Cyclopoid Copepods (Lichomolgidae) Associated with Hydroids in the Tropical Western Pacific Ocean

ARTHUR G. HUMES

ABSTRACT: Eight poecilostome copepods, two of them new, are reported from shallow-water hydroids at various points around Banda, Ceram, and Halmahera in the Moluccas and near Noumea in New Caledonia. From Aglaophenia cupressina Lamouroux: Macrochiron angulare n. sp.; M. cheliferum (Thompson & A. Scott, 1903); M. valgum Humes, 1966; M. veroorti Humes & De Maria, 1969; and Telestacicola sertus n. sp. From Lytocarpus balei Nutting: M. lobatum Humes & De Maria, 1969. From Lytocarpus philippinus (Kirchenpauer): M. lytocarpi Humes, 1966 and M. rostratum Humes, 1966. These records comprise two new hosts and five range extensions from Madagascar.

COPEPODS OF THE GENUS Macrochiron Brady, 1872, are primarily associates of hydroids. From the Pacific Ocean only one species, M. cheliferum (Thompson & A. Scott, 1903), has been recorded (Vervoort 1964), but six species are known from Madagascar (Humes 1966, Humes and De Maria 1969).

The eight copepods reported here comprise a new Macrochiron, a new Telestacicola (the first record of this genus from hydroids), and six species of Macrochiron, all representing range extensions and two of them being new host records.

MATERIALS AND METHODS

All measurements were made from specimens in lactic acid. The figures were drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: A₁ = first antenna, A₂ = second antenna, Mx₂ = second maxilla, MXPD = maxilliped, P₁ = leg 1, P₄ = leg 4, P₅ = leg 5, Exp = exopod, and Enp = endopod. In formulas for the armature the Roman numerals represent spines and the Arabic numerals indicate setae.

FAMILY LICHOMOLGIDAE KOSSMANN, 1877

Genus Macrochiron Brady, 1872

Macrochiron angulare n. sp.

Figures 1–3.

Type Material

From the hydroid Aglaophenia cupressina Lamouroux, 309 ♀♀ and 180 ♂♂ in 3 meters, southwestern shore of Goenoeng Api, Banda Islands, 4°31’45” S, 129°51’55” E, 4 May 1975. Holotype ♀, allotype, and 481 paratypes (305 ♀♀, 176 ♂♂) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.; the remaining paratypes (dissected) in the collection of the author.

Other Specimens (all from Aglaophenia cupressina)

In 4 meters, 1 ♀, 1 ♂, Marsegoe Island, western Ceram, 2°59’30” S, 128°03’30” E, 15 May 1975; 79 ♀♀, 22 ♂♂, in 3 meters, Karang Mie, Halmahera, 0°20’07” N, 128°25’00” E, 19 May 1975; 7 ♀♀, 5 ♂♂, in 2 meters, Parang Island, eastern Ceram, 3°17’00” S, 130°44’48” E, 23 May 1975.
Figure 1. *Macrochiron angulare* n. sp. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, genital area, dorsal (C); *d*, caudal ramus, dorsal (C); *e*, egg sac, dorsal (D); *f*, rostrum, ventral (B); *g*, tip of rostrum, ventral (E); *h*, first antenna, with three dots indicating positions of aesthetes added in male, ventral (F); *i*, second antenna, inner (F).
Copepods associated with Hydroids—HUMES

Female

Body (Figure 1a) with moderately broad prosome. Length 0.66 mm (0.63–0.70 mm) and greatest width 0.30 mm (0.26–0.31 mm), based on ten specimens in lactic acid. Weak transverse furrow dorsally between cephalosome and segment of leg 1. Ratio of length to width of prosome 1.46:1. Ratio of length of prosome to that of urosome 1.65:1.

Segment of leg 5 (Figure 1b) 50 × 95 μm. Genital segment 94 × 86 μm in dorsal view, broadest anteriorly, and tapering posteriorly. Genital areas located anterior to middle of segment. Each genital area (Figure 1c) with two small setae about 7 μm long and two spiniform processes. Three postgenital segments from anterior to posterior 32 × 42, 28 × 40, and 29 × 42 μm. Posteroventral margin of anal segment with very small spinules. Caudal ramus (Figure 1d) elongate, 33 × 18 μm. Ratio of length to width 1.83:1. Outer lateral seta 44 μm and dorsal seta 25 μm; both smooth. Outermost terminal seta 91 μm, innermost terminal seta 86 μm, and two long median terminal setae 180 μm (outer) and 268 μm (inner); both inserted between small dorsal and ventral flanges; all four setae with lateral spinules. Body surface with only a few hairs (sensilla) and refractile points.

