. The composition of the row of spinules on the tubercle appears to be rather constant; e.g., in *E. messinensis indica,* where 22 females from one population could be studied, the number of spinules was found to range nearly always between 17 and 20, while in only two individuals 16 and 22, respectively, were counted. This seems to be a rather limited range, compared with variability among all *Euchirella* species studied, where variation in this particular character ranges from 6 to 40.

The shape of the spinules and the way in which they are arranged is even less variable than their number (pl. 2c-e). The same holds for the central hairs, which are also more characteristic with regard to their shape, arrangement (pl. 1c-d) and relative length than to their number; the latter, however, is already fairly constant. The number of central hairs in *E. messinensis indica* was found to vary from 4 to 7 and occasionally from 3 to 8, while in the *Euchirella* species listed it ranges from 0 to 16 or even more (table 2).

The few data concerning individual variation within a limited area, obtained from other species, appear not to be in contradiction with the conclusions drawn from the *E. m. indica* material. The only exception in this respect are *E. orientalis* Sewell females (fig. 4a-b), where all characters mentioned show a large amount of variation even in one individual, i.e., the left and right leg. This species, however, is known to be rather variable also with regard to other characters, in particular the shape and number of tubercles on the genital segment (Tanaka & Omori, 1969: 54). One should note especially the differences in number and arrangement of the spinules on the endopodal tubercle, as well as the variation in the brush of thin-walled hairs. As regards this character, one brush may be found, or two incompletely divided brushes, or even two distinct, completely separated bundles of hairs.

As may be observed from the data listed (table 2) for the females of, e.g., *E. curticauda, E. messinensis indica,* and *E. pulchra,* all characters may vary geographically to a greater or lesser extent. In *E. m. indica,* the range of variation was found to vary geographically. Some variation in this respect is also encountered among the other available data, but there do not exist any large discrepancies. The size of the samples of these species, however, does not allow for any firm conclusions to be drawn as regards individual or geographical variation (pl. 3c-d).

Males and females, which have both been studied in *E. amoena, E. bella, E. bitumida, E. curticauda, E. maxima,* and *E. messinensis,* exhibit a rather close similarity with regard to the above characters (fig. 2a-b, c-d, pls. 4a-b, 6a-b). This is particularly true for the shape and arrangement of spinules and hairs, though these structures may in many cases be somewhat less robust in the male than in the female, e.g., the spinules of both sexes of *E. curticauda*. The differences between males and females in the number of central hairs and spinules, on the other hand, may be distinct, such as the number of spinules in *E. bitumida* (fig. 2c-d) and *E. curticauda*, or may vary roughly within the limits of the individual variation found in the females.

The male stage V copepodid of *E. amoena* agrees rather closely with the female of this species, which might well be expected when considering general calanoid morphology (pl. 4a, c).

Differences at species level may be considerable. Above, variation in numbers of spinules and central hairs has already been mentioned. The shape of the spinules varies from leaf-like (fig. 4a) to acutely triangular (figs. 2a, 3a-b) in anterior view, and from smoothly curved to straight in lateral view. The arrangement may be rather discrete (fig. 2b) or dense

