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MUCCHI - MODENA

Soft anatomies of some Ostracoda from the Bay of Naples described by Professor Giuliano Ruggieri and other workers

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KEY WORDS – Ostracoda, Ruggieri, Soft anatomies, Paracytherideidae, Polycopidae.

ABSTRACT – Detailed descriptions of their soft anatomies are provided for two Ostracoda recorded from the Bay of Naples: *Rectobuntonia subulata* (Ruggieri, 1954) and *Cytherella vulgatella* Aiello, Barra, Bonaduce & Russo, 1996. Additionally, the soft parts of *Procytherideis* Ruggieri, 1978 are indicated by description of *P. subspiralis* (Brady, Crosskey & Robertson, 1874); and those of *Pseudocytherura calcarata* (Seguenza, 1880) and *Paracytheridea depressa* Müller, 1894 are also described, with discussion on *Paracytherideidae*. Finally, the male soft anatomy of *Polycopsis compressa* (Brady & Robertson, 1869) is detailed with discussion on the family *Polycopidae* and the diagnosis of *Chavturopsis* new genus, having the type species *Chavturopsis pacifica* (Chavtur, 1977).

RIASSUNTO – [Anatomia delle parti molli di alcuni Ostracodi del Golfo di Napoli, descritti dal Professor Giuliano Ruggieri ed altri] - Vengono qui accuratamente descritte le anatomie delle parti molli di due specie di Ostracodi provenienti dal Golfo di Napoli: *Rectobuntonia subulata* (Ruggieri, 1954) e *Cytherella vulgatella* Aiello, Barra, Bonaduce & Russo, 1996. Le parti molli di *Procytherideis* Ruggieri, 1978 sono state osservate su *P. subspiralis* (Brady, Crosskey & Robertson, 1874). Vengono esaminate inoltre *Pseudocytherura calcarata* (Seguenza, 1880) e *Paracytheridea depressa* Müller, 1894, ed è discussa la famiglia *Paracytherideidae*. Infine, si riporta la descrizione delle parti molli del maschio di *Polycopsis compressa* (Brady & Robertson, 1869), con discussione della famiglia *Polycopidae* e diagnosi del nuovo genere *Chavturopsis*, con specie-tipo *Chavturopsis pacifica* (Chavtur, 1977).

INTRODUCTION

In a career of distinguished scientific publication spanning 60 years, the late Professor Giuliano Ruggieri laid the foundations for a more exact understanding of Cenozoic fossil and living marine benthic Ostracoda by Italian ostracodologists. It is largely due to his initiative and the excellent example furnished by his numerous publications that Italian Cenozoic ostracodes are now so well known.

In 1982, as part of a biocoenosis survey, the authors examined some living Bay of Naples Ostracoda, based on collections made by the senior author over several years, in order to complement the monograph of Müller (1894). The junior author dissected all specimens and illustrated their soft anatomies using a camera lucida. The species we examined, all identified by the senior author, included two which had been first described as fossils by Ruggieri: *Rectobuntonia subulata* (Ruggieri, 1954) and *Cytherella vulgatella* Ruggieri, 1962. Further, our material included *Procytherideis subspiralis* (Brady, Crosskey & Robertson, 1874) - the genus was established by Ruggieri in 1978 - as well as *Paracytheridea depressa* Müller, 1894 and *Pseudocytherura calcarata* (Seguenza, 1880). One of Ruggieri's continuing concerns was a critical restudy of Seguenza's pioneering work on Sicilian Ostracoda (Ruggieri, 1984). Finally, the polycopids included the imperfectly known *Polycopsis compressa* (Brady & Robertson, 1869). The soft anatomies of these taxa are redescribed

below. We use the technical terms Strahlen, for the ray-like setae of the maxillule and mandible epipods, and Zahnborsten for the tooth-like bristles of the maxillule lobes. Further, we use the terms protopod, exopod, endopod and epipod in the sense of Schram & Koenemann (2001, fig. 1). Good illustrations of the shells of the species considered can be found in references cited in the synonymies.

SYSTEMATICS

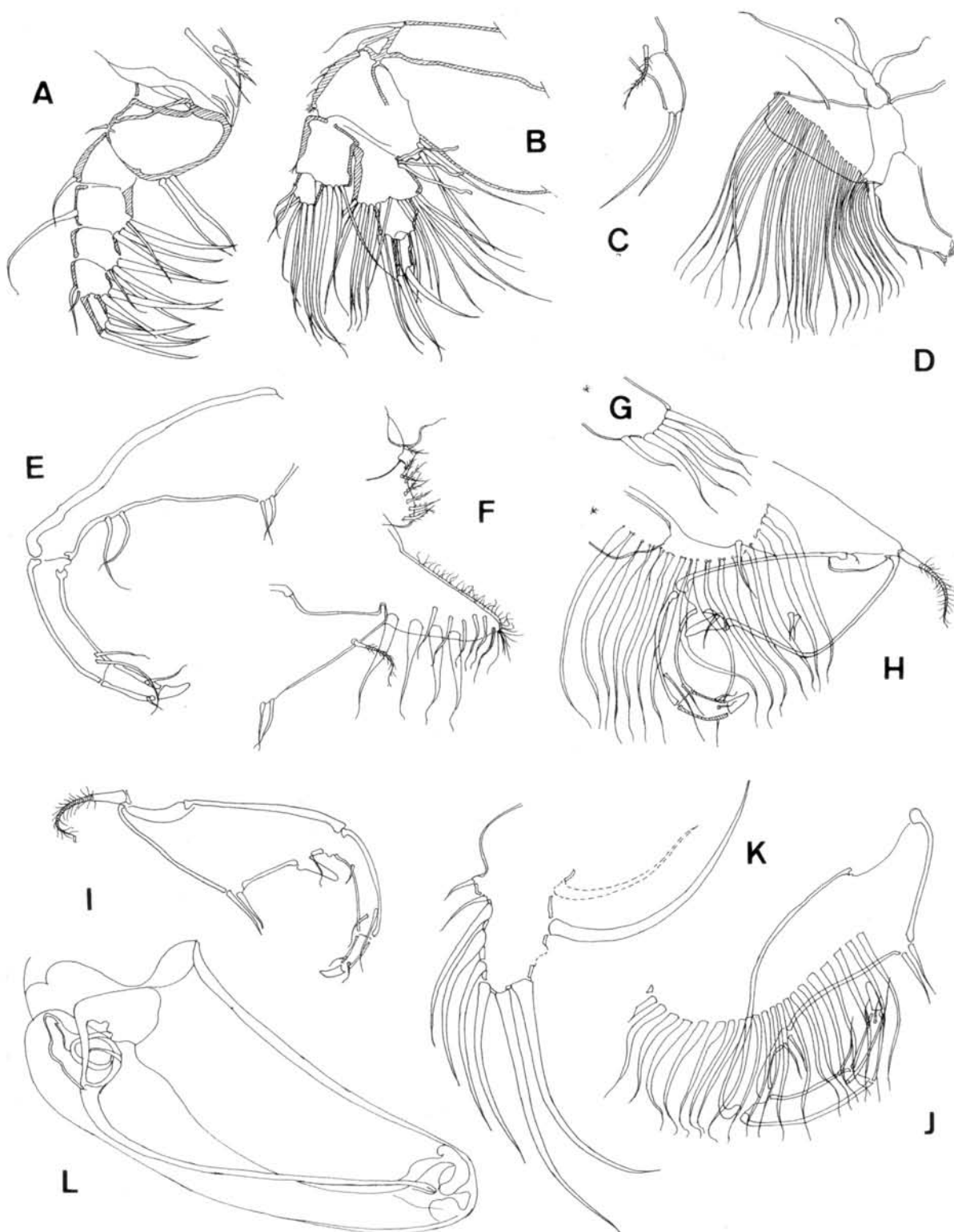
CYTHERELLA VULGATELLA Aiello, Barra, Bonaduce & Russo, 1996

Text-fig. 1 A-L; Text-fig. 2 A-G

1975 *Cytherella vulgata* Ruggieri - BONADUCE, CIAMPO & MASOLI, p. 21, pl. 4, figs 9-11.

