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A NEW SPECIES OF *MESOCYCLOPS* (COPEPODA: CYCLOPOIDA) FROM VIETNAM

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Abstract.—A new freshwater cyclopid, *Mesocyclops yenae* **sp. nov.** is described from Central Vietnam. Descriptions of the male, and copepodid stages IV and V are given as well the adult female. *Mesocyclops yenae* is unique within the genus in having an incompletely sclerotized "pseudosomite" between the pediger 5 and genital double-somite. In the same position, a whole-ring "pseudosomite" is known in some interstitial copepods only. The conspicously short terminal accessory caudal setae in *M. yenae* and other similarities in several morphological characters indicate a very close relationship with the Bornean *M. brevisetosus* Dussart et Sarnita, 1987.

Key words.— Copepoda, Cyclopidae, *Mesocyclops yenae* sp. nov., pseudosomite, Vietnam.

INTRODUCTION

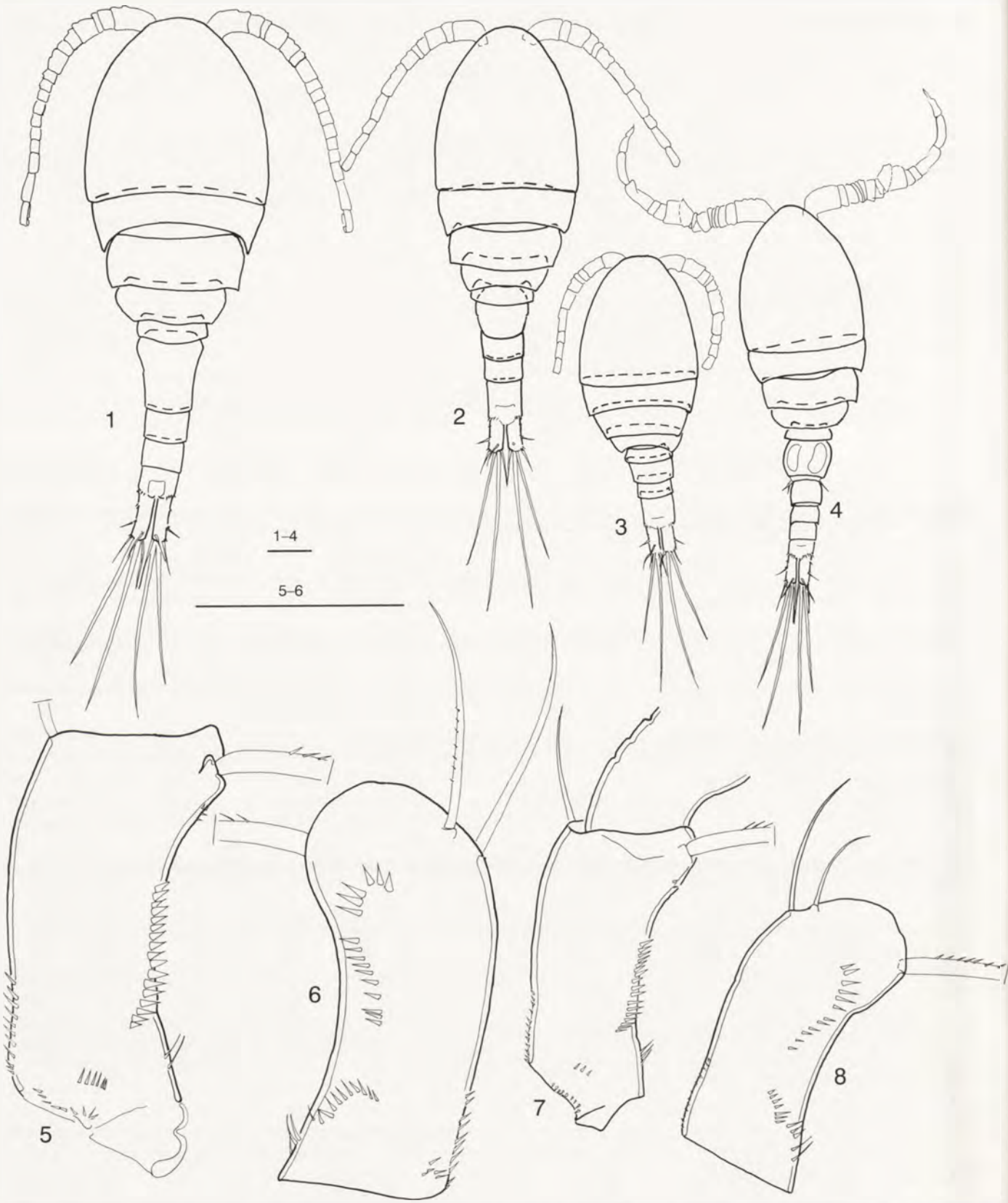
Studies evaluating *Mesocyclops* species for biological control of the dengue vector *Aedes aegypti* have been going on since the eighties in National Institute of Hygiene and Epidemiology (NIHE), Hanoi. At the beginning of these researches, however, no reliable information of *Mesocyclops* species living in Vietnam existed. With exception of Reid and Kay (1992) all other works (Richard 1894, Daday 1906, Lindberg 1952) recording only *M. leuckarti* (Claus, 1857) from Indochina, date back to the period when cosmopolitism of *M. leuckarti* was still widely accepted. In 1994/95 Dr. Gerald G. Marten (Kwansei Gakuen University, Gakuen, Japan) and Dr. Vu Sinh Nam (NIHE) asked Dr. Janet W. Reid (Smithsonian Institution) and me for help in identification of *Mesocyclops* collected from peridomestic, man-made biotopes (rainwater tanks, wells, ricefields, fishponds, pots). As a result, six species (*M. woutersi* Van de Velde, 1987, *M. affinis* Van de Velde, 1987, *M. thermocyclopoides* Harada 1931, *M. ogunnus* Onabamiro, 1957, *M. aspericornis* (Daday, 1906), and *M. ruttneri* Kiefer, 1981) have been reported from Vietnam. During a course on *Mesocyclops*, given in September 1996, *M. brevisetosus* Dussart et Sarnita 1987, a species known only from the type locality (West Kalimantan), was identified from a sample collected in Hue. Having compared the Vietnamese specimens with the holotype of *M. brevisetosus*, however I concluded, that *Mesocyclops* from Hue is a new species.

