

Fig. 3. *S. serratum* (F.). a-d, after Lejuez (1966): a, pleotelson in tergal view; b, pleotelson in lateral view; c, PI; d, detail PI; e, RMNH coll. nr. 6570: Mxp.

long, plumose setae being inserted. Tergally merus and ischium bearing 50-60 and 60 long, plumose setae, respectively. These setae, ending in short spine (about 1/10 of total length of seta), are densely and regularly plumose: length of setules best developed caudally.

Dorsal surface of pleotelson smooth. In lateral view pleotelson of both male and female regularly convex, posterior margin of apex in male broadly rounded, less straight transversally and relatively narrower than posterior margin of apex in female. Ratio of length to width of pleotelson, and ratio of pleotelson length to caudal apex width, rather constant in female; in male differing in different populations (see table). However, geographically close populations not necessarily have these ratios more similar than populations separated by large distances.

Uropodal rami robust, usually reaching just beyond posterior margin of pleotelson. External margin of exopod having 4-7 more or less pronounced teeth, mostly situated in caudal part. However, females may have irregularly serrated margin.

Ecology. — *S. serratum* is an intertidal species, often found in sheltered places under stones or in crevices preferring clean-grained sand or shelly sand.

Distribution. — The species has a remarkably extensive range. In the Atlantic it has been found from the British Isles to Morocco. It is also found in the Mediterranean, the Black Sea (Bulgarian and Rumanian coast) and even in the Suez Canal. Outside the area under consideration it is found in S. Africa and W. Australia (Holdich & Harrison, 1983; Holdich & Tolba, 1985).

Remarks. — Verhoeff (1943a, 1943b, 1949) described seven new species belonging to *Sphaeroma*. For their distinction he used characters like the shape of the cephalon and the presence of granulations or pits on it, and the shape of the segments of the sixth and seventh pereopods. I will discuss these later.

Verhoeff ignored the characters used by Monod (1931b). Other zoologists (like Consiglio & Argano, 1966) working in the group had their doubts about the value of the characters used by Verhoeff, and about the validity of his species. Argano et al. (1969, 1971) interbred a population of *Sphaeroma serratum* (F.) and *S. capreae* Verhoeff, 1943, and proved those two taxa conspecific. Schmalzfuss (1975) mentioned *S. aegaeum* Verhoeff, 1949, which is found near the coast of the island of Aegina (Greece), as a synonym of *S. serratum* (F.).

The following of Verhoeff's material was studied by me: *S. capreae* Verhoeff, 1943b — Island of Capri, Italy: coast (Leg. G. Buchner, many specimens). *S. dalmatinum* Verhoeff, 1949 — Southern Dalmatia, Yugoslavia, partly from Raguso (leg. K.W. Verhoeff, many specimens). *S.*

aegaeum Verhoeff, 1949 – Island Aegina, Greece: coast (leg. K.W. Verhoeff, 1♀). *S. foveolatum* Verhoeff, 1943b – St. Maxime, French rivièra: beach (leg. K.W. Verhoeff, 1♂). *S. adriaticum* Verhoeff, 1949 – Cherso, Yugoslavia (10 specimens); Buccari, Yugoslavia (1 specimen); Cherso, Yugoslavia (many species) (leg. K. Strasser). *S. serratum* (F.) – San Remo, St. Maxime, St. Jean and Antibes, French and Italian rivièra (leg. K.W. Verhoeff, many specimens).

A study of the above material, which includes type material of all Verhoeff's species mentioned, showed that the characters used by Verhoeff to distinguish his "species", like the shape and sculpture of the cephalon, and the shape of the last two pairs of pereopods, all fall within the variation of these characters shown by *S. serratum*, and that they are more or less constant within a population. A comparison of Verhoeff's material with other material of *S. serratum* confirmed this. Most of the characters used by Verhoeff were differences of degree, like length/width ratio of pereopod segments or length ratio of two pereopod segments, which were slightly higher in one of his species than in another. So Verhoeff thought the dactylus of P4 and P5 in *S. capreae* to be short and blunt, in *S. serratum* and his other species, long and sharp. I found that the specimens from Capri, on the whole, had the average length of the dactylus shorter than in a population from e.g. Israel, but in most populations of *S. serratum* these dactyls are robust and blunt. In some populations (e.g. from Split, Yugoslavia) the size range of the dactylus included both forms: the extreme short, blunt form (*S. capreae*) and the extreme long, sharp form, and all intermediate forms.

