

***Heteranthesius hoi*, a new species
(Copepoda: Pseudanthesiidae) from a sea-anemone in the
Straits of Gibraltar, with remarks on the genus**

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Abstract.—An unknown species of *Heteranthesius* is described as *H. hoi* and is compared with the three previously known species: *H. dubius* (T. Scott 1903), *H. scotti* Bocquet et al., 1959 and *H. furcatus* Stock, 1971. This is the first time male and female of this genus have been found together. The diagnostic characters of this species are two claws on the terminal segment of the second antenna and third segment of leg 4 exopodite with the armature formula II, I, 5. The diagnosis of the genus is modified to incorporate these and other features.

Resumen.—Se describe una nueva especie del género *Heteranthesius*, *H. hoi*, y se compara con las tres especies conocidas hasta ahora: *H. dubius* (T. Scott 1903), *H. scotti* Bocquet et al., 1959 y *H. furcatus* Stock, 1971. Esta es la primera vez que se ha encontrado el macho y la hembra de este género juntos. Las características típicas de la especie son: dos garfios terminales del último segmento de la segunda antena y la armadura del tercer segmento del exopodito de la pata cuarta, II, I, 5. Se modifica la diagnosis del género incorporando éstas y otras características.

In the course of research on copepod fauna associated with marine invertebrates from the Straits of Gibraltar and nearby areas, a female and male of copepod belonging to the genus *Heteranthesius* were found in the coelenteron of the sea-anemone *Aiptasiogeton pellucidus* (Hollard 1848). The genus *Heteranthesius* was erected by T. Scott (1904) for *Paranthesius dubius* T. Scott, 1903. *Paranthesius* T. Scott was replaced by *Heteranthesius* since the former name had been preoccupied by *Paranthesius* Claus, 1889, another copepod crustacean.

Three species have been recognized in *Heteranthesius*: *H. dubius* (T. Scott 1903), *H. scotti* Bocquet et al., 1959 and *H. furcatus* Stock, 1971. *Heteranthesius dubius* was described from a male dredged in British waters. *Heteranthesius scotti* was found in

washings of the calcareous alga *Lithophyllum incrustans* from Brittany. *H. furcatus* was collected in the branchial cavity of the ascidian *Microcosmus sabatieri*; this was the first time that the genus was found in Mediterranean waters. Two males of an undetermined *Heteranthesius* species were collected recently from the Irish coasts (Holmes & Gotto 1992). In this paper, *Heteranthesius hoi*, new species, is described and compared with the other species of the genus. The diagnosis of *Heteranthesius* is modified to accommodate the new features shown by *H. hoi*.

Material and Methods

Aiptasiogeton pellucidus was collected on stones from the infralittoral zone (4 m deep).

The copepods were removed by dissection of the sea-anemone and preserved in 70% ethanol. Because the purpose of host dissection was not to search for symbiotic copepods, the male specimen was slightly damaged. The specimens were stained with chlorazol black, dissected under a stereomicroscope. Permanent mounts were made in lactophenol and sealed using entellan. All figures were drawn with the aid of a camera lucida. The letter after explanation of each figure refers to the scale at which it was drawn.

Order Poecilostomatoida Thorell, 1859
Family Pseudanthessiidae Humes & Stock,
1972

Genus *Heteranthessius* T. Scott, 1904

Diagnosis (modified from Humes & Stock 1973).—Body of female transformed, prosome swollen. Body of the male cyclopi-form, elongate. Urosome in female 5-segmented, in male 6-segmented. Caudal ramus with 5 or 6 setae. First antenna 7-segmented. Second antenna 4-segmented, with one or 2 claws. Mandible consisting of broad basal area and 2 unequal slender, recurved lashes with denticulated edges. In females lashes may be partially fused or overlapping, so that it is difficult to distinguish them. First maxilla with 2 terminal elements. Second maxilla with terminal armature consisting of one long spine, terminally bifurcate in female, plus a short seta. Maxilliped in female non-prehensile, 3-segmented with rounded or pointed tip, in male prehensile, 4-segmented (that distal part of claw represents a fourth segment). Legs 1–4 with 3-segmented rami except leg 4 endopod which consists of a single small segment or knob with one or 2 terminal elements. Setae on all 4 legs short in female, long and plumose in male. Leg 4 exopodite with terminal segment having III, I, 5 or II, I, 5. Leg 5 without a free segment and represented only by two setae.

Found free, associated with ascidians or actinian coelenterates.

Type species: *Heteranthessius dubius* (T. Scott 1903).

Heteranthessius hoi, new species

Figs. 1–5

Type material.—1 ♀ and 1 ♂ from the sea-anemone *Aiptasiogeton pellucidus* (Hollard 1848) at Patricia, Cádiz (Spain), Feb. 1990. The holotype female and allotype male have been deposited in the Museo Nacional de Ciencias Naturales of Madrid, Spain (MNCN lot n° 20.04/334).

Description.—Female: Body transformed (Fig. 1a, b); length (not including setae on caudal rami) 2 mm and greatest width 1 mm, based on one specimen in 70% ethanol. Ratio of length to width of prosome 1.5:1. Ratio of length of prosome to that of urosome 3.8:1. Separation of pedigers weakly defined. Genital segment (Fig. 1c) wider than long, 258 × 387 μm. Genital areas located dorsolaterally on widest part of segment. Postgenital segments from anterior to posterior 45, 58, and anal segment 142 μm long. Caudal ramus about 3 times longer than wide. One outer anterolateral seta 96 μm, dorsal seta 32 μm, outermost terminal seta 96 μm, innermost terminal seta 109 μm, and two long median terminal setae 167 μm (outer) and 251 μm (inner). All setae naked. Rostrum rounded posteroventrally.