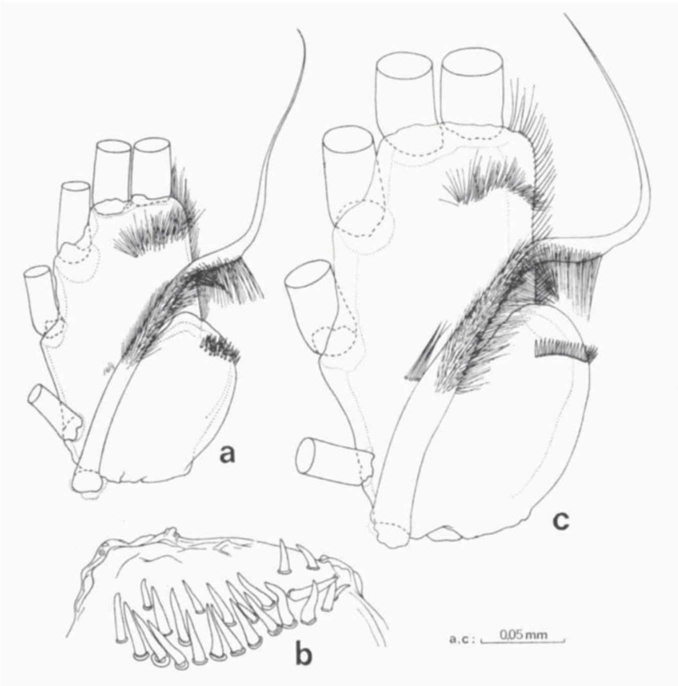

Fig. 3. Endopodite of the right first leg in anterior view (a and c only). *Euchirella curticauda* Giesbrecht, a, ♀ from Dana Exp. sta. 4771; b, ♀ from Atlantide Exp. sta. 139, detail of spinules on tubercle, more or less anterio-lateral view (highly magnified, drawn from SE-micrograph). *Euchirella galeata* Giesbrecht, c, ♀ from Dana Exp. sta. 3686 vii.

(fig. 3c) and may look like a regular row (e.g., pl. 4d), an alternating row (e.g., pl. 3c), or two separate and complete rows (fig. 2c), and eventually a circle or an irregular group (figs. 3a-b, 5c).

The central hairs may vary greatly in length relative to the length of the segment and in their own length-width ratio (pl. 5a-c). Moreover, there are large discrepancies in arrangement of these hairs and their position on the segment among the various species (vide figs. and pls.).

The brush or brushes of thin-walled hairs differ widely in their covering of the segment and also in their shape and position. Density, length and thickness of the individual hairs have also been noted to be variable though the latter features have not yet been studied in detail.

Notwithstanding the diversity within the genus *Euchirella*, comparison with the species *Pseudochirella obtusa* stresses the relative uniformity of the pattern in the former genus. In *P. obtusa* quite another picture is found: the spinules on the tubercle are numerous, viz., at least 28, but probably about 40 larger ones in the first and second rows and approximately 60-80 smaller ones scattered over the terminal region. Their relative size is much smaller, compared to spinules of *Euchirella*, and they are of a totally different shape. Although the shape of the spinules in *Euchirella maxima* (pl. 6a-b) is very similar to that in the other representatives of the genus, it is the only species of *Euchirella* showing a similar arrangement as is found in *P. obtusa* (pl. 6c).

Such similarities or differences may well shed another light onto the taxonomic position of the species and eventually also onto the relationship between the genera. In fact, it is my aim to conclude my forthcoming study of *Euchirella* and *Pseudochirella* with a revision of the position of these genera.

Discussion

With regard to the structures on the anterior surface of the endopodite of the first pair of swimming legs in *Euchirella*, it has been shown above that intraspecific variation of the individual features is relatively limited and that there exists an even greater uniformity of the pattern as a whole. Interspecific differences are in many cases sufficient to make this character useful as another feature of discrimination between the various species. On the other hand, similarities in structure of the endopodite of leg one may eventually be used as an additional indication of relationships within the genus. It seems probable that this may hold also, mutatis mutandis, for the various genera in the Aetideidae.

