

TWO SPECIES OF *UROCOPIA*, PLANKTONIC  
POECILOSTOMATOID COPEPODS OF THE  
FAMILY UROCOPIIDAE HUMES AND  
STOCK, 1972

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*Abstract.*—Since the original description of the bathypelagic copepod *Urocopia singularis* Sars, 1917, there have been only two other records of this species. New material from the eastern North Pacific Ocean has led to additional morphological details of the female and the first description of the male. A second poecilostome species, *Sinoculosapphirina deeveyae* Boxshall, 1981, is now considered to be in the genus *Urocopia*.

The bathypelagic genus *Urocopia* was based by Sars (1917) on two female copepods collected in the North Atlantic Ocean during the 1913 cruise of the ARMAUER HANSEN. Sars (1917:3) placed this genus in the family Lichomolgidae because of the morphology of the oral appendages, but he stated that the copepods "differed essentially from other known Lichomolgidae." Humes and Stock (1972) included the family Urocopiidae in the superfamily Lichomolgoidea when they revised the family Lichomolgidae. In Humes and Stock's key to the families (1972:122), the distinguishing characters of Urocopiidae are the 3-segmented exopods of legs 1 and 2 and endopod of leg 4, and leg 5 without a free segment. The family Lichomolgidae was separated on the basis of leg 4 endopod being 2-segmented, 1-segmented, reduced to a small knob, or absent.

There are characters in both families Urocopiidae and Lichomolgidae that resemble those of some species of *Sapphirina* J. V. Thompson, 1829, but this genus may be separated by the 1-segmented leg 5. Additional distinctive characters of *Sapphirina* species are two anterior cuticular lenses, a conspicuously depressed body with epimeral plates expanded laterally, and the lamelliform caudal rami.

An unpublished record of *Urocopia singularis* from off Oregon and California in the eastern North Pacific Ocean (Olson 1949) was later published and corroborated with a record from the Bering Sea (Minoda 1971). The following new records from the eastern North Pacific further characterize the geographical range of *U. singularis*.

Collections were made in 1964 and 1965 from the BROWN BEAR, former research vessel of the Department of Oceanography, University of Washington, with a specially-designed plankton net (mesh aperture 110  $\mu\text{m}$ ) which accompanied a deep water-bottle cast (Heron and Damkaer 1978).

The rare specimens of *Urocopia singularis* from the BROWN BEAR cruises and the loan of slides prepared by J. B. Olson have enabled us to supplement the published morphological details, as well as to describe the male. Figures were drawn with the aid of a Wild M20<sup>1</sup> drawing tube. The slide of the male *Urocopia singularis* from which the male appendages were illustrated, was prepared by W. K. Peterson in 1965 with methyl blue stain and Turttox CMC mounting medium. The stain Solophenyl

<sup>1</sup> Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.



Table 1. Collection data.

|                   | Date       | Depth (m) | Location              | Length   |             |          |
|-------------------|------------|-----------|-----------------------|----------|-------------|----------|
|                   |            |           |                       | ♀ (mm)   | ♂ (mm)      | ♂ V(mm)  |
| Previous records  |            |           |                       |          |             |          |
| Sars              | VII 13     | 700–600   | 59°35.0'N, 20°40.0'E  | 2 (1.90) |             |          |
| Olson             | 25 V 39    | 800–0     | 44°46.0'N, 128°22.0'W | 1 (1.97) |             |          |
|                   | 13 VI 39   | 800–0     | 35°42.0'N, 124°19.5'W |          | 1 (1.28)    |          |
| Minoda            | 13 VI 61   | 883–743   | 56°23.0'N, 174°38.0'E | 1 (2.10) |             |          |
| New Records       |            |           |                       |          |             |          |
| <i>BROWN BEAR</i> |            |           |                       |          |             |          |
| Cruise            |            |           |                       |          |             |          |
| 344               | 4 V 64     | 2600–0    | 45°29.3'N, 126°58.0'W |          |             | 1 (1.08) |
|                   | 28 V 64    | 4310–0    | 47°49.2'N, 144°57.7'W |          | 1 (1.05)    |          |
| 368               | 10 VIII 65 | 2700–0    | 45°22.0'N, 128°36.0'W | 1 (2.25) | 1 (damaged) |          |
|                   | 13 VIII 65 | 2000–0    | 45°20.6'N, 134°56.5'W |          | 1 (1.29)    |          |
|                   | 14 VIII 65 | 4250–0    | 45°17.5'N, 139°09.6'W | 1 (2.28) |             |          |

blue 2RL, dissolved in lactic acid, was used to study the other specimens (English and Heron 1976).

