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Cyclopina (Copepoda, Cyclopoida) from Brazilian sandy beaches

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Five new species of *Cyclopina* Claus are described and *C. mediterranea* Steuer is redescribed from Brazilian sandy beaches. *Cyclopina caroli* sp. n. can be very abundant in coarse sandy shores. It is related to *C. laurentica* Nicholls and *C. crassissetosa* Herbst with which it shares a similar structure of leg 5 in the female. *Cyclopina dorae* sp. n. is most closely related to *C. mediterranea* Steuer. *Cyclopina arenosa* sp. n. and *Cyclopina yutimaete* sp. n. are reminiscent of *C. pontica* Monchenko, the only other species of *Cyclopina* that possess a 2-segmented endopod in leg 1. *Cyclopina caissara* sp. n. is distinguished from all other congeneric species by having a very reduced inner spine in the leg 5 exopod of both male and female. This species shares with *C. schneideri* Scott and *C. brevifurca* Sars the 12-segmented antennule. Taxonomical problems related to *C. schneideri* and *C. brevifurca* are discussed. *Cyclopina mediterranea* Steuer, 1940 is recorded for the first time from the American continent.

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Introduction

Knowledge of psammic cyclopoid copepods from Brazil is restricted to the studies of Herbst (1955) and, more recently, of Lotufo & Rocha (1991, 1993*a*) and Lotufo & Rocha (1993*b*). Herbst (1955) recorded *Cyclopina* cf. *steueri* from a sandy beach in Ilhabela, State of São Paulo. Lotufo & Rocha (1991) described *Cyclopina caiala* from a sandy beach in Salvador, State of Bahia. These are the only records of this genus in South America. In this study, five new species are described and *Cyclopina mediterranea* Steuer, 1940 is recorded for the first time from the American continent.

Material and methods

For the collecting of psammic copepods, 100 sandy beaches along the coast of the State of São Paulo were sampled. Cyclopoid copepods were found in 30 beaches. *Cyclopina* occurred in five beaches: Pequea in Ilhabela, Cigarras, São Francisco, Zimbros and Segredo in São Sebastião. The interstitial fauna was collected in the intertidal zone. Interstitial water, collected in holes dug in the beach during low tide, was filtered through a 125 μm meshed collecting device. In the latter three beaches, copepods were collected near the bottom, at a depth of about 1 m by stirring up the sediment. Specimens were fixed in 4% formalin. Granulometric and salinity analyses were carried out only for intertidal samples. Copepods found to be associated with *Cyclopina* included harpacticoids and specimens of *Halicyclops, Neocyclops* and *Procyclopina*.

Intact specimens were examined in 85% lactic acid, and the dissected parts were mounted in glycerine on slides sealed with Glyceel. Figures were prepared using a camera lucida on a Leitz Laborlux microscope.

Type material and supplementary lots of the species examined were deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP). The remaining material is deposited in the Departamento de Zoologia da Universidade de São Paulo.

The terminology applied to body and appendage segmentation follows that of Huys and Boxshall (1990). The first (second, third) segment of the exopod (endopod) are denoted by exp(enp) -1(-2,-3).

Family CYCLOPINIDAE Sars
Subfamily CYCLOPININAE Kiefer
Cyclopina Claus, 1863

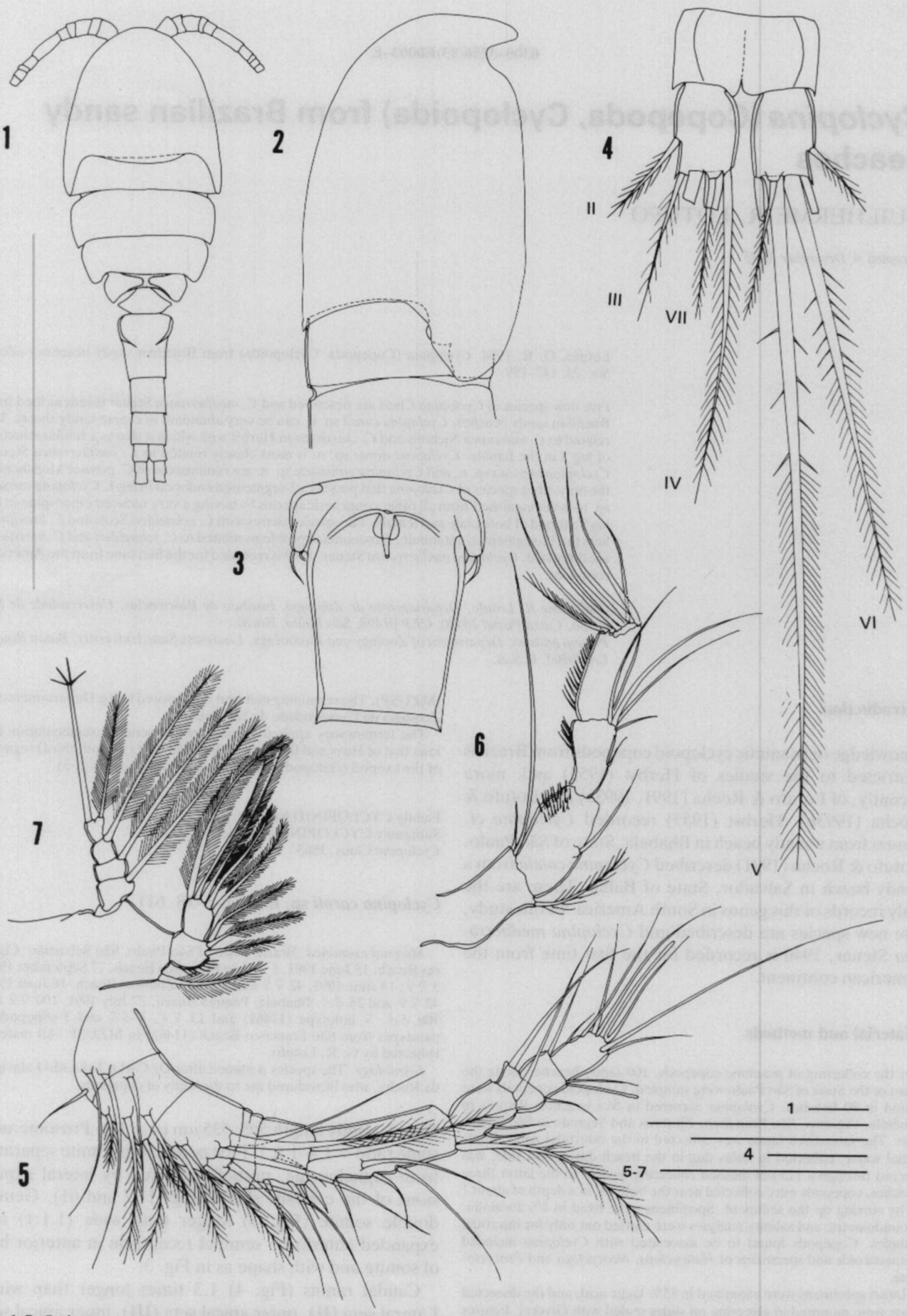
Cyclopina caroli sp. n. (Figs 1–18, 61)

Material examined. Brazil. State of São Paulo. São Sebastião: Cigarras Beach, 15 June 1991, 1 ♀; São Francisco Beach, 17 September 1990, 3 ♀♀; 14 June 1991, 42 ♀♀ and 25 ♂♂; Zimbros Beach, 16 June 1991, 42 ♀♀ and 25 ♂♂. Ilhabela: Pequea Beach, 27 July 1991, 100 ♀♀ and 100 ♂♂. ♀ holotype (11461) and 13 ♀♀, 3 ♂♂ and 3 copepodites paratypes from São Francisco Beach (11462) in MZUSP. All material collected by G. R. Lotufo.