Another character studied was the ratio of propodus length to dactylus length for P7. This ratio is rather constant within each population, although the overlap between populations is so great that the character is not usable. Verhoeff also mentioned the overlap of the merus of P6 over the carpus. In some of his species the overlap is half the length of the carpus. This character also is rather constant within each population, but again the overlap was too great to make the character usable.

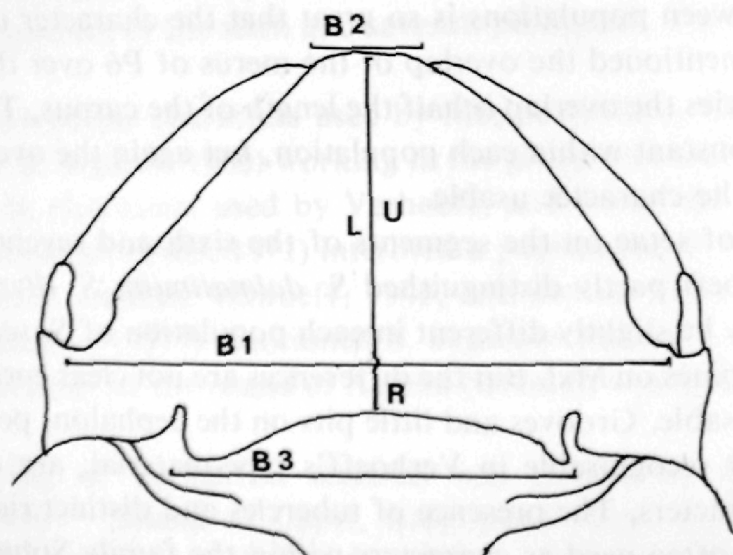
The number of setae on the segments of the sixth and seventh pereopod, on which Verhoeff partly distinguished *S. dalmatinum*, *S. illyricum* and *S. adriaticum*, may be slightly different in each population of *S. serratum*, as is the number of spines on Mx1. But the differences are not clear enough to make the characters usable. Grooves and little pits on the cephalon, pereonites and uropods, hardly recognisable in Verhoeff's type-material, are undoubtedly not distinct characters. The presence of tubercles and distinct ridges (e.g. on the pleotelson), often used as characters within the family Sphaeromatidae, are not always species-specific and should be used with some reserve.

Verhoeff evidently considered population-specific characters as species-specific and therefore came to the conclusion that a number of populations belonged to undescribed species. Although I did not study the type-material of *S. illyricum* Verhoeff, 1949 I consider it also conspecific with *S. serratum* because of the characters used by Verhoeff. Their distinctness varies greatly, even in a single population and cannot be considered reliable.

Many research workers have stated that the pleotelson of the male and of the female of *S. serratum* seems to show no obvious difference. However in my opinion both sexes are distinguishable on the characteristic form of the pleotelson, also mentioned lately by Holdich and Tolba (1985). To show this I made some measurements on the pleotelson of both male and female samples from diverse sites in its distributions area. Measured are: length of the pleotelson, L; width of the pleotelson between the uropods, B1; width of rostral part of the pleotelson, B2; width of caudal part of the pleotelson, B3; length of the caudal part of the pleotelson, from the insertion of the uropods to the tip, U; length of the rostral part of the pleotelson, R (see fig. 4). The results are given in table 1.

All specimens were adult, except for the few where the data are put between quotation marks. The table shows an obvious difference between the sexes when studying the ratios L:B3. The pleotelson of the male is relatively longer and caudally more narrow and less straight than the female pleotelson. Striking is the constant ratio L:B1 for both male and female, while the male ratio L:B3 differs between populations. The ratio U:R does not show which part of the telson is lengthened.

As the table shows, this difference in the ratio L:B3 of the male does not seem to be geographically determined.