The collection data for previous records and the new records of *Urocopia singularis* are shown in Table 1.

Specimens collected from the BROWN BEAR described in this report, except the 10 VIII 65 male and female, have been deposited in the Crustacea collection of the National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C. The Olson male and female, mounted on slides, have also been deposited in the National Museum of Natural History.

Poecilostomatoida Kabata, 1979  
 Urocopiidae Humes and Stock, 1972  
*Urocopia* G. O. Sars, 1917

*Sapphoncaea* Minoda 1971:46.  
*Sinoculosapphirina* Boxshall 1981:307.

*Diagnosis.*—Body cycloform, elongate. Urosome in female 5-segmented, in male 6-segmented. Caudal ramus elongate, lamellar. Rostrum absent. First antenna 6-segmented; incomplete sutures between segments 1 and 2 or 2 and 3. Second antenna 4-segmented, sexually dimorphic; terminal

segment of female with stout claw and 2 short apical setae; in male, length of terminal segment and width of claw reduced, outer apical seta very long.

Key to the Species of *Urocopia*

Females

- 1. Length 1.90–2.28 mm; caudal ramus length approximately equal to that of 3 preceding segments combined . . . . . *U. singularis*
- Length 3.50 mm; caudal ramus length approximately equal to that of 3 preceding segments plus genital segment combined . . . . . *U. deeveyae*

*Urocopia singularis* G. O. Sars, 1917  
 Figs. 1–4

*Urocopia singularis* G. O. Sars, 1917:3–11, figs. 1–15.—Lysholm and Nordgaard, 1921:29.—Humes and Stock, 1972:329, 330, fig. 183.—Gotto, 1979:6, 11, 13, fig. 26.

*Sapphoncaea moria* Olson, [MS], 1949:112, pl. 27, figs. 3–11; pl. 28, figs. 1–12.—Minoda, 1971:46, 47, pl. 4, figs. 1–12.

*Material examined.*—2 ♀♀, 3 ♂♂ (1 damaged), 1 ♂V; eastern Pacific (see Table). The



