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Quinquelaophonte varians n. sp. (Copepoda, Harpacticoida, Crustacea) and notes on its developmental stages

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Abstract. *Quinquelaophonte varians n. sp.* is described from samples collected in the rocky pools near to the Center of Marine Biology, University of São Paulo, and from bottom samples taken near to Guaecá Point, São Sebastião Channel region. Easily maintained in the laboratory, it yielded nauplii and copepodids, which also were characterized for eventual identification in bottom samples.The new species is compared to other nearly related species of the same genus (*sigmoides*, *parasigmoides*, *quinquespinosa*, *wellsi* and *longifurcata*).

Key words: Harpacticoida, infauna, nauplii, southeast Brazil, copepodids.

Resumo. *Quinquelaophonte varians* n. sp. (Copepoda, Harpacticoida, Crustcaea) e notas sobre seus estágios de desenvolvimento.*Quinquelaophonte varians sp. nov.* é descrita de amostras coletadas nas poças de maré próximas ao Centro de Biologia Marinha, U.S.P., e de amostras de fundo obtidas junto a Ponta de Guaecá, região do Canal de São Sebastião. Mantida facilmente em laboratório, forneceu náuplios e copepóditos, também sumariamente descritos para possível identificação em amostras de fundo. A nova espécie é comparada a outras (*sigmoides*, *parasigmoides*, *quinquespinosa*, *longifurcata* e *wellsi*) do mesmo gênero e proximamente relacionadas com ela.

Palavras-chave: Harpacticoida, infauna, náuplios, Sudeste do Brasil, copepoditos.

Introduction

Quinquelaophonte Wells, Hicks & Coull 1992 is a genus of harpacticoid copepods, family Laophontidae T.Scott 1905 (Lang, 1965). Before 1996 most of the literature concerning Harpacticoida in the region of São Sebastião Channel, SP, was referred to the planktonic harpacticoid copepod *Euterpina acutifrons* Dana, its physiology and ecology (Moreira, 1976; Moreira & Vernberg, 1978; Yamashita, 1977). The only attempt to survey the infauna of harpacticoids in the area was done by Alvarez (1987), but *Quinquelaophonte* was not mentioned.

Kihara (2003) listed all the infauna harpacticoids collected during an expedition to the north littoral off São Paulo State, including São Sebastião region and vicinity, without mentioning this genus. Por et al.(1984) found *Q. sigmoides* Willey 1930 in the mangrove intertidal muds of the Cananeia lagoon region (south littoral of the São Paulo State).

Specimens of *Quinquelaophonte* were collected in São Sebastião Channel from the bottom sand and gravel of rocky pools near to the Center of Marine Biology laboratory (São Sebastião Channel) and also in the sand and gravel off Guaecá Point. They were kept during several months in the laboratory and yielded nauplii and copepodids, showing a great resistance to live under those conditions. Nauplius larvae belonging *Heterolaophonte*, a genus closely related, have been already described and are well known (Dahms, l990). The nauplii of *Quinquelaophonte* will be therefore compared with those of *Heterolaophonte*. Drawings of its copepodid stages (their general aspect) are also provided so as to permit their recognition in infaunal studies.

Material and Methods

Harpacticoida specimens were brought to the laboratory alive in the bottom gravel, inside a 5 liters plastic container. The gravel layer from the sites where samples were collected, was about 2-3 cms deep inside the container, and covered by a 21

cms thick layer of sea water. They were collected at Itaçucê Point, São Sebastião, SP, in March, 2005, from 5-7 m depth with a bottom sampler. The collector was Almir Pepato, to whom we are deeply grateful. Samples from rockpool gravel, collected by hand with a plastic spoon, were also brought in 300 ml plastic containers by Mariene M. Nomura, to whom we are also very thankful.

Both containers, the big and the smaller one, were kept in the laboratory for several months in a shaded corner. Fresh water was added occasionally to maintain the water salinity in the containers more or less constant (34 ‰). Two milliliters of gravel and sea water were taken out weekly with a pipette, and the copepods found in this subsample were fixed in 4% formalin for future study.

In the first week after collection, several different genera of copepods were separated from the subsamples. After 1 month only *Quinquelaophonte* and a cyclopoid remained alive and reproducing. The cyclopoid nauplii were planktonic. The benthonic nauplii occurring in the gravel and their copepodids, thus, belonged to *Quinquelaophonte*.

For study, the specimens were cleared in lactic acid and mounted on slides with glycerine, sometimes slightly coloured with methylene green. Nauplii and young copepodids are very fragile and secrete a thick mucous layer all around the body, onto which a lot of debris remains attached. It is difficult to clean the body surface of these young specimens without dammaging their surface chitin. Sucking them in and squirting them out of a pipette several times was the only way to get rid of most of the debris.

The material used for this study is deposited in the Museu de Zoologia (MZ/USP) and in the Center of Marine Biology (CEBIMar) , University of São Paulo.

Abbreviations: A1= antennule; A2= antenna; C1 - C6= first copepodid to sixth copepodid; N1 - N6= first to sixth naupliar stage; P1 - P4= first to fourth swimming leg or pereiopod. P5 - P6= limb 5 and 6.

Results

Order Harpacticoida Sars, 1903

Family Laophontidae T. Scott, 1905

Quinquelaophonte Wells, Hicks & Coull, 1982

Quinquelaophonte varians new species

Material Examined**:** Holotype: whole female (MZ/USP no. 20300); Paratypes: 10 specimens: males and females in various stages of development (MZ/USP no. 18694) from a rock pool, near CEBIMar, São Sebastião; Allotype male (CEBIMar collection no. 008); Paratypes (several specimens in various stages of development (CEBIMar collection no. 009).

Type locality: São Sebastião Channel, SP, Brazil.

Description of Female: (Fig. 1 a) Length from point of rostrum to end of furcal ramus: 0.420 to 0.750 mm (n=10). Lengths vary according to state of contraction of specimens (largest occurred during spring and autumn, usually around 0.600 mm). Cylindrical body tapering towards posterior end. Prosome with sensilla scattered all over its surface. Rostrum rounded, well delimited at basis, with 2 sensory frontal setules. Eyes present. About 12 longer sensilla spaced along posterior margin of prosome. Pedigerous somites with rounded lateral projections, ornamented with marginal rows of spines. Posterior margin of somites bearing widely spaced setules. Urosome: genital double urosomite dorsally subdivided. Genital field as in Figure 2 a. Genital and three following somites bearing ventral marginal posterior rows of setules. Anal operculum with a minute seta on each side, bare or with minute row of posterior marginal microsetules. Genital somite with ventrolateral marginal strip bearing minute setules between two succeeding marginal setules (Fig. 2 b). Other urosomite margins with minute setules. Furcal rami (Fig. 2 c) four times longer than wide, slightly tapering towards distal rectangular end, covered by microsetules. Furcal setae (Fig. 2 c-d): two outer lateral short setae(I, II), a long outer terminal seta (IV), the long, strong seta (V), the terminal internal seta (VI), and the dorsal articulated seta (VII). Appendages: A1 (Fig. 1 c) six-segmented, setal formula 1:8:6:3 (1 aesthetask):1:9-10 (1 aesthetask), rows of setules on proximal segment. Microsetules frequently present on other segments of A1. A2 (Fig. 3 a): coxa small, allobasis with marginal spinules on anterior edge, exopod very small with 3 short setae, endopod with marginal row of spinules scattered on anterior surface, 3 short pre-terminal spines, 2 strong laterodistal spines, terminally one spine and 4 long setae (2 geniculate). Mandible: cutting edge (Fig. 3 b) of mandibular precoxa with 3 digitiform teeth, 3 distally crenulate cylindrical teeth, and small lateral setule. A lateral pre-distal, rounded, setulated knob. Palp (Fig. 3 c) well developed with 3 lateral and one terminal seta coalescent at base with small spine. Maxillule (Fig. 3 d): endite of precoxa with proximal tuft of long setules, with 3 marginal setules, and distally with 5 spines; coxa (Fig. 3 e) with row of spinules and 2 terminal setae; basis with 4 apical setae, one