		L:B1 ♂ ♀	L:B2 ♂ ♀	L:B3 ♂ ♀	U:R ♂ ♀				
Romenia									
coll. nr.	6553	0.80 '0.73'	0.68	1.14 '1.04'	0.97 '2.20'	3.20 '2.20'	2.30 '1.55'	2.20 '1.55'	1.60
Greece									
coll. nr.	6555	0.78		1.18		2.90		1.35	
	6556	0.79 0.77	0.60	1.15 1.11	0.84	2.60 2.73	1.59	1.20 1.22	2.00
Yugoslavia									
coll. nr.	6547	0.87 0.71	0.63	1.09 1.11	0.95	2.40 3.40	1.90	1.88 2.10	1.52
	6552	0.66		0.96		1.92		2.43	
Italy									
syntype									
S. capreae		0.74	0.63	1.20	1.09	2.43	1.92	1.62	1.40
Tunesia									
coll. nr.	2458	0.80 0.71	0.63	1.17 1.08	0.90	3.50 3.19	2.00	1.59 2.00	1.67
Italy									
coll. nr.	6557	0.68	0.68	1.06	1.05	2.52	2.10	1.62	1.18
Spain									
coll. nr.	6566	0.68 0.65	0.63	1.00 1.00	0.94	2.36 2.60	1.79	2.25 2.71	1.52
Spain									
coll. nr.	6558	0.76 '0.67'	0.60	1.12 '1.09'	0.90	2.67 '2.27'	1.64	1.91 '1.94'	2.00
Spain									
coll. nr.	6560	'0.61'	'0.64'	'0.96'	'1.00'	'2.09'	'1.68'	'2.21'	'1.67'
Spain									
coll. nr.	6573	'0.83'	'0.63'	'0.97'	'1.03'	'2.23'	'1.94'	'1.90'	'1.20'
	6570	0.73 0.72	0.57	1.03 1.09	0.80	2.57 2.96	1.78	1.69 1.32	1.67
Morocco									
coll. nr.	6567	'0.67' '0.71'	'0.67'	'0.94' '1.00'	'0.92'	'2.22' '2.45'	'2.18'	'1.55' '1.45'	'1.40'
Spain									
coll. nr.	2472	0.70	0.61	1.00	0.95	2.40	1.90	1.46	1.71
	2473	0.72 0.70	0.69	1.13 1.03	0.95	2.96 3.00	2.00	1.83 1.67	1.25
France									
coll. nr.	2460	0.70 '0.65'	'0.61'	1.03 '1.00'	'0.90'	2.60 '2.24'	'2.05'	1.66 '1.71'	'1.87'
Madeira									
coll. nr.	6569	'0.60'		'0.83'		1.85'		'2.00'	
Azores									
coll. nr.	6568	'0.69' '0.66'		'0.98' '1.00'		'2.12' '2.00'		'1.45' '1.64'	

Table 1. Ratios of length (L, U) and width (B1, B2, B3, R) of pleotelson of samples of males and females of *Sphaeroma serratum* (F.). For explanation, see text.

***Sphaeroma venustissimum* Monod, 1931**
(fig. 5)

Sphaeroma venustissimum Monod, 1931a: 492-494, figs. 1-3; Monod, 1931b: 37, figs. 3, 4, 18A, 23B, 25A, 32H, 33C-E, 34 F, L, 38H, 43H-I.

Material examined. — RMNH: Portugal: Albufeira, Algarve (on the shore, under stones, near the high-water mark, Exc. RMNH, November 1974, many specimens). Spain: Punta de la Cruz, Bay of Cadiz (beach W. of breakwaters, Exc. RMNH, October 1974, many specimens). Morocco: Agadir (beach, washed ashore, leg. J.A.W. Lucas, May 1974, 3 specimens). Senegal: Cap de Biche (sandy beach with lime-stone formation with holes and pools, leg. J.C. den Hartog, November 1983, many specimens).

Diagnosis of adult male. — Antenna with five-segmented peduncle and flagellum of 15 to 19 articles. Each article of flagellum with fringe of smooth setae at distal interior angle. Adult males with these setae more abundant and up to three times length of article. In female these setae reaching only 1.5 times length of article.

Interior endite of maxilliped with fringe of 13-17 robust, plumose setae with swollen base on internal border. Semicircular distal margin of endite with bare setae. Robust palp segments II-IV lacking lobes, interior margins, being little convex, situated in one line, bearing dense fringes of long fine-plumose setae. Ratio of width of third segment to that of protruding internal distal margin 5.5 : 1. Third and fourth segments bearing 7-8 and 6-10 long, bare setae, respectively in external distal corner.

Propodus of pereopod I with one stout comb-like infero-distal spine and one serrated rostro-distal spine. Near rostro-distal spine transverse row of 10 long, plumose setae being inserted. Merus and ischium tergally bearing 40-50 and 65-75 long, plumose setae, respectively. These setae, ending in short spine (about 1/10 of total length of seta), densely and regularly plumose: setules longest caudally.