MATERIALS AND METHODS

The description (Dussart and Sarnita 1987) of *M. brevisetosus* was based upon two females only, both deposited in Canadian Museum of Nature, Ottawa. As the regulations of the Canadian Museum do not permit sending the holotype by mail, and the search for the paratype was unsuccessful, Ms. Judith Price (Assistant Collection Manager) kindly offered to check some characteristics of the holotype (cat. no: NMCC1987-1106). The number of setae on the second endopodal segment of the antenna, the absence of teeth on the lateral edge of the medial spine of leg 4 end3, the presence of hairs on the medial expansion of leg 4 basis, the caudal spinule ornamentation of leg 4 coxa, and the lack of "pseudosomite" anterior to genital double-somite in the holotype of *M. brevisetosus* are observations of Ms. Price.

A subsample of the original material collected in Hue (Central Vietnam), was given by Dr. Nam's Laboratory (NIHE) to me for study. I examined all the specimens (18 adult females, 3 adult males, 4 CV, and 5 CIV copepodids) available. Samples collected from different places (tanks, ponds) in Hue were mixed in the vial containing the new species. In the same vial, were specimens of another species showing the characteristics of *M. ogunnus* together with some differences of yet unknown (individual or specific) significance. The observations and measurements were made on specimens in glycerine. Drawings were done by camera lucida attached to an Olympus B 201 microscope. Measurements were taken following the method of Koźmiński (1936), however, the length of pediger 5 was not taken into consideration in either the body or urosome length. The width of the third endopodal segment of leg 4 was measured across its widest part. All the linear dimensions with exception of the length of the body, urosome, and terminal caudal setae, where an accuracy of 5 μm was used, were measured with an accuracy of 1 μm.

Two specimens of *M. brevisetosus* [det. I. Van de Velde 1989; COP 3742, 3744; KBIN, Brussel] collected from Papua New Guinea (Madang Province, Awar Point, Sago put) have



Figures 1–8. *Mesocyclops yenae* sp. nov. (1) Adult female, habitus – paratype; (2) Copepodid V, habitus; (3) Copepodid IV, habitus; (4) Adult male habitus – paratype; 5–6. Holotype: (5) antennary basis – frontal; (6) antennary basis – caudal; 7–8. Male Paratype: (7) antennary basis – frontal; (8) atennary basis – caudal. Scales: 50 μm.

been also compared with *Mesocyclops* from Hue and with the holotype of *M. brevisetosus*.

Abbreviations used in the text: s=seta; sp=spine; ae=aesthetasc; enp=endopod; exp=exopod; CIV= copepodid IV; CV=copepodid V.

Mesocyclops yenae sp. nov.

Types. Female holotype (dissected) Vietnam, Hue, 16°30' N – 107°30' E. Leg. Dr. Hue, 28 May 1996. Seventeen female paratypes (four dissected) and three male paratypes (two dissected) from the same locality as holotype. All dissected specimens, except one male paratype, which is placed on one slide only, are mounted on two slides. One dissected female paratype is deposited in National Institute of Hygiene and Epidemiology, Hanoi, all other material is deposited in Museum and Institute of Zoology PAS, Warsaw.

Etymology. The species is dedicated to Mrs. Nguyen Thi Yen, a participant in the *Mesocyclops* training course in NIHE (Hanoi), who showed me the *Mesocyclops* from Hue. Mrs. Yen's enthusiasm, skill, and kindness enormously contributed to success of the course.

Description of holotype (female) (Fig. 1). Length of body (from tip of rostrum to distal margin of caudal rami)=1190 µm; prosome/urosome=1.42; cephalothorax length/width=0.92. Cephalothorax width/genital double-somite width=2.71

Pediger 5. (Fig. 21) No hairs on somite. On dorsal surface two sensilla medially and other two laterally near distal rim.

Incomplete hoop-like but open dorsally "pseudosomite" present between pediger 5 and genital double-somite, bearing neither appendages nor integumental organs (Figs 21–23).

Genital double-somite (Figs 21–23) Length/width=1.15. Somite ornamented with six sensilla dorsally and two sensilla laterally, and rows of pits on both ventral and dorsal surface, but no hairs. Lateral arms of receptaculum seminis elongated, and curved backward; anterior margin of proximal part is concave in the middle. One circular pore, posterior to horseshoe-shaped copulatory pore. Transverse ducts meeting straight copulatory duct at right angle.

Abdominal somites. Abdominal somites 2–4 with 2, 0, 2 sensilla on dorsal surface, no sensilla ventrally.

Anal somite (Fig. 24) Two sensilla dorsally, and two medial pores near distal rim ventrally; entire distal rim ornamented with spinules.

Caudal rami. (Fig. 24) Length/width=3.21. Whole surface ornamented with tiny spinules, but no hairs. Spinules larger laterally at proximal third, and at implantation of antero- and posterolateral setae. Dorsal seta/posterolateral seta=0.92. Length of terminal setae from terminal accessory (medialmost) to posterolateral (lateralmost): 120 µm, 425 µm, 315 µm, 100 µm. Inner terminal seta/urosome=0.87.