Etymology. The species is named after Dr Carlos Eduardo Falavigna da Rocha, who introduced me to the study of copepods.

Female. Body length 505–535 μm (n = 10). Prosome:urosome ratio = 1.4–1.6:1. First pedigerous somite separated from cephalosome, partially covered by lateral expansions of the cephalic shield (Figs 1, 2 and 61). Genital double somite (Fig. 3) longer than wide (1.1:1) and expanded anteriorly; seminal receptacle in anterior half of somite and with shape as in Fig. 3.

Caudal ramus (Fig. 4) 1.3 times longer than wide. Lateral seta (II), outer apical seta (III), inner apical seta (VI) and dorsal seta (VII) plumose. Dorsal seta shorter than apical outer seta. Inner apical seta twice as long as



Figs 1–7. Cyclopina caroli sp. n. Female:—*1.* Habitus, dorsal;—*2.* cephalosome and first pedigerous somite, lateral;—*3.* genital double somite, ventral, showing seminal receptacle;—*4.* anal somite and caudal rami, dorsal;—*5.* antennule;—*6.* antenna;—*7.* mandibular palp. Scale bars = 50 μm.

outer apical seta. Terminal setae (IV, V) spinulose proximally and plumose distally.

Antennule (Fig. 5) 10-segmented. Armature as follows: (Roman numeral = segment; Arabic numeral = seta; sp = spine; ae = aesthetasc): I—3; II—5; III—7; IV—3; V—5 + sp; VI—5; VII—3; VIII—2; IX—2 + 1 ae; X—7 + ae.

Antenna (Fig. 6) 4-segmented. Coxobasis armed with 1 apical inner seta and 2 outer setae representing the exopod.

Mandibular palp (Fig. 7) consisting of wide basis bearing 1 inner seta; endopod 2-segmented and with 3 setae on proximal segment and 6 setae on distal segment; exopod 4-segmented and with 1 plumose seta on segments 1–3 and 2 setae on terminal segment, the outermost one straight and tipped with crown of spinules.

Maxillule (Fig. 8) with biramous palp. Sutures between praecoxa, coxa and basis not clearly distinct. Praecoxal arthrite well developed, armed with 8 spiniform elements. Coxa with 2 outer plumose setae representing epipodite. Basis with 2 endites; proximal one with 3 setae and distal one with 2 setae. Exopod 1-segmented, with 4 setae on distal margin. Endopod 1-segmented and with 5 setae on distal margin and 2 setae on inner margin.

Maxilla (Fig. 9) 6-segmented. Praecoxa with 2 endites; proximal one with 3 setae and distal one with 1 seta. Coxa with 2 endites, proximal one with 2 setae and distal one with 3 setae. Basis with a claw-like element fused to the endite, 1 long and 1 short seta. Endopod 3-segmented and bearing 3, 2 and 4 setae on segments 1–3, respectively.

Maxilliped (Fig. 10) 6-segmented. Syncoxa with 3 endites with 1, 3 and 2 setae from proximal to distal. Basis with 2 plumose distal setae. Endopod 4-segmented; first and second segments lacking setae, segment 3 with 1 seta and segment 4 with 4 setae.

Legs 1–4 (Figs 11–13) with 3-segmented rami. Leg 3 differing from leg 2 (Fig. 12) in being larger and in bearing larger spines on exp-3. Armature as follows (Roman numerals = spines; Arabic numerals = setae):

	Coxa	Basis	Endopod	Exopod
Leg 1	0–1	1–I	0–1; 0–1; 1,2,3	I–1; I–1; IV, 4
Leg 2	0–1	1–0	0–1; 0–2; 1,2,3	I–1; I–1; IV, 5
Leg 3	0–1	1–0	0–1; 0–2; 1,2,3	I–1; I–1; IV, 5
Leg 4	0–1	1–0	0–1; 0–2; 1,2,2	I–1; I–1; III, 5

Outer margin of enp-3 of legs 1–3 with strip of serrate hyaline membrane between distal and outermost setae. Leg 1 (Fig. 11) exp-3 with distalmost spine plumose along inner margin and serrate along outer margin. This spine is also serrate distally on inner margin in legs 2–4. Leg 4 (Fig. 13) densely ornate with rows of spinules on coxa, basis, intercoxal sclerite, posterior surface of exp-2 and -3 and inner margin of exp-1; enp-2 setae and enp-3 proximal seta modified, plumose along outer margin and with serrate hyaline membrane distally along inner margin.

Leg 5 (Fig. 14) 2-segmented comprising protopod and 1-segmented exopod, joined by short and wide intercoxal sclerite. Coxobasis outer seta plumose. Exopod 1.7 times longer than wide, with rows of spinules along outer and inner margins and bearing 2 spines and 1 seta; inner spine with smooth hyaline membrane; outer spine 1.2 times longer than inner spine and with serrate hyaline membrane; apical seta naked and 1.5 times longer than the segment. Leg 6 (Fig. 15) located laterally, represented by small operculum with 2 setae which is partially fused to the somite and covers genital aperture on each side.

Male (Fig. 16). Body length 410–438 μm (n = 10). Prosome:urosome ratio = 1.4–1.5:1. Urosome 6-segmented. Digeniculate antennule 15-segmented. Leg 5 (Fig. 17) 2-segmented; exopod bearing 1 inner seta in addition to inner and outer spines and apical seta. Leg 6 (Fig. 18) armed with 1 inner spinulose seta and 1 outer naked seta. The male is identical to the female in all other respects.

Habitat. Specimens were collected in coarse sand (median grain size 570–960 μm, interstitial water salinity 26–30‰) and from the sediment in the sublittoral zone of São Francisco Beach at about 1 m depth.

Discussion. *Cyclopina caroli* sp. n. resembles *C. laurentica* Nicholls, 1939 and *C. crassisetosa* Herbst, 1953 by the shape and armature of the leg 5 in the female. *Cyclopina laurentica* is distinguished from *C. caroli* by the 13-segmented antennule and the caudal ramus which is wider than long. *Cyclopina crassisetosa* is distinguished from *C. caroli* by the length:width ratio of the caudal ramus (3.5:1), by the relative length of the caudal setae and by lacking the setae representing the antennary exopod.

This species was very abundant in the samples taken from Pequeá Beach, Ilhabela, comprising 25% of the copepods collected.

Cyclopina dorae sp. n. (Figs 19–24)

Material examined. Brazil, State of São Paulo, São Sebastião: Segredo Beach, 15 June 1991, 1 ♀. Coll. G. R. Lotufo, col. ♀ holotype (11463) in MZUSP.

Etymology. The species is named after Dr Maria Auxiliadora P. M. Amado, who contributed significantly to the study of parasitic copepods from Brazil.