coalescent with basis; exopod and endopod represented by 2 setae each; marginal spinules on basis. Maxilla (Fig. 3 f): syncoxa with row of setules and 3 endites:the proximal one, distally serrate, the next pinnate and bearing a medial seta, the third with 3 apical setae; basis claw-like with thin seta; endopod represented by 3 setae. Maxilliped (Fig. 3 g): basis with one seta; row of short marginal setules along first endopod segment; second endopod segment forming strong claw. Legs (Fig. 4 a-e, Table I): coxa with microspinules, bases of all legs with rows of spinules and spines. P1: first exopod segment shorter than second with marginal longer setules, distally short spine. Second segment with marginal setules, 2 distal spines, one terminal spine plus 2 long geniculate setae. Endopod bearing row of spaced setules along inner margin and second segment ending in big claw and small seta. P2: exopod three-segmented with rows of marginal spinules on all segments, also oblique rows of setules on first exopod segment; a strong laterodistal spine on first and second segments; third segment with 3 outer lateral spines, one thin inner marginal short seta, two terminal bipinnate, thin, long setae. Endopod two-segmented: outer minute marginal setules on both segments, inner marginal rows of large spaced setules, 2 thin bipinnate long setae terminally, one lateral long bipinnate seta. P3: exopod three-segmented, segments 1 and 2 with rows of setules marginally and distally. Segment 1 with oblique rows of setules; segments 1 and 2 with strong laterodistal spine each; segment 3 with 3 marginal outer spines and row of lateral spinules, 2 long terminal, thin bipinnate setae, a thin inner bipinnate seta , also present on segment 2. Endopod two-segmented with rows of longitudinal marginal spaced thin setules; 2 inner bipinnate, marginal, long thin setae, a thin bipinnate outer seta, terminally 2 long, bipinnate thin setae. P4: three-segmented exopod with oblique rows of setules , marginal and distal setules, also a long laterodistal spine on segment one; second segment with one inner and one outer seta; distal segment with marginal and terminal setules, 3 outer long pinnate spines, a short marginal inner spine and 2 long bipinnate terminal thin setae. Endopod two-segmented with rows of inner and outer marginal setules; segment 2 with long thin medial inner and 2 long terminal bipinnate setae. P5: baseoendopod with the external articulated seta and 5 inner marginal setae, besides the row of marginal setules. Exopod with 6 setae. Surface and margin of the fifth limbs covered with sensilla.

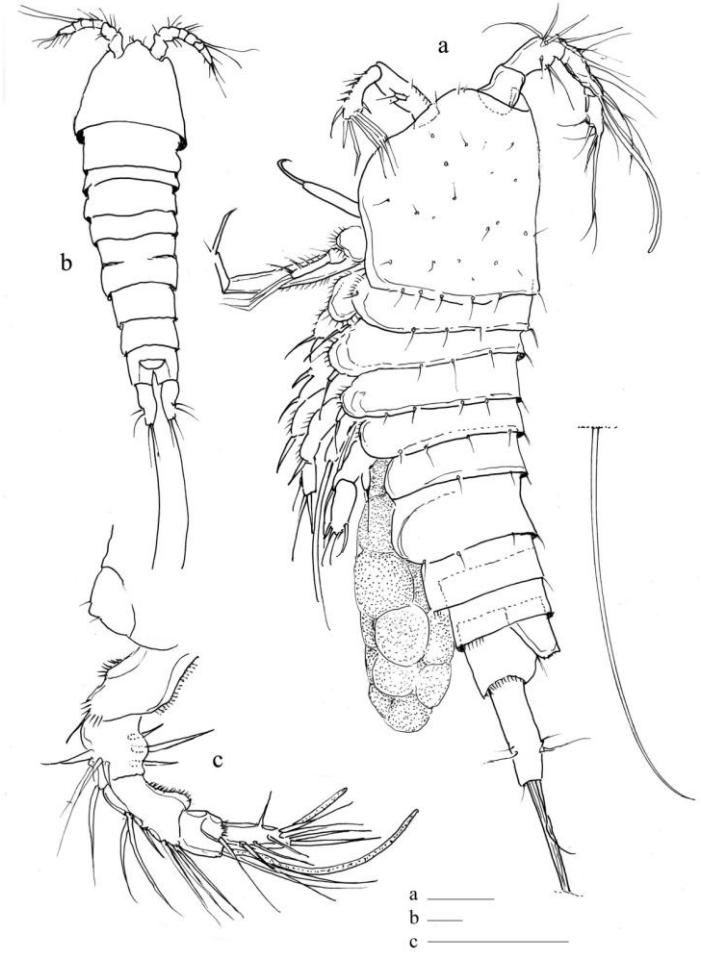

Figure 1. a - Female of *Quinquelaophonte varians* n. sp., lateral view; b - Female *Q. varians* n. sp., dorsal schematic view; c - Rostrum and antennule of adult female of *Q.varians* n. sp

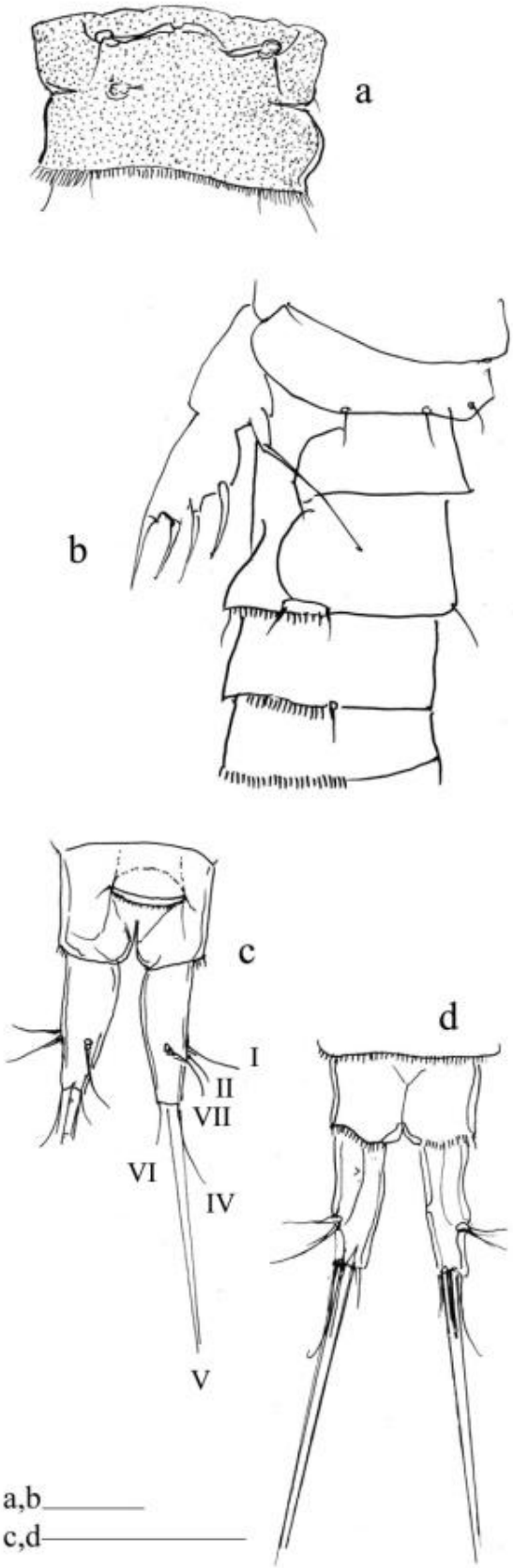

Figure 2. (a) Female genital field of *Q. varians*; (b) Marginal setules of female genital double segment and of two following segments of urosome; (c) Dorsal view and (d) ventral view of anal segment and of furcal rami