Antennula (Fig. 26) 17-segmented. Armature formula as in *M. leuckarti*: 8s, 4s, 2s, 6s, 4s, 1s+1sp, 2s, 1s, 1s, 0, 1s, 1s+1ae, 0, 1s, 2s, 2s+ae, 7s+ae. Last two segments with hyaline membrane. Hyaline membrane of segment 17, extending conspicuously beyond the implantation of medial seta of segment, with one large notch. Segments 1, 4, 5, 7–10, 12 and 13 ventrally adorned with spinule rows, segments 1 and 4 with scattered shallow pits on dorsal surface.

Antenna. Coxa, basis, and three-segmented endopod with 0, 3, 1, 9, 7 setae respectively. Two setae at medio-distal angle of basis of about equal size. Exopod seta long, reaching distal rim of third endopodal segment.

Basis, caudal spinule pattern (Fig. 6) simple: near base long spinules on lateral rim, very small ones on medial rim; oblique row of spinules next to spinules on lateral rim; longitudinal row of spinules (16) along lateral rim.

Basis frontal spinule pattern (Fig. 5): longitudinal row of spinules (17) along lateral rim; few very tiny spinules proximal to exopod seta; transverse row of relatively long spinules distal to row of small spinules along proximal rim.

Labrum. Except fringe hairs overhanging toothed distal rim, no other hairs on external surface of labrum.

Mandibula. (Fig. 9) Gnathobase with strongly chitinized teeth. One-segmented palp with two long and one small setae. Near palp three groups of spinules, those forming transverse row conspicuously larger than others.

Maxillula. (Fig. 10) Praecoxal arthrite with three distal claws, at their base one spiniform seta on ventral surface; two medium-sized, three small spiniform setae, and one large setulose seta on medial rim, and one small spine at base of arthrite. Palp with one spine and two setae apically, one lateral seta proximally, and three setae on lateral (outer) lobe. Long setules in proximal half of lateralmost seta of lateral lobe. No spinules on palp.

Maxilla. (Fig. 11) Syncoxa, basis and one-segmented endopod. Praecoxa and coxa fused, praecoxal-coxal suture present on caudal surface only. Praecoxa bearing one endite with two setae, coxa with one endite with one seta at distal third and one distal endite with one strong spiniform seta and one slender seta, ca. half as long as spiniform seta. Spiniform seta furnished with setules, of which one subapical setule conspicously longer. No ornamentation of spinules on frontal surface of coxa. Basis with two setae, shorter seta placed caudally, longer inserted in front of claw-like endite armed with strong teeth. Basal seta in front of claw-like endite with two longer setules inserted ca. midlength, followed by fine teeth on both anterior and posterior edge; row of teeth on anterior edge reaches only the distal fourth of seta. One-segmented endopod bearing five setae. Two small setae inserted on caudal surface of lateralmost spiniform seta, very near its articulation with free endopodal segment.

Maxilliped. (Fig. 12) Syncoxa, basis and two-segmented endopod. Syncoxa with three setae, group of small spinules frontally near lateral rim. Basis with one long medial seta at distal third and one spiniform seta on frontal surface. Long spinules on medial margin and frontal surface below insertion of basal setae, and two groups of scale-like spinules caudally and on outer margin. Enp1 bearing one

Figures 9–12. *Mesocyclops yenae* sp. nov. (Holotype). (9) mandibula – frontal; (10) maxillula – frontal; (11) maxilla – frontal; (12) maxilliped – frontal. Scale: 50 μm.

stout seta and few spinules on frontal surface. Enp2 with three setae of medially increasing length.

Leg 1–4. (Figs 13–18) Armature as in *M. leuckarti* (Table 1.)

		Coxa	Basis	Exopod	Endopod
Leg 1	CIV	0-1	1-0	I-1; II-II,1-3	0-1; 1-I,1-5
	CV	0-1	1-0	I-1; II-II,1-3	0-1; 1-I,1-5
	adult	0-1	1-0	I-1; I-1; I-II,1-2	0-1; 0-2; 1-I,1-3
Leg 2	CIV	0-1	1-0	I-1; II-II,1-4	0-1; 1-I,1-5
	CV	0-1	1-0	I-1; II-II,1-4	0-1; 1-I,1-5
	adult	0-1	1-0	I-1; I-1; I-II,1-3	0-1; 0-2; 1-I,1-3
Leg 3	CIV	0-1	1-0	I-1; II-II,1-4	0-1; 1-I,1-4
	CV	0-1	1-0	I-1; II-II,1-4	0-1; 1-I,1-5
	adult	0-1	1-0	I-1; I-1; I-II,1-3	0-1; 0-2; 1-I,1-3
Leg 4	CIV	0-1	1-0	I-0; II-II,1-4	0-1; 1-II-3
	CV	0-1	1-0	I-1; II-II,1-4	0-1; 1-II-4
	adult	0-1	1-0	I-1; I-1; I-II,1-3	0-1; 0-2; 1-II-2

Table 1. Armature of leg 1-4 of *Mesocyclops yenae* sp. nov. (Spines are denoted by Roman, setae by Arabic numerals. The armature on the outer margin of any segment is given first, followed by the elements on the apical and inner margins.)

Lateral rim of leg 1–4 coxa with hairs. Caudal spinule ornamentation on coxa with gradually increasing complexity from leg 1 to leg 4. Spinule pattern of leg 4 coxa includes: row of thin and elongated spinules (19/21) near distal rim, spinules in middle of row smaller and rather sparse; group of large spinules at latero-distal angle; dense group of hairs on and next to lateral rim and at latero-proximal angle; row of small spinules (19/20) near proximal rim.