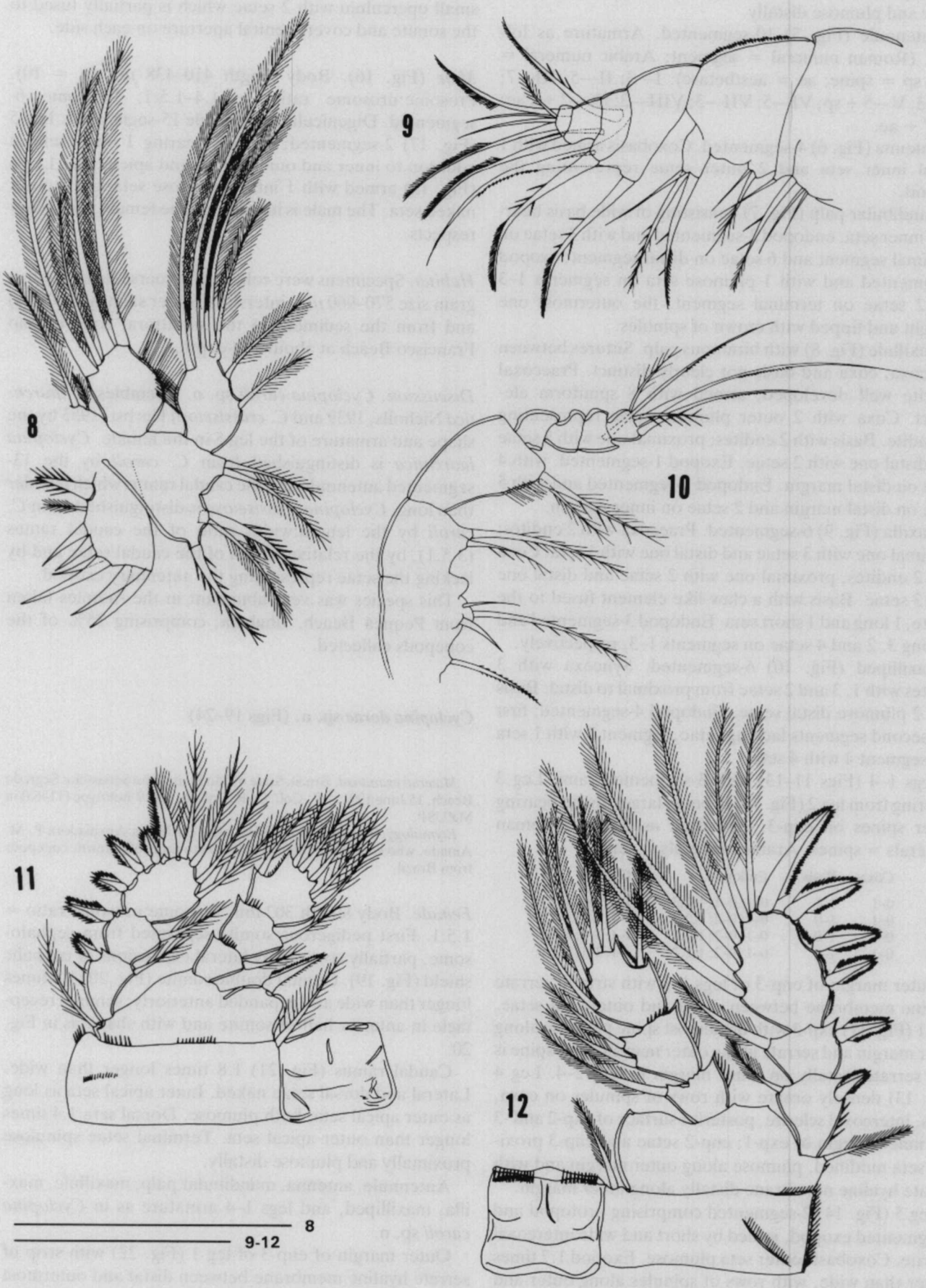
Female. Body length 302 μm. Prosome:urosome ratio = 1.5:1. First pedigerous somite separated from cephalosome, partially covered by lateral expansions of cephalic shield (Fig. 19). Genital double somite (Fig. 20) 1.4 times longer than wide and expanded anteriorly; seminal receptacle in anterior half of somite and with shape as in Fig. 20.

Caudal ramus (Fig. 21) 1.8 times longer than wide. Lateral and dorsal setae naked. Inner apical seta as long as outer apical seta, both plumose. Dorsal seta 1.4 times longer than outer apical seta. Terminal setae spinulose proximally and plumose distally.

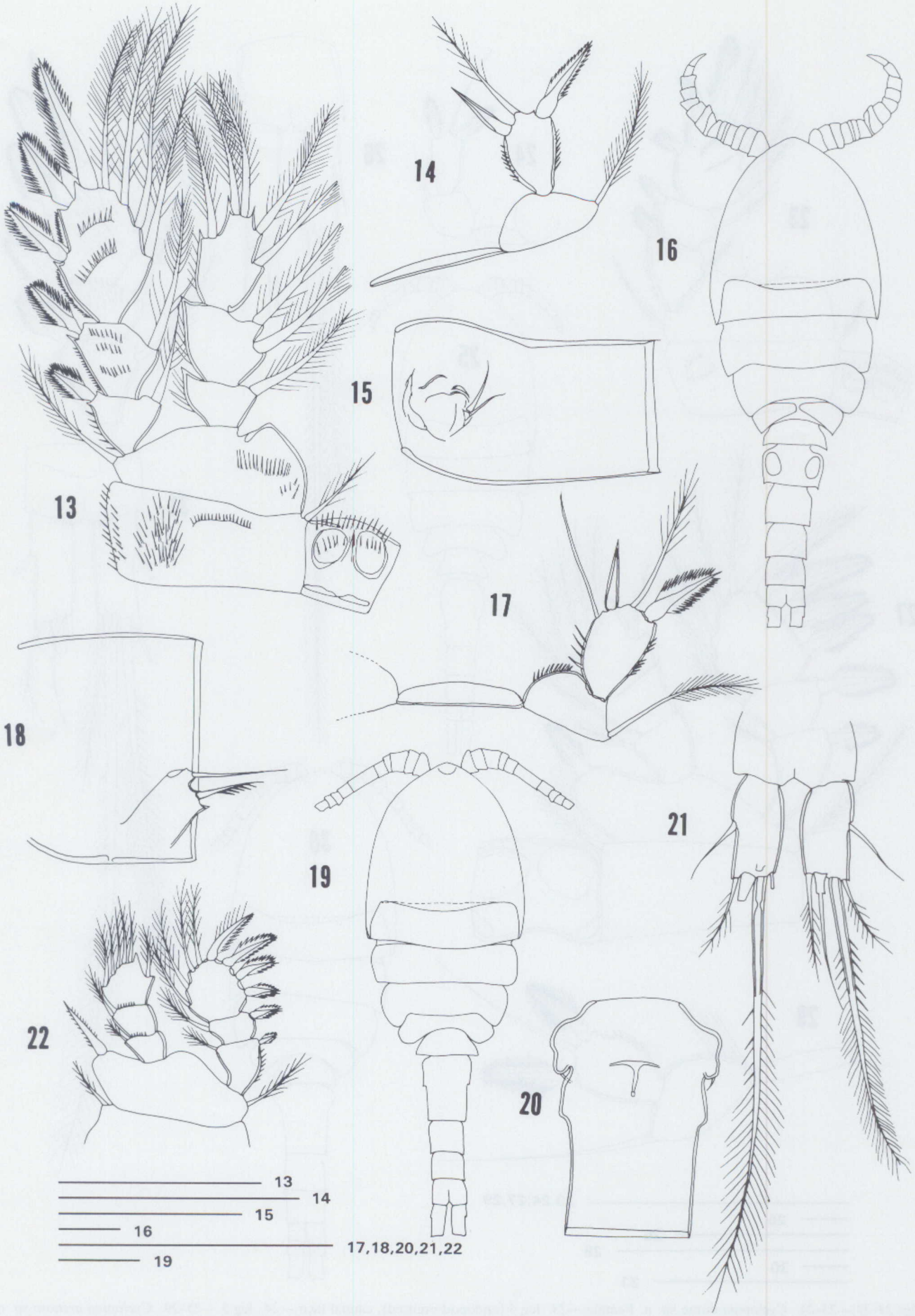
Antennule, antenna, mandibular palp, maxillule, maxilla, maxilliped, and legs 1–4 armature as in *Cyclopina caroli* sp. n.

