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## Sphaeromatidae from coral reefs of the Society Islands, French Polynesia (Crustacea : Isopoda).

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**Abstract :** Three species of sphaeromatid isopods are recorded from coral reefs at Bora Bora and Moorea, Society Islands. *Neonaesa rugosa* Harrison & Holdich, 1982, *Paracassidinopsis sculpta* Nobili, 1906, and *Paradella tuberculata* n.sp. are (re)described. The genus *Neocassidina* Roman, 1974 is considered a junior synonym of *Paracassidinopsis*.

**Résumé :** Trois espèces d'isopodes Sphaeromatidae des récifs coralliens de Bora Bora et Moorea, dans les Iles de la Société, sont étudiées ici : *Neonaesa rugosa* Harrison & Holdich, 1982, *Paracassidinopsis sculpta* Nobili, 1906, et *Paradella tuberculata* n. sp. Le genre *Neocassidina* Roman, 1974, est considéré comme un synonyme plus récent de *Paracassidinopsis*.

### INTRODUCTION

Our knowledge concerning the marine isopod fauna of tropical islands in the Pacific is very limited. Only Nobili (1906, 1907) recorded on three species of Sphaeromatidae from the Tuamotu Archipelago, French Polynesia.

During a survey of coral reef inhabiting crustaceans at Bora Bora and Moorea, Society Islands, three species of Sphaeromatidae in three genera were collected by the author. One of these is new to science, belonging to the genus *Paradella* Harrison & Holdich, 1982. Another species *Neonaesa rugosa* Harrison & Holdich, 1982, is first recorded from the eastern Pacific. Moreover, *Paracassidinopsis sculpta* Nobili, 1906, already known from French Polynesia (the islands Rikitea and Marutea in the Tuamotu Archipelago), has been found in Moorea. The present paper summarizes the information available for these species and gives detailed descriptions.

The specimens are stored in the Muséum National d'Histoire Naturelle, Paris, France (MNHN), the Senckenberg Museum, Frankfurt, Germany (SMF) and the Queensland Museum, Brisbane, Australia (QM).

### METHODS

Samples were obtained by hand while skin diving or wading in very shallow water. The substratum was collected and transported in plastic barrels. After storage in 5 %

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formalin/sea-water for some hours, the material has been washed with fresh water over a 0.5 mm sieve and preserved in 70 % ethanol. Appendages removed from specimens were preserved in glycerine on a microscopical slide and sealed with paraffin.

#### Systematic account

*Neonaesa* Harrison & Holdich, 1982.

*Neonaesa rugosa* Harrison & Holdich, 1982 : 442 (Figs 1-6).

Material : 26 ♂, 4 ♀ (1 ovigerous) (MNHN), Bora Bora ; fringing reef near Vaitape ; dead corals covered with sponges and algae, near slope, 0.5-1 m, 27 February - 6 March 1988. 7♂, 1 ♀ (ovigerous) (QM), Moorea ; crest of Tiahura barrier reef ; dead corals, 0.5-1 m, 25 March 1988. 56 ♂, 11 ♀ (9 ovigerous) (SMF 19339), Moorea : Cook's Bay, about 50 m south of "R. Gump South Pacific Biological Research Station" ; sheltered fringing reef, 0.5-1 m, 25 March 1988. 2 ♂ (MNHN), Moorea ; exposed fringing reef near Afareaitu ; coral slope, dead corals, 1-2 m, 26 March 1988. 1 ♀ (ovigerous) (MNHN), Moorea ; about 2.6 km west of airport, near Maharepa ; crest of barrier reef, dead corals, 0.5 m, March 1988.

Description, ♂ : total length about 7 mm. Dorsal surface of body with scattered granules. Lateral eyes large, composed of many small ommatidia. Pleotelson with lateral ridges and medial, posteriorly directed hump. Posterior margin of pleotelson with 3 shallow notches. Clypeal region as figured. Penes small, well separated tubercles (not illustrated).

Antenna 1, peduncle of 3 articles ; proximal article longest, longer than articles 2 and 3 together ; second article wider than long ; third article narrow, twice length of second article ; flagellum of 8 articles ; first flagellar article short and wider than long, bearing 2 simple setae and 2 feathered sensory setae ; articles 2-7 longer than wide ; articles 4-7 bearing single aesthetasc ; terminal article minute, as wide as long, bearing some distal simple setae. Antenna 2, peduncle 5-articulated, articles increasing in length distally ; flagellum of 10 setose articles which are longer than wide. Incisor of mandibles unicuspidate ; spine row of right mandible composed of 6 spines of different shape ; lacinia mobilis of left mandible 3-cuspidate ; spine row of 7 spines ; molar of both mandibles strongly developed, wider than long ; second article of 3-articulated mandibular palp longest, bearing 4 elongate distal setae ; distal article bearing 7 setae in two distal thirds. Maxilla 1, endopodite shorter and more slender than exopodite, bearing 4 distal plumose spines and 1 short seta ; exopodite with 9 robust distal spines and 6 setae at medial margin. Maxilla 2, inner lobe with 6 distal spines of different shape, 1 short seta and several setules along medial margin ; inner lobe of outer ramus with 6, outer lobe with 5 curved spines. Maxilliped, palp of 5 articles ; articles 2-4 with setose mediiodistal lobe ; endite distally rounded, with 6 plumose setae and a short simple seta at mediiodistal margin ; medial margin of endite with single coupling hook. Pereopod 1 relatively robust, posterior margin of propodus with 2 elongate spines ; carpus roughly triangular, posterodistal margin bearing elongate spine ; posterior margin of ischium with short, tooth-shaped tubercle. Pereopods 2-7 slender, carpus rectangular ; pereopods 3-5 quite similar to each other, anterior margin of basis with tooth-shaped tubercle.