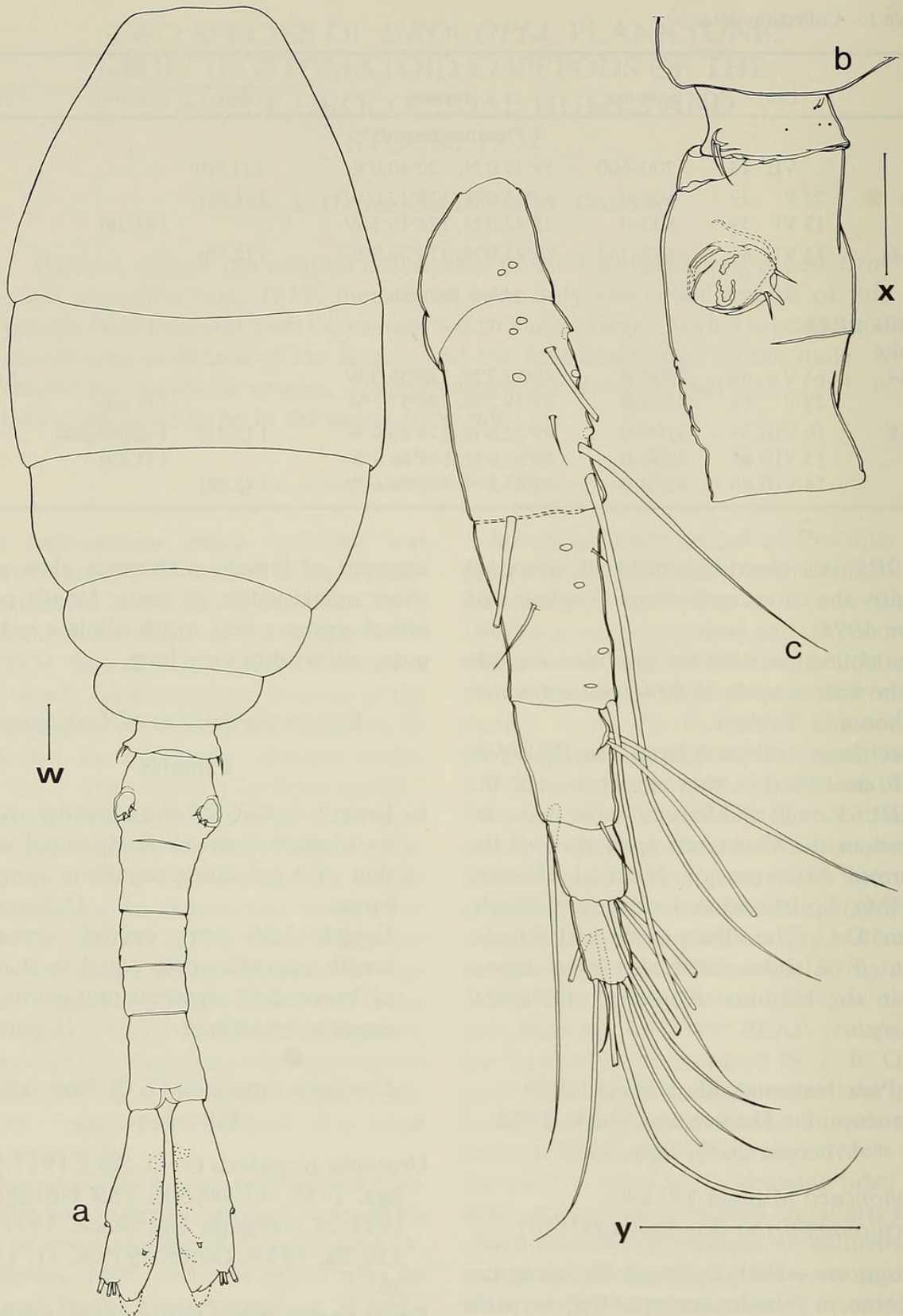


Fig. 1. *Urocopia singularis* Sars, female: a, Habitus, dorsal (w); b, Segment of leg 5 and genital segment, lateral (x); c, First antenna, right ventral (y). Each scale bar equals 0.10 mm.



male of this species is described for the first time.

*Female.*—Lengths of two females 2.25 and 2.28 mm. Prosoma relatively robust compared to slender urosome (Fig. 1a). Ratio of length of prosoma to that of urosome 1.2:1. Pediger 1 delimited from cephalosome dorsally by suture. Between segment of leg 5 and genital segment a pronounced ventral intersegmental sclerite (Fig. 1b).

Genital segment shorter than length of caudal ramus. Genital areas located dorsolaterally anterior to middle of segment; lamellar fringe forming dorsal transverse line on one female. Each genital area with 2 setae, posteriormost adjacent to sclerotized prong extending from operculum and overlying 2 pores, anteriorly and posteriorly. Surfaces of genital segment and 3 postgenital segments with slightly crenulate appearance.

Caudal ramus elongate, dilated in area of lateral seta, terminating in inner tapered protuberance (that of smaller female twice as protuberant, shown by dashed line on Fig. 1a); minute spinules on inner and dorsal surfaces. Setae broken or missing; based on hyaline circles of insertion (and those of male and stage V male specimens), a lateral, a dorsal, and three short terminal setae present. Innermost terminal seta absent.

Rostrum absent. First antenna (Fig. 1c) 6-segmented, with partly coalesced suture between segments 2 and 3. Most setae broken or missing; based on hyaline circles of insertion, armament formula may be: 2; 11; 7; 3, 1 esthete; 2, 1 esthete; 7, 1 esthete.