Intercoxal sclerites of all swimming legs naked on both frontal and caudal surfaces. Leg 1 basis frontally adorned with small spinules in semicircular arch. Apical hairs on medial expansion of basis present in leg 1–3, absent in leg 4. Two large acute outgrowths on distal rim of intercoxal sclerite of leg 4. Coxal seta conspicuously (1.58×) longer than medial expansion of leg 4 basis. Leg 4 enp3: length/width=2.27; apical spines, medial/lateral=1.37; medial apical spine/length of enp3=0.99; lateral edge of medial apical spine with few (3/0) teeth in proximal half.

Leg 5. (Fig. 21) Segmentation and setation typical of genus. Setae relatively short: length of medial and apical exopod setae and basal seta 81 µm, 74 µm, and 52 µm respectively.

Leg 6. (Figs 22, 23) Long medial seta and two short spines of about equal length.

Variability. Variability in body ratios is shown in Table 2.

Spinule ornamentation on antennary basis and leg 4 coxa essentially the same, only number of spinules variable: 17–23 spinules in longitudinal row of spinules on frontal surface of antennary basis; 19–24 and 18–21 spinules in rows near distal and proximal rim on caudal surface of leg 4 coxa.

	Range	Mean
Total I (17)	1160-1315 µm	1221 µm
Cephalothorax l/w (12)	0.92-1.17	1.04
Prosome/urosome (17)	1.30-1.68	1.48
Genital double-somite, l/w (17)	1.10-1.21	1.15
Cephalothorax w/genital double-somite w (12)	2.50-2.88	2.70
P4 enp3		
l/w (11)	2.15-2.48	2.31
apical spines, medial/lateral (12)	1.28-1.47	1.39
medial apical spine/enp3 I (12)	0.88-1.04	0.98
P5 setae		
medial/apical (9)	1.00-1.29	1.13
medial/basal (11)	1.54-2.00	1.70
Caudal ramus l/w (18)	2.73-3.62	3.29
Caudal setae		
terminal accessory (17)	115-135 µm	126 µm
inner terminal (18)	410-455 µm	426 µm
outer terminal (18)	305-345 µm	324 µm
posterolateral (18)	85-100 µm	95 µm
anterolateral/caudal ramus I (18)	0.32-0.40	0.36
dorsal/posterolateral (18)	0.83-0.98	0.92
terminal accessory/posterolateral (17)	1.20-1.47	1.34
inner terminal/terminal accessory (17)	3.22-3.82	3.46
inner terminal/urosome (18)	0.81-0.94	0.87

Abbreviations: enp3= third segment of endopod , l=length, P4=leg 4, , P5=leg 5, w=width.

Table 2. Morphometric variability of adult females *Mesocyclops yenae* sp. nov. (In parentheses the numbers of specimens measured)

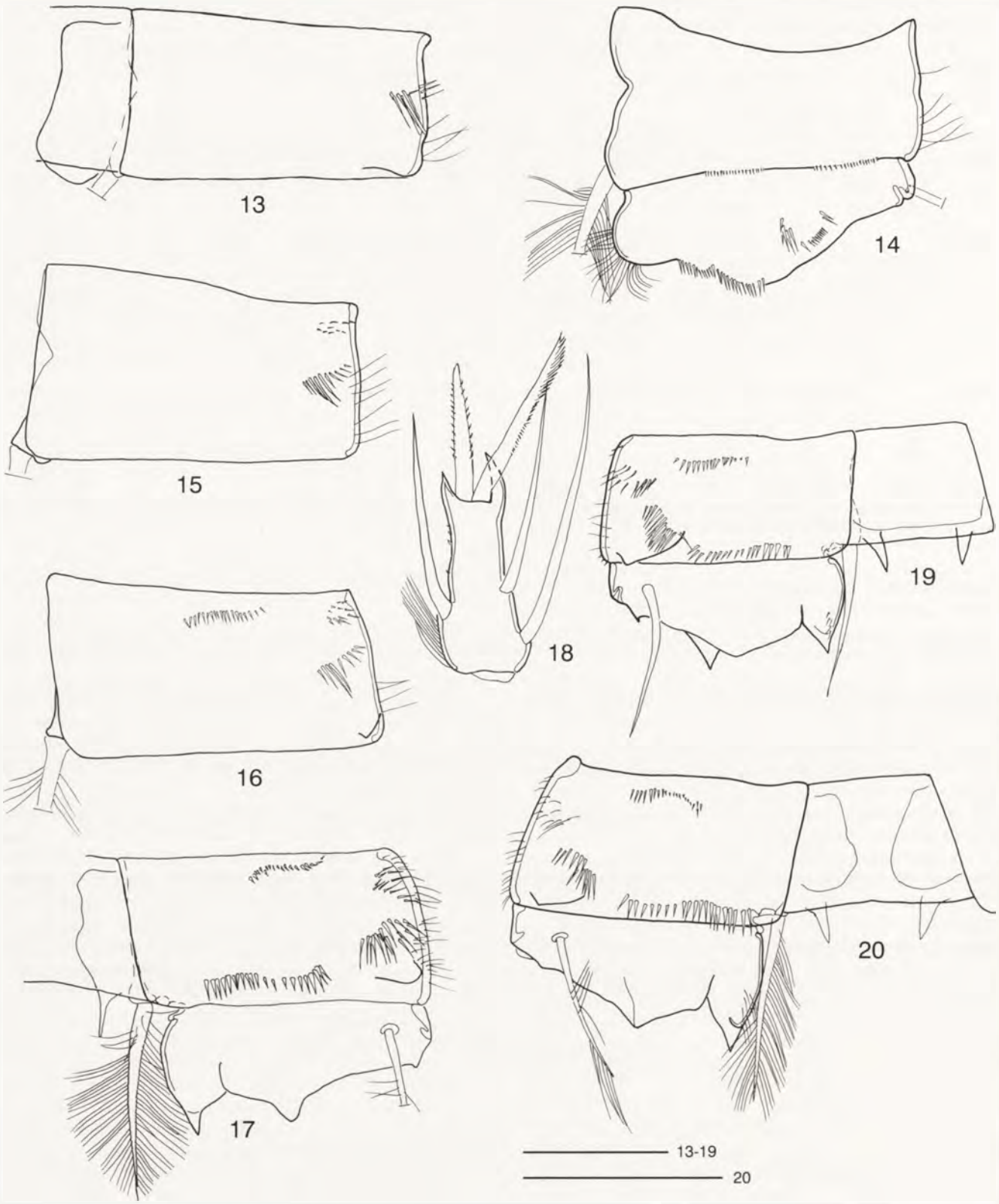
Description of male. (Except the morphometric characteristics, which were measured in all specimens available, other features were examined in two dissected specimens)