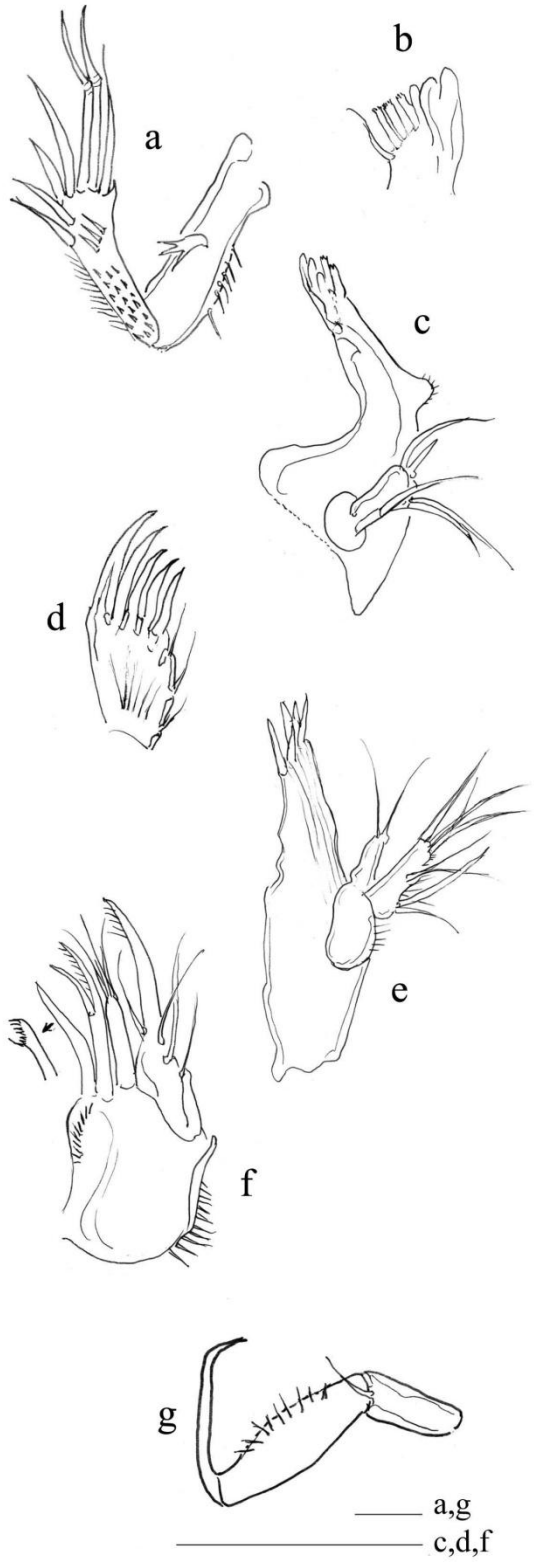

Figure 3. Female *Q. varians* n. sp.; a – Antenna; b - Mandible gnathobase; c - Mandible total view; d - Maxillule endite of precoxa; e - Total view; f – Maxilla; g - Maxilliped

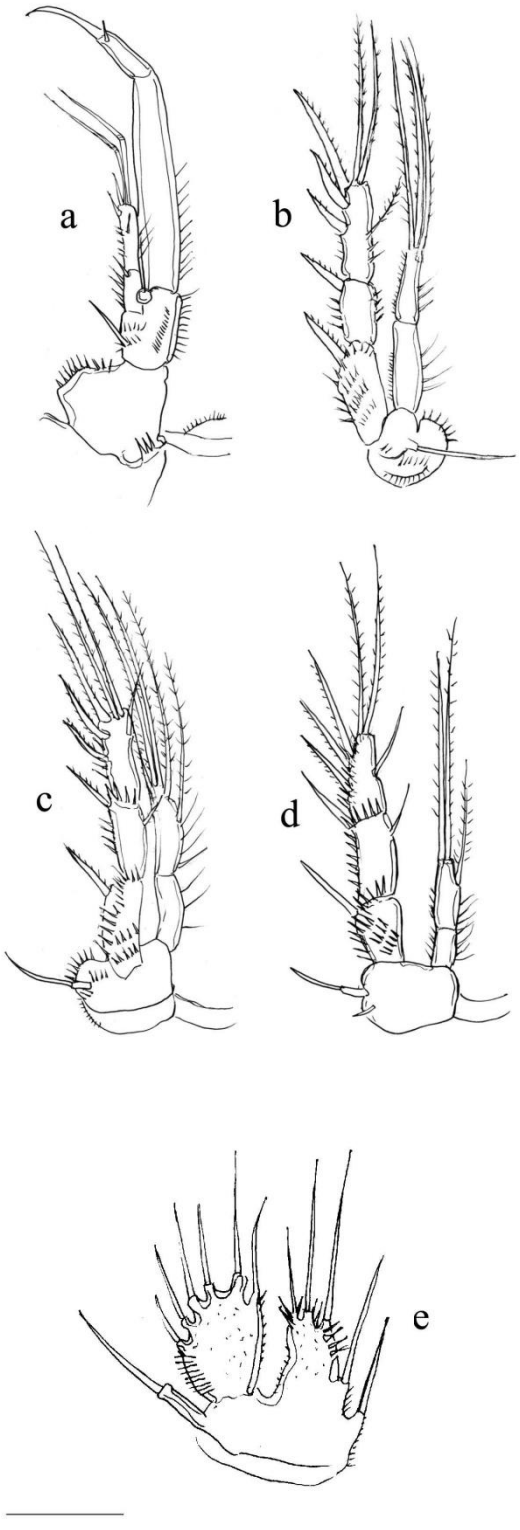

Figure 4. Legs of female *Q. varians* n. sp.; a - Leg 1 (P1); b - Leg 2 (P2); c - Leg 3 (P3); d - Leg 4 (P4); e - Limb 5 (P5) (Table I)

Table I. Setal formula of female legs:

	Endopod	Exopod
P2	0.120	0.0.123
P3	0.221	0.1.123
P4	0.120	0.1.123

Description of Male: (Fig. 5 a-b) body more slender than female, cylindrical , tapering towards posterior end, 0.520-0.700 mm long, number of free somites 10, cephalon subquadrangular, eyes present. Terga of pedigerous somites prolonged laterally into denticulated rounded epimeral projections on prosome. Ventral ornaments as in female. Dorsal margins of cephalon and thoracosomites ornamented with a few longer sensilla. Whole body, including furcal rami, covered by micropores and secretion to which all sorts of debris remain attached, giving the animal a fuzzy appearance. A1 (Fig. 5 c) six or seven-segmented, sub-chirocer with setal formula 1:8:4:12:0:6 or 7 (Fig. 5 d); first segment with rows of setules, fourth segment with very long aesthetask and two setae on a cone, a characteristic pectiniform seta, also present in other *Quinquelaophonte* species. A2, mouthparts and maxilliped are similar to those present in female. P1 to P4 (Fig. 6, Table II) differ from female legs mainly because of stronger spines. P5, 5 setae; P6, 2 setae.

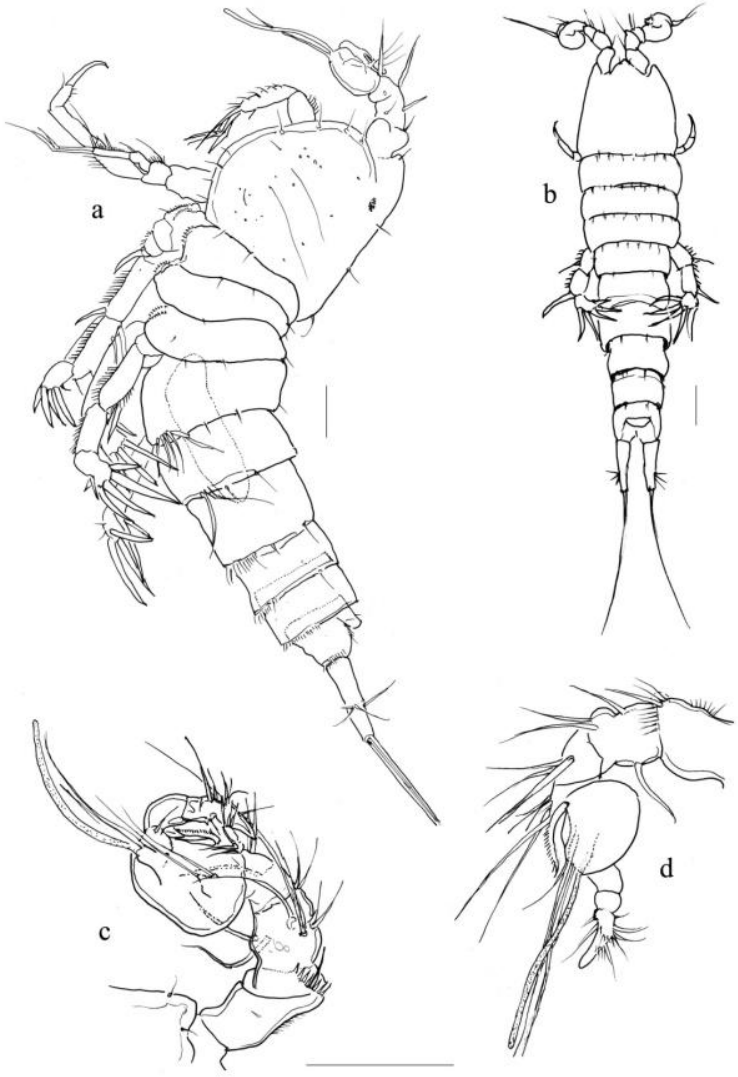

Figure 5. Male *Q. varians* n.sp.; a - Lateral view; b - dorsal view, schematic; c - Antennule, dorsal view; d - ventral view with less setae represented to show segmentation.