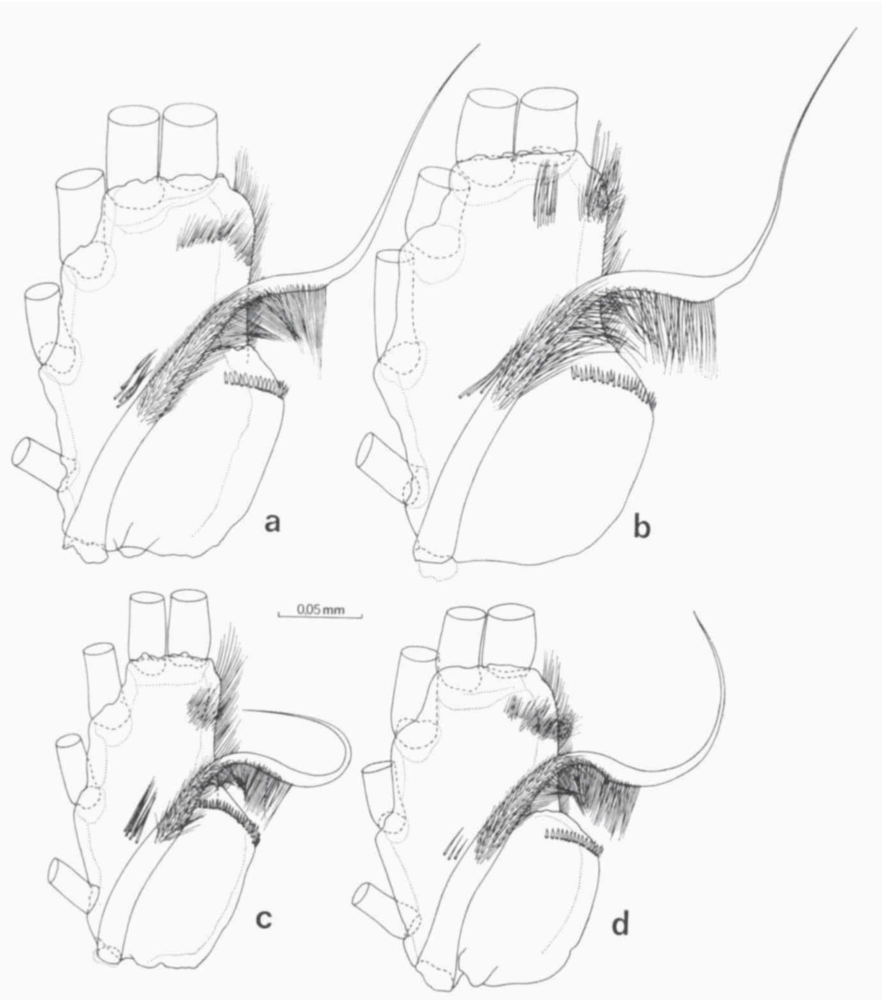

Fig. 4. Endopodite of the right first leg in anterior view. *Euchirella orientalis* Sewell, a, ♀ from Dana Exp. sta. 3683; b, ♀ from Dana Exp. sta. 4760. *Euchirella messinensis* (Claus), c, ♂ from Atlantide Exp. sta. 139. *Euchirella splendens* Vervoort, d, ♀ from Dana Exp. sta. 4762.

In my opinion, the newly discovered series of characters has the advantage that it may be used to connect male and female of a species. This has always been rather hazardous, not in the least in the Aetideidae. The frequently used characters like habitus, shape of the head, structure of the genital segment, and spinules on basipodite one of the fourth leg in the female, and the structure of the fifth pair of legs in the male, are as a rule applicable only to one sex. The characters that have now become available, however, will probably aid in eventually allowing a proper classification of males and females within the genus *Euchirella* and perhaps in other aetideid genera as well.

The described structures are readily observed through the compound microscope at a magnification of 400×. However, taking their considerable hyalinity into account, one can imagine that they may easily be overlooked, or that not enough attention is paid to, e.g., the spinules. The hairs of the brushes as well as the central hairs in particular, are practically invisible when slightly out of focus. In my experience, the effect of staining is only negative: in the few stained preparations that I have seen, the central hairs nor the brushes of hairs could be discerned, while the image of the spinules was also rather vague. The opportunity to make parallel observations by compound microscope and by SEM appeared to be of great advantage.

Now that several structures of the endopodite have been described, one may be curious about the functions of same in the living animal. Considering the many hairs and the peculiar, curved seta, acting as a counterpart to the row of distinctly tooth-like spinules, one may assume that a grooming-apparatus is concerned. This seems even more probable because at the distal part of the tubercle a number of pores may be observed, while in this area the integument is rather thin. The presence of some glandular function in this region may thus be expected. The position of such a grooming-apparatus, immediately behind the mouthparts, seems not unlikely. Of course, other functions in feeding behaviour might also be present, next to the locomotory function of the first legs.

Reduction of feeding and consequently of the mouthparts in the male may have resulted also in reduction of the structures on the endopodite of leg one. Since the mandibles, the maxillulae and the maxillae have been more markedly reduced than the maxillipeds, some reduction, eventually approaching that of the maxillipeds, may be expected here.

The glandular pores, the warts, the extremely thin hairs in the area of the spinules and several other structures, like very minute hairs and pits, most of which have been observed with the SEM only, have not yet been studied in detail. For this purpose, however, cleaner SEM preparations devoid of dust and crystals will be required, but unfortunately we do have no regular access, normally, to a suitable freeze-drying apparatus.