Second antenna (Fig. 2a) 4-segmented; inner seta on first and second segments, 2 inner setae on short third segment, and stout claw plus 2 apical setae on fourth segment.

Labrum (Fig. 2a) incised into 2 rounded, posteroventral lobes; inner third of each lobe delimited with thinner chitin; intricate sclerotization pattern extending from apex of incision.

Mandible (Fig. 2b) with 2 outer setose

elements followed by denticulate ridge; terminating in spiniform lash; inner row of spinules on concave edge of blade.

First maxilla (Fig. 2c) with row of short, minute spinules on outer anteroventral corner; 4 setae on anterior half of segment; minute spinules on 2 longest setae, the terminal and antepenultimate. Single apodeme, remarkably long, extending from base of segment.

Second maxilla (Fig. 2d) 2-segmented; first segment with rugose ventral surface. Second segment bearing 2 elements on inner surface; shorter element barbed, distalmost element spinose and longer than terminal lash. Terminal lash, with vertical row of setules near base, carrying ventral row of setules adjacent to 3 or 4 triangular, inwardly-directed teeth.

Maxilliped (Fig. 2e) 3-segmented. First segment with short, minute spinules on inner surface. Second segment with inner and distal patches of minute spinules plus 2 inner setae. Third segment bearing 2 inner setae near base and terminating in barbed claw.

Legs 1–4 with trimerous rami. Spines with wide, serrate, hyaline flange. Minute spinules on posterolateral margins of coxae. First and second segments of leg 4 endopod with anterior digital projection overlapping base of wide, flat setae. Leg armament: see Table 2.

Leg 5 (Fig. 1b) represented by 2 posterolateral setae inserted on short pedicel.

Leg 6 (Fig. 1b) probably represented by 2 setae and prong on posterodorsal margin of genital operculum.

*Male.*—Lengths of two males 1.05 and 1.29 mm. Body compact, length of prosoma approximately twice that of urosome (Fig. 3a, b). Pediger 1 delimited from cephalosome by dorsal suture. Urosome (Fig. 3c) 6-segmented. Anal segment and caudal ramus with rows and patches of minute spinules on dorsal and ventral surfaces. Caudal ramus showing remarkable sexual dimor-