1996 *Cytherella vulgatella* n. sp. AIELLO, BARRA, BONADUCE & RUSSO, p. 187, pl. 1, figs 1-14, pl. 2, figs 1-3, 6, 7.

Description (both sexes) – Antennule 7-segmented, length ratios of the last 6 segments 14:4:6:4.5:4:5; first segment with at least 3 dorsal bristles (2 subequal and short, the third longer), remainder of limb deflexed; second segment with 2 dorsodistal and 1 short ventrodiscal bristles; third segment with a single ventrodiscal bristle; fourth segment with 3 claw-like and 1 one other dorsodistal plus 1 subventrodiscal bristles; fifth segment with 3 claw-like and 1 other dorsodistal bristles; sixth segment with 2 claw-like and one other dorsodistal plus 2 unequal ventrodiscal bristles; seventh segment with 4 unequal terminal claw-



Text-fig. 1 - Bay of Naples locality BC-33, 76-80 m, *Cytherella vulgata* Ruggieri, 1962, mature male. A) antennule; B) antenna; C) terminal segments of the mandibular endopod; D) mandible coxale, epipod, endopodial filter fan and part of endopod; E) left P1 endopod; F) left P1 exopod; G) right P2 exopod; H) right P2 endopod and filter fan; I) left P2 endopod; J) right P1 endopod and filter fan; K) furca; L) hemipenis. Magnifications: A, B, K, L x 225; C-J x 420.

like bristles (one of these set subterminally).

Antenna comprising a wide protopod and well developed exopod and endopod, thus a good example for Ostracoda of the characteristic crustacean limb; protopod coxale with a dorsodistal bristle, basale with 3 ventral bristles plus 4 dorsal clumps of spiky hairs; exopod 2-segmented, length/width ratios of the segments 8/7:4/3.5, first exopod segment with 5 long ventrodiscal bristles plus a dorsodistal cluster of a few spiky hairs; second segment with 3 shorter dorsal bristles plus 4 long terminal bristles; endopod 3-segmented, length/width ratios of the segments 7/8:5/5:5/2.5; first endopod segment carrying a proximoventral clump of 3 sensory filaments plus a small dorsodistal bristle and a total of 13 long distal bristles (6 dorsal, 1 medial, 6 ventral); second segment with 2 dorsodistal and 2 ventrodiscal claw-like bristles plus a mediobasal bristle; third segment with 1 medioventral bristle plus 3 terminal claw-like bristles.

Mandible coxale relatively weak (compared to typical Cytheroidea, Cyproidea and Bairdioidea), distal edge with 4 simple anterior teeth followed by 5 spines plus an anteromedial bristle; basale with at least 1 thick ventral bristle; epipod with at least 3, and probably 5, Strahlen; endopod 2-segmented, length ratios of the segments 15:8.5 and differing between the sexes; male first segment with 1 mediobasal bristle and a large filtering comb of 40-45 slender setae tending obliquely across the segment from proximoventral to dorsodistal plus 1 hirsute mediobasal bristle; second segment with 2 unequal claw-like terminal bristles; female endopod has additionally a dorsodistal row of hairs on the first segment which continues proximally on the second segment, and the 2 bristles of the second segment are set subterminally.

Labium large, ovate and fringed with numerous short hairs.

Maxillule epipod with about 35 Strahlen; palp plump, 2-segmented; ventral part of the first segment trilobate (the boundary between the 2 distal lobes sutured), this segment carrying a filtering comb of 25-30 slender setae, its 3 ventral lobations bearing 5, 3 and 3 short bristles respectively; second segment with 2 terminal bristles; third to first lobes each bear 6-7 terminal bristles, some shorter than others.

Fifth limb (P1) strongly dimorphic; epipod with 25-30 Strahlen. In females, exopod bearing at least a longish ventrodiscal bristle; endopod lobate with a long mediobasal bristle plus 5-6 medial bristles and 4 stout ventral bristles. In males, the lobate endites above the exopod have 1 and 9 hirsute bristles respectively; exopod with numerous dorsal hairs extending to its tip, carrying 6-7 medial bristles and 4 thicker ventral bristles; endopod 3-segmented; first segment wide and wedge-shaped with 2 medioventral bristles and, ventrodistally, a short bristle and associated stubby claw; second segment with 2 subdistal bristles; third segment about half the length of the second segment and carrying 2 short distal bristles plus a stubby claw.

Sixth limb (P2) also strongly dimorphic; reduced in females to a simple lamella bearing 6 distal bristles (1 set more proximally). In males, epipod with about 15 Strahlen on a near vertical comb on the right limb but only 10 Strahlen on the left limb; protopod undivided, with a smooth medioventral bristle and an hirsute dorsodistal bristle; second segment slender with a small proximoventral and 2 unequal subdistal bristles; third segment about half the length of the second segment, with 2 short subdistal bristles plus a stubby terminal claw.

Furca lamellar; 9 claws in the female but 9 longer plus 2 short claws in the male. Posterior of the body comprising an exoskeletal framework suggesting 8-10 abdominal segments, although, the body itself is not segmented; dorsally it carries 3 clumps of setae with 5, 4 and 2 setae respectively (from anterior- to rear-most), there are also some small dorsal intersegmental setules, usually 1 per segment.

Hemipenis and elongate cone, subtruncate terminally, copulatory tube complex basally the strongly arched and simple for the rest of its considerable length.

Remarks – This platycopid species (family Cytherellidae Sars, 1866) was formerly assigned to *Cytherella vulgata* Ruggieri, 1962 (see synonymy).

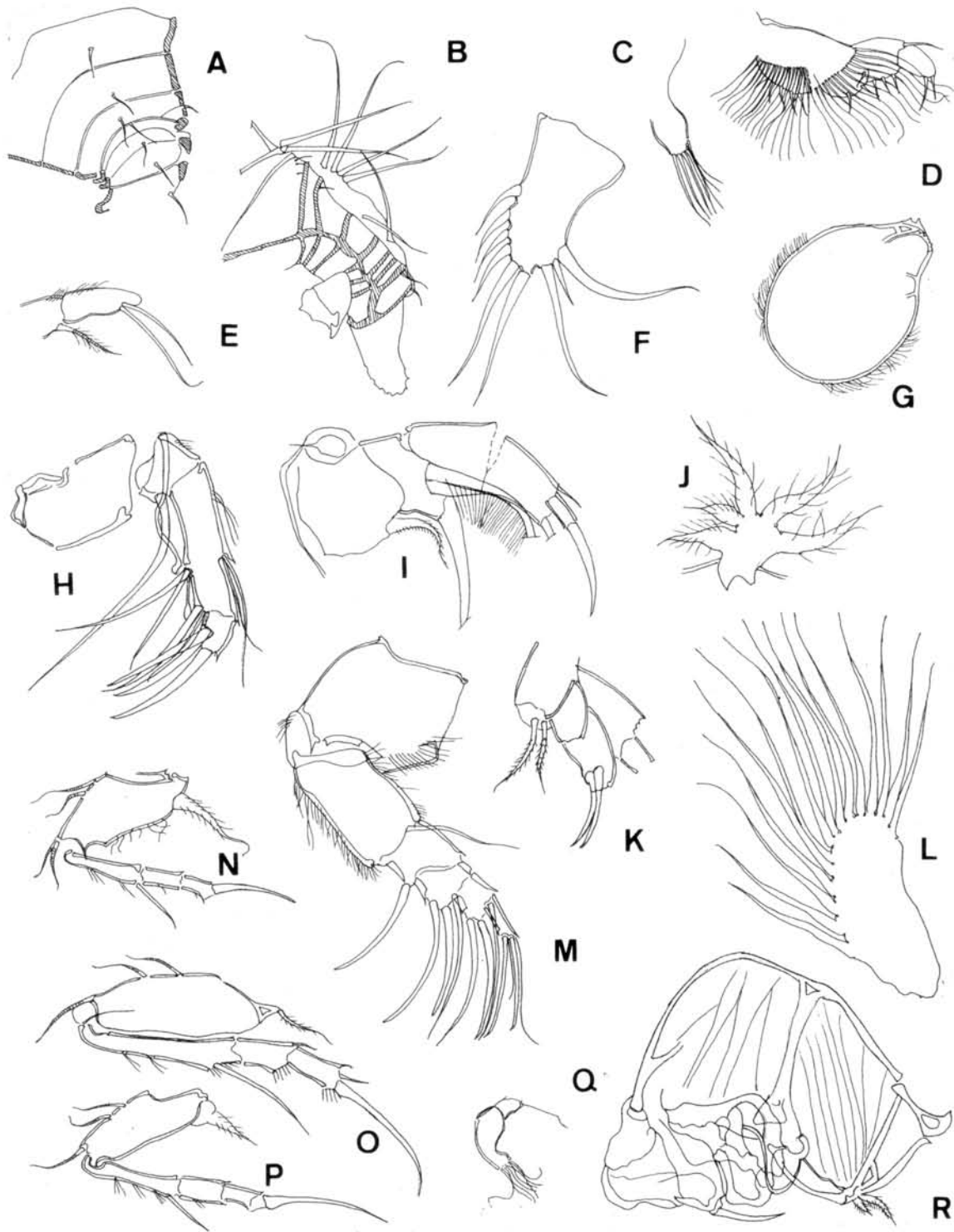
Size - Female L = 0.88 mm, H = 0.59 mm; Male L = 0.83 mm, H = 0.52 mm.