Caudal part of dorsal surface of pleotelson bearing four longitudinal rows of prominent tubercles, two on either side of midline caudally converging. Rostro-laterally pleotelson with another, short row of tubercles. Dorsal surface of body (especially tergites 5-7) with rows of tubercles along posterior margins, those median being most prominent. In lateral view pleotelson subapically concave, posterior margin of apex more or less straight and slightly crenated. In older specimens distal half of lateral margin of pleotelson ridge-like, raised, giving spoon-like appearance.

Uropodal rami robust, usually reaching beyond posterior margin of pleotelson. External margin of exopod with 4-5 pronounced teeth, mostly situated in caudal region. In female these teeth pronounced also and both rami reaching posterior margin of pleotelson.

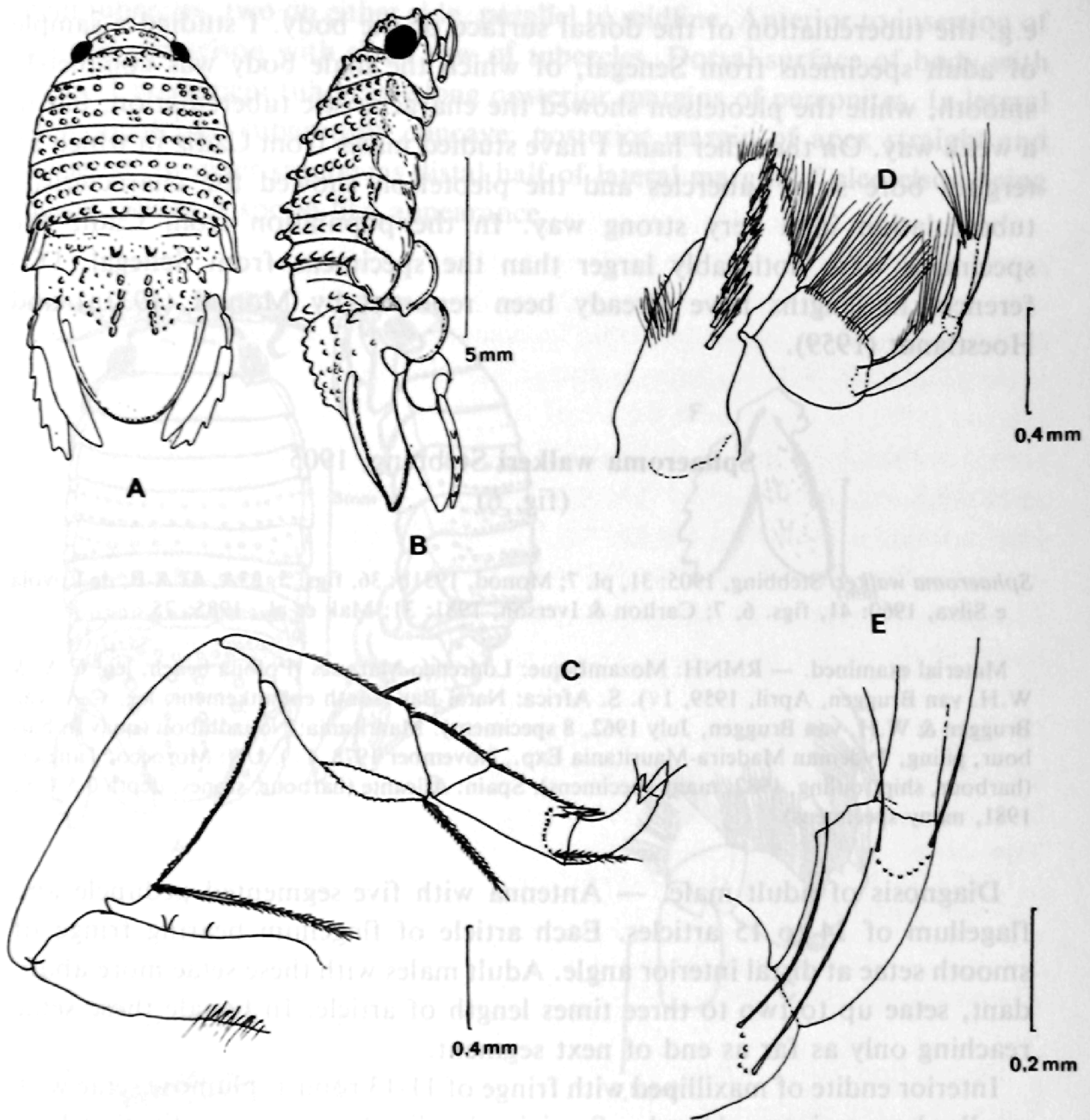


Fig. 5. *S. venustissimum* Monod. a-b, after Monod (1931b): a, tergal view; b, lateral view; c-e, RMNH coll. nr. 6576: c, Pl; d, Mxp; e, Mxp palpsegments III, IV, V.

Ecology. — *S. venustissimum* is an intertidal species, often found under stones preferring clean sand. Sometimes it is found on the beach, a little higher on the shore than *S. serratum*.

Distribution. — The species is found along the Atlantic coast of NW. Africa (Morocco, Mauritania and Senegal) and along the coast of the Iberian peninsula (Algarve, Andalusia).

Remarks. — Like in most other *Sphaeroma* and *Lekanesphaera* species, the populations of *S. venustissimum* differ from each other in some characters,

e.g. the tuberculation of the dorsal surface of the body. I studied a sample of adult specimens from Senegal, of which the male body was completely smooth, while the pleotelson showed the characteristic tuberculation, but in a weak way. On the other hand I have studied males from Cadiz in which all tergites bore stout tubercles and the pleotelson showed the characteristic tuberculation in a very strong way. In the population from Cadiz the specimens were noticeably larger than the specimens from Senegal. Differences in lengths have already been reported by Monod (1931a) and Hoestlandt (1959).

***Sphaeroma walkeri* Stebbing, 1905**

(fig. 6)