Egg sac (Figure 1e) oval, 242 × 120 μm, containing approximately 17 eggs, each about 52 μm in average diameter (range 47–57 μm).

Rostrum (Figure 1f) broad with median point on posteroverentral margin (Figure 1g).

First antenna (Figure 1h) 215 μm long. Lengths of seven segments (measured along their posterior nonsetiferous margins): 18 (37 μm along anterior margin), 53, 17, 37, 28, 19, and 24 μm, respectively. Formula for armature: 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All setae naked.

Second antenna (Figure 1i) 166 μm long (without claws), three-segmented. Formula: 1, 1, 3, 2 claws + 5. Second segment with inner surface ornamented with a recurved inner row of minute spinules. Third segment with greatest length 91 μm, bearing proximally a short transverse row of very small spinules. Two terminal claws unequal. Larger claw serrate along concave margin, incompletely divided midway, and jointed distally. Inner claw slender, jointed midway, and smooth. All setae naked except one proximal seta on third segment which is unilaterally barbed.

Labrum (Figure 2a) with two broad posteroverentral lobes.

Mandible (Figure 2b) resembling that of Macrochiron vervoorti Humes & De Maria, 1969. Paragnath a small lobe with a few short hairs. First maxilla (Figure 2c) with four setae. Second maxilla (Figure 2d) and maxilliped (Figure 2e, f) similar to those in M. vervoorti, but distal segment of maxilliped a little shorter and less bowed than in that species.

Ventral area between maxillipeds and first pair of legs as in Figure 2g.

Legs 1–4 (Figures 2h, i, j, 3a) with the same segmentation and spine and setal formula as in M. vervoorti. Leg 4 with inner coxal seta 9 μm and naked. Inner margin of basis smooth. Exopod 117 μm, third segment with II, 1, 5. Endopod 36 × 10.5 μm, its two terminal fringed spines 21 μm (outer) and 36 μm (inner). Outer margin of endopod with slight indentation and haired.

Leg 5 (Figure 3b) with unornamented free segment 57 × 10.5 μm. Ratio of length to width about 5.43:1. Two terminal setae 26 μm and fringed along one side and 39 μm and smooth. Dorsal seta approximately 15 μm. Body segment carrying leg 5 forming a pointed process extending ventrally to free segment of leg (Figure 3c).

Leg 6 represented by two setae on genital area (Figure 1c).

Color in living specimens in transmitted light opaque gray, eye red, egg sacs gray.

Male

Body (Figure 3d) a little more slender than in female. Length 0.59 mm (0.56–0.62 mm) and greatest width 0.21 mm (0.20–0.22 mm), based on ten specimens in lactic acid. Ratio of length to width of prosome 1.75:1. Ratio of length of prosome to that of urosome 1.53:1.

Segment of leg 5 (Figure 3e) 28 × 51 μm.
FIGURE 2. *Macrochiron angulare* n. sp. Female: *a*, labrum, with position of paragnaths indicated by broken lines, ventral (G); *b*, mandible, posterior (F); *c*, first maxilla, posterior (C); *d*, second maxilla, posterior (C); *e*, maxilliped, antero-inner (C); *f*, maxilliped, posteroventral (C); *g*, area between maxillipeds and first pair of legs, ventral (B); *h*, leg 1 and intercoxal plate, anterior (F); *i*, leg 2, anterior (F); *j*, third segment of endopod of leg 3, anterior (F).
FIGURE 3. *Macrochiron angulare* n. sp. Female: a, leg 4 and intercoxal plate, anterior (F); b, leg 5, dorsal (G); c, process on body near leg 5, ventral (G). Male: d, dorsal (A); e, urosome, dorsal (B); f, maxilliped, postero-inner (F); g, third segment of endopod of leg 1, anterior (G); h, third segment of endopod of leg 2, anterior (G); i, third segment of endopod of leg 3, anterior (G); j, leg 5, dorsal (G); k, leg 6, ventral (G); l, spermatophores, attached to female, ventral (B); m, four spermatophores attached to genital segment of male, lateral (B).
Genital segment 104 × 86 μm, a little longer than wide. Four postgenital segments from anterior to posterior 22 × 37, 21 × 35, 19 × 35, and 22 × 34 μm.

Caudal ramus resembling that of female but smaller, 24 × 15.5 μm. Ratio 1.56:1.

Body surface with a few hairs and re­fractile points as in female.

Rostrum like that of female.