RECTOBUNTONIA SUBULATA (Ruggieri, 1954) Text-fig. 2 H-R

- 1954 *Buntonia subulata* n. sp. RUGGIERI, p. 568, figs 34-37.
1972 *Rectobuntonia subulata* - SISSINGH, p. 96.
1975 *Buntonia subulata* - BONADUCE, PUGLIESE & MINICHELLI, pl.1, fig. 2.
1993 *Rectobuntonia subulata* - MCKENZIE & BONADUCE, p. 605.

Description (male) – Antennule 6-segmented, length ratios of the last 5 segments 15:6:5:5:5; first segment bearing a small dorsodistal clump of hairs and hirsute along the entire ventral margin; second segment hirsute along both margins, also with a long ventrodiscal bristle; third segment with a long dorsodistal bristle; fourth and fifth segments each with 3 dorsodistal claw-like bristles (2 strong, 1 more slender); sixth segment not as wide as the others, bearing 2 claw-like bristles plus 2 other bristles one of which has a club-shaped tip.

Antennal protopod elongate and bare; exopod slender and jointed twice; endopod 3-segmented, length ratios of the segments 10:45:6; first segment with a clump of dorsodistal hairs and a very long ventrodiscal bristle; second segment elongate, with a cluster of longish dorsal hairs, plus 2 mediobasal and 4 medioventral bristles (2 of the latter club-tipped) and, ventrodistally, a slender bristle and a long claw; third segment bearing 2 unequal proximoventral claws and a terminal claw plus a bristle.



Text-fig. 2 - Bay of Naples locality BC-33, 76-80 m, *Cytherella vulgata* Ruggieri, 1962, mature male. A) posterior of body showing segmental spinules; mature female; B) segmented posterior of body, displaying dorsal bristles; C) upper lobe of maxillule; D) endopod of maxillule with filter fan (damaged), epipod and Strahlen omitted; E) terminal segments of the mandibular endopod; F) furca; G) lower lip or labium.

Bay of Naples locality BC-33, 76-80 m, *Rectobuntonia subulata* (Ruggieri, 1954), mature female. H) antenna, showing the flexuous exopod; I) mandible endopod, indicating ornament of the principal bristles; K) maxillule palp and lobes, showing only the smooth Zahnborsten and sideways-directed bristles of the latter; L) maxillule epipod with 15 Strahlen; M) antennule; N) P1; O) P3; P) P2. Mature male. J) mandible epipod with 5 Strahlen; Q) brush-shaped appendage; R) hemipenis. Magnifications: A, C-F x 420; B, G x 225; H, I, L-P, R x 300; J, K, Q x 560.

Mandible coxale with 5 cutting-edge teeth, plus 2 posterior bristles and a large anteromedial bristle; basale with 1 or 2 ventral bristles; epipod with 5 Strahlen, 2 of these smaller than the others; endopod 3-segmented; first segment with a dorsodistal bristle and 4 ventrodistal bristles (2 of the latter large and pilose); second segment with 4-5 dorsodistal bristles and 2 ventrodistal bristles (1 of them large and pilose); third segment with 2 terminal claws, one stronger than the other; the entire ventral margins of the last 2 endopod segments adorned with long soft hairs.

Labium with a serrated ventral margin and clothed with numerous fine hairs.

Maxillule with 15 Strahlen but no downwards-directed setae. Palp and lobes rather broad, their chaetotaxy normal; third lobe carrying two Zahnborsten, first lobe with two prominent sideways-directed bristles.

P1 and P2 dimorphic, left P1 somewhat larger than the right P1 and left P2 much smaller than the right P2. P1 protopod wide and bearing a fat hirsute proximoventral bristle plus 2 mediodorsal and 2 dorsodistal bristles; endopod 3-segmented; first segment with 2 dorsal clumps of hairs and a dorsodistal bristle; second segment with a single mediodorsal clump of hairs plus a ventrodistal spinule; third segment with a dorsodistal spinule and a curved terminal claw. P2 protopod with a fat proximoventral bristle plus 2 mediodorsal and 1 dorsodistal bristles; first endopod segment bearing 3 dorsal clumps of hairs and a dorsodistal bristle, second and third segments as for the P1, except that the terminal claw is longer. P3 protopod with a slender proximoventral bristle plus 2 mediodorsal and 1 dorsodistal bristles; first endopod segment with 2 dorsal clumps of hairs and a dorsodistal bristle, second segment with some spiky hairs dorsodistally and a short ventrodistal spinule; third segment also with some spiky hairs dorsodistally plus 2 ventrodistal spinules and a large claw.

Brush-like appendage small, cylindrical, tufted with about a dozen longish hairs, set between the P1 and P2.

Hemipenes domeshaped; broadly rounded frontally in the anterior part which projects backwards in a long ventral spine, copulatory tube sinusoidal; postero-ventrally there are 2 small hirsute bristles.

Remarks – This podocopid species (tribe Buntoniini Apostolescu, 1961, subfamily Cytherettinae Puri, 1957 and family Trachyleberididae Sylvester-Bradley, 1948) has already been reviewed by Bonaduce, Pugliese & Minichelli (1976), and the soft anatomy was described briefly in McKenzie & Bonaduce (1993). See also Schornikov (1969, pl. 17). The shell characters were described by Ruggieri (1954, p. 568).

Size – L = 0.45 mm, H = 0.30 mm.