Sphaeroma walkeri Stebbing, 1905: 31, pl. 7; Monod, 1931b: 36, figs. 5, 23A, 43 A-B; de Loyola e Silva, 1960: 41, figs. 6, 7; Carlton & Iverson, 1981: 31; Mak et al., 1985: 75.

Material examined. — RMNH: Mozambique: Lourenço Marques (Polona beach, leg. C.A. & W.H. van Bruggen, April, 1959, 1 ♂). S. Africa: Natal Bay (south embankment, leg. C.A. van Bruggen & W.H. van Bruggen, July 1962, 8 specimens). Mauritania: Nouadhibou (quay in harbour, piling, Tydeman Madeira-Mauritania Exp., November 1978, 1 ♂). UN: Morocco: Tangiers (harbour, ship fouling, 1982, many specimens). Spain: Alicante (harbour, stones, depth 0.5-1 m, 1981, many specimens).

Diagnosis of adult male. — Antenna with five-segmented peduncle and flagellum of 14 to 15 articles. Each article of flagellum bearing fringe of smooth setae at distal interior angle. Adult males with these setae more abundant, setae up to two to three times length of article. In female these setae reaching only as far as end of next segment.

Interior endite of maxilliped with fringe of 11-13 robust, plumose setae with swollen base on internal border. Semicircular distal margin of endite with bare setae. Robust palp segments II-IV lacking lobes, interior margins straight, bearing dense fringes of long, fine-plumose setae. Ratio of width of third segment to that of protruding internal margin 6 : 1. In external distal corner third and fourth segment bearing 4-7 and 7-10 long, bare setae, respectively.

Propodus of pereopod I with one stout comb-like infero-distal spine and one serrated rostro-distal spine. Near rostro-distal spine transverse row of 10 long, plumose setae being inserted. Merus and ischium bear tergally 30-40 and 50-60 long, plumose setae, respectively. These setae, ending in a short spine (about 1/10 of total length of seta), being densely and regularly plumose: length of setules best developed caudally.

Dorsal surface of pleotelson bearing four long, longitudinal rows of promi-

ment tubercles, two on either side, parallel to midline. Anterior to insertion of uropod pleotelson with short row of tubercles. Dorsal surface of body with rows of prominent tubercles along posterior margins of pereonites. In lateral view pleotelson subapically concave, posterior margin of apex straight and crenated. In older specimens distal half of lateral margin of pleotelson being raised, giving a spoon-like appearance.