Sexual dimorphism in: body length and proportions, structure and armature of antennules, number of setae on second endopodal segment of antenna, hairiness of medial expansion of leg 4 basis, structure of genital segment and leg 6, lack of "pseudosomite".

Length of body: 890–930 µm; prosome/urosome= 1.49–1.62; cephalothorax length/width:1.14–1.17

Pediger 5 (Figs 30, 31) without hairs, four sensilla in same position as in female.

"Pseudosomite" absent. Genital somite (Figs 30, 31), containing two kidney-shaped spermatophores inside, ornamented with four sensilla on dorsal surface. Abdominal somites 1–4 with 2, 0,0,0 ventral sensilla, and 2,2,0,2 dorsal sensilla. Entire distal rim of anal somite with row of spinules. Caudal rami 3.05–3.17× as long as wide. Spinules laterally at proximal third, and at implantation of antero- and posterolateral caudal setae. No hairs on rami. Dorsal seta/posterolateral caudal seta: 0.92–1.22. Length of terminal setae from medialmost to lateralmost: 100–115 µm; 355–400 µm; 255–275 µm; 75 µm. Ratio of ter-



Figures 13–20. *Mesocyclops yenae* sp. nov. 13–18. Holotype; 19. Copepodid V; 20. Male paratype. (13) leg 1 coxa – caudal; (14) leg 1 coxa, and basis – frontal; (15) leg 2 coxa – caudal; (16) leg 3 coxa – caudal; (17) leg 4 coxa, and basis – caudal; (18) leg 4 end3; (19) leg 4 coxa, basis and intercoxal sclerite – caudal; (20) leg 4 coxa, basis, and intercoxal sclerite – caudal. Scales: 50 µm.

minal accessory (medialmost) and posterolateral caudal setae, and inner terminal and terminal accessory caudal setae 1.33–1.53 and 3.43–3.52 respectively. Longest (inner terminal) seta 0.99–1.07× as long as urosome.

Antennula. (Fig. 25) 17-segmented, last two segments partly fused. Armature formula: 8s+3ae; 4s, 2s, 2s+ae, 2s, 2s, 2s, 2s, 1s+1sp+1ae, 2s, 2s, 2s, 2s+ae, 2s, 1s, 5s, 7s+ae. At distal geniculation, plate-like structures (one large on segment 14, and two smaller ones on segment 15) with striated surface and single pore, and short conical element on segment 14 and 15 each (Figs 32, 33). Segment 1 with spinules on ventral surface, pits caudally. Pits observed in one specimen on segments 10 and 14 also.

Antenna. Coxa, basis and three-segmented endopod with 0, 3, 1, 7, 7 setae respectively. Exopod seta long, reaching distal rim of third endopodal segment. Of two setae implanted at medio-distal angle of basis, lateral shorter than medial. Caudal and frontal spinule ornamentation of basis similar to those in females (Figs 7, 8).

Mouthparts. Segmentation and setation identical to those in female. Teeth on anterior edge of longer seta of maxillary basis less numerous than in females.

Legs 1–4. Armature formula as in female. Caudal spinule ornamentation of leg 1–4 coxa similar to that in female (Fig. 20).

Intercoxal sclerites of all swimming legs naked on both frontal and caudal surface. Leg 1 basis frontally adorned with small spinules in semicircular arch. Apical hairs on medial expansion of basis present in leg 1–4. Two large outgrowths on distal rim of intercoxal sclerite of leg 4. Coxal seta conspicuously (1.61–1.71×) longer than medial expansion of leg 4 basis.

Leg 4 enp3 length/width: 2.21–2.81; apical spines, medial/lateral: 1.34–1.54; medial apical spine/length of enp3: 1.02–1.08; lateral edge of medial apical spine with 1–9 teeth in proximal half.

Leg 5. (Fig. 30) Segmentation and setation as in female. Length of medial and apical exopod setae and basal seta 65–72 µm, 57–60 µm, and 46–49 µm respectively. Ratio of medial and apical setae of exopod: 1.22 (two specimens). Ratio of medial exopod and basal setae: 1.40 (one specimen).

Leg 6. (Fig. 30) Consisting of one stout medial spine (25–27 µm), slender seta of about equal length (22–27 µm) and long lateral seta (56–63 µm).

Description of copepodid IV and V stages (except the morphometric characteristics, which were measured in all specimens available, other features were compared in one dissected specimen of CIV and CV each.)

Length of body in CIV and CV 785–830 µm and 1050–1065 µm respectively. Number of somites 8 in CIV and 9 in CV. Ratio of prosome and urosome 1.72–1.91 in CIV, 1.52–1.71 in CV. Cephalothorax length/width 1.05–1.20 in CIV, and 1.03–1.11 in CV.