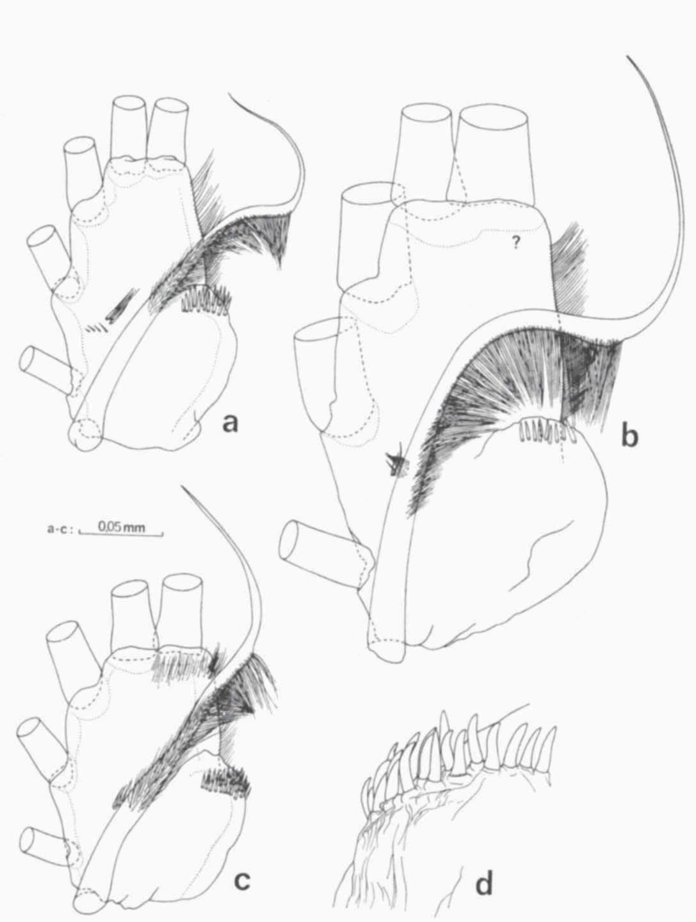

Fig. 5. Endopodite of the right first leg in anterior view. *Euchirella rostrata* (Claus), a, ♀ from Dana Exp. sta. 4771. ***Euchirella rostromagna*** Wolfenden, b, ♀ from NZOI sta. B 118. *Euchirella* ***unispina*** Park, c, ♀ from Dana Exp. sta. 3789 viii. *Euchirella truncata* Esterly, d, ♀ from Dana Exp. sta. 4763, detail of spinules on the tubercle of the endopodite of the left first leg (highly magnified, drawn from SE-micrograph).

Acknowledgements

I am very much indebted to Dr. J. Bradford of the New Zealand Oceanographic Institute for kindly sending me material of *Euchirella* from the Southwestern Pacific. The valuable assistance of Mr. H. Heijn in preparing the drawings, of Mr. W. Kuiters for operating the SEM, and of Messrs. W. C. Laurijsse and Chr. Hoorn for processing and printing the photographs is gratefully acknowledged. Part of this study has been made possible by a grant from the Netherlands Organisation for the Advancement of Pure Research (Z.W.O.).