Outer margin of enp-3 of leg 1 (Fig. 22) with strip of serrate hyaline membrane between distal and outermost setae. Leg 4 (Fig. 23) ornated with rows of spinules on coxa, intercoxal sclerite, posterior surface of exp-3 and inner margin of exopod 1.

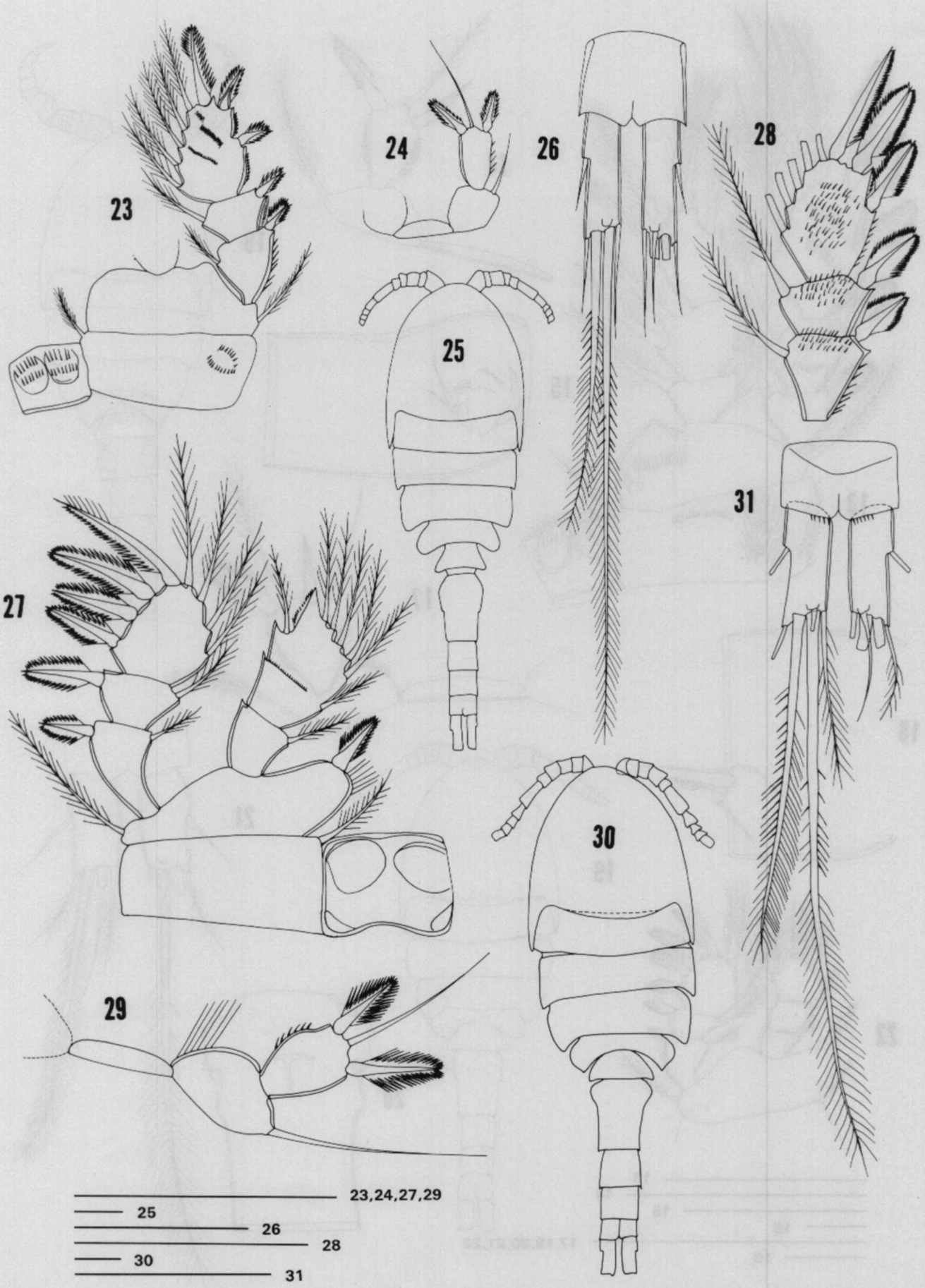
Leg 5 (Fig. 24) 2-segmented and joined by intercoxal



Figs 8–12. Cyclopina caroli sp. n. Female:—*8.* Maxillule;—*9.* maxilla;—*10.* maxilliped;—*11.* leg 1;—*12.* leg 2. Scale bars = 50 μm.



Figs 13–22.—13–18. *Cyclopina caroli* sp. n. Female:—*13.* Leg 4, caudal view;—*14.* leg 5;—*15.* genital double somite, lateral, showing leg 6; male:—*16.* Habitus, dorsal:—*17.* leg 5;—*18.* genital somite, lateral, showing leg 6—*19–22. Cyclopina dorae* sp. n.—*19.* Habitus, dorsal;—*20.* genital double somite, ventral, showing seminal receptacle;—*21.* caudal rami, dorsal;—*22.* leg 1. Scale bars = 50 μm.



Figs 23–31.—23–24. Cyclopina dorae sp. n. Female:—*23.* leg 4 (endopod omitted), caudal face;—*24.* leg 5.—*25–29. Cyclopina arenosa* sp. n. Female:—*25.* Habitus, dorsal;—*26.* anal somite and caudal rami, dorsal;—*27.* leg 1;—*28.* leg 4 exopod;—*29.* leg 5.—*30–31 Cyclopina yutimaete* sp. n. Female:—*30.* Habitus, dorsal;—*31.* anal somite and caudal rami. Scale bars = 50 μm.

sclerite. Coxobasis outer seta naked. Exopod 2.2 times longer than wide, ornated with rows of spinules on outer margin and bearing 2 spines and 1 seta; inner spine 1.1 longer than outer spine, both with serrate hyaline membrane; apical seta plumose and 1.5 times longer than the segment. Leg 6 as in *Cyclopina caroli* sp. n.

Male. Unknown.

Habitat. Specimen was collected in coarse sand (median grain size 520 μm). Interstitial water salinity was 28‰.

Discussion. *Cyclopina dorae* sp. n. shares with *C. mediterranea* Steuer, 1940 the caudal rami length:width ratio and the structure of leg 5 exopod in the female. *Cyclopina dorae* differs from this species in the relative length of the dorsal, outer apical and inner apical caudal setae, in having 2 setae representing the antennary exopod, the terminal segment of the maxillipedal endopod having 4 setae and the outer seta of the leg 5 coxobasis being as long as the exopod. Furthermore, *C. dorae* differs from the specimens of *C. mediterranea* collected in the State of São Paulo in the spinule ornamentation on leg 4.

Cyclopina arenosa **sp. n.** (Figs 25–29)

Material examined. Brazil, State of São Paulo, São Sebastião: Segredo Beach, 12 February 1985, 1 ♀. Coll. C. E. F. Rocha. ♀ holotype (11464) in MZUSP.