Pediger 5 without hairs, four sensilla in same position as in female.

"Pseudosomite" absent (Fig. 27). In CIV urosomal somites 2–4 bearing no sensilla on ventral surface, and 2, 0, 2 sensilla on dorsal surface. In CV two sensilla ventrally on urosomal somite 3, and 4, 2, 0, 2 sensilla on dorsal surface of urosomal somites 2–5. Entire distal rim of anal somite with row of spinules. Caudal rami 2.67–3.00 and 2.20–2.92 as long as wide in CIV and CV respectively. Spinules laterally at proximal third, and at implantation of antero- and posterolateral caudal setae. No hairs on caudal rami. Ratio of dorsal and posterolateral caudal setae 1.29–1.65 in CIV and 1.05–1.11 in CV. Length of terminal setae from medialmost to lateralmost: 65–75 µm, 340–375 µm, 230–245 µm, 50–55 µm in CIV, and 90–100 µm, 375–400 µm, 270–280 µm and 65–75 µm in CV. Ratio of terminal accessory (medialmost) and posterolateral caudal setae 1.23–1.50 in CIV, and 1.27–1.54 in CV. Ratio of inner terminal and terminal accessory caudal setae 4.60–5.63 in CIV, and 3.85–4.38 in CV. Longest (inner terminal) caudal seta 1.17–1.25× and 0.89–0.99× as long as urosome in CIV and CV respectively.

Antennula. 10-segmented in CIV, and 11-segmented in CV. Last two segments with hyaline membrane. Hyaline membrane of last segment does not extend beyond implantation of medial seta in CIV and scarcely does in CV. No distinct notch in CIV, and a small one in CV. Armature of antennule as follows:

CIV:	5s,	6s,	2s,	1s+1sp,	2s,	3s,	2s+1ae,	2s,	2s+1ae,	7s+1ae
	1.	2–4.	5.	6.	7.	8–11.	12–14.	15.	16.	17.
CV:	7s,	4s,	8s,	4s,	1s+1sp,	2s,	3s,	2s+1ae,	2s,	2s+1ae,	7s+1ae
	1.	2.	3–4.	5.	6.	7.	8–11.	12–14.	15.	16.	17.

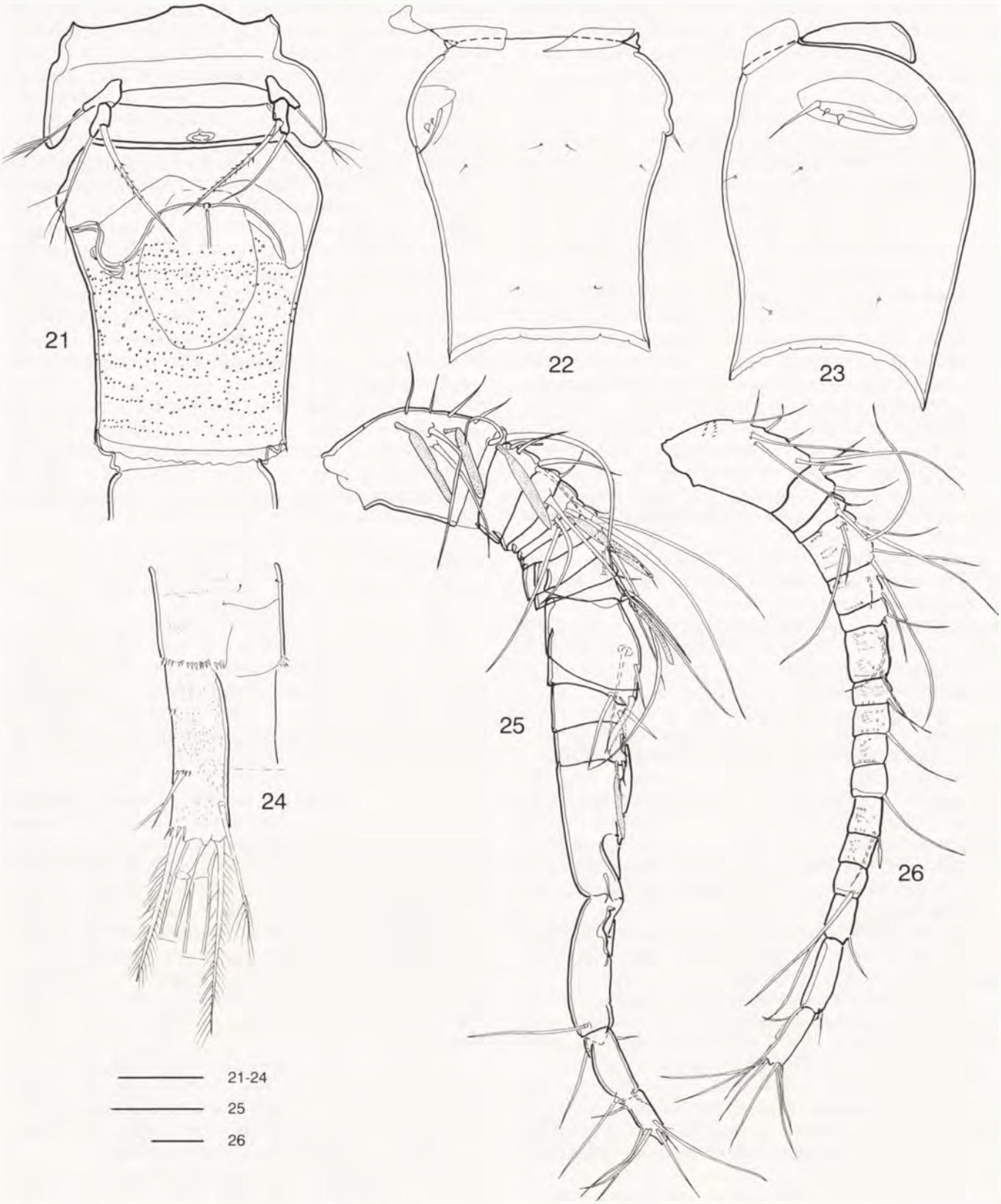
Homology between larval and adult antennule segments is inferred from position of reference indicators (spine, aesthetasc, setae inserted on dorsal surface, hyaline lamellae). Transverse rows of spinules present on compound antennule segments homologous with those on adult female segments 1, 5, 7–10, 12, 13, in CIV and 1, 4, 5, 7–10, 12, 13 in CV.