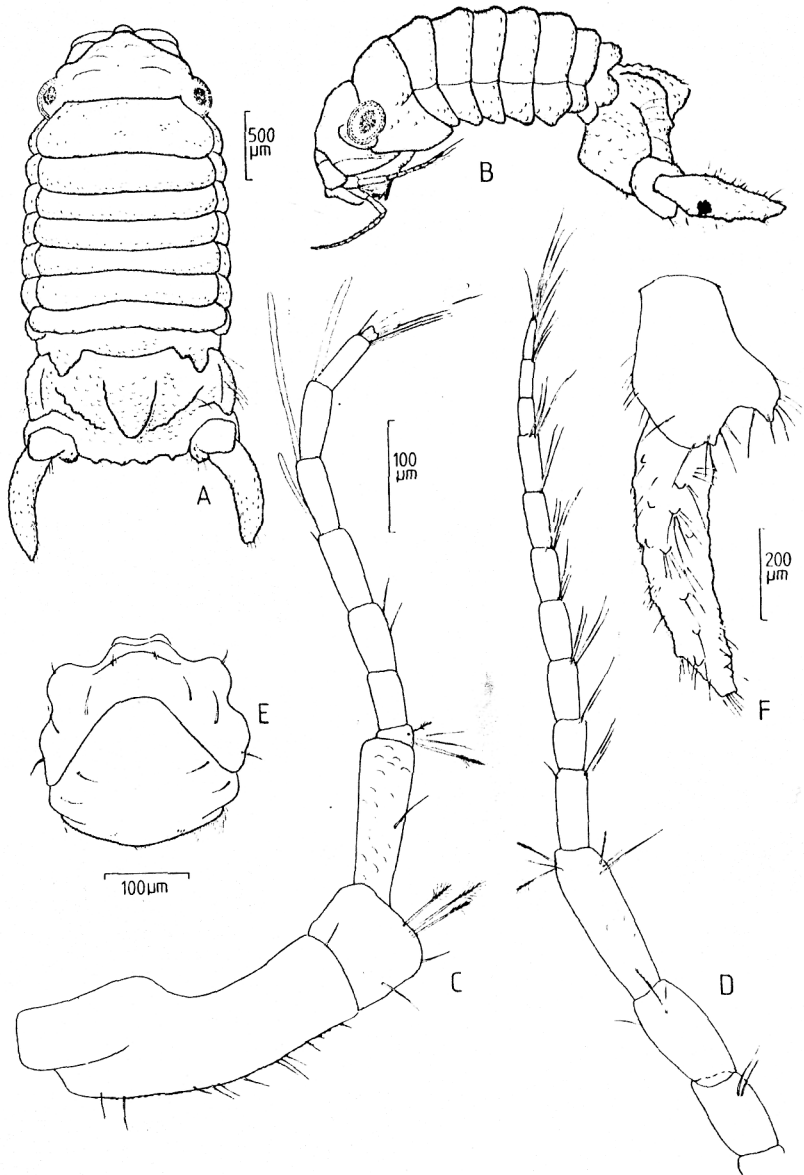


Fig. 1: *Neonaesa rugosa* Harrison & Holdich, 1982, ♂ : A, dorsal view : B, lateral view, pereopods omitted : C, antenna 1 : D, antenna 2 : E, clypeal region : F, uropod.

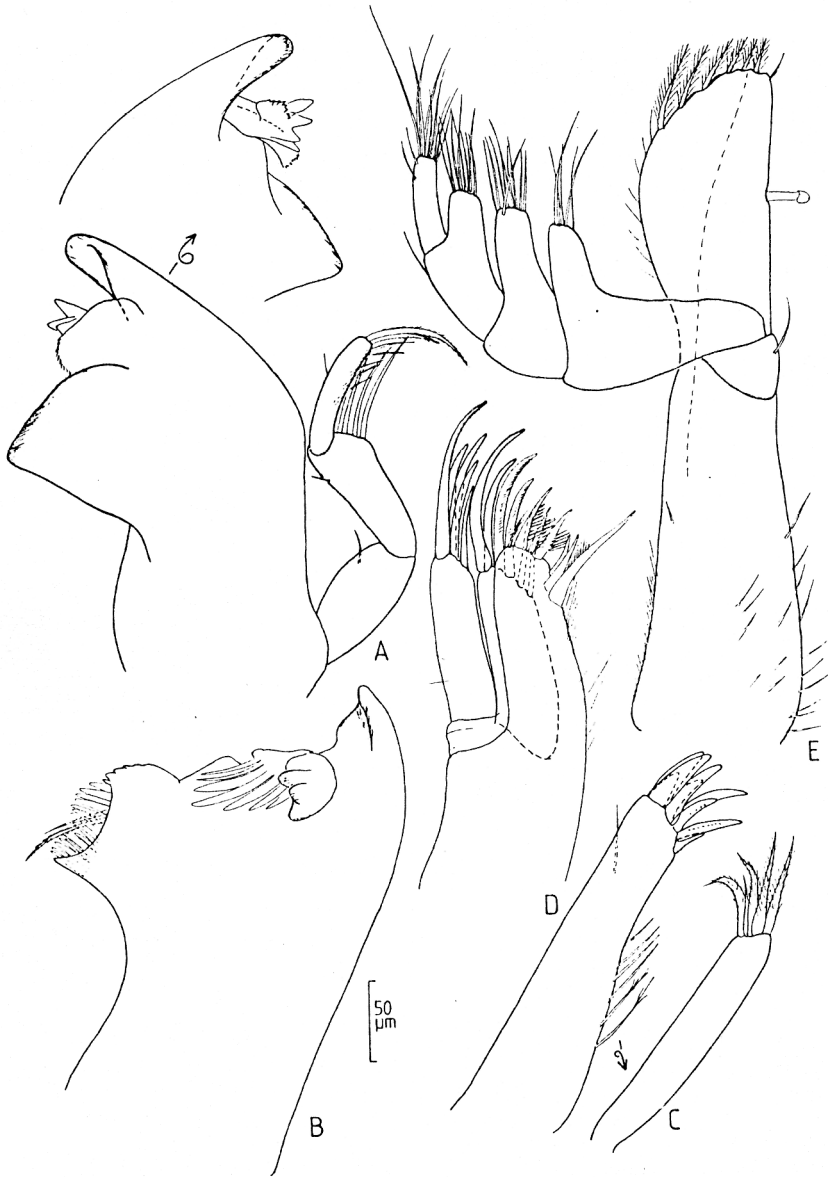


Fig. 2: *Neonaesa rugosa* Harrison & Holdich 1982, ♂ : A, right mandible ; B, left mandible, palp omitted ; C, maxilla 1 ; D, maxilla 2 ; E, maxilliped.



Fig. 3. : *Neonaesa rugosa* Harrison & Holdich, 1982. ♂ : A, pereopod 1 ; B, pereopod 2 ; C, pereopod 3.



Fig. 4 : *Neonaesa rugosa* Harrison & Holdich, 1982. ♂ : A, pereopod 6 : B, pereopod 7 : C, pleopod 1.

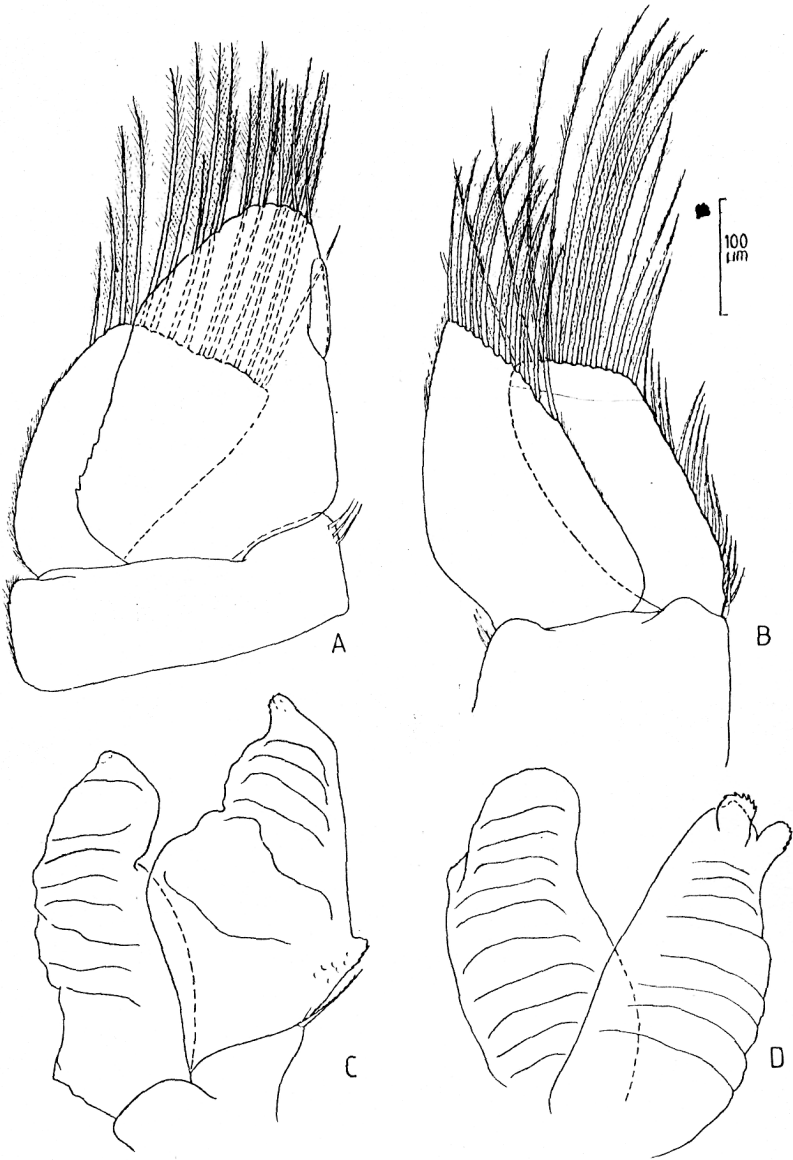


Fig. 5 : *Neonaesa ringosa* Harrison & Holdich, 1982, ♂ : A, pleopod 2 ; B, pleopod 3 ; C, pleopod 4 ; D, pleopod 5.