Etymology. The specific name is derived from the Latin arena, meaning sand, in reference to the animal habitat.

Female. Body length 495 μm. Prosome:urosome ratio = 1.25:1. First pedigerous somite separated from cephalosome, partially covered by lateral expansions of cephalic shield (Fig. 25). Genital double somite (Fig. 25) twice as long as wide with shape similar to that of *C. dorae*.

Caudal ramus (Fig. 26) 3.2 times longer than wide. Lateral and dorsal setae naked. Lateral, outer apical and inner apical setae naked. Inner apical seta 2.5 times longer than outer apical seta. Dorsal seta 1.5 times longer than outer apical seta. Middle apical setae spinulose proximally and plumose distally.

Antennule, antenna, mandibular palp, maxillule and maxilla as in *Cyclopina caroli* sp. n.

Maxilliped with protopodite as in *C. caroli* sp. n. The endopod was broken in the specimen examined.

Legs 1–4 armature as in *C. caroli*. Leg 1 (Fig. 27) with exopod 3-segmented; enp-2 and -3 fused; original segmentation marked by spinular row. Leg 4 exopod (Fig. 28) densely ornated with spinules.

Leg 5 (Fig. 29) 2-segmented and joined by intercoxal sclerite. Coxobasis outer seta naked. Exopod 1.7 times longer than wide, ornated with rows of spinules on both margins and bearing 2 spines and 1 seta; outer spine 1.2 times longer than inner spine; both with serrate hyaline membrane; apical seta plumose and 2.1 times longer than the segment. Leg 6 as in *Cyclopina caroli* sp. n.

Male. Unknown.

Habitat. Specimen was collected in coarse sand (median grain size 520 μm). Interstitial water salinity was 28‰.

Discussion. Among the species of *Cyclopina*, only *C. arenosa* sp. n. and *C. pontica* Monchenko, 1977 display a 2-segmented endopod in leg 1. These two species also resemble each other in the caudal ramus length:width ratio, relative length of the caudal setae, and in the exopodal spines on leg 5. *Cyclopina arenosa* differs from *C. pontica* in the length:width ratio of the genital double somite, in having 1 inner seta on the antennary coxobasis representing the exopod, 6 setae on the endopod and a modified seta on the exopod 4 of the mandibular palp, and modified setae on the leg 4 endopod.

Cyclopina yutimaete **sp. n.** (Figs 30–33)

Material examined. Brazil, State of São Paulo, Ilhabela: Pequeá Beach, 27 July 1991, 2 ♀♀. Coll. G. R. Lotufo. ♀ holotype (11465) in MZUSP.

Etymology. The specific name is derived from the Tupiguarani language and means 'leg bearing many spines' and refers to the densely spinulose leg 4 of this species.

Female. Body length 382–390 μm. Prosome:urosome ratio = 1.3:1. First pedigerous somite separated from cephalosome, partially covered by lateral expansions of cephalic shield (Fig. 27). Genital double somite (Fig. 30) 1.3 times longer than wide and expanded anteriorly.

Caudal ramus (Fig. 31) 2.5 times longer than wide. Dorsal seta naked, 1.2 times longer than outer apical seta. Inner apical seta 1.9 times longer than outer apical seta, both plumose. Middle apical setae spinulose proximally and plumose distally.

Antennule, antenna, mandibular palp, maxillule, maxilla, maxilliped, and legs 1–4 armed as in *Cyclopina caroli* sp. n.

Leg 1 as in *Cyclopina arenosa* sp. n., with 2-segmented endopod and 3-segmented exopod. Leg 4 (Fig. 32) ornated with rows of spinules on coxa and exopod; enp-1 proximal seta stouter than other setae on ramus; enp-2 setae and enp-3 proximal seta modified as in *Cyclopina caroli* sp. n.

Leg 5 (Fig. 33) 2-segmented and joined by narrow intercoxal sclerite. Coxobasis outer seta reaching tip of exopod inner spine. Exopod 1.8 times longer than wide, ornated with rows of spinules on both margins and bearing 2 spines and 1 seta; outer spine 1.6 times longer than inner spine; apical seta naked 3.5 times longer than the segment. Leg 6 as in *Cyclopina caroli* sp. n.

Male. Unknown.

Habitat. Specimens were collected in coarse sand. Interstitial water salinity was 26‰.

Discussion. *Cyclopina yutimaete* sp. n. shares with *C. pontica* Monchenko, 1979 and *C. arenosa* sp. n. the leg 1 endopod 2-segmented. *Cyclopina yutimaete* differs from *C. pontica* in the length:width ratio of the caudal ramus in addition to the differences already mentioned to dis-

tinguish *C. pontica* from *C. arenosa*. *Cyclopina yutimaete* sp. n. differs from *C. arenosa* in the length:width ratio of the caudal rami, the relative length of the caudal setae, and shape and relative length of the armature elements in leg 5.

Cyclopina yutimaete shares with *C. kieferi* Schäfer, 1936 the length:width ratio of the caudal ramus, structure of the leg 5 and modified setae on leg 4 endopod. Both species can be distinguished by the number of segments on leg 1 endopod.

Herbst (1953) recorded *C.* cf. *kieferi* from the Mediterranean coast of France. Herbst's specimens differed from Schäfer's original description of the length:width ratio of the caudal ramus and relative length of the leg 5 exopodal spines. These differences suggest that the French specimens probably belong to a new species.

Cyclopina caissara sp. n. (Figs 34–53)

Material examined. Brazil, State of São Paulo, São Sebastião: Segredo Beach, 12 February 1985, 6 ♀♀ and 2 ♂♂. ♀ holotype (11491) and 5 ♀♀ and 1 ♂ paratypes (11492) in MZUSP. Coll. G. R. Lotufo.

Etymology. The specific name alludes to the local inhabitants of the coast of the State of Sã Paulo.

Female. Body length 670–720 μm (n = 10). Prosome:urosome ratio = 1.68–1.82:1. First pedigerous somite separated from cephalosome, partially covered by lateral expansions of cephalic shield (Fig. 34). Genital double somite (Fig. 35) longer than wide (1.1:1); seminal receptacle in anterior half of somite and with shape as shown in Fig. 35.

Caudal ramus (Fig. 36) 1.3 times longer than wide. Lateral, inner apical, outer apical and dorsal setae plumose. Dorsal seta plumose distally and shorter than outer apical seta. Inner apical seta twice as long as outer apical seta. Terminal setae spinulose proximally and plumose distally.

Antennule (Fig. 37) 12-segmented. Armature as follows: (Roman numeral = segment; Arabic numeral = seta; sp = spine; ae = aesthetasc): I—3; II—5; III—8; IV—4; V—5 + sp; VI—6; VII—1 + ae; VIII—1; IX—1; X—2; XI—2 + ae; XII—6 + ae.

Antenna (Fig. 38) 4-segmented. Coxobasis armed with 1 apical inner seta and 1 naked outer seta representing the exopod.

Mandible (Fig. 39) consisting of coxa with gnathobase and biramous palp. Palp as in *Cyclopina caroli* sp. n.

Maxillule (Fig. 40) with biramous palp; armature as in *C. caroli* sp. n. Sutures between praecoxa, coxa and basis not clearly distinct. Praecoxal arthrite well developed, armed with 12 elements.