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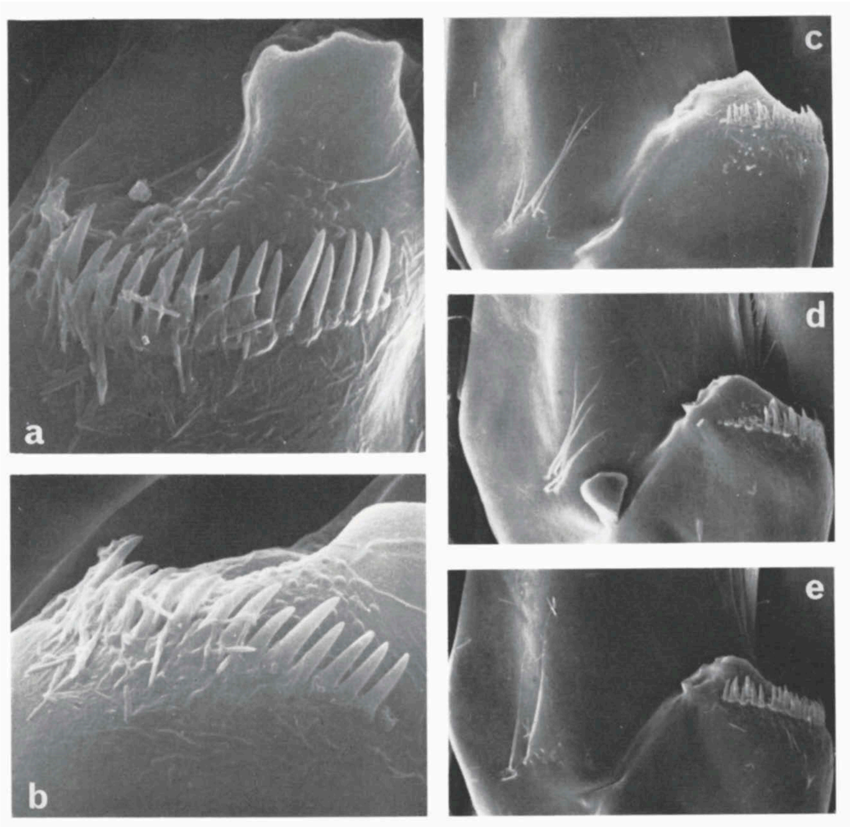
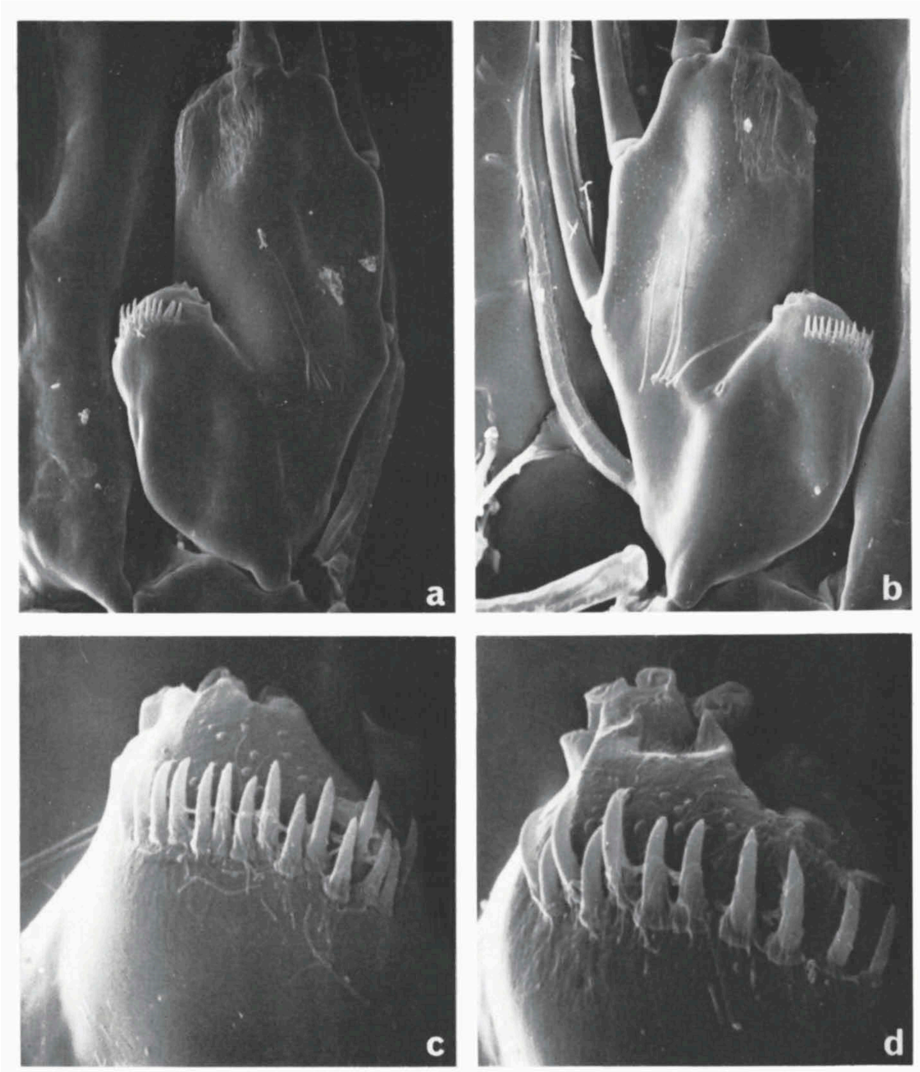
Euchirella messinensis indica Vervoort, ♀♀ from Dana Exp. sta. 3683; pictures of four different specimens; endopodite of leg one shown in anterior view. a, left endopodite, curved seta in situ; b, right endopodite, curved seta removed; c-d, right endopodites, showing variation in arrangement of central hairs. a-d, 450 ×.