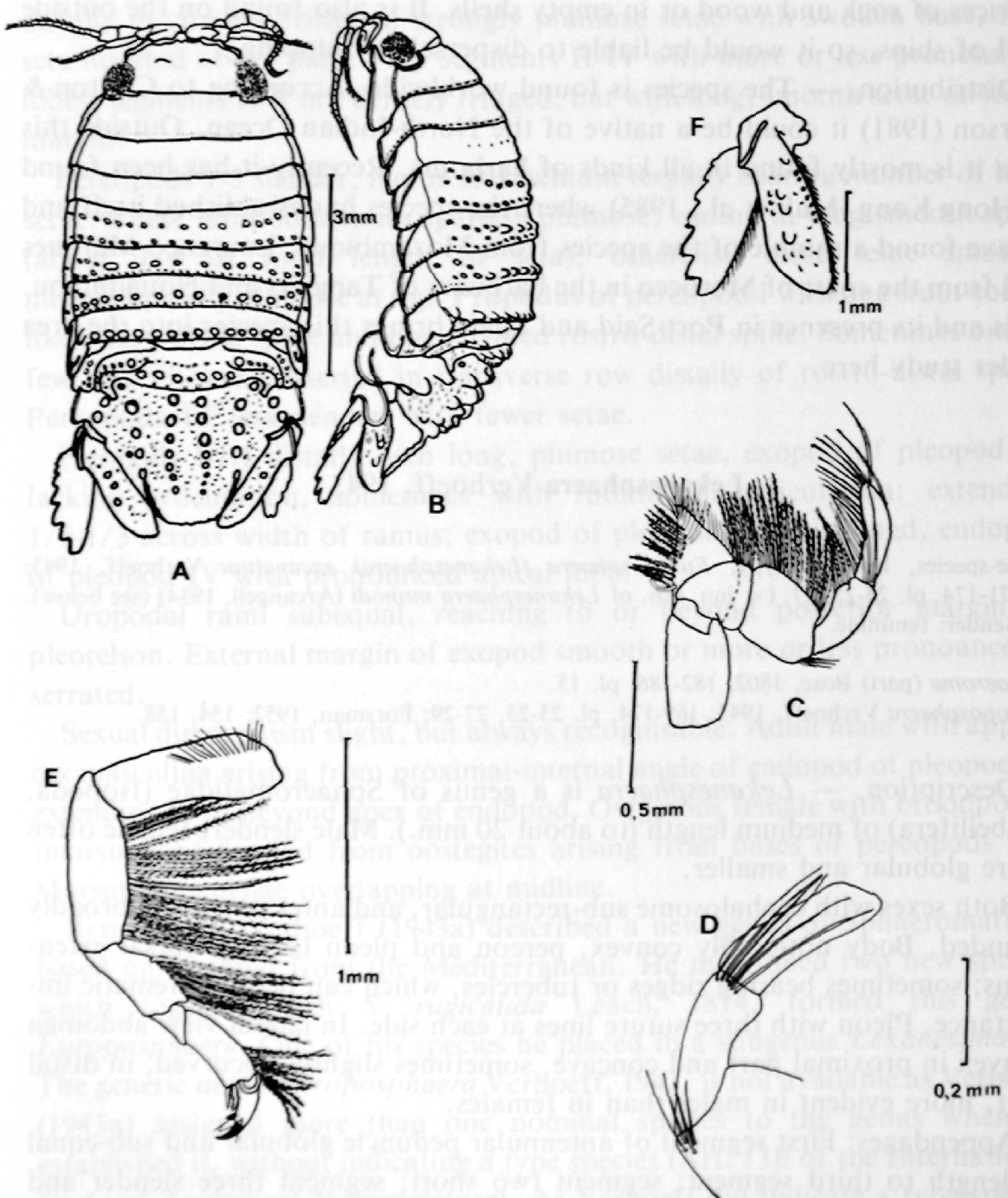


Fig. 6. *S. walkeri* Stebbing. a-e, after Loyola & Silva (1960): a, tergal view; b, lateral view; c, Mxp; d, Pl; e, uropoda ♂; f, RMNH coll. nr. 6578: Mxp palpsegments III, IV, V.

Uropodal rami robust, usually reaching beyond posterior margin of pleotelson. External margin of exopod with 5-7 pronounced teeth, mostly situated in caudal region. In female these teeth pronounced also and both rami reaching posterior margin of pleotelson. In both male and female endopod of uropod dorsally bearing few prominent, median tubercles.