Table II. Setal formulae of male legs:

	Endopod	Exopod
P2	0.120	0.1.123
P3	0.121	0.0.213
P4	0.120	0.0.213

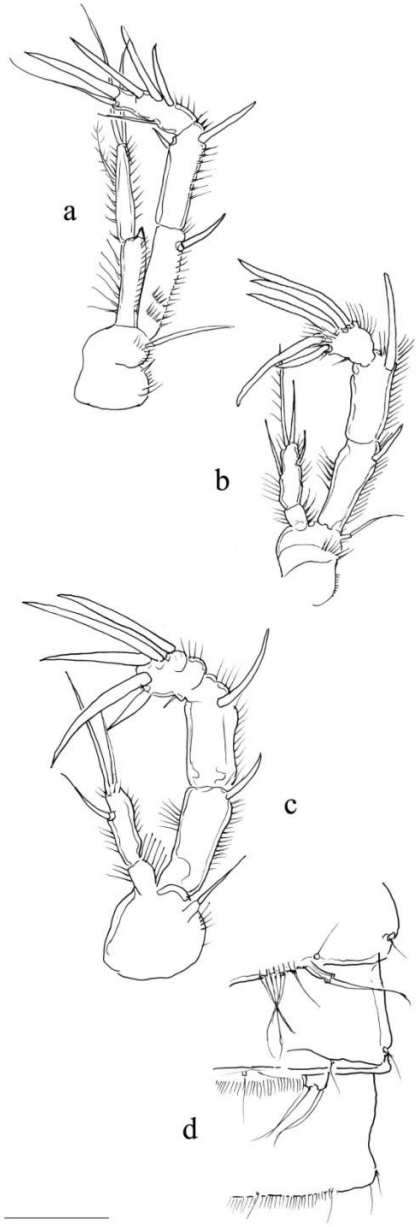

Fig. 6. Legs of male *Q. varians* n. sp.; a - Leg 2 (P2); b - Leg 3 (P3); c - Leg 4 (P4); d - Limbs 5 and 6 on urosome (lateral view)

Naupliar Stages (Figs. 7-9): NI (Fig. 7 a) 0.099 mm long. Body round, transparent, bearing two setae at posterior end and row of terminal setules in half circle dorsally. Labrum anteriorly rectangular, posteriorly rounded. A1 indistinctly divided into three segments ornamented with rows of setules: first segment without setae; second with longer seta mounted on a protuberance and smaller pinnate seta; third with three setae and row of setules. A2: basis with masticatory process, row of setules and acute thin processes; exopod unsegmented, with five setae; endopod with lateral seta, long terminal claw and minute terminal seta. Mandible: strongly setulated digitiform process on

coxobasis and three small setae; exopod bulge bearing long pinnate seta coalesced at base with thin shorter seta; endopod bifurcate into two laminar curved pointed blades. NII (Fig. 7 b) differs from NI in body shape, now oval, and presence of two minute setae on ventral side of body representing maxillules. A1 has a seta added to first segment. NIII (Fig. 7 c) 0.115 mm long, pear-shaped with 2 setae added to the posterior end. A1 with spinulous bulge added to the second segment, now more visibly separated from first. Maxillular seta now inserted on ventral bulge. NIV (Fig. 7 d) 0.115 mm long. Furcal ramus with three setae. A1 with more setules added, three segments clearly delimited. Maxillules represented by four setae, two on each half of ventral face of body. NV (Fig. 8 a) 0.160 mm long. Two horizontal furcal dorsal spines added posteriorly with overlapping distal tips. Mandible with one thin seta added to the three present on coxobasis. Body horizontally divided. Rows of preterminal setules present posteriorly. Furcal rami with four setae each plus the newly added one. NVI (Figs. 8 c, 9 k, o) 0.175 mm. Fringe of ventral setules represent future maxillula. Spinules and spinulous bulges added to ventral face represent the future maxillipeds, the first and second pairs of legs. In some nauplii VI ventral spine-like structures were present near to the limb buds (future ramal spines?).

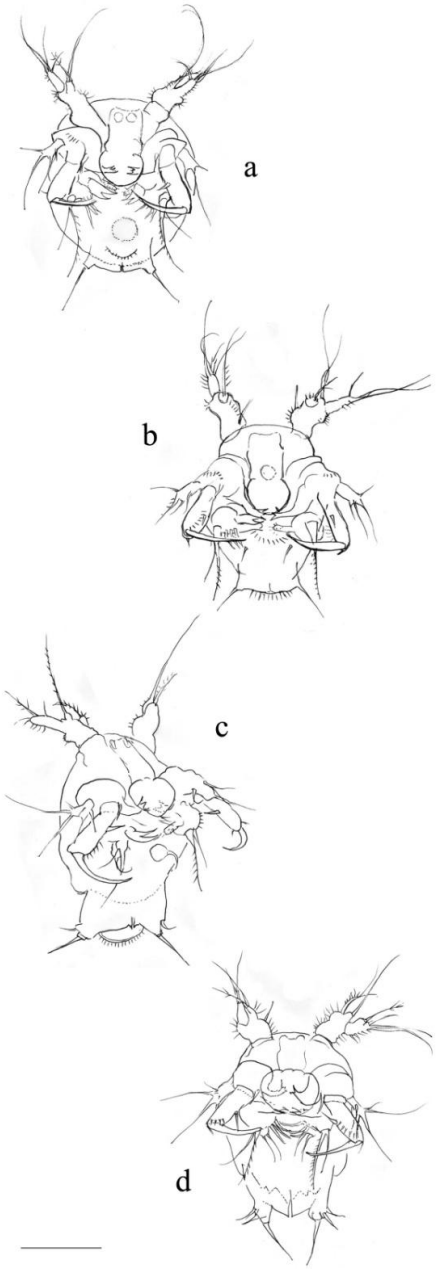

Fig. 7. Nauplii of *Q. varians* n. sp.; a-d - first to fourth naupliar stages.

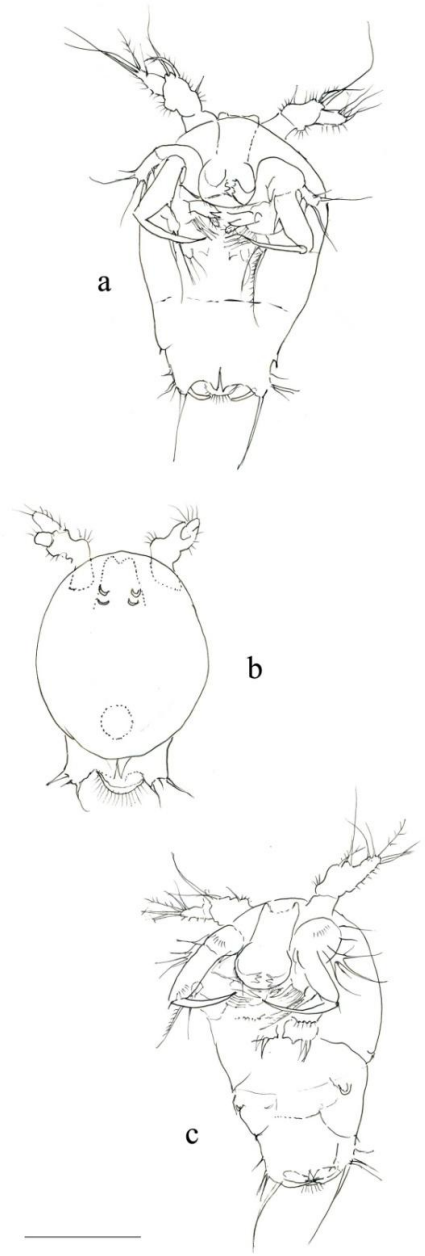

Fig. 8. *Q. varians* n. sp.; a - Fifth naupliar stage; b - dorsal view of scutum and posterior body of fourth naupliar stage; c - Sixth naupliar stage (right side dammaged).