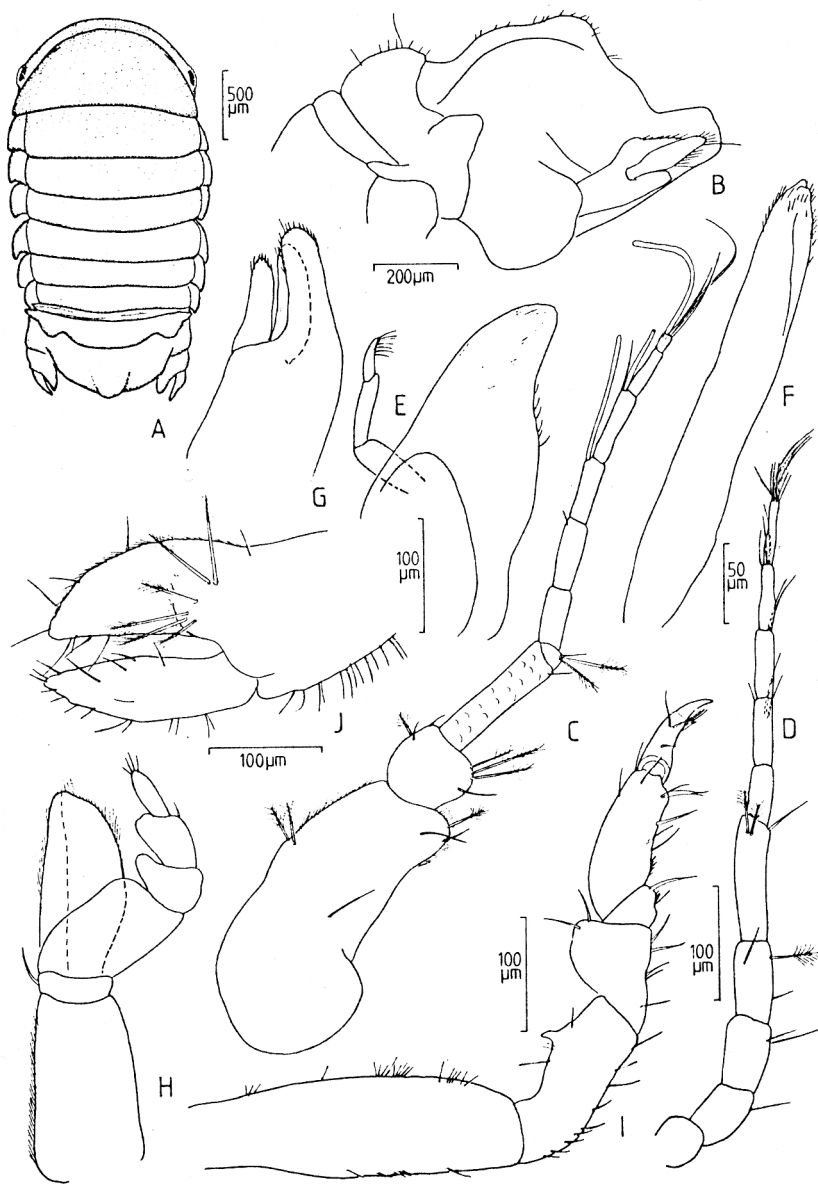


Fig. 6: *Neonaesa rugosa* Harrison & Holdich, 1982, ovigerous ♀: A, dorsal view; B, posterior part of body, lateral view; C, antenna 1; D, antenna 2; E, mandible; F, maxilla 1, inner ramus broken off; G, maxilla 2; H, maxilliped; I, pereopod 1; J, uropod.



Ischium and propodus of pereopod 7 more slender and more densely setose than in pereopods 1-6; posterior margin of carpus and merus with some elongate setae. Pleopod 1, sympodite with 3 retinaculae; endopodite bearing 11, exopodite bearing 23 plumose setae. Pleopod 2, sympodite with 3 retinaculae; exopodite truncate, 2/3 of length of roughly triangular endopodite; appendix masculina short, distally rounded, articulating at proximal part of distal half of endopodite. Pleopod 3, sympodite with 3 retinaculae; exopodite with sub-apical articulation; exopodite about 4/5 of length of endopodite, bearing 29 plumose setae along distal and ectal margin; endopodite roughly triangular, bearing 11 distal plumose setae. Both rami of pleopods 4 and 5 with transverse ridges; exopodite of pleopod 5 with 2 denticulate, rounded distal projections. Endopodite of uropod fused with sympodite, indicated as lateral tubercle; exopodite relatively long, somewhat medially curved and granular, 1.6-1.7 times length of sympodite.

Ovigerous ♀: total length about 5.6 mm. Integument smooth. Lateral eyes relatively small. Pleotelson with shallow medial hump.

Antenna 1, first article of peduncle more robust than in ♂; flagellum of 7 articles; articles 4-6 bearing aesthetasc. Flagellum of antenna 2 of only 5 articles. Mouthparts strongly metamorphosed. Mandible with small palp; third article of palp with 7 short setae. Lobes of maxillae simple, without spines. Maxilliped much smaller than in ♂, palp with few distal setae. Pereopods quite similar to ♂. Endopodite and exopodite of uropod similar to each other; endopodite fused with sympodite, more robust than exopodite; proximal part of endopodite with 6 feathered sensory setae.

Remarks: The monotypic genus *Neonaesa*, with the species *N. rugosa*, was previously known only from coral reefs of the Queensland area, Australia (Harrison & Holdich, 1982 a: 425). The present records therefore considerably extend its known range eastward to the Society Islands in the south-eastern Pacific. It was considered useful to figure this species again to show some features in more detail than in the original description and to point out some differences with the Australian material.

Specimens from Australia available for re-examination closely resemble those from the Society Islands. However, males from Australia have the uropodal exopodite somewhat shorter, 1.3 times as long as the sympodite, and the medial hump of the pleotelson is less pronounced.

At Bora Bora and Moorea *N. rugosa* was found in more numerous in sheltered or moderately exposed locations, associated with dead coral substratum. Few specimens are available from strongly exposed sampling stations at the barrier reef of Moorea.

*Paracassidinopsis* Nobili, 1906

*Paracassidinopsis sculpta* Nobili, 1906: 268; 1907: 424 (Figs 7-12)

Material: 1 ♂, 2 immature adults (1 preparatory ♂), deposited as follows: 1 ♂, 1 preparatory ♂, SMF 19338; 1 immature adult, MNHN; Moorea, coral slope of exposed fringing reef near Afareaitu; dead corals, 1-2 m, 26 March 1988.