First antenna similar to that of female, but three aesthetes added, two on second segment and one on fourth segment (at points indicated by dots in Figure 1h), so that formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

Second antenna, labrum, mandible, para­gnath, first maxilla, and second maxilla as in female. Maxilliped (Figure 3f) resembling that of M. vervoorti. Claw 109 μm along axis.

Ventral area between maxillipeds and first pair of legs as in female.

Legs 1–4 segmented as in female and having same spine and setal formula except for third segment of endopod of leg 1, which is I, I, 4 (Figure 3g). Slight sexual dimorphism in relative lengths of spines in third segment of endopod of leg 2 (Figure 3h) and leg 3 (Figure 3i). Leg 4 as in female.

Leg 5 (Figure 3j) with free segment 28 × 7 μm. Ratio 4:1. Body segment carrying leg 5 lacking pointed process seen in female near insertion of free segment of leg.

Leg 6 (Figure 3k) a posteroventral flap on genital segment bearing two naked setae 12 μm and 24 μm.

Spermatophores (Figure 3l) attached to female in pairs, approximately 94 × 42 μm, not including neck. One male with two pairs of spermatophores attached to anterodorsal surface of genital segment (Figure 3m). Similar “homosexual” attachment of spermatophores previously observed in Vahinius petax Humes, 1967 (Humes 1969).

Living specimens colored as in female.

Remarks

Five species of Macrochiron differ from M. angulare in having the formula III, I, 5 on the third exopod segment of leg 4; these are M. echinicolum Humes & Stock, 1973; M. lytocarpi Humes, 1966; M. lobatum Humes & De Maria, 1969; M. mutatum Stock, 1957; and M. sargassi Sars, 1916. The remaining seven species have the formula II, 1, 5 on this segment. Each of these may be differentiated from M. angulare by the following features: Macrochiron avirostrum Morris, 1973. Length of male 0.90 mm; caudal ramus 1.8:1; rostrum with subconical beaklike process with sharp terminal point projecting posteroventrally (female unknown).

Macrochiron cheliforum (Thompson & A. Scott, 1903); M. fucicolum Brady, 1872; M. hudsoni Morris, 1973; M. rostratum Humes, 1966; M. valgum Humes, 1966; and M. vervoorti Humes & De Maria, 1966. All lacking the pair of pointed processes near leg 5 in the female as seen in the new species.

Macrochiron angulare appears to be close to M. vervoorti, an associate of Aglaophenia cupressina in Madagascar. Features in addition to the form of the processes on the body segment bearing leg 5 whereby these two species may be distinguished are the shape of the female genital segment, the nature of the median posteroventral process on the rostrum, the relative length of the female maxilliped, and the nature of the two spines on the third endopod segment of the male.

Macrochiron cheliforum
(Thompson & A. Scott, 1903)

Figures 4–6.

Material Studiea (all from the hydroid Aglaophenia cupressina Lamouroux)

In 3 meters, 6 ♀♀, 3 ♂♂, southwestern shore of Goenoeng Api, Banda Islands, 4°31'45" S, 129°51'55" E, 4 May 1975; 1 ♀, 2 ♂♂, in 2 meters, Parang Island, northeastern Ceram, 3°17'00" S, 130°44'48" E, 23 May 1975. Specimens have been deposited in the Na­tional Museum of Natural History, Smith­sonian Institution, Washington, D.C.
FIGURE 4. Macrochiron cheliferum (Thompson & A. Scott, 1903). Female: a, dorsal (A); b, uosome, dorsal (H); c, genital area, dorsal (G); d, caudal ramus, dorsal (G); e, rostrum, ventral (H); f, first antenna, with three dots indicating positions of aesthetes added in male, ventral (F); g, second antenna, inner (F); h, labrum, with position of paragnaths indicated by broken lines, ventral (G).
Female

Body (Figure 4a) with moderately broad prosome. Length 0.89 mm (0.86–0.97 mm) and greatest width 0.37 mm (0.34–0.40 mm), based on seven specimens in lactic acid. Weak transverse dorsal furrow between cephalosome and segment of leg 1. Ratio of length to width of prosome 1.46:1. Ratio of length of prosome to that of urosome 1.46:1.

Segment of leg 5 (Figure 4b) 65 x 104 μm. Genital segment 130 x 101 μm, longer than wide, in dorsal view its anterolateral margins somewhat angular at broadest part of segment. Genital areas located dorsolaterally just posterior to broadest part. Each area (Figure 4c) bearing two small naked setae about 8 μm and a spiniform process. Three postgenital segments from anterior to posterior 42 x 50, 36 x 49, and 39 x 49 μm. Posteroventral margin of anal segment bearing minute spinules.