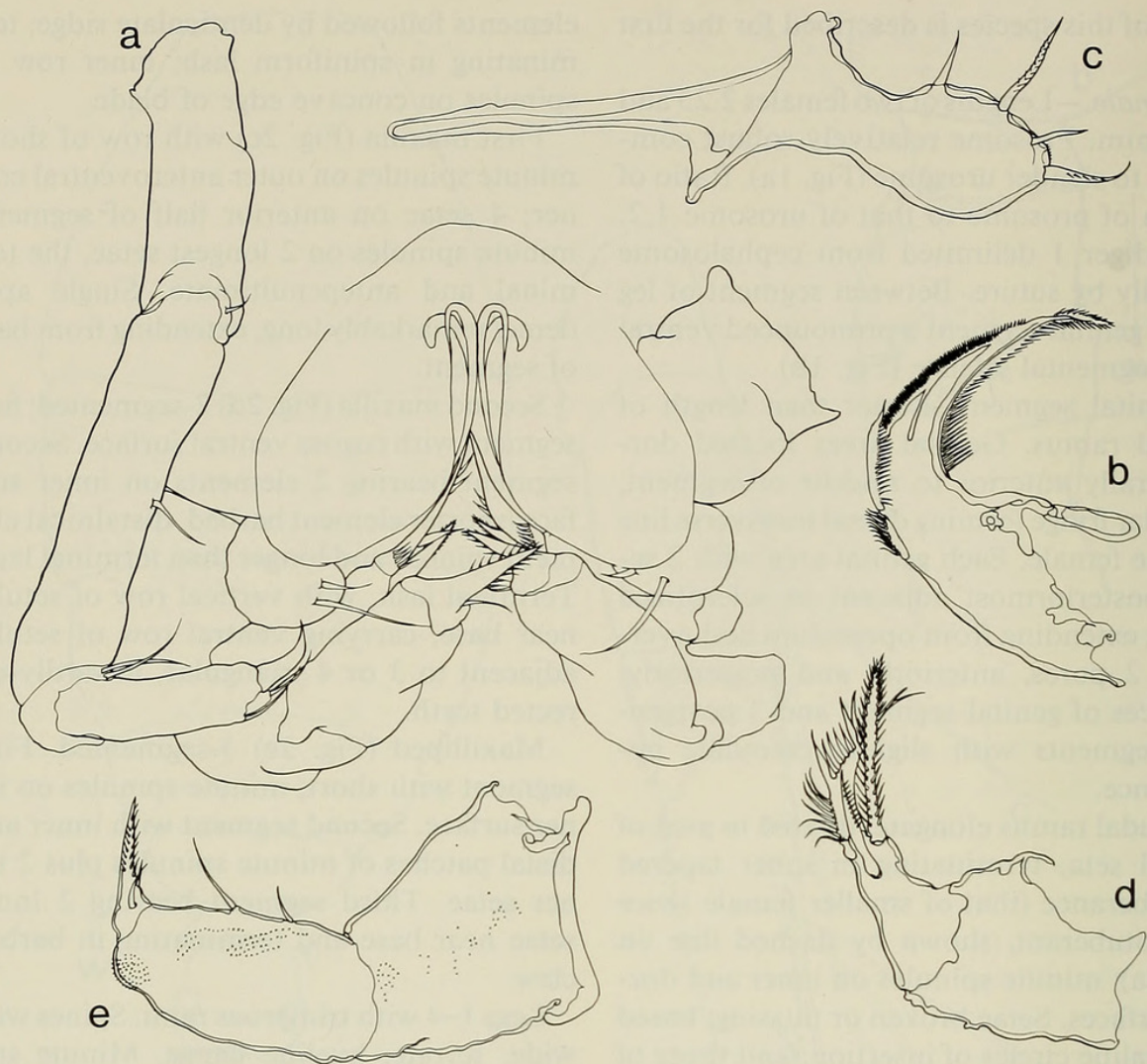


Fig. 2. *Urocopia singularis* Sars, female: a, Second antenna and oral area, ventral (y); b, Mandible, right (y); c, First maxilla, right (y); d, Second maxilla, right (y); e, Maxilliped, right (y).

phism; terminal protuberance of female developed as articulated, blunt outgrowth, possibly the modification of innermost terminal seta.

Rostral area, mandible, first maxilla, and second maxilla similar to those of female.

First antenna with line of coalescence between segments 2 and 3 scarcely discernible; several setae and esthetes longer than those of female, posterior esthete reaching as far as coxa of leg 1.

Second antenna (Fig. 3d) segments resem-

Table 2. Leg armament.

| Leg | Coxa | Basis | Endopod |    |    |    |    | Exopod |    |    |    |    |     |
|-----|------|-------|---------|----|----|----|----|--------|----|----|----|----|-----|
|     |      |       | 1       |    | 2  |    | 3  | 1      |    | 2  |    | 3  |     |
|     |      |       | Si      | Si | Si | St | Se | Se     | Si | Se | Si | St | Se  |
| 1   | 1    | 1     | 1       | 1  | 4  | 1  | I  | I      | 1  | I  | 4  | I  | III |
| 2   | 1    | 1     | 1       | 2  | 3  | II | I  | I      | 1  | I  | 5  | I  | III |
| 3   | 1    | 1     | 1       | 2  | 2  | II | I  | I      | 1  | I  | 5  | I  | III |
| 4   | 1    | 1     | 1       | 1  | -  | II | -  | I      | 1  | I  | 5  | I  | II  |