Description, immature adult: total length 1.5 mm. Integument indurate, lateral eyes well pigmented. Dorsal surface of body with some scattered small pigment spots. Fused pleonite

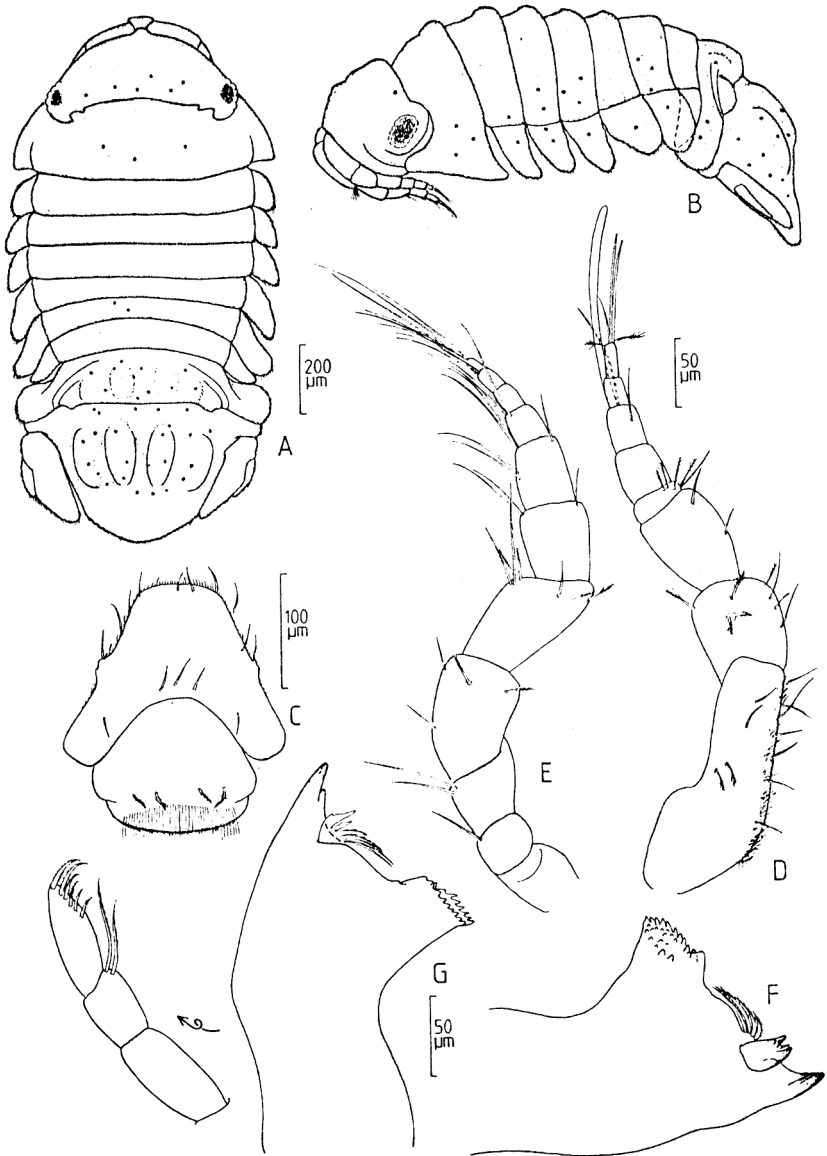


Fig. 7: *Paracassinopsis sculpta* Nobili, 1906 : immature adult : A, dorsal view ; B, lateral view ; C, clypeal region ; D, antenna 1 ; E, antenna 2 ; F, left mandible, palp omitted ; G, right mandible.

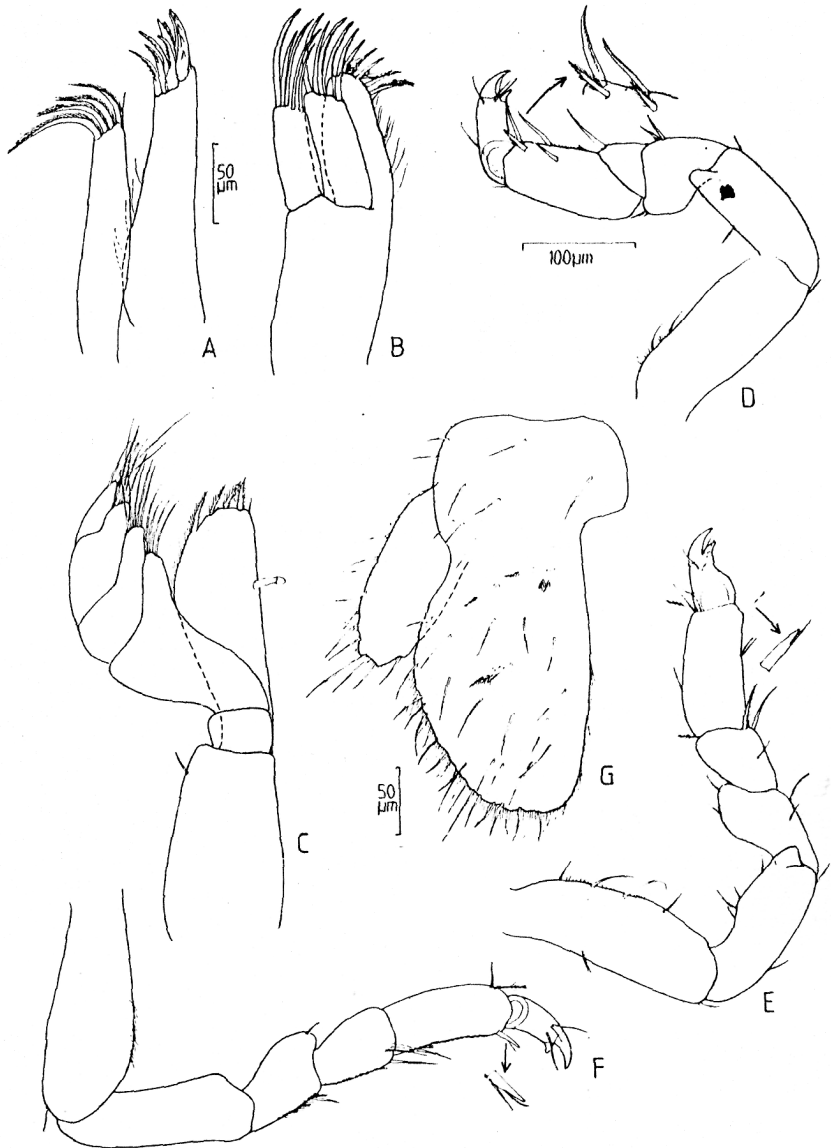


Fig. 8 : *Paracassidinopsis sculpta* Nobili, 1906, immature adult : A. maxilla 1 ; B. maxilla 2 ; C. maxilliped ; D. pereopod 1 ; E. pereopod 2 ; F. pereopod 7 ; G. uropod.

section with transverse row of low oval tubercles. Pleotelson with transverse row of elongate oval tubercles ; distal fourth of pleotelson broad, tapering to broadly rounded distal margin. Clypeal region as figured.

Antenna 1, peduncle 3-articulated ; proximal article curved, 1.5 times as long as articles 2 and 3 combined ; flagellum of 5 articles ; proximal article shortest and widest, bearing 4 feathered sensory setae ; third article with robust aesthetasc ; terminal article narrowest, bearing 3 simple and 2 feathered sensory setae. Peduncle of antenna 2 of 5 articles, increasing in size distally ; flagellum of 6 setose articles. Mandibular palp 3-articulated ; articles 1 and 3 subequal in length, longer than second article ; article 2 bearing 2 long, article 3 bearing 6 short fringed setae. Both mandibles with 2-cuspidate incisor ; lacinia mobilis of left mandible with 3 cusps ; spine row of left mandible with 4 fringed spines ; molar blunt, with several denticles and marginal teeth. Right mandible, spine row of 6 spines ; molar as in left mandible. Maxilla 1, inner ramus with 4 curved, elongate fringed setae and a very short simple seta ; outer ramus with 8 denticulate and pectinate stout spines. Maxilla 2, inner ramus with 6 fringed spines at distal and mediolateral margin ; both lobes of outer ramus with 5 elongate curved spines. Maxillipedal endite with single coupling hook ; distal margin of endite with 4 rather short plumose spines ; palp 5-articulated, article 2 longest ; articles 2-4 with setose mediolateral lobe. Pereopod 1 with stout unguis and accessory spine on dactylus ; posterodistal margin of propodus with 2 finely fringed spines ; mesial surface