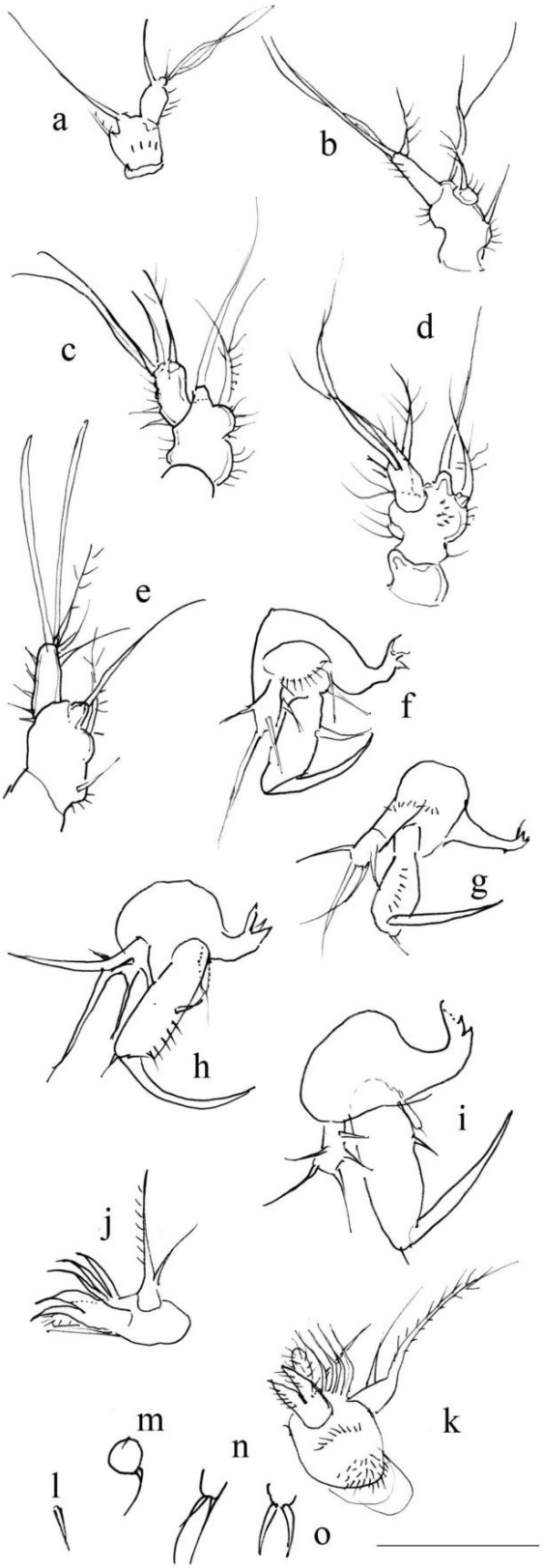

Fig. 9. *Q. varians* n.sp. naupliar appendages. Antennules: a - N1 lateral, b - N1 ventral; c - N4; d - N5; e - N6. Antennae: f - N1; g - N2; h - N4; i - N5. Mandibles: j - N1; k - N6. Maxillules: l - N2; m - N3; n - N4; o - N6.

Copepodid Stages: CI (Fig. 10 a-c) 0.210 - 0.260mm long. Body: cephalosome + 4 free somites. Anal somite with two tufts of setules lateral to midline, feature present in all copepodid stages. Rostrum delimited dorsally with two sensilla present anteriorly and also present in all following copepodid stages. Caudal rami with dorsal articulated seta, two lateral marginal setae, row of terminal setules or spinules, terminal seta V with small branched off thinner seta, a feature only of CI. Anal operculum with glabrous posterior margin. A1 (Fig. 10 d): three-segmented: first segment with one setule; second with lateral seta, a protuberance with an aesthetask and long seta; third segment with three lateral setae on one side, two lateral setae on the other, terminally three setae. Setal formula: 1:3-4: 7-8 with variations in number of setae/spines. A2 (Fig. 10 e): four curved terminal setae on endopod; three pre-terminal spines, spinules on dorsal face and margins (features present in the next copepodid stages). Minute exopod, with three microsetules. P1 (Fig. 10 f) basis with seta and row of microsetules distally; unsegmented endopod, row of setules on one margin, terminal claw and long accessory seta; unsegmented exopod, with three marginal spines and row of setules and two distal setae. P2 (Fig. 10 g): basis with row of spinules, unsegmented endopod with two setae, unsegmented exopod -with three marginal spines and row of setules and two terminal setae. P3 (Fig. 10 h) two setae on a limb bud. CII (Fig.11 a-b) 0.320-0.350mm long. Cephalosome+ five free somites. Furcal rami with seta V coalesced only at base with lateral seta, as well as in following stages including adults. A1 (Fig. 11 d) with setal formula 1:6:10 with variations in number of setae. P1 (Fig. 11 e) with two-segmented endopod and exopod ; exopodal first segment with a seta and setules, second segment with three lateral and two terminal geniculate longer setae. P2 (Fig. 11 f) two-segmented endo- and exopod : two terminal setae on distal segment of endopod, one spine and marginal setules on exopodal first segment, second segment with two distal spines and two long setae. P3 (Fig. 11 g) both endopod and exopod unsegmented ; endopod with two setae, exopod with three lateral spines and two terminal setae. P4: two setae on a protuberance. CIII (Fig. 12 a-b) 0.330-0.380 mm long. Cephalosome+six free somites. A1 four-five segmented (Fig. 12 c) and setal formula 1:4:7:10 or 1:4:7:1: 9. A2 as in CII. P1 (Fig. 12 d) spinules added to basis, endopod and exopod. P2 (Fig. 12 e): exopod three-segmented, spinules on coxobasis, first and second segments, otherwise as in CII. P3 (Fig. 12 f) endopod and exopod two-segmented: endopod with two terminal setae, first exopodal segment with distal spine, second with two distal spines and two setae. P4 (Fig. 12 g) unsegmented endopod and exopod (exopod partly coalesced with basis); endopod with two setae, exopod with a marginal seta, two lateral spines and two terminal setae plus distal row of setules . P5 as Fig. 12 h. CIV (Fig. 13 a): 0.400-0.440 mm long. Cephalosome+ seven somites. A1 (Fig.13 b-c) five-segmented, setal formulae: 1:4:8:1:8 (female) or 1:7:6:1:7 (male). P1 (Fig. 13 d) as in CIII . P2 (Fig. 13 e) with two inner setae and one terminal spine added to second exopod segment, endopod with one seta added to distal segment. In other specimens P2 exopod is three-segmented. P3 (Fig. 13 f) with one spine added to each distal segment of endopod and exopod. P4 (Fig. 13 g) both rami divided into two segments: first exopod segment with row of setules and seta, second with two lateral spines, a distal spine and two terminal setae. P5 as in Figure 13 h (future female) and in Figure 13 i (future male). CV (Fig. 14 a): 0.450-0.480mm long (female) and 0.440-0.522mm long (future male, Fig. 14 b): cephalosome+eight free somites. A1 (Fig. 14 c) five segmented in female, setal formula 1:8:9:1:7 and five or six segmented in male (Fig. 14 d-e) setal formula 1-2 :4-6:11:1-2:4-6. A2 as in adult. P1 as in CIV, similar in both sexes. P2 as in Figure 15 a (female); in male P2 (Fig. 15 b) exopod distal segment bears three terminal elements, 2 lateral outer spines and one inner marginal seta; segment before last bears outer distal spine and inner marginal seta. Female P3 (Fig.15 c) with rows of spinules on coxobasis and rami ; a distal spine on first and second exopodal segments; three lateral spines and two setae on last segment. Distal endopod segment with four setae. Male P3 (Fig. 15 d) with last exopodal segment bearing three spines a lateral seta and two terminal setae; on first and second segments a distal spine (spines usually thick at the insertion point tapering rapidly to a filament in male). Endopod with spinules on first segment and two distal and one lateral setae on second segment. Female P4 (Fig.15 e) with three exopod segments bearing rows of spinules; first and second segments with distolateral spine, third with two spines and two terminal setae. Two-segmented endopod with two terminal setae. Male P4 (Fig. 15 f) exopod with distolateral spine on first and second segment and row of marginal spinules; third segment with three terminal spines, a pinnate seta and two lateral spines. Female P5 (Fig. 15 g) foliaceous with baseoendopod bearing outer seta and five inner spinules, coalesced exopod with six spines. Male P5 (Fig. 15 h) four setae on a protuberance and the outer seta. P6: two setules.