Caudal ramus (Figure 4d) elongate, 55 x 23 μm. Ratio of length to width 2.39:1. Outer lateral seta 73 μm and dorsal seta 44 μm, both smooth. Outermost terminal seta 101 μm, innermost terminal seta 83 μm, and two long median terminal setae 170 μm (outer) and 245 μm (inner), both inserted between dorsal smooth flange and ventral flange with marginal row of very small spinules; all four setae with lateral spinules.

Body surface with a few hairs (sensilla).

Egg sac unknown.

Rostrum (Figure 4e) broad with a long median needlelike point on posteroventral margin.

First antenna (Figure 4f) 253 μm long. Lengths of seven segments (measured along their posterior nonsetiferous margins): 21 (47 μm along anterior margin), 57, 17, 49, 32, 22, and 29 μm, respectively. Formula for armature as in M. angulare. All setae naked.

Second antenna (Figure 4g) 169 μm long (without claws), three-segmented. Formula: 1, 1, 3, 2 claws + 5. Second segment ornamented on inner surface with minute spinules and bearing a seta much stouter than that on first segment. Third segment 99 μm in greatest length. Two terminal claws unequal. Concave margin of larger claw (140 μm along its axis) with proximal field of many small spines followed by single row of large teeth and beyond distal joint another row of smaller teeth. Inner claw (90 μm) slender, smooth, and jointed midway. All setae naked.

Labrum (Figure 4h) with two broad posteroventral lobes.

Mandible (Figure 5a), paragnath, first maxilla (Figure 5b), and second maxilla (Figure 5c) resembling those of M. valgum Humes, 1966. Maxillipeds (Figure 5d) also similar to that in M. valgum, but second segment slightly longer.

Ventral area between maxillipeds and first pair of legs (Figure 5e) similar to that in M. valgum.

Legs 1–4 (Figure 5f, g, h, i) with the same segmentation and spine and setal formula as in M. angulare. Inner coxal seta on leg 4 small, 10 μm, and naked. Leg 4 exopod 120 μm long, third segment with II, I, 5. Endopod 34 x 10 μm and unornamented. Outer terminal element 17.5 μm and weak. Inner element 45 μm and stronger, with minute outer barbules.

Leg 5 (Figure 6a) with unornamented free segment 65 x 15.5 μm. Ratio of length to width 4.19:1. Two terminal setae 55 μm and 40 μm, both minutely barbed. Dorsal seta smooth. Ventrally near insertion of free segment body forming a small rounded lobe (Figure 6b).

Leg 6 represented by two setae on genital area (Figure 4c).

Color in living specimens in transmitted light opaque gray, eye red, egg sacs gray.

Male

Body (Figure 6c) with prosome less tapered anteriorly than in female. Length 0.75 mm (0.70–0.80 mm) and greatest width 0.26 mm (0.24–0.29 mm), based on five specimens in lactic acid. Ratio of length to width of prosome 1.68:1. Ratio of length of prosome to that of urosome 1.41:1.

Segment of leg 5 (Figure 6d) 36 x 75 μm. Genital segment 143 x 122 μm, a little longer than wide. Four postgenital segments from anterior to posterior 34 x 47, 34 x 45, 29 x 43, and 36 x 44 μm.
Copepods associated with Hydroids—Humes

FIGURE 5. Macrochiron cheliferum (Thompson & A. Scott, 1903). Female: a, mandible, posterior (C); b, first maxilla, ventral (C); c, second maxilla, posterior (C); d, maxilliped, antero-inner (G); e, area between maxillipeds and first pair of legs, ventral (H); f, leg 1 and intercoxal plate, anterior (F); g, leg 2, anterior (F); h, third segment of endopod of leg 3, anterior (F); i, leg 4 and intercoxal plate, anterior (F).
FIGURE 6. *Macrochiron cheliferum* (Thompson & A. Scott, 1903). Female: a, leg 5, dorsal (F); b, leg 5, ventral (F). Male: c, dorsal (A); d, urosome, dorsal (H); e, maxilliped, postero-inner (G); f, endopod of leg 1, anterior (F); g, endopod of leg 2, anterior (F); h, leg 5, dorsal (G); i, leg 6, ventral (F).
Copepods associated with Hydroids—Humes

Caudal ramus similar to that in female but smaller, $47 \times 22 \ \mu m$. Ratio $2.14:1$.

Body surface sparsely ornamented with hairs (sensilla).

Rostrum as in female. First antenna like that of female, but three long aesthetes added (at points indicated by dots in figure 4f), so that formula is same as in male of $M. \text{angulare}$.