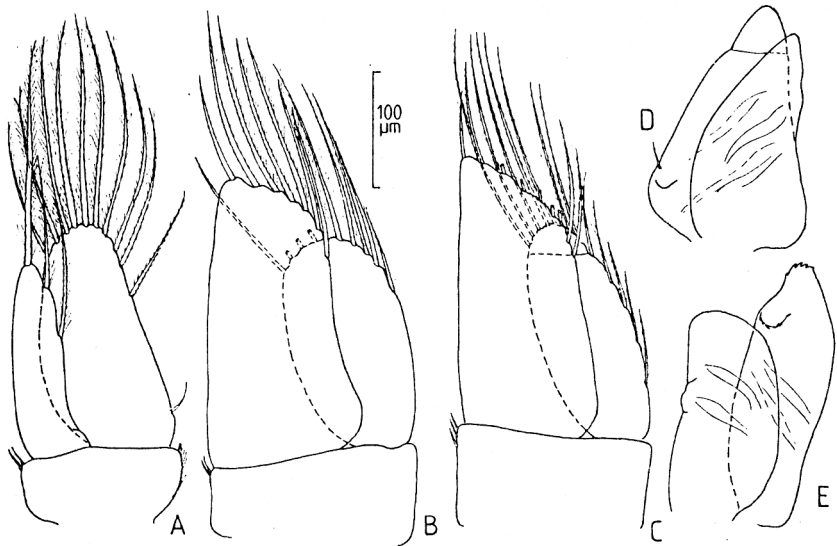


Fig. 9 : *Paracassinopsis sculpta* Nobili, 1906, immature adult : A, pleopod 1 ; B, pleopod 2 ; C, pleopod 3 ; D, pleopod 4 ; E, pleopod 5.

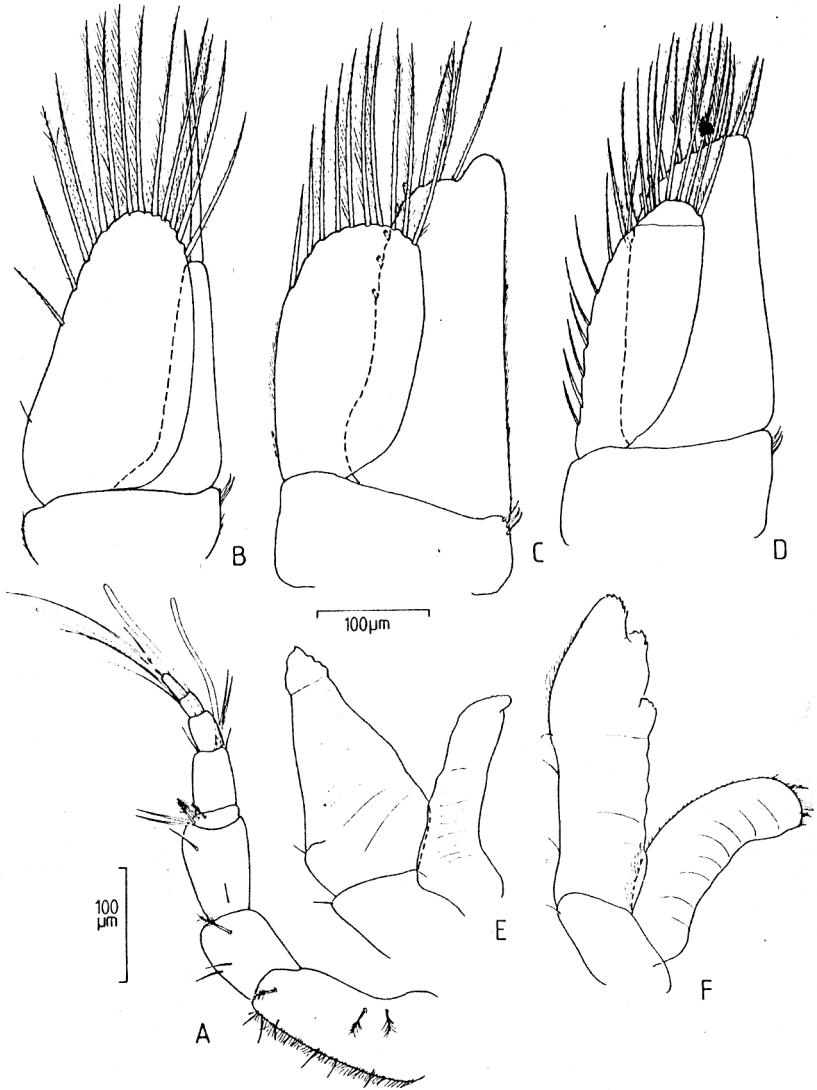


Fig. 10 : *Paracassinopsis sculpta* Nobili, 1906, preparatory ♂ : A, antenna 1 ; B, pleopod 1 ; C, pleopod 2 ; D, pleopod 3 ; E, pleopod 4 ; F, pleopod 5.

of propodus with 2 shorter plumose spines; carpus roughly triangular with elongate posterodistal spine. Pereopods 2-6 robust, similar to each other; propodus with stout posterodistal spines. Propodus and carpus of pereopod 7 more slender than in pereopods 1-6. Pleopod 1, sympodite with 2 retinaculae; endopodite narrow,  $4/5$  of length of wider exopodite; endopodite with 3, exopodite with 10 marginal plumose setae. Pleopod 2, sympodite with 2 retinaculae; endopodite proximally broad, somewhat tapering distally, longer than ovate exopodite; distal margin of endopodite with 7, of exopodite with 9 plumose setae. Pleopod 3, sympodite with 3 retinaculae; endopodite proximally broad, somewhat tapering distally; exopodite ovate, with transverse suture in distal fifth; endopodite with 9, exopodite with 13 marginal plumose setae. Pleopod 4, endopodite tapering distally, with distal transverse suture; exopodite with transverse ridges. Pleopod 5, exopodite with 2 rounded distal denticulate bosses; endopodite roughly oval, shorter and wider than exopodite, with 2 transverse ridges. Uropodal endopodite wide, somewhat tapering in distal half to broadly rounded apex, fused with sympodite; surface of endopodite with several simple and 7 feathered sensory setae; uropodal exopodite small, roughly ovate in outline; margin of both uropodal rami with several simple setae and numerous setules.

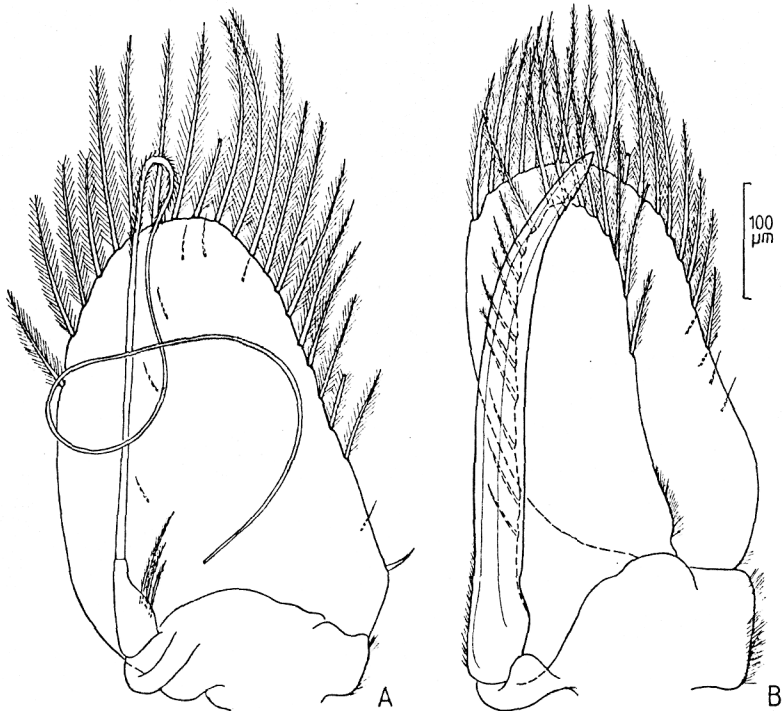


Fig. 11 : *Paracassidinopsis sculpta* Nobili, 1906. ♂ : A, pleopod 1; B, pleopod 2.