Maxilla (Fig. 41) 6-segmented. Praecoxa, coxa and basis with armature as in *C. caroli* sp. n.; endopod 3-segmented with 4, 2 and 4 setae on segments 1–3, respectively.

Maxilliped (Fig. 42) and legs 1–4 (Figs 43–45) armature as in *C. caroli* sp. n.

Leg 3 differing from leg 2 (Fig. 44) in being larger and in bearing larger spines on exopod. Leg 4 (Fig. 45) densely ornated with rows of spinules on coxa, basis and exp-1 outer margin; endopod setae plumose. Legs 1–3 intercoxal sclerites (Figs 46, 47) ornated with thick spinules on distal margin and posterior surface. Leg 4 intercoxal sclerite (Fig. 48) with convex distal margin and ornated with thick spinules on posterior surface.

Leg 5 (Fig. 49) 2-segmented and joined by intercoxal sclerite. Coxobasis outer seta plumose. Exopod 2.5 times longer than wide, ornated with rows of spines on outer margins and bearing 2 spines and 1 seta; outer spine with serrate hyaline membrane and 5.8 times longer than inner spine; inner spine reduced and lacking hyaline membrane. Leg 6 (Fig. 50) represented by 2 setae set on a small protuberance partially fused to the somite and covering genital apertures; dorsal seta longer and with serrate hyalin membrane.

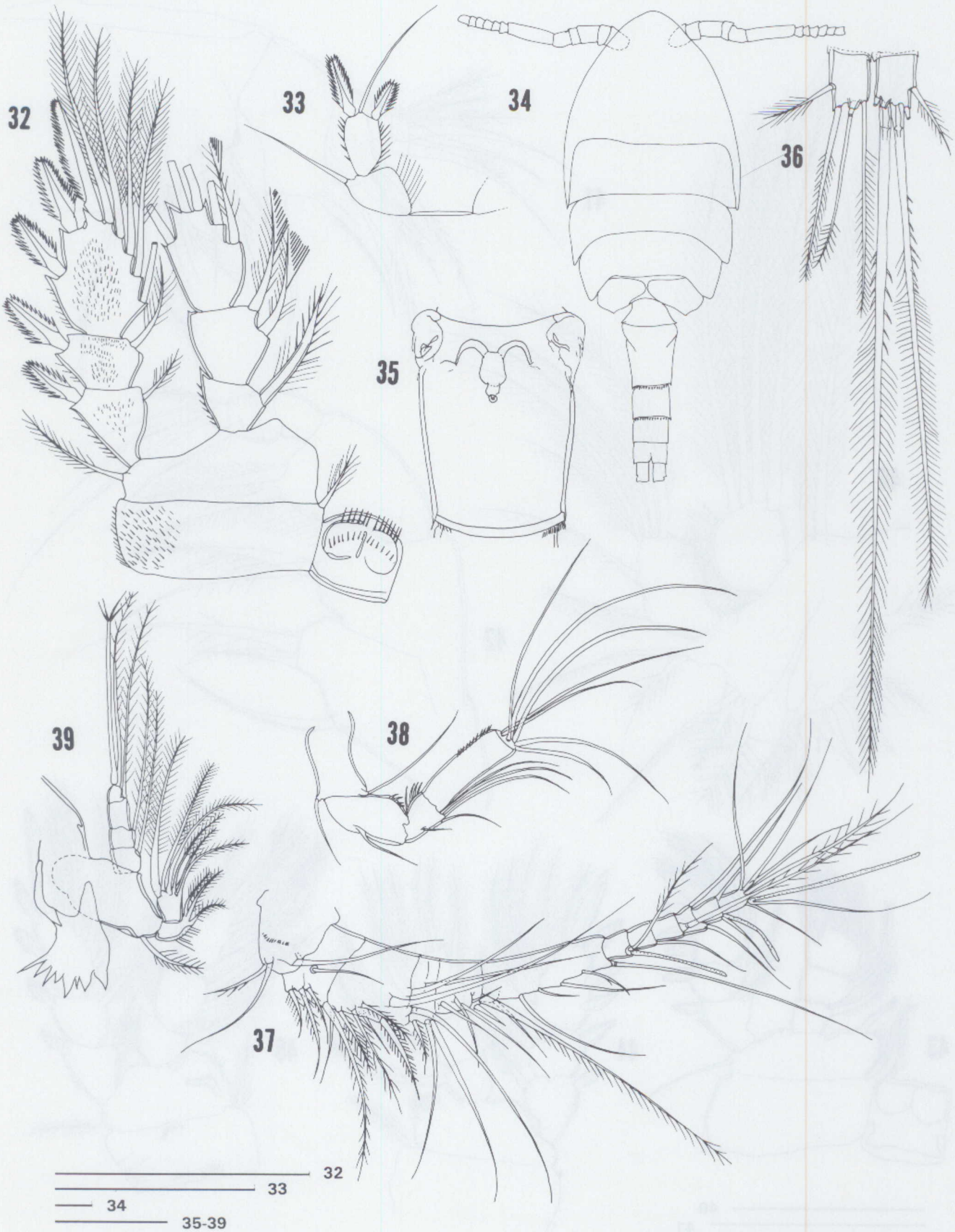
Male (Fig. 51). Body length 440–520 μm. Prosome:urosome ratio = 1.4:1. Urosome 6-segmented. Digeniculate antennule 14-segmented. Leg 5 (Fig. 52) 2-segmented; exopod bearing 2 slender and plumose inner seta in addition to inner and outer spines and apical seta. Leg 6 (Fig. 53) armed with 2 plumose setae set between 2 spiniform projections. The male is identical to the female in all other respects.

Habitat. Specimens were collected from the sediment in the sublittoral zone of Segredo Beach at about 1 m depth.