PROCYTHERIDEIS SUBSPIRALIS (Brady, Crosskey & Robertson, 1874)
Text-fig. 3 A-H

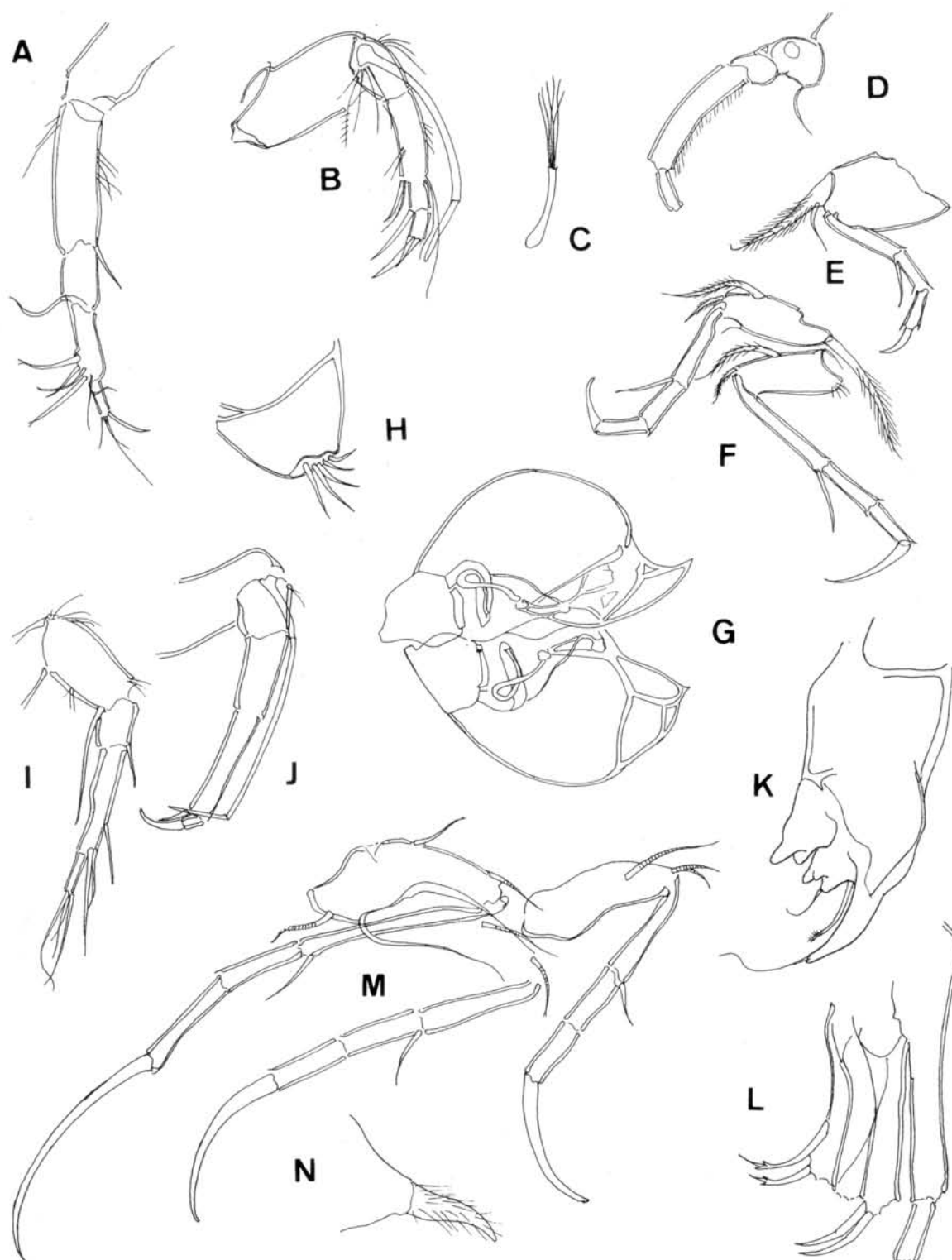
- 1874 *Cytherideis subspiralis* BRADY, CROSSKEY & ROBERTSON, p. 211, pl. 10, figs 16,17.
1975 *Neocytherideis subspiralis* - BONADUCE, CIAMPO & MASOLI, p. 62, pl. 35, figs 11-14.
1978 *Procytherideis subspiralis* - RUGGIERI, p. 10.

Description (male) – Antennule 5-segmented, length ratios of the last 4 segments 7:3:4:2; first segment bare, second segment with proximal clumps of hairs on both dorsal and ventral margins plus a short ventrodistal bristle, third segment with a flexuous dorsodistal bristle, fourth segment with 6 distal bristles (2 very slender, another 2 bifid at their tips), fifth segment with a short claw-like bristle and 3 other bristles, two of these almost as long as the claw-like bristle the other about twice as long.

Antenna comprising protopod, exopod and endopod; protopod bare; exopod long and jointed at about 2/3 its length from the base; endopod 3-segmented, length ratios of the segments 2:4:1, first segment with proximodorsal and proximoventral clumps of stiff hairs, second segment with proximodorsal and proximoventral clumps of hairs, below these 2 mediodorsal bristles and, medioventrally, a stout claw and longer bristle plus a powerful ventrodistal claw, third segment with 2 stout claws (one more proximal than the other) and a short dorsodistal spine.

Mandible coxale with 5 teeth that decrease in strength from front to rear, plus 2 short bristles on the cutting edge and a long anteromedial bristle, basale with at least one short ventrodistal bristle, epipod consisting of a single large Strahl tufted at about its mid-length with 6 or more fine hairs - other Strahlen could not be seen on the dissection although 3 more are described for the family (Hartmann & Puri, 1974); exopod a long bristle, bifid from about its mid-length, and sited dorsodistally relative to the endopod; the latter 3-segmented, length ratios of the segments 4:17:6, first segment with 4 ventrodistal bristles, one short and slender the other 3 long and stout and adorned with numerous closely-set stiff hairs; ventral margin of the elongate second segment bearing numerous widely spaced long hairs plus 5 dorsodistal bristles and 2 ventrodistal bristles (one resembling the large ventrodistal bristles of the first segment), third segment with 2 slender claws and 2 bristles of moderate length, its ventral margin also carrying long hairs.

Maxillule comprising epipod, palp and lobes; epipod with 15 Strahlen and an aberrant seta, plus 2 downwards-directed setae; palp broad and 2-segmented, first segment with 3 dorsodistal, 1 mediodistal and 1 ventrodistal bristles, second segment with 3 claw-like and 1 slender terminal bristles; third lobe with 2 smooth Zahnborsten and 4 normal terminal bristles, second lobe with 6 terminal bristles, first lobe with 2



Text-fig. 3 - Bay of Naples locality Cenito, M-13, nearshore, *Procytherideis subspiralis* (Brady, Crosskey & Robertson, 1874), mature male. A) antennule; B) antenna; C) epipod of mandible; D) basale and endopod of mandible (setae omitted), note the elongate 2nd segment; E) P1; F) P2 and P3; G) paired hemipenes; H) posterior of body. Bay of Naples locality Bocca Piccola, 50 m, *Paracytheridea depressa* Müller, 1894, mature female. I) antennule; J) antenna; K) 'hand' of mandible coxale; L) maxillule palp and lobes, setae omitted; M) P1, P2 and P3; N) posterior of body. Magnifications: A, B, D-G, I, J, M, N x 300; C, H, K, L x 560.

reflexed and falcate Zahnborsten plus 4 normal bristles.

P1-P3 symmetrical on either side of the body, characterised by hirsute protopod bristles, especially the mediodorsal and proximoventral bristles of the P1 protopod.

Brush-shaped appendage small, set between the P1 and P2, tufted with about a dozen fine flexuous hairs.

Hemipenes dome-shaped; capsule sustained by 5 large muscles stretching from front to rear and 10 more slender muscle bands extending from the posterior upwards, copulatory tube coiled in a single simple spiral; proximoventrally of each hemipenis are 2 unequal bristles.

Remarks – *Procytherideis* Ruggieri, 1978 belongs in the podocopid family Neocytherideidae Puri, 1957, which also contains the genera *Neocytherideis* Puri, 1952 and *Sahnicythere* Athersuch, 1982 (Athersuch, 1982). It is readily differentiated from them by the marked internal posteroventral selva, especially in the RV.

Size – L = 0.72 mm, H = 0.28 mm.