Second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla resembling those of female. Maxilliped (Figure 6e) with first segment and small third segment unarmed. Second segment with row of stout spines and two naked setae. Claw $107 \ \mu m$ along its axis, partly divided midway, and bearing proximally two very unequal naked setae.

Ventral area between maxillipeds and first pair of legs as in female.

Legs 1–4 segmented as in female and having same spine and setal formula except for third segment of endopod of leg 1, which is 1, 1, 4 (Figure 6f). Three spines on third segment of endopod of leg 3 (Figure 6g) shorter than in female, 11, 12, and 21 $\mu m$ from outer to inner (in female these spines 11, 18.5, and 25 $\mu m$). Legs 3 and 4 like those of female.

Leg 5 (Figure 6h) with free segment $26 \times 11 \ \mu m$; its two setae $32 \ \mu m$ and $24 \ \mu m$.

Leg 6 (Figure 6i) a posteroventral flap on genital segment bearing two naked setae $22 \ \mu m$ and $13 \ \mu m$.

Spermatophore not seen.

Living specimens colored as in female.

Remarks

The descriptions and figures of $Macrochiron \text{cheliferum}$ available in the literature are in many respects incomplete. The original description (as $Pseudanthessius \text{chelifer}$) by Thompson and Scott (1903) lacks many details, but even so the general similarity of their Ceylonese species (females only, no host given) with the Moluccan material is evident. Unfortunately Thompson and Scott’s specimens are no longer in existence (Humes and Ho 1967:209) and therefore cannot be compared with the present specimens.

The species was briefly noted by Gurney (1927) on the basis of one male from the Suez Canal (no host given). A more detailed description by Vervoort (1964), based on both sexes from Ifaluk Atoll (no host given, but apparently from a hydroid), provided additional details. In none of these partial descriptions are there features inconsistent with the Moluccan specimens.

A direct comparison of the Moluccan specimens with Vervoort’s specimens of $M. \text{cheliferum}$ from Ifaluk Atoll (USNM 109764) has confirmed that they represent the same species.

$Macrochiron \text{lobatum}$ Humes & De Maria, 1969

Material Collected

From two small colonies of $Lytocarpus \text{balei}$ Nutting, 24 ♀♀, 19 ♂♂, and 16 copepodids in 10 meters, Gomumu Island, south of Obi, Moluccas, 1°50’00” S, 127°30’54” E, 30 May 1975.

$Lytocarpus \text{balei}$ is a new host for $M. \text{lobatum}$, previously known only from $L. \text{phoeniceus}$ (Busk) in Madagascar.

A comparison of the Moluccan specimens with paratypes of $M. \text{lobatum}$ has shown no important differences, though the copepods from the Moluccas have a somewhat smaller body size. The measurements of ten specimens in lactic acid were: female, length 0.84 mm (0.79–0.88 mm), male, 0.76 mm (0.72–0.79 mm). In $M. \text{lobatum}$ the length of the female is 1.09 mm (1.01–1.13 mm) and of the male 0.93 mm (0.89–0.97 mm). The smaller body size is reflected in slightly smaller body parts such as the caudal ramus. Such size difference may be related to the different hosts. The very close similarities in the body form and the appendages support the determination of the Moluccan specimens as $M. \text{lobatum}$.

$Macrochiron \text{lytocarpi}$ Humes, 1966

Material Collected

From eight small colonies of $Lytocarpus \text{philippinus}$ (Kirchenpauer), 1 ♂, 1 copepodid
in 2 meters, Rocher à la Voile, Noumea, New Caledonia, 22°18'24" S, 166°25'50" E, 2 June 1971; 1 ♀, 1 ♂, and 5 copepodids from three colonies of the same host, in 1 m, Rocher à la Voile, Noumea, 2 August 1971.

This represents a range extension from Madagascar, where *M. lytocarpi* is known from the same host.

**Macrochiron rostratum** Humes, 1966

**Material Collected**

From eight small colonies of *Lytocarpus philippinus* (Kirchenpauer), 2 ♀♀ in 2 meters Rocher à la Voile, Noumea, New Caledonia, 22°18'24" S, 166°25'50" E, 2 June 1971.

This species has previously been known only from Madagascar, where it occurs on the same host.

**Macrochiron valgum** Humes, 1966

**Material Collected**

From *Aglaophenia cupressina* Lamouroux, 3 ♀♀ in 2 meters, Parang Island, eastern Ceram, 3°17'00" S, 130°44'48" E, 23 May 1975; 1 ♀, 2 ♂♂ from the same host, in 3 meters, southwestern shore of Goenoeng Api, Banda Islands, 4°31'45" S, 129°51'55" E, 4 May 1975.