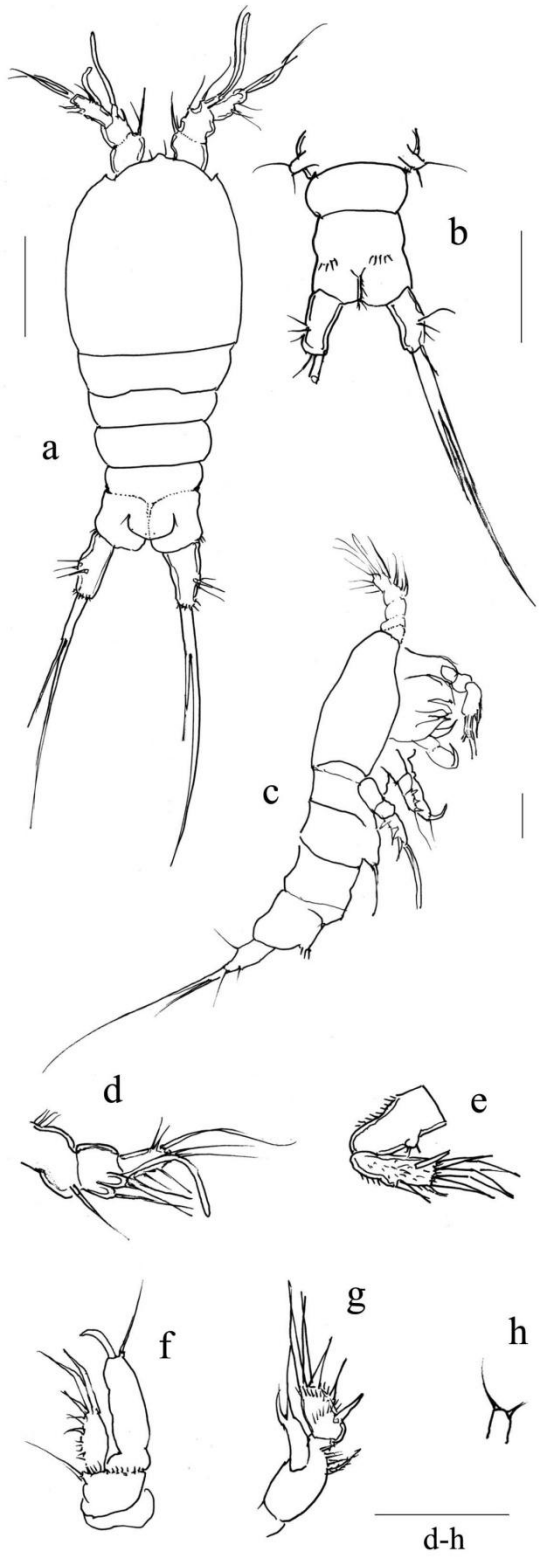

Fig. 10. Copepodid I. a - dorsal view; b - ventral view of urosome; c - Copepodid I: lateral view; d – Antennule; e – Antenna; f - First leg; g - Second leg; h - Limb bud of future leg 3.

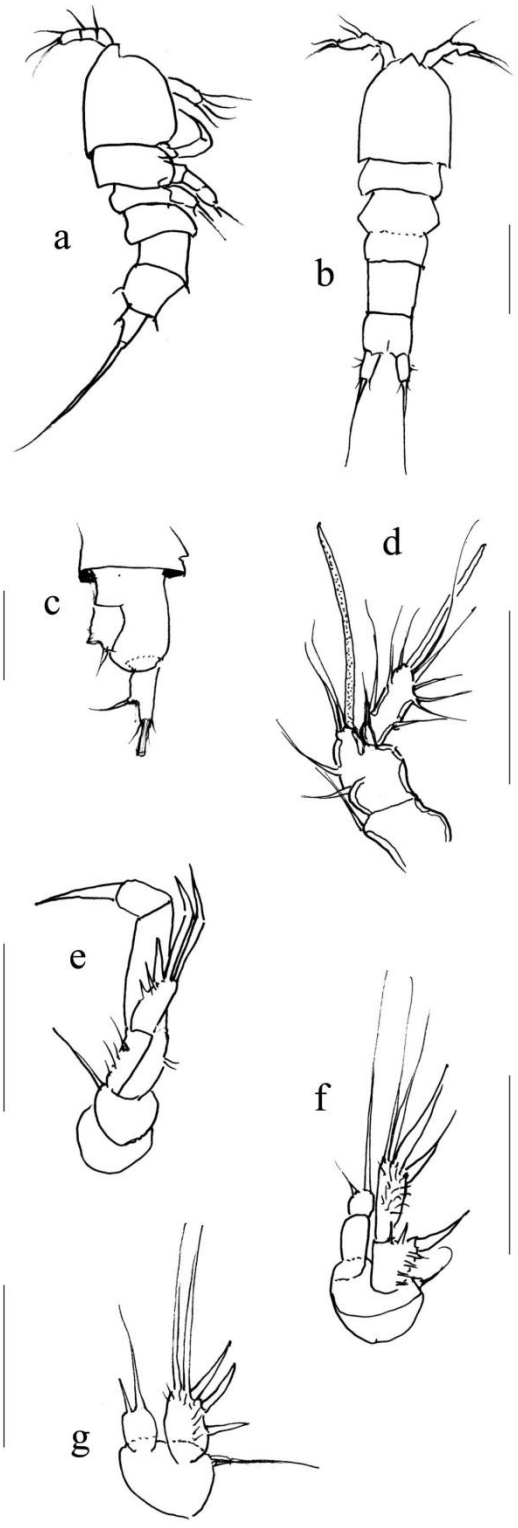

Fig.11. Copepodid II. a - Lateral view; b - Dorsal view; c - Lateral view of anal somite and furca; d – Antennule; e - First leg; f - Second leg; g - Third leg.

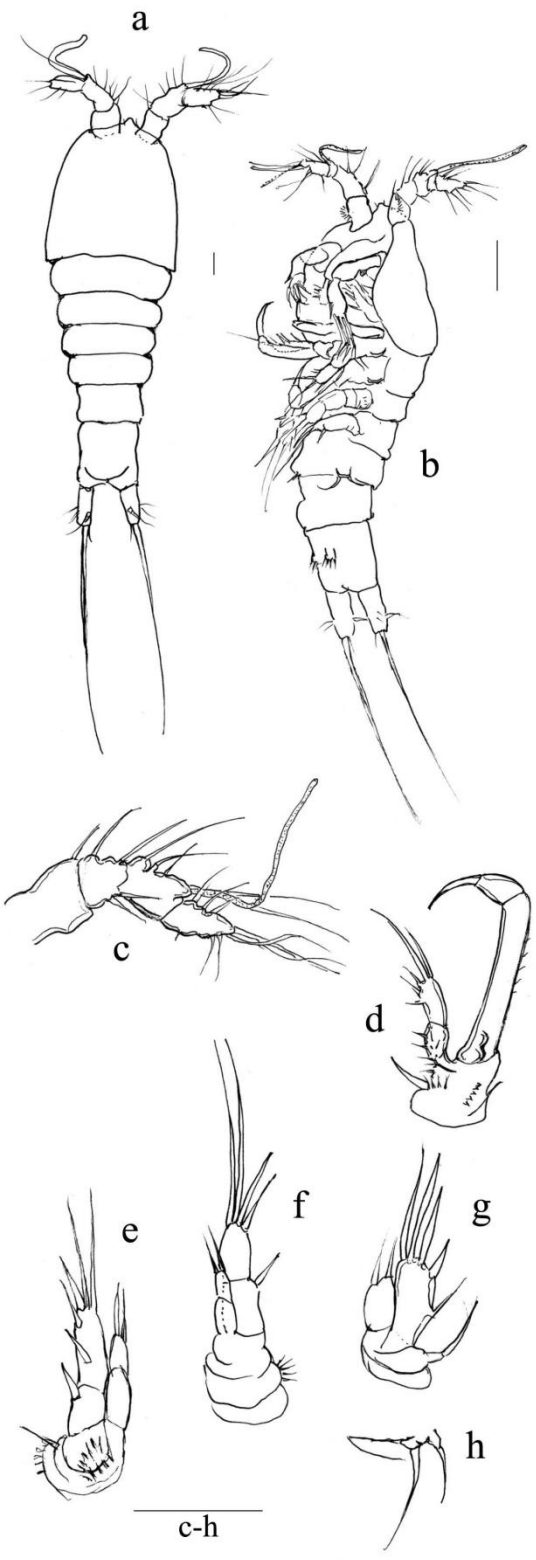

Fig. 12. Copepodid III. a - Dorsal view; b - Lateral view; c – Antennule; d - First leg; e - Second leg; f - Third leg; g - Fourth leg; h - Fifth limb.