Antenna. Coxa, basis and three-segmented endopod with 0, 3, 1, 7, 7 and 0, 3, 1, 8, 7 setae in CIV and CV respectively. Two setae at medio-distal angle of basis about equal size. Exopod seta long, reaching distal rim of third endopodal segment. Caudal and frontal spinule ornamentation of basis (Figs 28, 29) similar to female, except small spinules proximal to exopod seta on frontal surface absent in CIV.

Mouthparts. Segmentation and setation identical to female. Teeth on anterior edge of longer seta of maxillary basis less numerous than in female. Lateralmost seta of lateral lobe of maxillulary palp with longer setules in proximal half.

Legs 1–4. Two-segmented rami in both stages. Armature formula – see Table 1. In CV three new setae added (leg 3 end2, leg 4 end2, leg 4 exp1). Caudal spinule ornamentation of legs 1–4 coxa (Fig. 19) similar to female, only number of spinules within groups reduced.

Intercoxal sclerites of all swimming legs naked on both frontal and caudal surfaces. Leg 1 basis frontally adorned with small spinules in semicircular arch. Apical hairs on medial expansion of basis present in legs 1–4. Two large outgrowths present on distal rim of intercoxal sclerite of



Figures 21–26. *Mesocyclops yenae* sp. nov. 21, 26. Holotype; 22–24. Female paratypes. 25. Male paratype. (21) pediger 5, and genital double-somite – ventral; (22) "pseudosomite" (dorsally open), and genital double-somite – dorsal – pits are not shown; (23) "pseudosomite" (dorsally open), and genital double-somite – lateral – pits are not shown; (24) anal somite, and caudal rami – latero-dorsal; (25) antennula – ventral; (26) antennula – ventral. Scales: 50 μm.

leg 4. Coxal seta conspicuously (1,29× in CIV, 1,47× in CV) longer than medial expansion of leg 4 basis.

Leg 4 terminal spines: medial spine 1.10–1.21 and 1.18–1.31× as long as lateral spine in CIV and CV. Lateral edge of medial apical spine with 10 teeth in CIV and 0–11 teeth in CV.

Leg 5. (Fig. 27) Segmentation and setation as in female. Length of medial and apical exopod setae and basal seta 20–30 µm, 49–61 µm, and 47–61 µm respectively in CIV and 57–61 µm, 61–76 µm and 42–54 µm in CV. Ratio of medial and apical setae of exopod 0.4–0.5 in CIV and 0.76–0.92 in CV. Ratio of medial exopod and basal setae 0.33–0.58 in CIV and 1.05–1.47 in CV.

Leg 6. Represented by one stout spine (10–15 µm) and one long seta (34–41 µm) ventrally on distal rim of genital segment in CIV, and one long seta (54–61 µm) and two small spines shifted to laterodorsal surface in CV. As inferred from structure and position of leg 6, CV specimens examined were female.

Diagnosis. *Mesocyclops yenae* sp. nov. can be distinguished by the following combination of characters: presence of incompletely sclerotized "pseudosomite" between pediger 5 and genital double-somite; receptaculum seminis with elongated lateral arms, transverse ducts meeting at ca. 180° before the connection with straight copulatory duct; no hairs on pediger 5; caudal rami without hairs; spinule row at implantation of antero- and posterolateral caudal setae; terminal accessory (medialmost) and inner terminal (longest) caudal setae relatively short – terminal accessory/posterolateral < 2.00, and inner terminal/urosome length < 1.00; longer seta of maxillary basis furnished with teeth on both anterior and posterior edges; no spine on medial expansion of leg 1 basis; medial expansion of leg 4 basis naked; caudal surface of leg 4 coxa with numerous (>18), elongated spinules along distal rim; caudal surface of antennary basis without oblique row of fine spinules, starting from medial rim; intercoxal sclerite of leg 4 with large, pointed outgrowths. *M. yenae* differs from its closest relative, *M. brevisetosus*, in having a "pseudosomite", relatively short inner terminal (longest) caudal seta, longer coxal seta on leg 4, and no hairs on medial expansion of leg 4 basis.

Remarks. One very conspicuous characteristic of *M. yenae* is the short terminal accessory caudal seta (less than 2 times as long as the posterolateral caudal seta), which within the genus is shared only with the Bornean *M. brevisetosus*, and the American *M. reidae* Petkovski, 1986, *M. yutsil* Reid, 1996, and *M. chaci* Fiers, 1996. The three New World species distributed in Central America, Mexico, the Antilles, and the southern United States form a monophyletic species group (Fiers *et al.* 1996). The American species possess several supposedly plesiomorphic features (small spinules on the antennula confined to the first segment; spine on medial expansion of leg 1 basis; short hyaline lamella on the last antennulary segment; group of large spinules on frontal surface of maxilliped syncoxa; and three group of spinules caudally on maxilliped basis), which are not shared (as in the majority of Old World *Mesocyclops* species) by either *M. brevisetosus*, or *M. yenae*. The Asian and American species obviously differ in structure of the female genital system also. Available data suggest that the shortening of the terminal accessory setae in the two groups (*brevisetosus-yenae* vs. *reidae-chaci-yutsil*) to be a homoplasy, but this hypothesis can be confirmed only by phylogenetic analysis of the whole genus.