*M. valgum* has been known previously only from Madagascar on *Lytocarpus philippinus*, *Gymnangium hians*, and *G. gracilicaulis*. The Moluccan specimens represent both a new host record and a range extension.

**Macrochiron vervoorti** Humes & De Maria, 1969

**Material Collected**

From *Aglaophenia cupressina* Lamouroux, 38 ♀♀, 38 ♂♂ in 3 meters, Karang Mie, eastern Halmahera, 0°20'07" N, 128°25'00" E, 19 May 1975; 74 ♀♀, 124 ♂♂ from the same host, in 2 meters, Parang Island, eastern Ceram, 3°17'00" S, 130°44'48" E, 23 May 1975.

This species has previously been known only from Madagascar on the same host.

PACIFIC SCIENCE, Volume 31, October 1977

Genus *Telestacicola* Humes & Stock, 1972

*Telestacicola sertus* n. sp.

Figures 7–9.

**Type Material**

From the hydroid *Aglaophenia cupressina* Lamouroux, 19 ♀♀, 46 ♂♂, and 1 copepodid in 3 meters, southwestern shore of Goenoeng Api, Banda Islands, 4°31'45" S, 129°51'55" E, 4 May 1975. Holotype ♀, allotype, and 60 paratypes (16 ♀♀, 44 ♂♂) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.; the remaining paratypes (dissected) in the collection of the author.

**Other Specimens (all from Aglaophenia cupressina)**

In 4 meters, 1 ♂, 3 copepodids, Marsegoe Island, western Ceram, 2°59'30" S, 128°03'30" E, 15 May 1975; 2 ♀♀, 14 ♂♂, in 3 meters, Karang Mie, eastern Halmahera, 0°20'07" N, 128°25'00" E, 19 May 1975; 6 ♀♀, 4 ♂♂, in 2 meters, Parang Island, eastern Ceram, 3°17'00" S, 130°44'48" E, 23 May 1975.

**Female**

Body (Figure 7a) with moderately broad prosome. Length 0.95 mm (0.88–1.03 mm) and greatest width 0.35 mm (0.33–0.37 mm), based on ten specimens in lactic acid. Segment of leg 1 separated from cephalosome by dorsal transverse furrow. Ratio of length to width of prosome 1.59:1. Ratio of length of prosome to that of urosome 1.59:1.

Segment of leg 5 (Figure 7b) 68 × 117 μm. Genital segment 164 μm long, 104 μm in greatest width, and 69 μm wide just posterior to the lateral indentations. Genital areas situated dorsally anterior to middle of segment. Each genital area (Figure 7c) bearing two small naked setae about 5.5 μm and an inconspicuous spiniform process. Three postgenital segments from anterior to posterior 55 × 60, 39 × 55, and 49 × 58 μm. Posteroventral margin of anal segment with a few minute spinules.

**Telestacicola sertus** n. sp.
FIGURE 7. *Telestaccola serlus* n. sp. Female: *a*, dorsal (A); *b*, urosome, dorsal (H); *c*, genital area, dorsal (C); *d*, caudal ramus, dorsal (G); *e*, egg sac, lateral (A); *f*, rostrum, ventral (B); *g*, first antenna, ventral (B); *h*, second antenna, posterior (B); *i*, claw of second antenna, anterior (G).
**FIGURE 8.** *Telestaccola sertus* n. sp. Female: *a*, labrum, with position of paragnaths indicated by broken lines, ventral (F); *b*, mandible, posterior (G); *c*, first maxilla, posterior (G); *d*, second maxilla, posterior (G); *e*, maxilliped, antero-inner (G); *f*, area between maxillipeds and first pair of legs, ventral (H); *g*, leg 1 and intercoxal plate, anterior (B); *h*, leg 2, anterior (B); *i*, third segment of endopod of leg 3, anterior (B); *j*, leg 4 and intercoxal plate, anterior (B).
Copepods associated with Hydroids—Humes

Caudal ramus (Figure 7d) elongate, 57 × 28 µm. Ratio of length to width 2.04:1. Outer lateral seta 78 µm and dorsal seta 35 µm, both smooth. Outermost terminal seta 117 µm, innermost terminal seta 112 µm, and two long median terminal setae 187 µm (outer) and 242 µm (inner), both with lateral spinules and inserted between dorsal (smooth) and ventral (with few extremely small marginal spinules) flanges; all four setae with lateral spinules.

Body surface with a few hairs (sensilla).

Egg sac (Figure 7e) elongate oval, 374 × 210 µm, containing many eggs and extending well beyond caudal rami. Each egg about 49 µm in diameter.