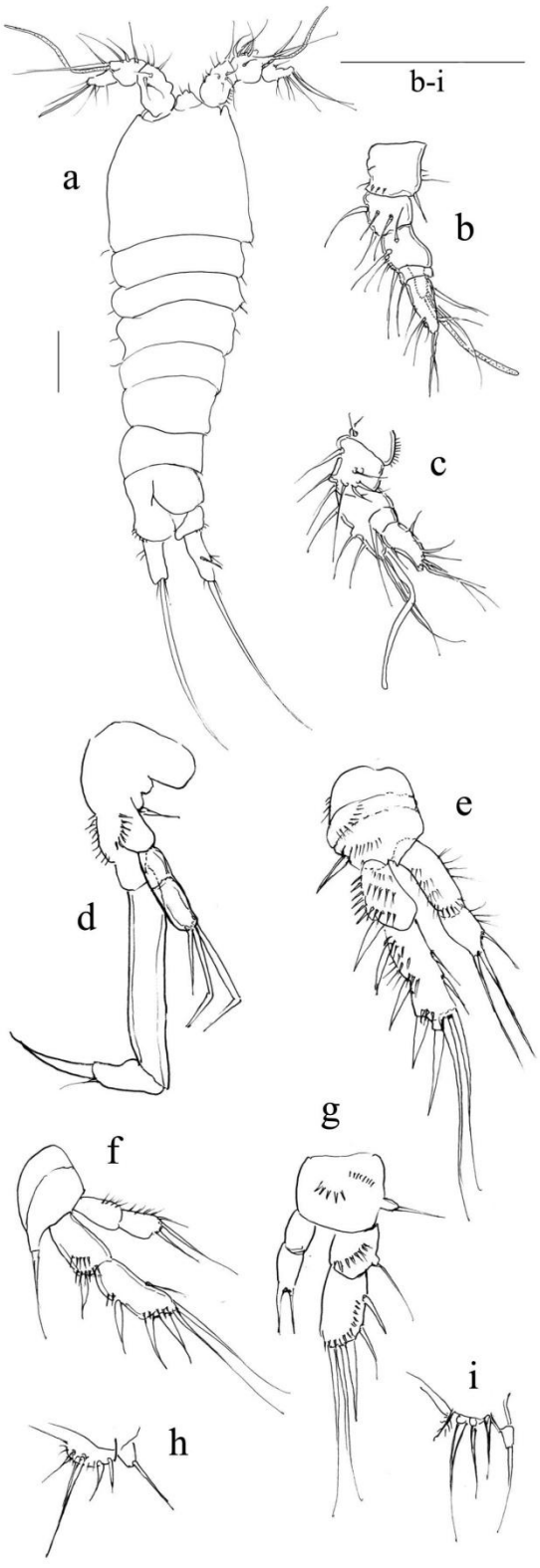

Fig. 13. Copepodid IV. a - Dorsal view; b - Antennule: ; uture female; c - Antennule: future male; d - First leg; e - Second leg; f - Third leg; g - Fourth leg; h - Fifth limb of future female; i - Fifth limb of future male.

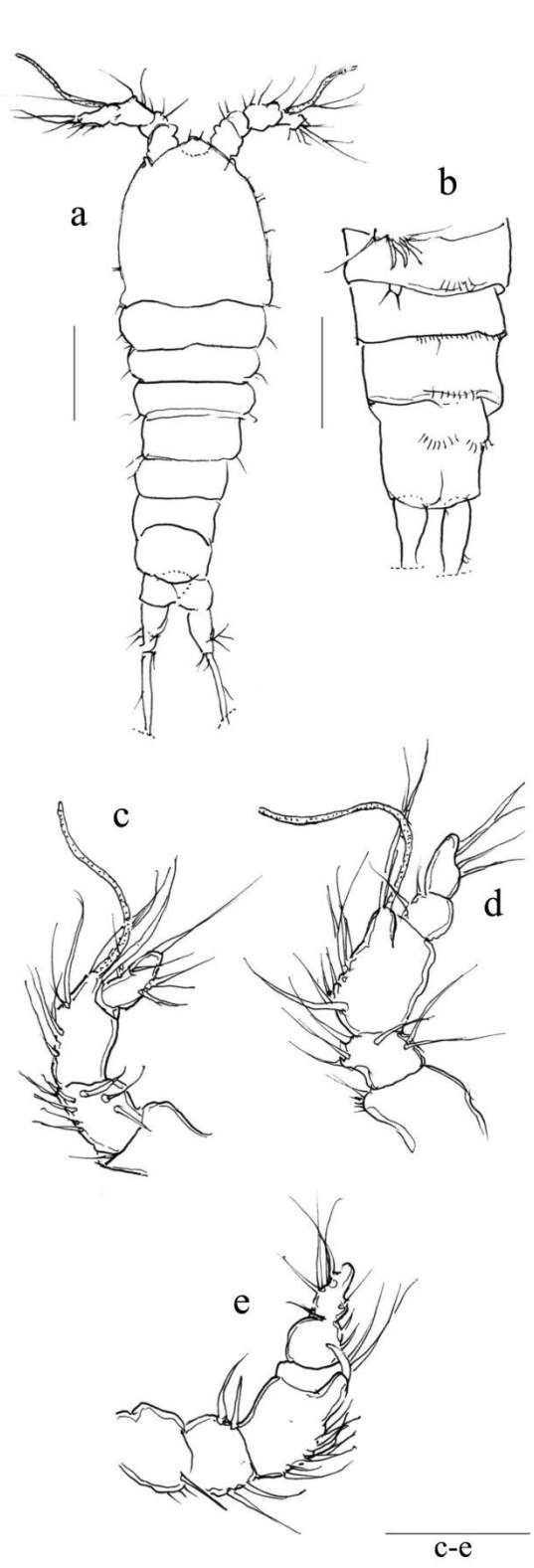

Fig. 14. Copepodid V. a - Dorsal view: future female; b - Urosome of future male, lateral view; c - Antennule of future female; d - Antennule of future male; e - Antennule of future male, another specimen.

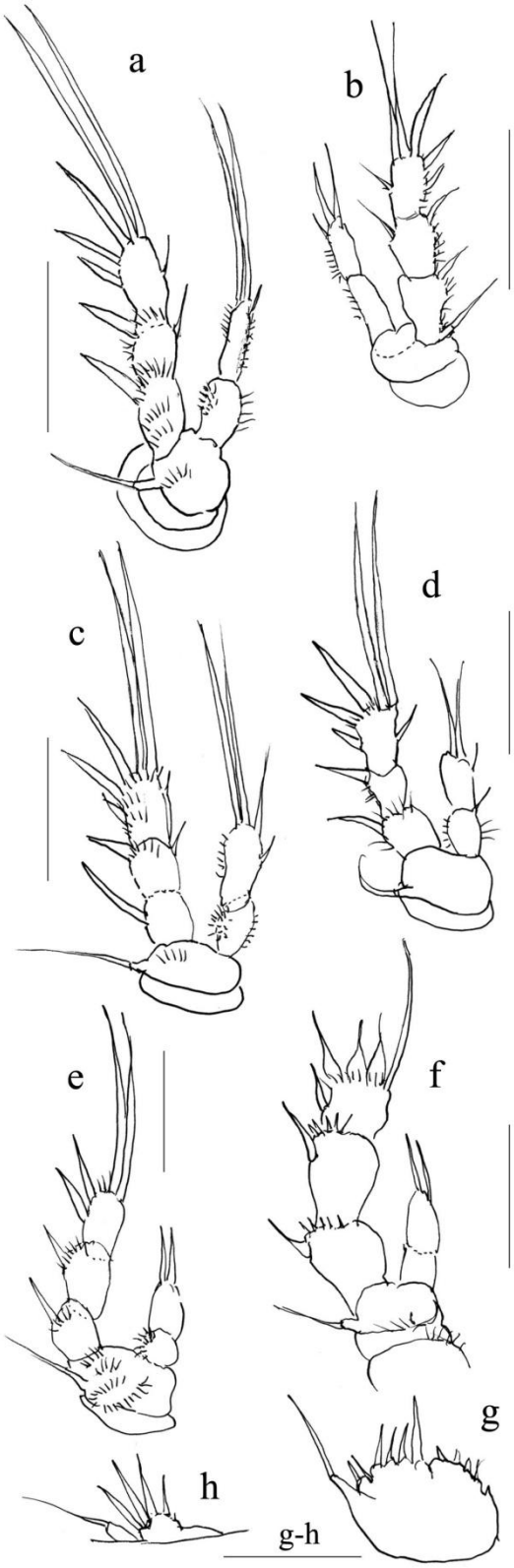

Fig. 15. Copepodid V, limbs second to fifth. a - second leg of future female; b - second leg of future male; c - third leg of future female; d - third leg of future male; e - fourth leg of future female; f - fourth leg of future male; g - fifth leg of future female; h - fifth leg of future male.