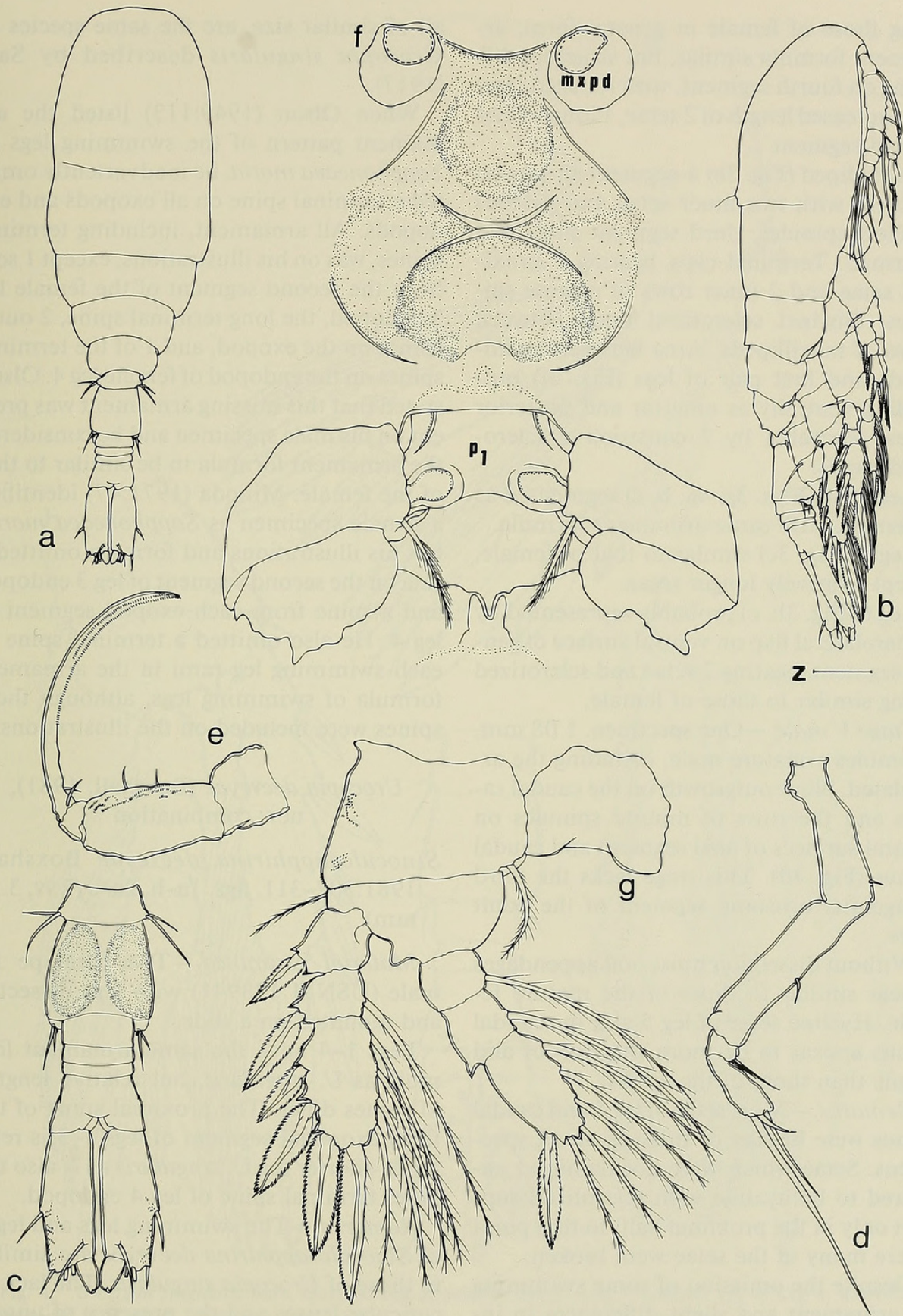


Fig. 3. *Urocopia singularis* Sars, male: a, Habitus, dorsal (w); b, Habitus, lateral (z); c, Urosome, dorsal (x); d, Second antenna, right (y); e, Maxilliped, right (y); f, Area between maxillipeds and first legs, ventral (y); g, Leg 1, anterior (y).



bling those of female in general form; armament formula similar, but structure differing on fourth segment, with reduced claw and increased length of 2 setae, 1 longer than second segment.