Rostrum (Figure 7f) pointed and beaklike.

First antenna (Figure 7g) 280 µm long. Lengths of seven segments (measured along their posterior nonsetiferous margins): 15 (42 µm along anterior margin), 68, 21, 47, 37, 27, and 38 µm, respectively. Formula for armature: 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All setae naked.

Second antenna (Figure 7h) 231 µm long not including claws, four-segmented. Formula: 1, 1, 3, 2 claws + 5. Setae on first three segments finely barbed along one side; longest seta on third segment jointed. Second segment with inner group of very small spines proximal to seta. Fourth segment 83 µm along outer edge, 57 µm along inner edge, and 21 µm wide at middle, bearing terminally five long slender smooth setae and two slender jointed claws 83 µm along axis and pectinate along concave side (Figure 7i).

Labrum (Figure 8a) with two broad posterovertral lobes.

Mandible (Figure 8b) with long lash. Paragnath a small lobe with a few hairs. First maxilla (Figure 8c) with three terminal haired setae and one smaller subterminal smooth seta. Second maxilla (Figure 8d) with second segment bearing a small setule proximally on anterior surface, a smooth seta on posterior surface, and an inner barbed seta. Lash with coarse teeth proximally and more slender teeth distally; these two groups separated by a few shorter teeth. Maxilliped (Figure 8e) apparently two-segmented, with no clear articulation between second and third segments. Second segment greatly expanded inwardly and bearing two very unequal setae; larger seta with strong lateral spinules, smaller seta naked. Third segment bearing two small naked setae and terminating in two spinelike processes, one of them with bilateral barbs.

Ventral area between maxillipeds and first pair of legs (Figure 8f) slightly proteruberant.

Legs 1–4 (Figure 8g, h, i, j) segmented as in Telestacicola angoti Humes & Stock, 1973. Details of armature of legs 1–3 very similar to that species. Leg 4 (Figure 8j) with exopod 153 µm long and third segment having formula III, I, 5. Endopod a single segment 55 µm long without spiniform processes (57 µm long with these processes) and 19 µm in greatest width. Two terminal fringed spines 28 µm (outer) and 41 µm (inner). Feathered seta on inner margin of segment 31 µm. Outer margin with a thornlike process nearly opposite inner seta and bearing long hairs. Inner coxal seta 19 µm and delicately feathered.

Leg 5 (Figure 9a) with unornamented free segment 78 × 15.5 µm (width at middle). Ratio 5.03:1, with slight inner proximal expansion (width here 18 µm). Inner terminal seta 38 µm and barbed; outer terminal seta 40 µm and smooth. Smooth dorsal seta approximately 30 µm, but held erect and difficult to measure accurately.

Leg 6 represented by two setae on genital area (Figure 7c).

Color in living specimens opaque gray, eye red, egg sacs gray.

Male

Body (Figure 9b) with slender prosome. Length 0.73 mm (0.69–0.78 mm) and greatest width 0.22 mm (0.20–0.23 mm), based on ten specimens in lactic acid. Ratio of length to width of prosome 1.79:1. Ratio of length of prosome to that of urosome 1.27:1.

Segment of leg 5 (Figure 9c) 42 × 68 µm. Genital segment elongate, 180 × 143 µm. Four postgenital segments from anterior to posterior 26 × 45, 26 × 44, 18 × 42, and 27 × 45 µm.

Caudal ramus (Figure 9d) 34 × 21 µm.
Ratio about 1.6:1. Relatively shorter than in female but similarly armed.

Body surface with hairs as in female.

Rostrum as in female. First antenna as in female but three long aesthetes added (at points indicated by dots in Figure 7g).

Formula: 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

Second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla as in female. Maxilliped (Figure 9e) with unarmed first segment. Second segment bearing a row of long spinules and two very dissimilar setae (Figure 9f), one stout and barbed, the other slender and smooth. Small third segment unarmed. Claw 112 μm along its axis, with two very unequal, smooth setae proximally and lacking a terminal lamella.

Ventral area between maxillipeds and first pair of legs as in female.