PARACYTHERIDEA DEPRESSA Müller, 1894
Text-fig. 3 I-N

1894 *Paracytheridea depressa* MÜLLER, p. 340, pl. 29, fig. 8.
1912 *Paracytheridea bovetensis* Seguenza, 1880 - MÜLLER, p. 305.
1975 *Paracytheridea depressa* - BONADUCE, CIAMPO & MASOLI, p. 90.

Description (female) – Antennule 5-segmented and elongate, length ratios of the segments 5:5:2:5:5:2; first segment bare, second segment with proximodorsal and dorsodistal clumps of hairs plus a few stiff medioventral hairs and a long ventrodistal bristle, third segment with a dorsodistal bristle, fourth segment with a slender mediodorsal claw-like bristle and 2 dorsodistal bristles (one claw-like), fifth segment with 2 long bristles (one claw-like, the other flexuous and sensory), plus another 2 more slender and shorter bristles.

Antenna elongate, comprising protopod, exopod and endopod; protopod bare; exopod a long flagellum reaching to almost the end of the terminal claw and jointed at about 1/5 its length from the tip; endopod 3-segmented, length ratios of the segments 5:15:2, first segment with a proximodorsal clump of hairs and a ventrodistal bristle, second segment elongate, with 2 medioventral and 2 mediodorsal bristles plus a short ventrodistal claw, third segment with a single claw plus an associated shorter bristle.

Mandible coxale very distinctive, carrying only 3 large teeth on the cutting edge, anterior tooth incisor-like with a long filament protruding from its tip, between it and the next tooth is a curved 'toothbrush' bristle, second tooth cusate and with a protruding filament, third tooth also cusate, no small posterior bristles were seen on our dissection; basale with at

least one small ventrodistal bristle; epipod with 2 unequal Strahlen; endopod 3-segmented, length ratios of the segments 4.5:4:1.5, first segment with a large pilose dorsodistal bristle and 4 ventrodistal bristles (2 long, 2 short), second segment with 4 or 5 subequal plus 1 longer medio-dorsodistal bristles, also a laterodistal and 2 ventrodistal bristles, third segment with 2 unequal claw-like bristles plus 1 associated bristle.

Maxillule epipod with 14 Strahlen plus an aberrant seta; palp 2-segmented, length/width ratios of the segments 28/3.5:6.5:2, first segment carrying a group of 3 or 4 long dorsodistal bristles, second segment with 4 terminal bristles; the lobes are elongate, characterized by 2 smooth Zahnborsten on the third lobe and 2 spinose Zahnborsten on the first lobe, plus the usual other terminal bristles.

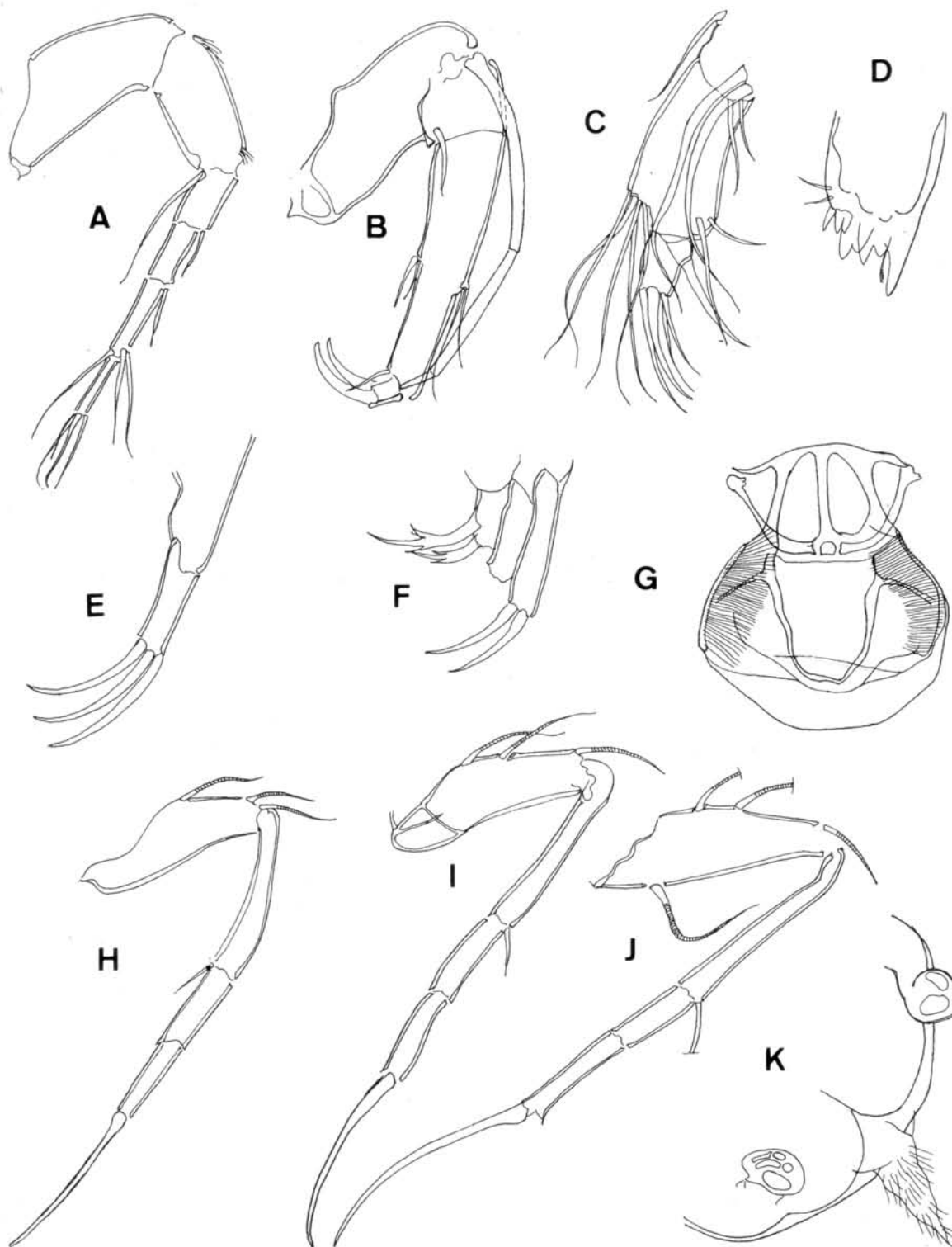
P1 protopod bearing a large hirsute proximoventral bristle, plus a mediodorsal and 2 dorsodistal bristles; first endopod segment with a single dorsodistal bristle, second segment bare, third segment armed with a stout curved terminal claw. P2 protopod with a large hirsute proximoventral bristle, plus a mediodorsal and 1 dorsodistal bristles; first endopod segment with 1 dorsodistal bristle, second segment bare, third segment with a curved terminal claw (longer than the claw of the P1). P3 similar to the P2 in its chaetotaxy; endopod segments distinctly more elongate than in the P1 and P2, terminal curved claw more slender and also longer than the claws of the P1 and P2.

Spermathecae paired and projecting ventrally, ovate in shape.

Furca with two short bristles.

Posterior of the body ending in a plump, strongly pilose seta.