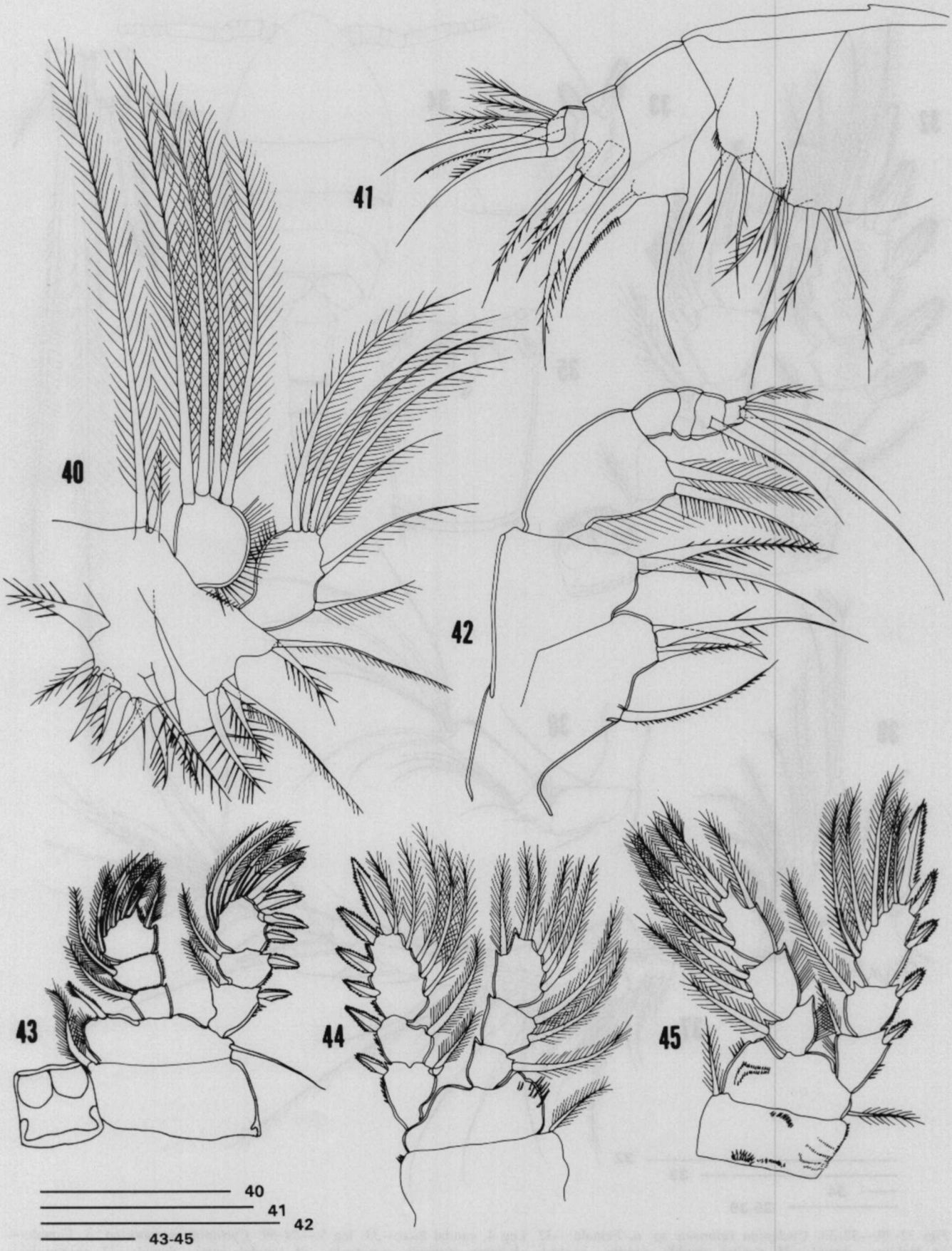
Discussion. *Cyclopina caissara* sp. n. shares with *C. schneideri* Scott, 1903 a 12-segmented antennule in the female. *Cyclopina schneideri* is distinguished from *C. caissara* by the antennary exopod represented by 2 setae, the presence of a modified seta on the maxillary exopod, enp-2 of the maxilliped with 1 seta, leg 4 endopod with all seta being plumose, and leg 5 with different relative lengths of the exopodal spines.

Cyclopina brevifurca Sars, 1913, also with a 12-segmented antennule, is distinguished from *C. caissara* sp. n. by the length:width ratio of the caudal ramus and by having the endopod of the maxilliped 3-segmented. In 1918, Sars synonymized *C. brevifurca* and *C. schneideri*. According to Fontaine's (1955) redescription of *C. schneideri*, based on the latter species' type-material, the latter species can be distinguished from *C. brevifurca* by the length:width ratio of the caudal ramus, and by having 1 modified seta on the exopod 3 of the mandibular palp. According to Granger & Mohammed's (1991) redescription, *C. schneideri* can be distinguished from *C. brevifurca* by the antennary exopod represented by 2 setae, the presence of a modified seta on the exopod of the maxillule, and the maxilliped with 3-segmented exopod. These differences suggest that *C. brevifurca* and *C. schneideri* are 2 distinct species, as already suggested by Smirnov (1935).

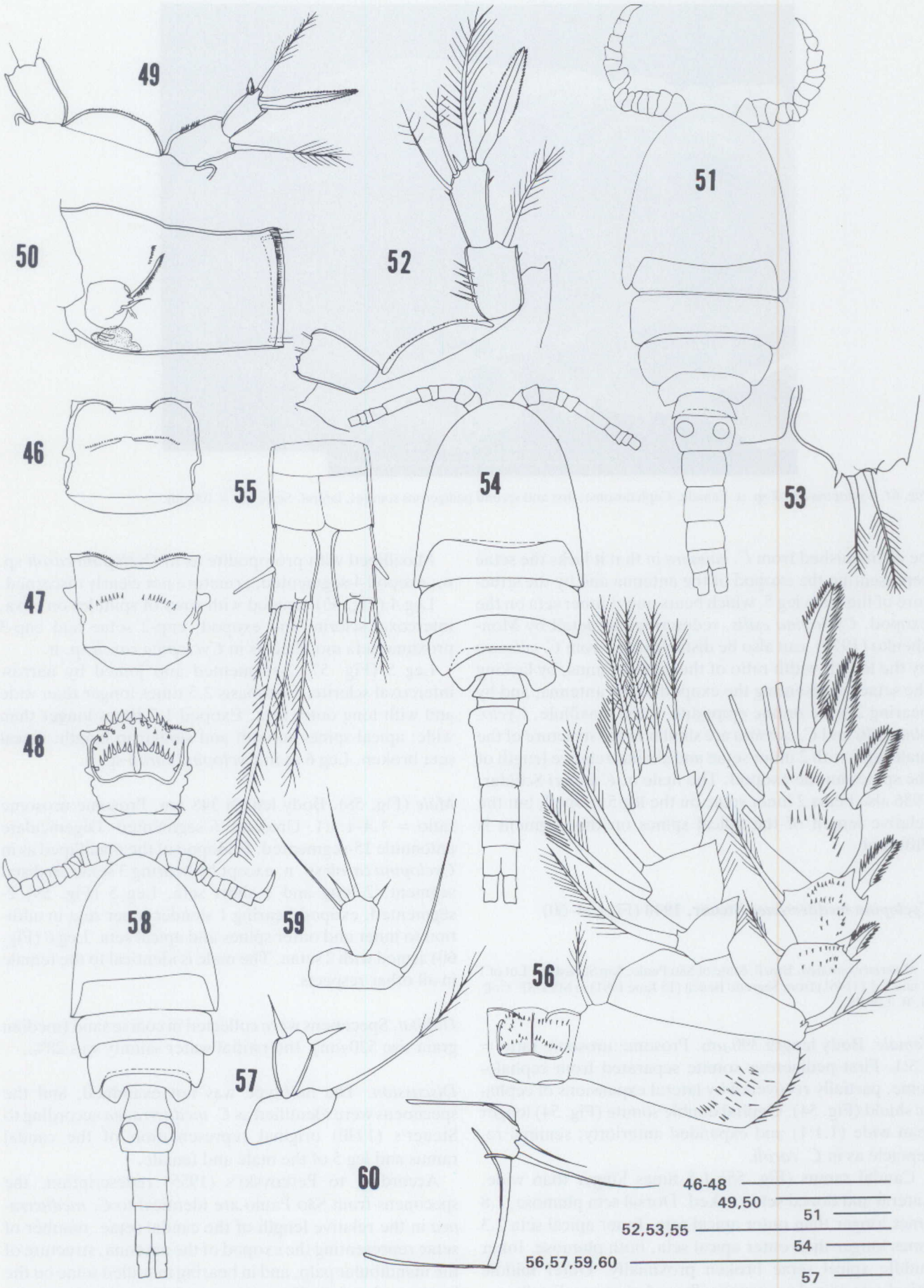
Cyclopina caissara sp. n. differs from all other congeneric species in having the leg 5 exopod 1.5 times longer than wide and with the outer spine very reduced, being 6 times shorter than the outer spine in both sexes. *Cyclopina americana* Herbst, 1982 and *C. esilis* Brian, 1938 also bear a reduced inner spine in the leg 5 exopod (2.5 times shorter than outer spine). *Cyclopina americana* can also



Figs 32–39.—32–33. *Cyclopina yutimaete* sp. n. Female:—*32.* Leg 4, caudal face;—*33.* leg 5.—*34–39. Cyclopina caissara* sp. n. Female:—*34.* Habitus, dorsal;—*35.* genital double somite, ventral, showing seminal receptacle;—*36.* caudal rami, dorsal;—*37.* antennule;—*38.* antenna.—*39.* mandible. Scale bars = 50 μm.