Maxilliped (Fig. 3e) 4-segmented; second segment with two inner setae and patches of short spinules; third segment short and unarmed. Terminal claw bearing 2 proximal setae and 2 inner rows of minute spinules. Distinct sclerotized band between bases of maxillipeds. Area between maxillipeds and first pair of legs (Fig. 3f) protruding ventrally as anterior and posterior lobes, separated by 2 constrictive sclerotized bands.

Legs 1-4 (Figs. 3g; 4a, b, c) segmented as in female, with same armament formula.

Leg 5 (Fig. 3c) similar to that of female, except relatively longer setae.

Leg 6 (Fig. 3b, c) probably represented by posterolateral flap on ventral surface of genital segment, bearing 2 setae and sclerotized prong similar to those of female.

*Stage V male.*—One specimen, 1.08 mm, resembles a mature male, including the articulated, blunt outgrowth on the caudal ramus and the rows of minute spinules on ventral surfaces of anal segment and caudal ramus (Fig. 4d). This stage lacks the third postgenital urosome segment of the adult male.

Without dissection most oral appendages appear similar to those of the mature female. Hyaline setae of leg 5 and the caudal ramus appear to be more transparent and fragile than those of the adults.

*Remarks.*—Most setae of leg 5 and caudal ramus were broken or missing on all specimens. Setae which were not damaged appeared to be hyaline with sclerotized support only in the proximal half, to that point where many of the setae were broken.

Despite the omission of some swimming leg armament and slight differences in interpretations of details and illustrations of oral appendages, there seems little question that Olson's, Minoda's, and our specimens,

all of similar size, are the same species as *Urocopia singularis* described by Sars (1917).

When Olson (1949:113) listed the armament pattern of the swimming legs of *Sapphoncaea moria*, he inadvertently omitted a terminal spine on all exopods and endopods. All armament, including terminal spines, was on his illustrations, except 1 seta from the second segment of the female leg 3 endopod, the long terminal spine, 2 outer spines on the exopod, and 1 of the terminal spines on the endopod of female leg 4. Olson stated that this missing armament was present on his male specimen and he considered the armament formula to be similar to that of the female. Minoda (1971:47) identified a female specimen as *Sapphoncaea moria*, but his illustrations and formula omitted a seta on the second segment of leg 3 endopod and a spine from each exopod segment of leg 4. He also omitted a terminal spine of each swimming leg rami in the armament formula of swimming legs, although these spines were included on the illustrations.

*Urocopia deeveyae* (Boxshall, 1981),  
new combination

*Sinoculosapphirina deeveyae* Boxshall, 1981:307-311. figs. 1a-h, 2a-e (2 ♀♀, 3.50 mm).

*Material examined.*—The paratype female (USNM 173941) with legs dissected and mounted on a slide.

Legs 1-4 have the same armament formula as *U. singularis*, but relative lengths of spines differ. The proximal spine of the third exopodal segment of legs 1-3 is relatively shorter for *U. singularis* as is also the outer terminal spine of leg 4 endopod.

*Remarks.*—The swimming legs and leg 5 of *Sinoculosapphirina deeveyae* are similar to those of *Urocopia singularis*. The lack of cuticular lenses and the presence of unsegmented leg 5 indicate that it is more closely related to Urocopiidae than to Sapphirinidae. The 6-segmented first antenna of *Uro-*