Remarks – The valves were described by Müller (1894, p. 340). This and the following species belong in the podocopid family Paracytherideidae Puri, 1957. Athersuch, Horne & Whittaker (1989) synonymised *Xenocythere* Sars, 1925 with *Paracytheridea* Müller, 1894 after comparing the soft anatomies of *X. cuneiformis* (Brady, 1868) and *P. depressa* Müller, 1894. However, we cannot agree with that conclusion. In particular, the antennule and antenna of *X. cuneiformis* are relatively stout, not slender as in *P. depressa*, and the mandible coxale of the latter is very distinctive, quite unlike the more normal coxale of *X. cuneiformis* (Sars, 1925, pl. 82). Their illustrations are not sufficiently detailed for intergenus comparison of the maxillules and P1-P3s. We believe, therefore, that the two genera remain distinct, one boreal in its distribution (*Xenocythere*) while the other (*Paracytheridea*) is cosmopolitan. Both are readily distinguished from the third genus in the family Pseudocytherura Dubowsky, 1939 found living in the Black Sea and Mediterranean. *Paracytheridea* (Cretaceous-Recent) is strongly alate with a pronounced cauda, *Xenocythere* (Pleistocene-Recent) is cuneiform with a weakly pointed cauda and *Pseudocytherura* (Neogene-Recent) is rect-



Text-fig. 4 - Bay of Naples locality Stintino, Isola Ponza, nearshore, *Pseudocytherura calcarata* (Seguenza, 1885), mature female. A) antennule; B) antenna, with exopod joined twice; C) mandible endopod; D) 'hand' of mandible coxale; E) maxillule palp and terminal setae; F) maxillule lobes, displaying smooth and falcate Zahnborsten; G) mouth region from below; H) P1; I) P2; J) P3; K) posterior of body, showing paired spermathecae. Magnifications: A, B, G-K x 300; C-F x 560.

angular with a small posterodorsal cauda. Family characters are summarized in Hartmann & Puri (1974, p. 46). Additionally, there are 2-3 Strahlen on the mandible epipod (2 in *Paracytheridea depressa*, 3 in *Xenocythere cuneiformis* and *Pseudocytherura calcarata*). Further, the chaetotaxy of the P1-P3 is distinctive for *Pseudocytherura* compared with the two other paracytherideid genera because there are 2 mediodorsal bristles on its P2 and P3 protopods as against only 1 such bristle on these protopods for *Paracytheridea* and *Xenocythere*. Finally, the maxillule has 2 downwards-directed setae on its epipod in *Pseudocytherura* but not in either of the other genera.

Size – L = 0.54 mm, H = 0.24 mm.

PSEUDOCYTHERURA CALCARATA (Seguenza, 1885)
Text-fig. 4 A-K

- 1885 *Cytheropteron calcaratum* SEGUENZA, p. 365, pl. 17, figs 53, 53a.
1952 *Paracytheropteron calcaratum* - RUGGIERI, p. 21, pl. 6, figs 1-3, pl. 7, fig. 7.
1963 *Pseudocytherura calcarata* - VAN MORKHOVEN, p. 380, figs 630-632.
1975 *Pseudocytherura calcarata* - BONADUCE, CIAMPO & MASOLI, p. 90, pl. 50, figs 7-12.

Description (female) – Antennule 6-segmented, length ratios of the segments 14:14:7:7:9:7; first segment bare, second segment with proximodorsal and dorsodistal clumps of hairs plus a ventrodorsal bristle, third and fourth segments each with a dorsodistal bristle, fifth segment with 2 dorsodistal and 1 ventrodorsal bristles, sixth segment with 4 terminal bristles.

Antennal protopod bare; exopod a thick flagellum jointed twice and reaching to the end of the second endopod segment; endopod 3-segmented, length ratios of the segments 7:25:2.5, first segment with 1 ventrodorsal bristle, second segment with 2 mediodorsal, 2 medioventral and 1 ventrodorsal bristles; third segment bearing 2 stout and unequal curved terminal claws.

Mandible coxale with 4 teeth on the cutting edge plus a posterior spike and 2 sideways-directed bristles, also an anteromedian bristle (the anterior tooth is incisor-like, teeth 2 and 3 are cusped, tooth 4 is deeply divided); basale with 3 ventrodorsal bristles; epipod with 3 unequal Strahlen (one of them small); endopod 3-segmented, length ratios of the last 2 segments 16:6, first segment with 1 dorsodistal and 4 ventrodorsal bristles (2 of these large), second segment wide (length/width ratio 16:10), with 6 dorsodistal, 2 ventrodorsal and 1 claw-like mediodistal bristle, third segment with 2 claw-like and 2 other bristles.

Labium hirsute along its ventral margin, clothed in long hairs.

Maxillule epipod with 15 Strahlen plus a small aberrant seta and 2 downwards-directed setae; palp elongate and 2-segmented, second segment bearing 3

claw-like bristles; third lobe elongate bearing 2 smooth Zahnborsten, second lobe less long, first lobe relatively plump with 2 falcate Zahnborsten, other lobal bristles normal.

P1-P3 increase in size from the P1 to the P3; P1 protopod without a proximoventral bristle but bearing 1 mediodorsal and 2 dorsodistal bristles, P2 and P3 protopods both with 2 mediodorsal bristles but only one dorsodistal bristle, and the P3 additionally has a long proximoventral bristle; endopods of all the legs with single dorsodistal bristles on the first segments, second segments bare, and third segments each bearing a curved claw (largest in the P3).

Spermathecae paired and subcircular.

Furca comprising 2 short bristles. Posterior of the body ending in a fat hirsute seta.

Remarks – The valves were described by Ruggieri (1952, p. 21). For its family and generic relationships, refer to the previous species. See also Schornikov (1969, pl. 29).

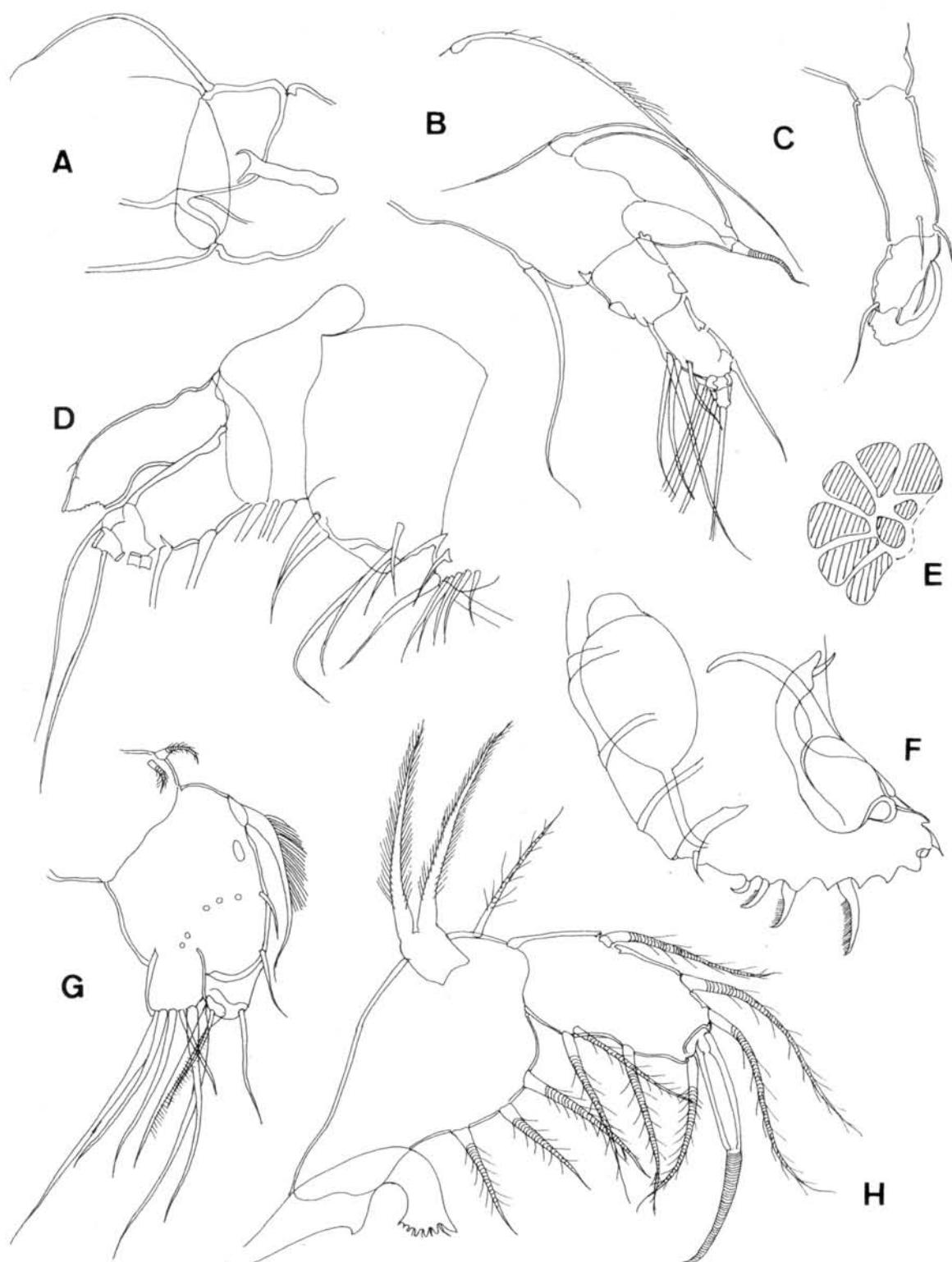
Size – L = 0.68 mm, H = 0.32 mm.