Figs 40–45. Cyclopina caissara sp. n. Female:—*40*. Maxillule;—*41*. maxilla;—*42*. maxilliped;—*43*. leg 1;—*44*. leg 2;—*45*. leg 4, caudal face. Scale bars = 50 μm.



Figs 46–60.—46–53. *Cyclopina caissara* sp. n. Female:—*46.* Intercoxal sclerite leg 1;—*47.* intercoxal sclerite leg 2;—*48.* intercoxal sclerite leg 4;—*49.* leg 5;—*50.* genital double somite, lateral; showing leg 6. Male:—*51.* Habitus, dorsal;—*52.* leg 5;—*53.* leg 6.—*54–60. Cyclopina mediterranea* Steuer, 1940. Female:—*54.* Habitus, dorsal;—*55.* caudal rami, dorsal;—*56.* leg 4;—*57.* leg 5. Male:—*58.* Habitus, dorsal;—*59.* leg 5;—*60.* genital somite, lateral, showing leg 6. Scale bars = 50 μm.

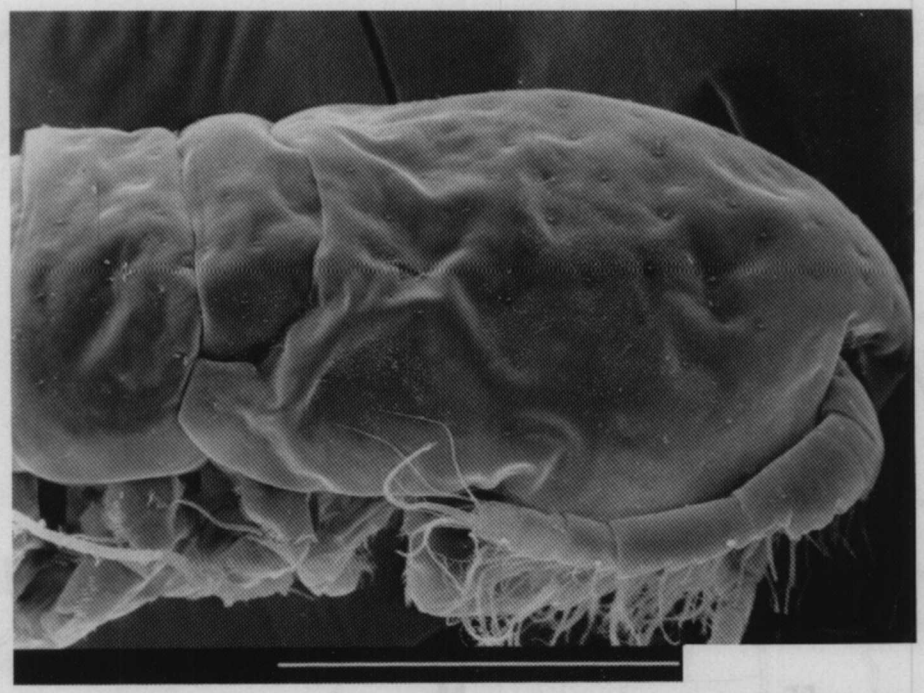


Fig. 61. Cyclopina caroli sp. n. Female. Cephalosome, first and second pedigerous somites, lateral. Scale bar = 100 μm.

be distinguished from *C. caissara* in that it lacks the setae representing the exopod of the antenna and by the structure of the male leg 5, which bears only 1 inner seta on the exopod. *Cyclopina esilis*, redescribed in detail by Monchenko (1979), can also be distinguished from *C. caissara* by the length:width ratio of the caudal ramus, by lacking the setae representing the exopod of the antenna, and by bearing 2 setae on the epipodite of the maxillule. *Cyclopina esilis* and *C. caissara* are similar in the structure of the male leg 5 with 2 inner setae and similar relative length of the spines on the exopod. The male of *C kieferi* Schäfer, 1936 also bears 2 inner setae on the leg 5 exopod, but the relative length of the apical spines on this segment is different.

Cyclopina mediterranea Steuer, 1940 (Figs 54–60)

Material examined. Brazil, State of São Paulo, São Sebastião: Lot of 1 ♀ and 1 ♂ (11461) from Segredo Beach (15 June 1991) in MZUSP. Coll. G. R. Lotufo.

Female. Body length 390 μm. Prosome:urosome ratio = 1.3:1. First pedigerous somite separated from cephalosome, partially recovered by lateral expansions of cephalic shield (Fig. 54). Genital double somite (Fig. 54) longer than wide (1.1:1) and expanded anteriorly; seminal receptacle as in *C. caroli*.

Caudal ramus (Fig. 55) 1.5 times longer than wide. Lateral and dorsal setae naked. Dorsal seta plumose, 1.8 times longer than outer apical seta. Inner apical seta 2.3 times longer than outer apical seta, both plumose. Inner middle apical setae broken proximally. Outer middle apical seta spinulose proximally and plumose distally.

Antennule, mandibular palp, maxillule, maxilla, maxilliped, and legs 1–4 armature as in *Cyclopina caroli* sp. n.

Antenna as in *Cyclopina arenosa* sp. n.

Maxilliped with protopodite as in *Cyclopina caroli* sp. n.; exopod 4-segmented, armature not clearly discerned.

Leg 4 (Fig. 56) ornated with rows of spinules on coxa, intercoxal sclerite and exopod; enp-2 setae and enp-3 proximal seta modified as in *Cyclopina caroli* sp. n.

Leg 5 (Fig. 57) 2-segmented and joined by narrow intercoxal sclerite. Coxobasis 2.5 times longer than wide and with long outer seta. Exopod 1.7 times longer than wide; apical spines smooth and similar in length; apical seta broken. Leg 6 as in *Cyclopina caroli* sp. n.

Male (Fig. 58). Body length 348 μm. Prosome:urosome ratio = 1.4–1.4:1. Urosome 6 segmented. Digeniculate antennule 15-segmented. Endopod of the maxilliped as in *Cyclopina caroli* sp. n. except by bearing 3 setae on distal segment, 2 long and 1 short seta. Leg 5 (Fig. 59) 2-segmented; exopod bearing 1 slender inner seta in addition to inner and outer spines and apical seta. Leg 6 (Fig. 60) armed with 2 setae. The male is identical to the female in all other respects.

Habitat. Specimens were collected in coarse sand (median grain size 520 μm). Interstitial water salinity was 28‰.

Discussion. The holotype was not examined, and the specimens were identified as *C. mediterranea* according to Steuer's (1940) original representation of the caudal ramus and leg 5 of the male and female.

According to Petkovski's (1955) redescription, the specimens from São Paulo are identical to *C. mediterranea* in the relative length of the caudal setae, number of setae representing the exopod of the antenna, structure of the mandibular palp, and in bearing modified setae on the leg 4 enp-2 and -3. The armature of the terminal segment of the maxilliped endopod, as represented by Petkovski, was not discerned in the female, but was confirmed in the male.

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