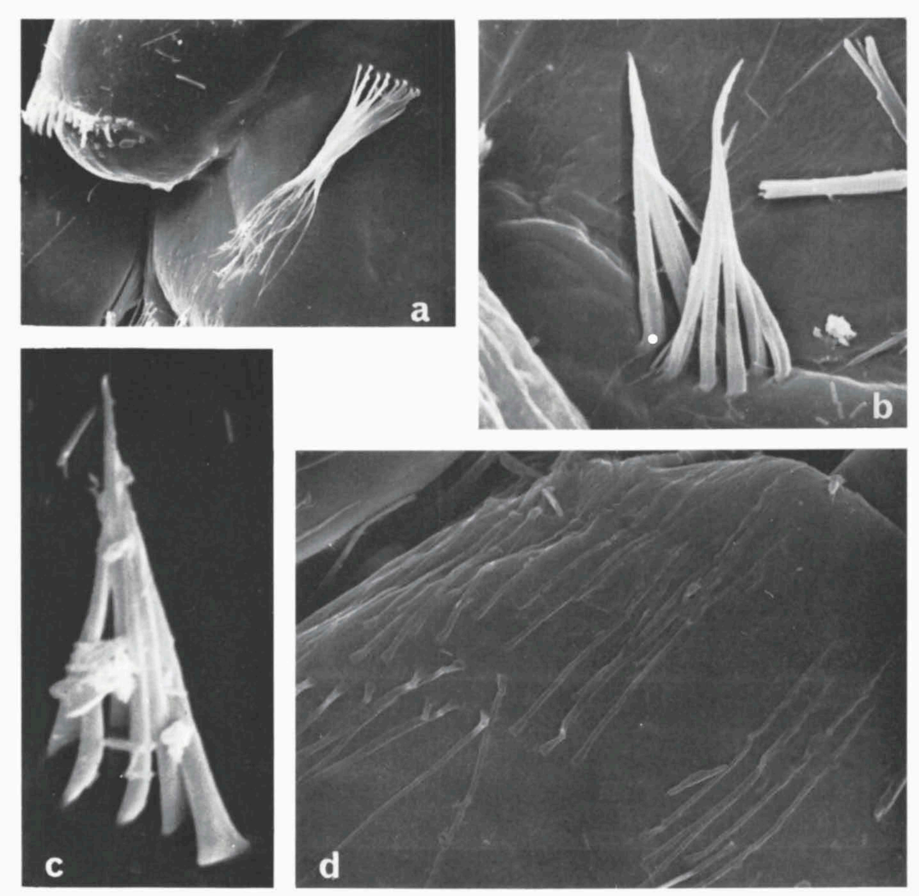


Euchirella messinensis indica Vervoort, ♀♀ from Dana Exp. sta. 3683; pictures of four different specimens; endopodite of the first leg. a, left endopodite, detail of distal end of tubercle in lateral view, showing row of spinules, warts, and wrinkles; b, same row of spinules, viewed at from a different angle; c-e, details of right endopodites in anterior view; three different specimens, showing variation in arrangement of the spinules. Note the circular pedestals on the tubercle, where the spinules have been broken off. a-b, 1900 ×; c-e, 450 ×.