POLYCOPSIS COMPRESSA (Brady & Robertson, 1869)
Text-fig. 5 A-H

- 1969 *Polycopse compressa* BRADY & ROBERTSON, 1869, p. 20, pl. 21, figs 5-21.
1984 *Polycopsis compressa* - MÜLLER, p. 238, pl. 8, fig. 21.
1982 *Metapolycope compressa* - BONADUCE *et al.*, p. 352, pl. 4, figs 1, 2, pl. 5, fig. 10.

Description (male) – Antennule 6-segmented, length ratios of the segments 8:17:4:4:1:1; first segment bearing a backward-directed mediolateral digitiform sensory process slightly turned up distally and also a long dorsodistal bristle, second segment expanded dorsally into 2 bulbous lappets each with an annulate terminal seta, the proximal lappet hirsute dorsally, the distal lappet strongly chitinated, and also carrying a long ventrodorsal bristle, third segment bare, fourth segment with 1 dorsodistal and 4 ventrodorsal bristles (1 long, 1 short and 2 of median length), fifth segment with 3 very long bristles, sixth segment with a very long terminal bristle.

Antennal protopod large, triangular-shaped and hirsute dorsodistally; exopod 9-segmented, the first segment as long or longer than the rest combined, segments 1-8 each bearing a long ventrodorsal natatory bristle and projecting ventrodorsally into a broad short spine, the last segment with at least 2 terminal bristles, one natatory the other shorter and sensory (?); endopod 3-segmented, length ratios of the segments 20:10:13, first segment with a mediodorsal clump of hairs plus at least 2 short distal bristles, second segment bearing 7 ventral bristles, of which 5 are very long and natatory, 1 moderately long and 1 slender and shorter, plus one or more short bristles on the dorsal margin, third segment with at least 4 nata-



Text-fig. 5 - Bay of Naples locality Campione C, Vervece, 55 m, *Polycopis compressa* (Brady & Robertson, 1869), mature male. A) proximal right antennule, showing the rod-like process; B) distal right antennule, displaying the two dorsal lappets of the 2nd segment and 4 terminal natatory setae; C) segmented endopod of the antenna with terminal clasper; D) maxillule, most terminal bristles of the endopod and all exopod bristles omitted; E) detail of 8 central adductor muscle scars; F) posterior of body, furca, penis and seminal sac; G) maxilla basale, exopod and endopod, positions of missing bristles indicated; H) mandible. Magnifications: A-E, G, H x 560; F x 300.

tory bristles plus a backwards-directed clasping process.

Mandible coxale rather small, cutting edge wide comprising a large anterior tooth behind which are 4-5 small pointed teeth with slender bristles between them; basale large with 3 ventral bristles and 1 dorso-distal bristle; epipod with 2 plumose Strahlen; endopod 2-segmented, length ratios of the segments 15:1, first segment long carrying 3 widely-spaced dorsal bristles and 3 ventral bristles (one set apart from the other 2), second segment minute bearing a terminal bristle plus a large terminal claw which is annulate from about its mid-length.

Maxillule precoxale lobate with 5 bristles close together plus 2 set apart and unequal in length; coxale with 10 bristles in two groups (4 proximoventral and 6 ventrodistal); basale with a proximodorsal hump and bearing 3 ventral bristles; exopod with a clump of hairs dorsodistally plus 9 terminal bristles (8 long, the other shorter); endopod 3-segmented, length ratios of the segments 26:8:5, first segment with 2 widely-separated ventral bristles, second segment with a long dorsodistal bristle and 4 long ventrodistal bristles, third segment with 4 terminal bristles (3 long, 1 shorter).

Fifth limb (maxilla) hirsute; coxale with 10-11 bristles; epipod bearing 15 Strahlen (relatively shorter compared with podocypids); basale with 9 bristles (2 long, plumose and proximodorsal, 2 dorsal, 3 mediolateral and 2 ventrodistal); exopod with 4 bristles (2 moderately long and slender, 2 broad-based and longer); endopod with 6 bristles (1 short, 2 of median length and 3 long).

Furca bilamellar, each lamella bidentate anteriorly, bearing 8 claws decreasing in size from front to rear, the first 7 are spinose the last one is smooth and more strongly curved, the ventral margin between each pair of claws is broadly V-shaped, posterior of the furcal lamellae on the rear of the body is a small unpaired bristle.

Posterior of the body displaying an apparent segmentation into at least 3 segments.

Seminal sac subovoid, located near-terminally in the posterior body.

Penis bipartite and asymmetrical. Viewed from the right furcal lamella it comprises an outer process, broad-based then curving forwards and housing distally a sclerotized pointed tip, and an inner process which is large, spine-like and recurved.

Central adductor muscle scar pattern comprising a half rosette of 8 scars.

Remarks – The species belongs in the cladocypid family Polycopidae (Bonaduce, 1964). Recently, confusion has arisen concerning the type species of *Polycopis*. This is the first description of the male of *Polycopis compressa*. In describing the female, Sars (1923, pl. 17) illustrated the shell with 3 central adductor muscle scars. We believe that Sars' illustration of the

shell muscle scars was wrong – at that time all polycopids were believed to have only 3 such scars. Sars (1923, p. 37) also noted that Müller (1894) had made *Polycopis compressa* Brady & Robertson, 1869 the type species of a new genus *Polycopis*. This opinion was endorsed by subsequent designation by Sylvester Bradley in the American Treatise (Moore (ed.), 1961, p. Q405). Nevertheless Chavtur (1981, p. 59) cited *Polycopis serrata* Müller, 1894 as the type species. Meanwhile, Kornicker & Van Morkhoven (1976) described *Metapolycopis hartmanni* n. sp. as type species of a new bathyal genus *Metapolycopis*. Careful comparison of their description with Sars (1923) description of the female and our description of the male of *Polycopis compressa* indicates numerous similarities. In particular, both genera have 2 dorsal lappets on the second segment of the antennule. However, the antennule in *P. compressa* has 6 segments while that of *Metapolycopis* has 5 (Kornicker & Van Morkhoven, 1976, p. 3). Further, Chavtur (1981, p. 60) defined *Metapolycopis* as also possessing at least 9 central adductor muscle scars in a half rosette pattern – and *M. kornickeri* Chavtur, 1979 has 14 such scars. On the other hand, *Polycopis compressa* has 8 central adductor muscle scars in a half rosette pattern as we illustrate. Further, *Metapolycopis* is bathyal or found in anchialine caves (Kornicker & Illiffe, 1989), while *Polycopis compressa* occurs usually in shallower water (Sars, 1923; Bonaduce *et al.*, 1982). The record of *Metapolycopis* sp. A (Whatley, Cooke & Warne, 1995) from shallow water in Shoal Bay, northern Australia, therefore, seems referable rather to *Polycopis*, since it too has 8 central adductor muscle scars in a half rosette pattern.