Discussion

Lang (1965) listed and presented a key to identify 23 *Heterolaophonte* species. Of these *H.quinquespinosa* (Sewell) was removed to another genus *Quinquelaophonte* (Wells et al.1982) to which Lang's (1948) species belonging to the *H. quinquespinosa* group and other species were added (Mielke, 1975; Lee, 2003; Walker-Smith, 2004). Seven of them have the same general aspect: *Q. brevicornis* (T. Scott, 1893), *Q.quinquespinosa* (Sewell,1924), *Q. sigmoides* (Willey,1930), *Q. longifurcata* Lang (1965), *Q. parasigmoides* Bozic (1969), *Q. wellsi* Hamond (1973) and the here described species. *Q. brevicornis* was considered a "species inquirenda" because of the "deficient description" (Wells & McKenzie,1973). The other six species differ in the setal formulae of legs (Table III). *Q. prolixasetae* Walker-Smith (2004) has furcal rami about as long as the new species, but it is immediately differentiated by the very long setae on the endopod of the first pair of legs and is therefore left out of the Table III.

Table III. Setal formulae of female *Quinquelaophonte* with a furcal ramus about 2.5 times longer than wide

Female Setal Formulae:

	New species		sigmoides		parasigmoides		longifurcata		wellsi		quinquespinosa	
	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod
P3	0.221	0.1.123	0.221	0.1.223	1.320	0.1.123	0.221	0.1.1-023	0.221	0.1.223	0.221	0.1.223
P4	0.120	0.1.123	0.120	0.1223	0.120	0.1.123	0.121	0.1.023	0.120	0.1.123	0.120	0.1.223

Male Setal Formulae:

	New species		sigmoides		parasigmoides		longifurcata		wellsi		quinquespinosa	
	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod	Endopod	Exopod
P3	0.121	0.0.212	0.221	0.1.223	0.221	0.1.123	0.221	0.1.222	0.221	0.1.123	0.221	0.1.23
P4	0.120	0.0.222	0.120	0.1.222	0.120	0.1.123	0.121	0.0.113	0.120	0.1.123	0.120	0.23

Por et al. (l984) identified *Q. sigmoides* in the Cananéia lagoon region (State of São Paulo). This species was succintly described by Willey and redescribed by Hamond (1973). Both authors found 7 elements (spines/setae) on P2 third exopod segment. Our specimens have only 6 elements on P2 exopod 3. Willey did not figure the mouthparts of his specimens, but Hamond (1973) did. The new species differs from Q.*sigmoides* (cf. Hamond) and from *Q. wellsi* partly in the setal formulae and also in the number and ornaments of the antenna, the maxillule and the maxilla. *Q. wellsi* female has the same setal formula of the legs as the new species but the accessory seta of the endopod of P1, next to the terminal claw, is much longer than the claw, a feature also present in *Q. prolixasetae*. Bozic (1969) found one female in the material from La Réunion Island (Indian Ocean) which he identified as *Q. sigmoides*. The animal had a teratological P4. In his specimen he registered six elements on P2 third exopod segment as we observed in the new species. In the material examined for this work teratological specimens were also found . In one female the fourth pair of legs was missing. One male had a complete P4 on one side and on the other the P4 exopod three had a spine less. Until more specimens of these several species are obtained from the regions where they occurred, it is impossible to come to a valid conclusion. The great variation in size of the several adults obtained in nature and in the laboratory , both before fixation and after fixation and treatment with lactic acid, is partly due to the destruction of the strong muscles of the species: the arthrodial membranes between two successive somites extend to their maximum size and the animals lengthen considerably. Another important factor to be considered, and in most cases impossible to access, is the ecophysiology of the species. *Euterpina acutifrons* Dana 1848, for example, a widely distributed species, occurs in Santos Bay and in São Sebastião Channel, neighbouring regions, but crossing experiments between specimens of the populations inhabiting these two environments were not successful (Moreira, personal communication) though the specimens used in the experiments, when closely examined did not present any morphological differences. Therefore we feel justified in creating a new specific name for this *Quinquelaophonte: varians*, from the latin "which varies".

Heterolaophonte nauplii are already known (Dahms, 1999). The nauplii of the new species are very similar to *H. minuta* nauplii (op.cit.). *Quinquelaophonte* nauplii were partly dammaged, but even so drawings and descriptions were prepared of what could be distinguished, to facilitate their identification in bottom samples. *H. minuta* NIII has two terminal furcal setae. This also occurs in NI and NII of the new species. NIII and IV already show four terminal setae and NV and VI can be easily recognized by the two terminal dorsal furcal spines

usually turned medially with their tips overlapping each other, besides the other four furcal setae. The antennules of the new species, with six setae in NI (as in *H.minuta*), increase their number up to 13 in NVI. The antennae and mandibles show less ornaments than in *H.minuta*. Maxillules appear in NV as an oblique ventral fringe posteriorly to the mandibles, and NVI can be recognized by the presence of ventral spines representing, first and second pairs of legs. The similarity of the new species to the *H. minuta* nauplius proves that nauplii are good indicators of genera relationship.

Copepodid I can be easily recognized by the following characteristics: the presence of only four free somites, two pairs of legs (the third represented by filaments) and a bifurcated seta V. It is distinguished from other species at the same stage of development by the longer furcal rami and, when alive or recently fixed, by the many bottom debris attached to its surface, the characteristic pair of tufts of spinules near the midline of the ventral region of the anal segment and by the longer accessory seta next to the endopod claw of the first pair of legs. This last feature of CI is interesting and should merit close attention in future *Quinquelaophonte* studies of this group of species. It is also present in the adult stage of *Q. wellsi* and *Q. prolixasetae*, and it could be the expression of a gene common to the group The antennules' aspect is also useful in the identification of the copepodids of the new species though a great variation in the number of setae occurs. The following copepodid stages can be distinguished from one another by the number of free somites and by the number and structure of the pairs of legs. CIV and CV show features which permit the identification of the future male and the future female: the A1 of the future male does not present terminal setae on the last antennule segment, the P5 of the future female has more setules on the limb bud than the future male.

Dahms (1992) traced the origin of the copepodid I appendages from the observation of intermoult NVI instars of *Amonardia normani* (a diosaccid harpacticoid). The following aspects were confirmed in the new species: from NVI to CI the body lengthens about 1.5 times; in CI the limb buds of the third legs are added; CI has four free somites besides the cephalosome; to each following copepodid stage a new somite is added. Dahms states that the second naupliar segment of A1 originates the first segment of A1 of CI and the tip of the naupliar A1 forms the last segment of the copepodid A1. The antennal coxa and the masticatory gnathobase of the NVI disappear in CI. In *Amonardia*, Dahms derived the furcal setae IV and V from the longest furcal seta of the nauplius. In the species here described it was not possible to elucidate whether seta V originated from the longest terminal seta or from the horizontally placed furcal seta of CV and CVI. In the new species the longest naupliar furcal seta is branched in CI. Leg 3 of CI in many copepods shows 3 terminal spines on the presumptive exopod and 2 terminal setae on the presumptive endopod (Ferrari & Dahms, 2007). These rami of P3 in CI of *Quinquelaophonte* are represented by one seta each .on a pair of ventral buds. In the next two copepodid stages the newly added presumptive limbs are also in the form of pairs of setae inserted on ventral buds.

Remarks on the behavior**:** The new species, while maintained in the laboratory, lived on the bottom surface, under the upper layer of debris. It moves worm-like, clumsily through this layer, not like other bottom copepods which glide rapidly over the bottom surface and keep their body surface clean. The behavior of *Quinquelaophonte* is perhaps the reason for its success in outliving the other copepod species when maintained in the laboratory, because it remains hidden under the debris, and, should it come out, it is not easily localized , because it remains wrapped in the fine particles of bottom-mud adhered to its surface. The nauplius also crawls over the minute grains of sand, disguised by its covering of bottom particles.

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