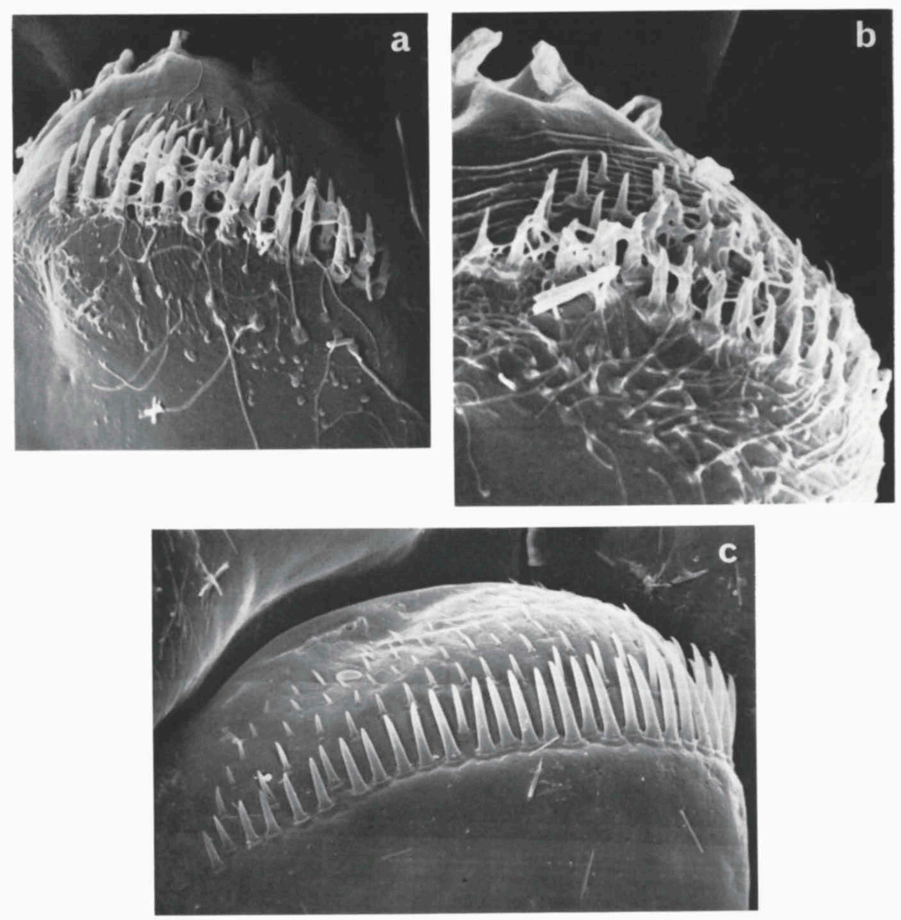


Euchirella pulchra (Lubbock). a-b, ♀ from Atlantide Exp. sta. 83, endopodites of left and right first leg of the same specimen in anterior view, showing similarity in spinules, central hairs, and hairbrush. Note the pore on the inner limitation of the tubercle. c-d, details of row of spinules of right endopodites in lateral view; c, ♀ from Atlantide Exp. sta. 83, 15 spinules; d, ♀ from Dana Exp. sta. 4771, 11 spinules. a-b, 450 ×; c-d, 1900 ×.

Euchirella amoena Giesbrecht, endopodite of the first leg in anterior view. a, ♀ from Dana Exp. sta. 3683; b, ♂ from Dana Exp. sta. 3683; c, ♂ stage V from Atlantide Exp. sta. 25. Note the similarity in the spinules of the ♀, ♂ and ♂ stage V; the similarity in hairbrush covering and central hairs in ♀ and ♂ stage V; the shorter central hairs and the less extended hairbrush in the ♂. *Euchirella venusta* Giesbrecht, d, ♀ from Dana Exp. sta. 3683, endopodite of the right first leg in anterior view. The spinules are placed in an extremely regular row. a-d, 450 ×.



a-c, variability of the central hairs within *Euchirella* Giesbrecht. a, *Euchirella bitumida* With, ♀ from Dana Exp. sta. 3786 viii; b, *Euchirella truncata* Esterly, ♀ from Dana Exp. sta. 4763; c, *Euchirella maxima* Wolfenden, ♂ from Dana Exp. sta. 3683; d, detail of the thin-walled hairs of the distal hairbrush on the endopodite of the first leg of *Euchirella messinensis indica* Vervoort, ♀ from Dana Exp. sta. 3683. a, 450 ×; b, 1900 ×; c-d, 4500 ×.



Details of the spinules on the endopodal tubercles of the first legs of a, ♀ and b, ♂ of *Euchirella maxima* Wolfenden from Dana Exp. sta. 3683 (spinules partly covered with the thin, interspinular hairs which have become glued together as a result of drying), and of c, *Pseudochirella obtusa* (G. O. Sars), ♀ from Atlantide Exp. sta. 139. a, c, 960 ×; b, 1900 ×.