This leaves polycopid species that have a single dorsal lappet on the second segment of the antennule without a proper generic affiliation. Chavtur (1981) includes in this group *Polycopis serrata* Müller, 1894, *Polycopis quadridentata* Bonaduce, Ciampo & Masoli, 1975, *Polycopis pacifica* Chavtur, 1977 and *Polycopis compacta* Chavtur, 1981. For this group, we introduce the new genus *Chavturopsis* Bonaduce & McKenzie, with the type species *Polycopis pacifica* Chavtur, 1977, occurring in shallow water in the Kurile Islands of the northwestern Pacific. Apart from a single dorsal lappet on the second segment of the 6-segmented antennule, *Chavturopsis* is characterized by a small-medium sized shell (0.34-0.65 mm), with a finely- to coarsely-serrated anterior edge and 3-6 central adductor muscle scars in a full rosette pattern. Our choice of the type species for *Chavturopsis* stems from the fact that a relatively full description of *C. pacifica* is available (Chavtur, 1977, p. 20, figs 11, 5-8 and 12, 1-4) based on an adequate number of museum specimens. On the other hand, type material of the Bay of Naples species, *Polycopis serrata* Müller, 1894 no longer occurs in the G.W. Müller collection (Athersuch, 1976), and in their restudy of Polycopidae from the Bay of Naples Bonaduce *et al.* (1982) found it at only one station.

Size – L = 0.46 mm, H = 0.40 mm.

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REFERENCES

- AIELLO, G., BARRA, D., BONADUCE, G. & RUSSO, A., 1976, The genus *Cytherella* Jones, 1849 (Ostracoda) in the Italian Tortonian-Recent: *Rev. Micropaléont.* 39 (3): 171-190.
- ATHERSUCH, J., 1976, The G. W. Müller ostracod collection: *Pubbl. Staz. Zool. Napoli*, 40: 344-348, 1 table.
- , 1982, Some ostracod genera formerly of the Family Cytheridae Sars. *In* Bate, R., Robinson, E. & Sheppard, L.M. (eds), *Fossil and Recent ostracods*: 231-275, 8 figs, 8 pls., The British Micropalaeontological Society, Ellis Horwood Ltd.
- , HORNE, D.J. & WHITTAKER, J.E., 1989, Marine and brackish water ostracods. *In* Kermack, D.M. & Barnes, R.S.K. (eds), *Synopses of the British fauna (New Series)*, 43: 1-360, 137 figs, 7 pls. The Linnean Society of London & The Estuarine and Brackish-water Association, E.J. Brill.
- BONADUCE, G., 1964, Contributo alla conoscenza e correlazione sistematica nell'ambito della Famiglia Polycopidae (Ostracoda, Cladocopa) con particolare riferimento alle relazioni tra parte molle e carapace: *Pubbl. Staz. Zool. Napoli*, 34: 137-159, 12 figs.
- , CIAMPO, G. & MASOLI, M., 1975, Distribution of Ostracoda in the Adriatic Sea: *Pubbl. Staz. Zool. Napoli*, 40 suppl.: 1-304, 45 text-figs, 73 pls.
- , CILIBERTO, B., MASOLI, M., MINICHELLI, G. & PUGLIESE, N., 1982, Systematics and distribution of the Family Polycopidae in the Bay of Naples. *In* Bate, R., Robinsons, E. & Sheppard, L.M. (eds), *Fossil and Recent ostracods*: 344-364, 1 text-fig., 1 table, 5 pls., The British Micropalaeontological Society, Ellis Horwood Ltd.
- , PUGLIESE, N. & MINICHELLI, G., 1976, *Buntonia subulata* Ruggieri (Ostracoda) in the Gulf of Naples: *Pubbl. Staz. Zool. Napoli*, 40: 429-432, 1 text-fig., 2 figs.
- CHAVTUR, V.G., 1977, Ostracoda of the Family Polycopidae (Cladocopa) from the Kurile Islands. *In* *Invertebrate fauna of the Kurile Islands*: 144-171, 14 figs, Science Press, Moscow [in Russian].
- , 1981, On the systematic position of the modern Ostracoda in the Family Polycopidae (Ostracoda, Cladocopinae): *Proc. Inst. Oceanol. P.P. Shirshov*: 53-61 [in Russian].
- HARTMANN, G. & PURI, H.S., 1974, Summary of neontological and paleontological classification of Ostracoda: *Mitt. hamb. zool. Mus. Inst.*, 70: 7-73.
- KORNICKER, L.S. & ILLIFFE, T.M., 1989, Ostracoda (Myodocopina, Cladocopina, Halocypridina) mainly from anchialine caves in Bermuda: *Smithsonian Contrib. Zool.*, 475: 1-88, 49 figs.
- & VAN MORKHOVEN, F.P.C.M., 1976, *Metapolycope*, a new genus of bathyal Ostracoda from the Atlantic (Suborder Cladocopina): *Smithsonian Contrib. Zool.*, 225: 1-29, 1 text-fig., 24 figs.
- MCKENZIE, K.G. & BONADUCE, G., 1993, Partial redescription of some Trachyleberididae and Hemicytheridae from the Bay of Naples, comparisons, and a reappraisal of trachyleberidid-hemicytherid classification. *In* McKenzie, K.G. & Jones, P.J. (eds), *Ostracoda in the Earth and Life Sciences*: 599-620, 2 figs, Balkema.
- MOORE, R.C. (ed.), 1961, *Treatise of Invertebrate Paleontology. Part Q Arthropoda 3 Crustacea Ostracoda*, pp. i-xxiii, Q1-Q442, 334 figs, The Geological Society of America and The University of Kansas.
- MÜLLER, G.W., 1894, Die Ostracoden des Golfes von Neapel und der angrenzenden Meeresabschnitte: *Fauna u. Flora des Golfes von Neapel*, 21: 1-404, 14 figs, 7 tables, 40 pls.
- RUGGIERI, G., 1954, Iconografia degli Ostracodi marini del Pliocene e del Pleistocene italiani. Parte II: *Att. Soc. ital. Sc. Nat.*, 93: 561-575, figs 17-41.
- , 1962, Gli Ostracodi marini del Tortoniano (Miocene medio-superiore) di Enna, nella Sicilia centrale: *Palaeontogr. Ital.*, 56: 1-68, 7 pls.
- , 1978, Due ostracofaune dell'Emiliano (Pleistocene inferiore) argilloso del Sub-appennino di Faenza: *Boll. Soc. Paleont. Ital.*, 17: 3-14, 7 figs.
- , 1984, Gli Ostracodi del Pleistocene inferiore di Rizzolo studiati da Seguenza: *Naturalista sicil.*, 8: 121-131.
- SARS, G.O., 1923, An Account of the Crustacea of Norway. Vol. IX Ostracoda. Parts III & IV, Polycopidae (concluded), Cytherellidae, Cypridae (part): 33-72, pls. 17-32, The Bergen Museum.
- , 1925, An Account of the Crustacea of Norway. Vol. IX Ostracoda. Parts XI & XII, Cytheridae (continued): 177-208, pls. 81-96, The Bergen Museum.
- SCHORNIKOV, E.I., 1969, Subclass Ostracoda. *In* Morduca-Boltovskoy, E.D. (ed.), *Keys to the fauna of the Black and Azov Seas. Vol. 2 - free-living invertebrates, Crustacea*: 163-260, 42 pls., Science Press, Kiev [in Russian].
- SCHRAM, F.R. & KOENEMANN, S., 2001, Developmental genetics and arthropod evolution: part 1, on legs: *Evol. & Develop.*, 3: 343-354, 10 figs.
- WHATLEY, R.C., COOKE, P.C.B. & WARNE, M.T., 1995, The Ostracoda from Lee Point on Shoal Bay, northern Australia: Part 1 - Cladocopa and Platycopina: *Rev. Esp. Micropalaeont.*, 27: 69-89, 3 pls.

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