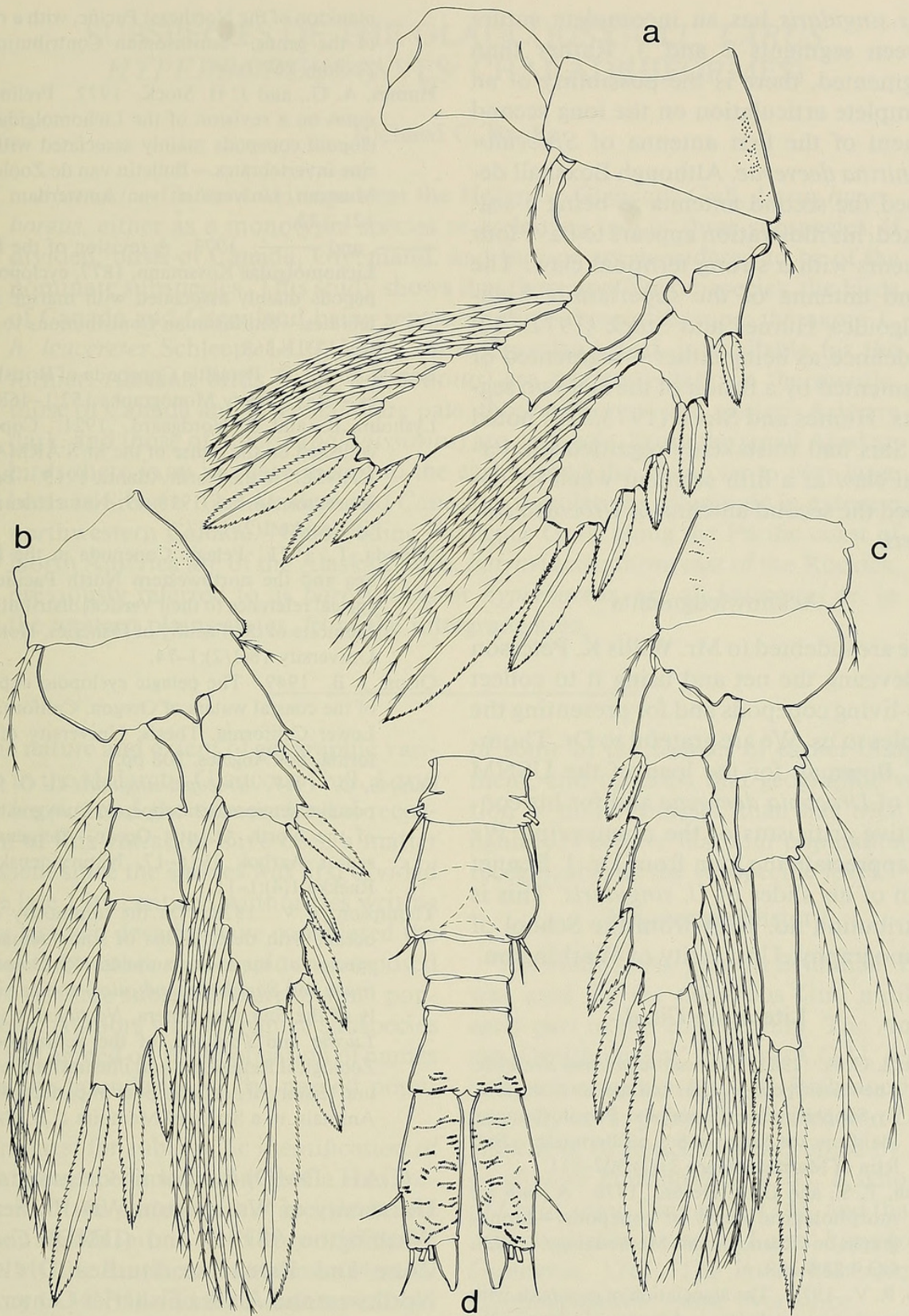


Fig. 4. *Urocopia singularis* Sars, male: a, Leg 2, anterior (y); b, Leg 3, anterior (y); c, Leg 4, anterior (y). Copepod V, male: d, Urosome, ventral (x).



*copia singularis* has an incomplete suture between segments 2 and 3. Rather than 5-segmented, there is the possibility of an incomplete articulation on the long second segment of the first antenna of *Sinoculosapphirina deeveyae*. Although Boxshall described the second antenna as being 5-segmented, his illustration appears to have four segments with a strong terminal claw. The second antenna of the superfamily Lichomolgoidea Humes and Stock (1972:122) was defined as being either 4-segmented or 3-segmented by a fusion of the last two segments. Humes and Stock (1973:329) noted that Sars had mistakenly regarded the terminal claw as a fifth segment when he described the second antenna of *Urocopia singularis*.

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