Ecology. — *S. walkeri* is an intertidal species, mostly found in sheltered places, sometimes along the open coast (India, Brazil). It can be found in crevices of rock and wood or in empty shells. It is also found on the outside wall of ships, so it would be liable to dispersal by shipping.

Distribution. — The species is found worldwide. According to Carlton & Iverson (1981) it could be a native of the North-Indian Ocean. Outside this area it is mostly found in all kinds of harbours. Recently it has been found in Hong Kong (Mak et al., 1985) where the species has established itself and I have found a sample of the species from Mozambique, Lourenço Marques and from the coast of Morocco in the harbours of Tangiers and Nouadhibou. This and its presence in Port-Said and Spain brings this species into the area under study here.

Lekanesphaera Verhoeff, 1943

Type-species, by monotypy, *Europosphaera (Lekanesphaera) excavatum* Verhoeff, 1943: 171-174, pl. 23-25, 27. (= jun. syn. of *Lekanesphaera monodi* (Arcangeli, 1934) (see below).
Gender: feminine.

Sphaeroma (part) Bosc, 1802: 182-186, pl. 15.

Europosphaera Verhoeff, 1943: 169-174, pl. 23-25, 27-29; Forsman, 1952: 154, 158.

Description. — *Lekanesphaera* is a genus of Sphaeromatidae (Isopoda, Flabellifera) of medium length (to about 20 mm.). Male slender, female often more globular and smaller.

Both sexes with cephalosome sub-rectangular, and anterior margin broadly rounded. Body noticeably convex, pereon and pleon lacking dorsal extensions; sometimes bearing ridges or tubercles, which can be of systematic importance. Pleon with three suture lines at each side. In lateral view abdomen convex in proximal part and concave, sometimes slightly upcurved, in distal part, more evident in males than in females.

Appendages: First segment of antennular peduncle globular and sub-equal in length to third segment; segment two short; segment three slender and oblong; flagellum multi-articulate, with all articles, except first and sometimes second with few setae and one or two aesthetascs, distal-most article bearing

fringe of setae. First segment of antennal peduncle small; segments four and five more oblong; flagellum with many articles, each article bearing semicircular fringe of smooth setae at distal interior angle. In adult males these fringes of setae being more abundant and better developed than in adult females or juveniles.

Mouthparts of usual sphaeromatid form, not metamorphosed in ovigerous female. Maxillipeds showing important generic character: endite ending distally in circular fringe of strongly plumose setae with swollen base, first seta inserted above palp. Palp segments II-IV with more or less pronounced lobes; segments II-V not densely fringed, but with long, smooth setae on inner margin.

Pereopods 1-3 slender, merus and ischium tergally bearing number of long setae. These setae sometimes sparsely plumose, ending in long smooth spine (about 1/3 of total length of seta), otherwise these setae smooth, microscopically plumose at top. Propodus of pereopod I with one stout comb-like infero-distal spine and one serrated rostro-distal spine. Sometimes one or few smooth setae inserted in transverse row distally of rostro-distal spine. Pereopods 4-7 less slender, with fewer setae.

Pleopods I-III distally with long, plumose setae, exopod of pleopod III lacking articulation, sometimes with rudimental articulation: extending 1/5-1/3 across width of ramus; exopod of pleopod IV articulated, endopod of pleopod IV with pronounced apical lobe.

Uropodal rami subequal, reaching to or beyond posterior margin of pleotelson. External margin of exopod smooth or more or less pronouncedly serrated.

Sexual dimorphism slight, but always recognisable. Adult male with appendix masculina arising from proximal-internal angle of endopod of pleopod II, extending to or beyond apex of endopod. Ovigerous female with broodpouch (marsupium) formed from oostegites arising from bases of pereopods 2-4. Marsupial lamellae overlapping at midline.

Remarks. — Verhoeff (1943a) described a new genus of Sphaeromatidae based on material from the Mediterranean. He mentioned two new species which together with *S. rugicauda* Leach, 1814, formed this genus *Europosphaera*. One of his species he placed in a subgenus *Lekanesphaera*. The generic name *Europosphaera* Verhoeff, 1943, is not available as Verhoeff (1943a) assigned more than one nominal species to the genus when he established it, without indicating a type species (Art. 13b of the International Code of Zoological Nomenclature). As Verhoeff did indicate a type species for his subgenus *Lekanesphaera*, that name becomes thereby available and being the oldest available name for the genus, has to be accepted as the valid