The large difference in length of the apical spines on the third endopodal segment of leg 4, shared by *M. yenae* and *M. brevisetosus*, is also uncommon within *Mesocyclops*, but does occur in some otherwise unrelated species [*M. aspericornis* (Daday, 1906), *M. salinus* Onabamiro, 1957, *M. leuckarti arakhlensis* Alekseev, 1993, *M. annulatus diversus* Herbst, 1962, *M. tenuisaccus* (Sars, 1927), *M. notius* Kiefer, 1981, *M. australiensis* (Sars, 1908), *M. araucanus* (Loeffler, 1961)].

Yet, appearance of "pseudosomite" is unique in the genus *Mesocyclops*. *Diacyclops biceri* Boxshall, Evstigneeva et Clark, 1993 is to my knowledge the only species in the family Cyclopidae, where this feature has been reported (Boxshall et al. 1993). A "pseudosomite" is also known in some marine copepods (paramesochrid harpacticoids and cyclopinid cyclopoids – Mielke 1984 a,b; Huys and Boxshall 1991). All these marine forms, along with *Diacyclops biceri*, live in the interstitial, and Huys and Boxshall (1991) considered the "pseudosomite", likely to be as an adaptation – by increasing the flexibility of the urosome – to an interstitial mode of life. Unfortunately there is no precise information on the biotope where *M. yenae* was collected. Other features of *M. yenae*, shortening of the leg segments and lateral seta at mediodistal angle of the male antennary basis could be interpreted as a **very slight** shift toward characteristics of the interstitial cyclopine copepods (for detailed review of interstitial adaptations see Reid and Strayer 1994).

In all cases observed, the additional "pseudosomite" without any appendages or integumental organs appears in the same position, between the genital double-somite and pediger 5, and exclusively in females. The latter fact could be explained by stronger selection pressure on females, where the large genital double-somite can hamper movement in the narrow interstitial space more than in males. As to origin of the "pseudosomite", Huys and Boxshall (1991) supposed, that it had separated off the anterior end of the genital double-somite. The fact, that legs 5 and the sensilla at the laterodorsal angle, structures of the very distal margin of pediger 5, have not been displaced to the "pseudosomite" clearly suggests, that the "pseudosomite" has not separated of the posterior end of pediger 5. Yet, there is a third possibility: that the "pseudosomite" developed simply by sclerotization of the arthrodial membrane connecting pediger 5 and the genital double-somite. The lack of integumental ornamenation on the "pseudosomite", and the hoop-like but dorsally open structure shown here seem to be in accordance with this latter hypothesis.

The only safe method to describe larvae is undoubtedly by breeding the species, yet the copepodids IV and V

Figures 27–33. *Mesocyclops yenae* sp. nov. 27–29. Copepodid V. 30–33 Male paratypes. (27) pediger 5, and genital segment – ventral; (28) antennary basis – frontal; (29) antennary basis – caudal; (30) pediger 5, and genital segment – ventral; (31) pediger 5 and genital segment – lateral; (32) antennulary segments around distal geniculation – dorsal; (33) antennulary segments around distal geniculation – ventral. Scales: 50 µm.

considered as *M. yenae* have several characteristics of the adult female (terminal accessory caudal seta short, spinule ornamentation on the caudal surface of leg 4 coxa and antennary basis, longer seta of the maxillary basis with teeth on both posterior and anterior edge, outgrowths on distal margin of intercoxal sclerite of leg 4 large), the co-occurence of which renders rather low probability for misidentification of the larvae. Segmentation and armature of the legs and antennulae in copepodids IV and V agree with those in copepodids IV and V of *M. thermocyclopoides*. In the redescription (Holynski, 1994) of *M. thermocyclopoides* the larval armature of the penultimate antennular segment was erroneously given: this segment bears two setae and a small aesthetasc in copepodids IV and V. Until more comparative data on postnaupliar development in other *Mesocyclops* species are available, the similarity between *M. thermocyclopoides* and *M. yenae* can not be interpreted. On the other hand, personal observations on 19 different species of *Mesocyclops* indicate highly conservative nature of the antennular armature of the adult female within the genus: the antennula armature is exactly the same in *M. yenae* and all the species mentioned above. Concerning the male antennules, reexamination of those in *M. leuckarti* and *M. thermocyclopoides*, contrary to the descriptions and drawings given by Dahms and Fernando (1993) and Holynski (1994), revealed that these species share the same armature with *M yenae*.

M. yenae shows the closest affinity to *M. brevisetosus*, expressed in several morphological features: lack of spine on the medial expansion of the leg 1 basis; structure of female genital system; caudal ornamentation of the leg 4 coxa; outgrowths on distal margin of intercoxal sclerite of the leg 4 large; conspicuously unequal apical spines on the leg 4 endopod; pediger 5 without hairs; ratio of the terminal accessory and posterolateral caudal setae. The two New Guinean specimens identified by Isabella Van de Velde as *M. brevisetosus* (not published) possess obviously longer coxal seta on the leg 4 (1.8× as long as the medial expansion of the basis), and shorter inner terminal caudal seta (ca. 3.6× as long as the terminal accessory seta), than the types of *M. brevisetosus*, and, there are no hairs present in *M. brevisetosus* on medial expansion of the leg 4 basis. These characteristics of the New Guinean specimens are closer to *M. yenae*, but they have no "pseudosomite". Lack of data on infraspecific variability of *M. brevisetosus* does not enable me to confirm the identification of the *Mesocyclops* from New Guinea.

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