Preparatory  $\delta$  : articles 2, 3 and 4 of antenna 1 flagellum bearing robust aesthetasc. Endopodite of pleopod 1 narrow, tapering distally and bearing elongate stout spine at apex ; distal margin of exopodite with 13 plumose setae. Pleopod 2, endopodite with rounded mediobasal projection indicating incompletely developed appendix masculina ; distal margin of endopodite with 8 plumose setae ; distal margin of exopodite with 10 plumose setae. Endopodite of pleopod 3 with 11, exopodite with 16 marginal plumose setae. Exopodite of pleopod 4 with short seta at outer proximal margin. Exopodite of pleopod 5 with 3 rounded distal denticulate bosses.

Mature  $\delta$  : in general habitus, antennae, mouthparts, pereopods and uropods similar to preparatory  $\delta$ . Endopodite of pleopod 1 very small, ectal margin bearing 3 short plumose setae ; apex of endopodite with extremely long, twisted seta ("flagellum") ; distal loop of flagellum extending beyond distal margin of exopodite, in that part bearing numerous denticles ; exopodite broad, roughly ovate, its margin bearing 20 plumose setae in distal half. Pleopod 2, sympodite lacking retinaculae ; endopodite about half width of exopodite, not reaching to distal margin of exopodite ; appendix masculina strongly developed, articulating at mediobasal margin of endopodite, directed outward in distal third ; distal third stylet-

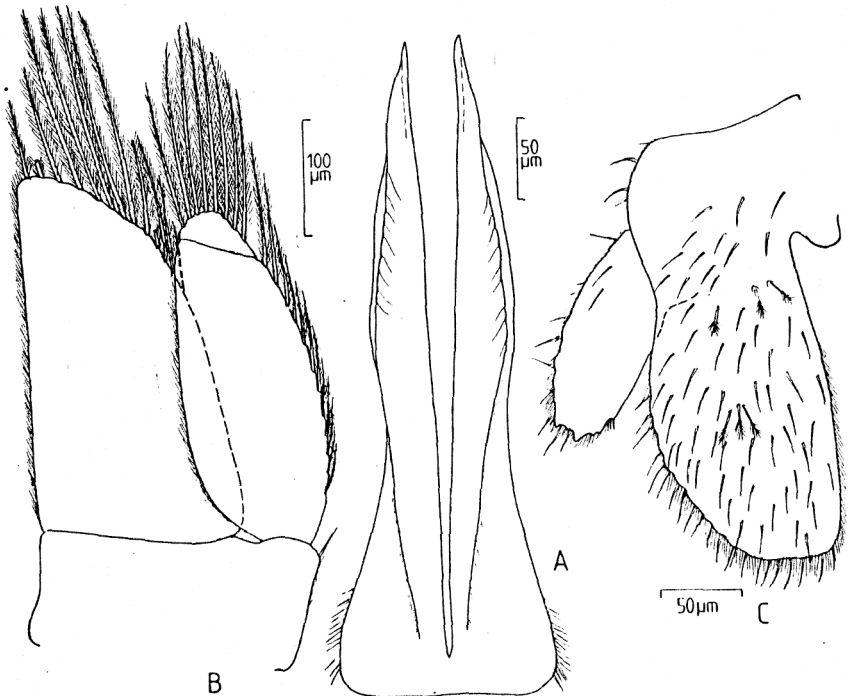


Fig. 12 : *Paracassinopsis sculpta* Nobili, 1906.  $\delta$  : A, penes ; B, pleopod 3 ; C, uropod.

to-like, with 4 denticulations at ectal margin ; appendix masculina slightly extending beyond distal margin of exopodite ; margin of endopodite with 18 plumose setae ; exopodite with 16 marginal plumose setae. Pleopod 3, endopodite with 16 distal marginal setae ; exopodite ovate, slightly shorter than endopodite, with 20 marginal setae. Uropod quite similar to immature adult. Penaeal rami stout, fused at base, tapering in distal half to acute apex.

Remarks : The complete redescription of a specimen has been made from an immature adult, because the only mature ♂ of the fresh material available was broken in to two pieces. Six syntypes of *P. sculpta* in poor condition from the Museum National d'Histoire Naturelle in Paris have been to available me for comparison with the material from the Society Islands. The original description does not show all features characteristic for the genus. The figure of the pleotelson presented by Nobili (1907 : pl. II, Fig. 13a) is not correct, the pleotelson is much wider in its distal half. The characteristic morphology of the male pleopods 1 and 2 has never been shown in detail.

Roman (1974) described in great detail a new species of Sphaeromatidae from Madagascar with all the decisive features of *Paracassidinopsis*. She couldn't be aware of this fact and established the new genus *Neocassidina* for the species *N. perlata*. One mature ♂ of this species has been recently collected by myself in Kenya (Müller, in prep.). Comparison of that specimen with material of *Paracassidinopsis sculpta* clearly revealed that *Neocassidina* has to be considered a junior synonym of *Paracassidinopsis*. This genus is unique within the Sphaeromatidae by its very long flagellum at the endopodite of the first ♂ pleopods.

Thus, the genus *Paracassidinopsis* comprises two species, *P. sculpta* Nobili, 1906 from French Polynesia and *P. perlata* (Roman, 1974) from Madagascar and Kenya. *N. perlata* can easily be distinguished from *N. sculpta* by the strongly vaulted pereonites, the densely setulose body and by the presence of 6 tubercles on the pleotelson instead of four in *P. sculpta*.

*Paradella* Harrison & Holdich, 1982  
*Paradella tuberculata* n.sp. (Figs 13-16)

Holotype : Preparatory ♂ (SMF 19336), Moorea ; coral slope of exposed fringing reef near Afareaitu ; dead corals, 1-2 m, 26 March 1988.

Paratypes : 3 ♀ (ovigerous), deposited as follows : 2 ♀ (ovigerous) MNHN ; 1 ♀ (ovigerous) SMF 19337 ; Moorea ; collected together with holotype.

Derivatio nominis : The specific name is derived from the tuberculate pleon of the new species.

Description, preparatory ♂ : total length 1.9 mm. Dorsal surface of body with scattered granules and small pigment patches. Eyes large and well pigmented, situated anterolaterally. Fused pleonite section with 2 stout, granular tubercles, one on either side of midline. Dorsum of pleotelson with 8 stout, granular tubercles in two transverse rows of 4.