Legs 1–4 segmented as in female and with similar armature except for dimorphism in third segment of endopod of leg 1 where
Copepods associated with Hydroids—Humes

TABLE I
PRINCIPAL DISTINGUISHING FEATURES OF Telestacicola angoti AND T. sertus

<table>
<thead>
<tr>
<th>Feature</th>
<th>T. angoti</th>
<th>T. sertus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rostrum</td>
<td>linguiform, tip rounded</td>
<td>beaklike, tip pointed</td>
</tr>
<tr>
<td>Claws on A</td>
<td>coarsely dentate</td>
<td>finely pectinate</td>
</tr>
<tr>
<td>Lash on Mx₂ with uniform small teeth</td>
<td>MXPD three-segmented</td>
<td>MXPD with teeth of two sizes</td>
</tr>
<tr>
<td>♀ P₄ Exp third segment with 1.1.5</td>
<td>♀ P₄ Exp third segment with III.1.5</td>
<td></td>
</tr>
<tr>
<td>P₅ Enp without thorn on outer margin</td>
<td>P₅ Enp with thornlike process on outer margin</td>
<td></td>
</tr>
<tr>
<td>♀ caudal ramus 98 × 20 μm, 4.8:1</td>
<td>♀ caudal ramus 57 × 28 μm, 2.04:1</td>
<td></td>
</tr>
</tbody>
</table>

formula is I, I, 4 (Figure 9g). Endopod of leg 4 (Figure 9h) 39 × 13 μm, terminal spines 18 μm (outer) and 29 μm (inner).

Leg 5 (Figure 9f) with free segment 31 × 9 μm. Ratio 3.44:1. Shorter than in female and without inner proximal expansion.

Leg 6 (Figure 9j) a posteroventral flap on genital segment bearing two slender smooth setae 30 μm and 32 μm.

Spermatophore not seen.

Living specimens colored as in female.

Etymology

The specific name sertus (Latin meaning joined together) refers to the apparent union of the second and third segment of the second maxilla of the female.

Remarks

At present the genus Telestacicola Humes & Stock, 1972, contains only one species, T. angoti Humes & Stock, 1973, associated with the telestacean Coelogorgia palmosa Milne Edwards & Haime and with the gorgonacean Muricella rubra robusta J. A. Thompson & J. Simpson in Madagascar. The salient differences between T. angoti and T. sertus are shown in Table 1.

Remarks on Lichomolgid Associates of Hydroids

The geographical ranges of copepods on hydroids may be very broad. For example, four species (Macrochiron lobatum, M. lytocarpi, M. valgum, and M. vervoorti) occur in Madagascar and in the western Pacific. It seems probable that the various species of Macrochiron will be found wherever suitable hydroid hosts live.

A single species of hydroid may harbor more than one species of copepod. Aglaophenia cupressina at Parang Island in eastern Ceram serves as host for five species of copepods: Macrochiron angulare, M. cheliferum, M. valgum, M. vervoorti, and Telestacicola sertus. Since at the time of collection several colonies of this hydroid were combined, it is not known whether the five copepods can coexist on the same colony.

LIST OF LICHOMOLGID COPEPODS ASSOCIATED WITH HYDROIDS

Macrochiron lytocarpi
  with Lytocarpus philippinus

Macrochiron valgum
  with Lytocarpus philippinus
  with Aglaophenia cupressina
  with Gymnangium hians
  with Gymnangium gracilicaulis

Madagascar (Humes 1966)
New Caledonia (present paper)
Madagascar (Humes 1966)
Moluccas (present paper)
Madagascar (Humes and De Maria 1969)
Madagascar (Humes and De Maria 1969)
Macrochiron rostratum
  with Lytocarpus philippinus
  with Lytocarpus phoeniceus
  (=L. spectabilis)
  with Aglaophenia delicatula
  with Gymnangium hians
  with Gymnangium gracilicaulis

Macrochiron lobatum
  with Lytocarpus phoeniceus
  with Lytocarpus balei

Macrochiron vervoortii
  with Aglaophenia cupressina

Macrochiron angulare
  with Aglaophenia cupressina

Macrochiron cheli/erum
  with Aglaophenia cupressina

Macrochiron fucicolum
  with Kirchenpaueria pinnata

Macrochiron hudsoni
  probably with Obelia longissima

Macrochiron avirostrum
  probably with Obelia longissima

Telestacicola serlus
  with Aglaophenia cupressina

ACKNOWLEDGMENTS

The Moluccan copepods were collected during the Alpha Helix East Asian Bioluminescence Expedition, which was supported by the National Science Foundation under grants OFS 74-01830 and OFS 74-02888 to the Scripps Institution of Oceanography and National Science Foundation grant no. BMS 74-23242 to the University of California, Santa Barbara. The collection of the New Caledonian copepods was made possible by a grant (GB-8381X) from the National Science Foundation.

I am indebted to Dr. W. Vervoort, Rijksmuseum van Natuurlijke Historie, Leiden, for the identification of the hydroids.

LITERATURE CITED


HUMES, A. G., and A. De Maria. 1969. The cyclopid copepod genus Macrochiron