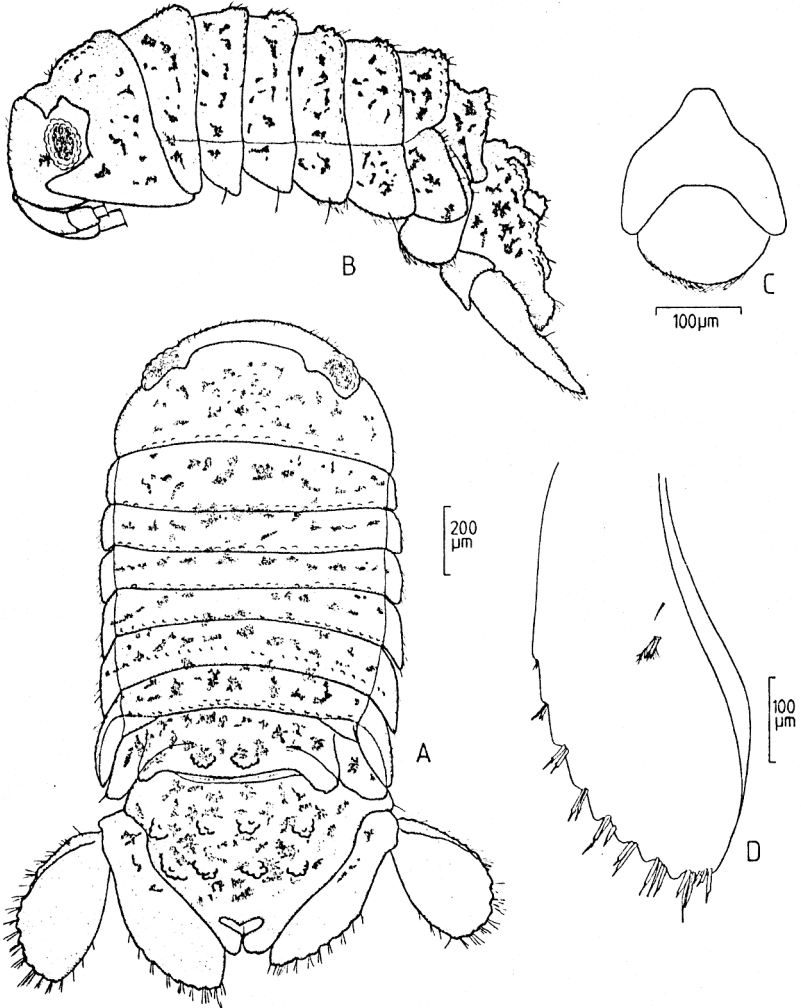


Subapical foramen of pleotelson heart-shaped in dorsal view. Clypeal region as figured. Penes smooth, fused at base, tapering distally.

Antenna 1, peduncle 3-articulated; first article widest, as long as second and third article combined; flagellum of 8 articles; proximal article wider than long, bearing 2 feathered sensory setae; articles 3-6 with single aesthetasc; terminal article narrowest, tipped with 2 simple setae. Antenna 2, peduncle 5-articulated with distal peduncular article longest; flagellum of 11 setose articles. Incisor of mandible 4-cuspidate; spine row of right mandible with 2 robust denticulate and 3 fringed slender spines; lacinia mobilis of left mandible 3-cuspidate, spine row of 4 slender spines; molar blunt with many tooth-shaped tubercles, marginal tubercles largest; molar of left mandible with 2 short fringed setae; article 1 of 3-articulated palp longest; article 2 with 4, article 3 with 7 fringed spines. Maxilla 1, inner ramus with 4 apical fringed spines; outer ramus with 7 robust spines and several setules. Maxilla 2, inner ramus with 4 distal spines of different shape and many setules; inner and outer lobe of outer ramus with 5 elongate spines, one of the inner lobe strongly pectinate. Maxilliped with 5-articulated palp, articles 2-4 with setose mediiodistal lobe; endite of mandible widening distally, bearing 9 distal spines of different shape and many setules; medial margin of endite with single coupling hook. Pereopod 1 shorter and more robust than other pereopods. Posterior margin of dactylus in pereopods 1 and 2 bearing some membranous scales; posterodistal margin of propodus of pereopod 1 with robust, elongate spine; carpus of pereopod 1 triangular, roughly trapezoid in pereopods 4-6 and rectangular in pereopods 2-3 and 7; anterodistal margin of merus in pereopods 4-6 with pair of pectinate spines; merus of pereopod 7 with 5 pectinate and fringed spines; posterior margin of propodus, carpus and merus densely setulose in pereopods 2-7; anterior margin of ischium and basis with scattered spinules. Sympodite of pleopods 1-3 with 3 retinaculac. Distal margin of endopodite of pleopod 1 slightly extending beyond exopodite; endopodite with 13, exopodite with 17 plumose setae. Pleopod 2, endopodite roughly triangular, with 10 plumose marginal setae; appendix masculina freely articulating, slightly extending beyond distal margin of ramus, bearing short apical seta; ovate exopodite bearing 17 plumose setae. Endopodite of pleopod 3 triangular, bearing 13 plumose setae; exopodite with 19 plumose setae. Pleopod 4, endopodite half of length of exopodite; exopodite with short distal spine. Exopodite of pleopod 5 with apical articulation and 2 denticulate bosses. Both rami of pleopods 4 and 5 with transverse ridges. Uropodal endopodite fused with sympodite, elongate ovate, extending beyond distal margin of pleotelson; outer distal margin with shallow indentations bearing some short spines; dorsal surface of endopodite with 3 feathered sensory setae; exopodite ovate, with denticulate and spinose outer and distal margins.

Ovigerous ♀: in size and habitus resembling preparatory ♂. Dorsal tubercles restricted to pleotelson, not granular. Apical pleotelsonic foramen roughly semicircular.

Remarks: this species resembles *Paradella octaphymata* Harrison & Holdich, 1982 from Australia, which has a similar arrangement of pleonal tubercles. However, these tubercles are smooth and narrower in males and preparatory males of *P. octaphymata*, granular and broader in *P. tuberculata* n.sp. (cf. Harrison & Holdich, 1982b: 100, Fig. 5). The relative lengths of the copulatory stylets of the second pleopods cannot be compared without knowledge of the mature ♂ of *P. tuberculata* n.sp.



512 Fig. 13: *Paradella tuberculata* n.sp., preparatory ♂, holotype : A, dorsal view ; B, lateral view ; C, clypeal region ; D, endopodite of uropod.

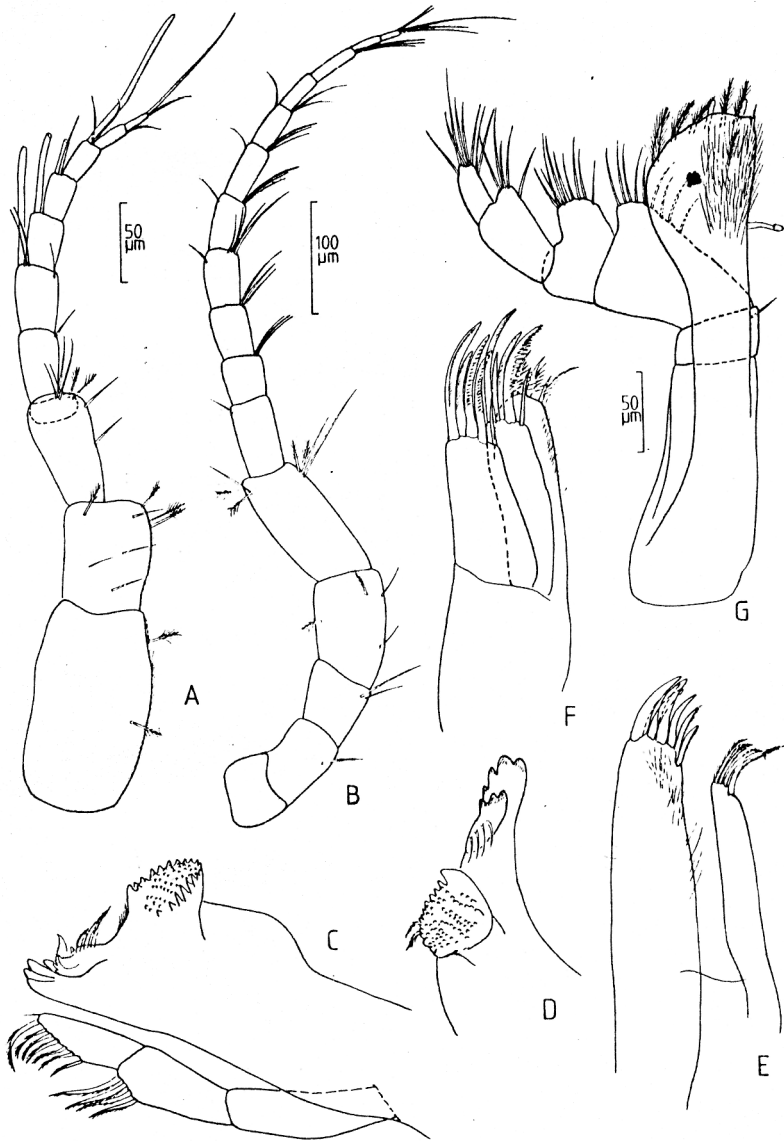


Fig. 14 : *Paradella tuberculata* n.sp., preparatory ♂, holotype : A, antenna 1 ; B, antenna 2 ; C, right mandible ; D, distal part of left mandible ; E, maxilla 1 ; F, maxilla 2 ; G, maxilliped.

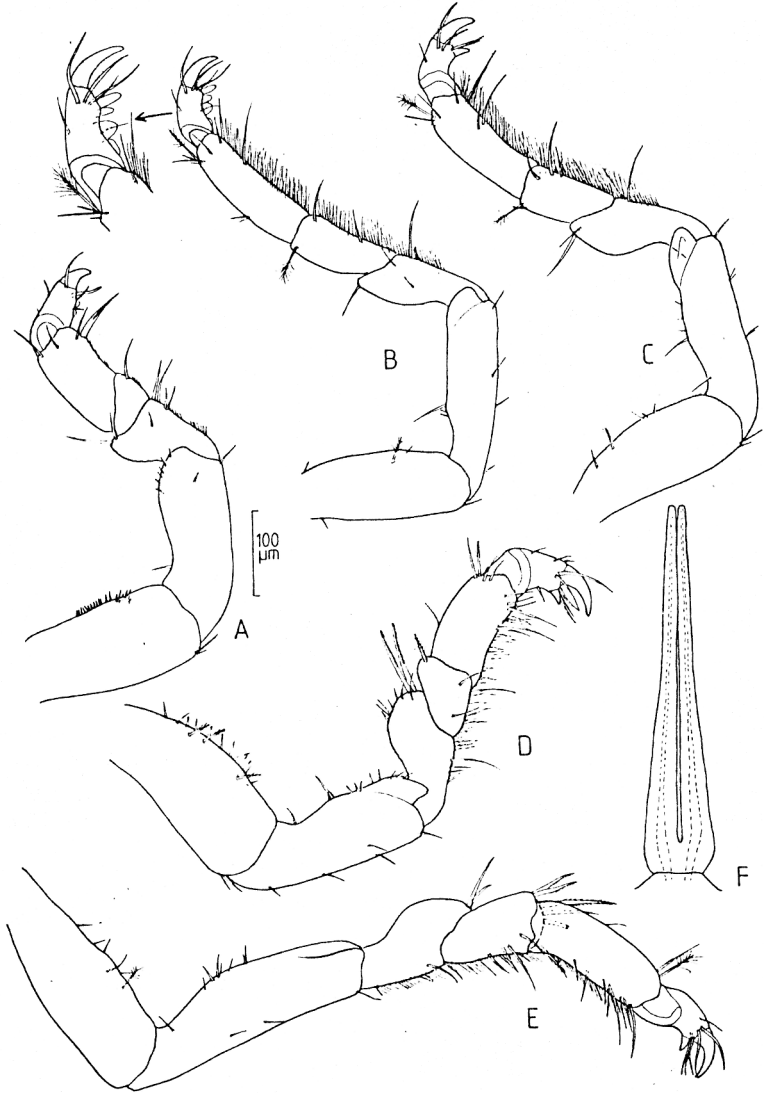


Fig. 15 : *Paradella tuberculata* n.sp., preparatory ♂, holotype : A, pereopod 1 ; B, pereopod 2 ; C, pereopod 3 ; D, pereopod 4 ; E, pereopod 7 ; F, penis.

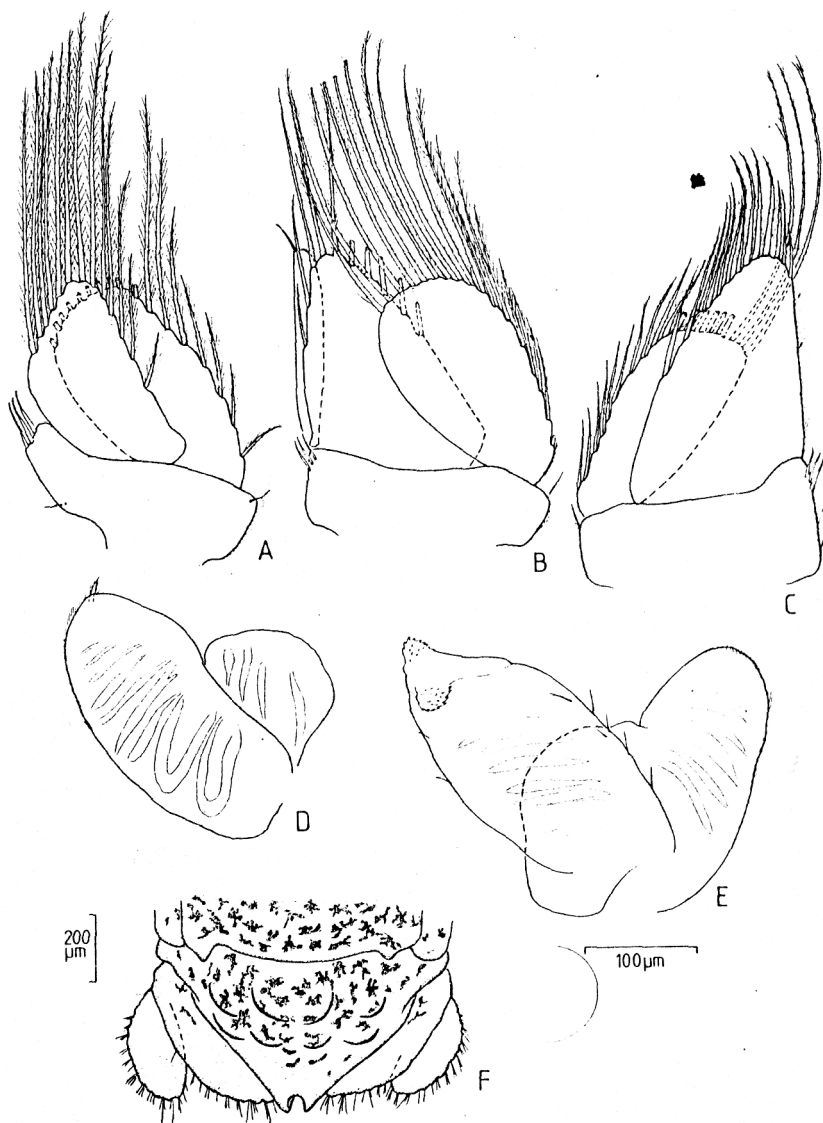


Fig. 16: *Paradella tuberculata* n.sp.; preparatory  $\delta$ , holotype: A, pleopod 1; B, pleopod 2; C, pleopod 3; D, pleopod 4; E, pleopod 5. Ovigerous  $\text{?}$ , paratype: F, posterior part of body, dorsal view.

*Paradella tuberculata* was found only once, at the exposed upper coral slope of the fringing reef near Afareaitu, Moorea.

#### CONCLUSIONS

The number of sphaeromatid species inhabiting coral reefs at Bora Bora and Moorea proved to be rather low. Only *Neonaesa rugosa* was collected in larger numbers at both islands, whereas *Paracassinopsis sculpta* and *Paradella tuberculata* n.sp. are represented by few specimens from the exposed fringing reef near Afareaitu at Moorea only.

The species of Sphaeromatidae recorded from the Society Islands show distinct affinities to the fauna of the tropical western Indopacific.

#### ACKNOWLEDGMENTS

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