First antenna (Fig. 1d) about 408 μm long, lengths of 7 segments (measured along their posterior nonsetiferous margins) 48 (87 μm along anterior margin), 132, 48, 45, 64, 42 and 29 μm, respectively. Formula for armature 4, 12, 2, 4, 4+1 aesthete, 2 and 6 setae. All setae naked.

Second antenna (Fig. 1e) 4-segmented. First segment, 74 μm along its outer edge, 154 μm along its inner edge; remaining segments, 106, 42, 87, respectively. Formula for armature: 1, 1, 3, and 3 setae + 2 unequal claws. All elements naked.

Labrum (Fig. 1f), with two posteroventral lobes, with medial projection. Paragnaths smooth.

Mandible (Figs. 1g, 5a) with concave side

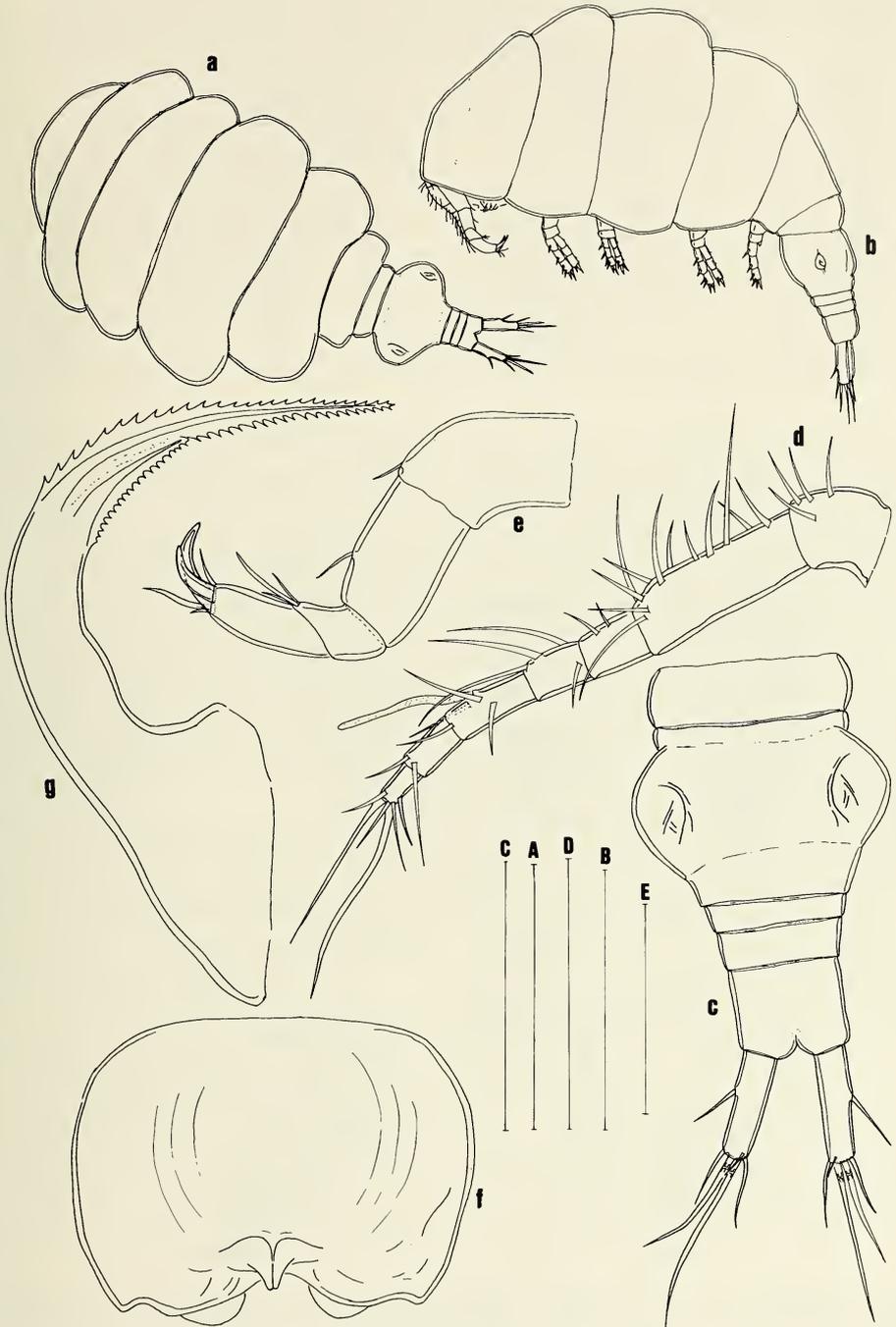


Fig. 1. *Heteranthessius hoi*, new species. Female. Holotype: a, dorsal (A); b, lateral (A); c, urosome dorsal (B); d, first antenna (C); e, second antenna (C); f, labrum, ventral (D); g, mandible (E). Scale bars: A, 1 mm; B, 400 μ m; C, 200 μ m; D, 100 μ m; E, 35 μ m.

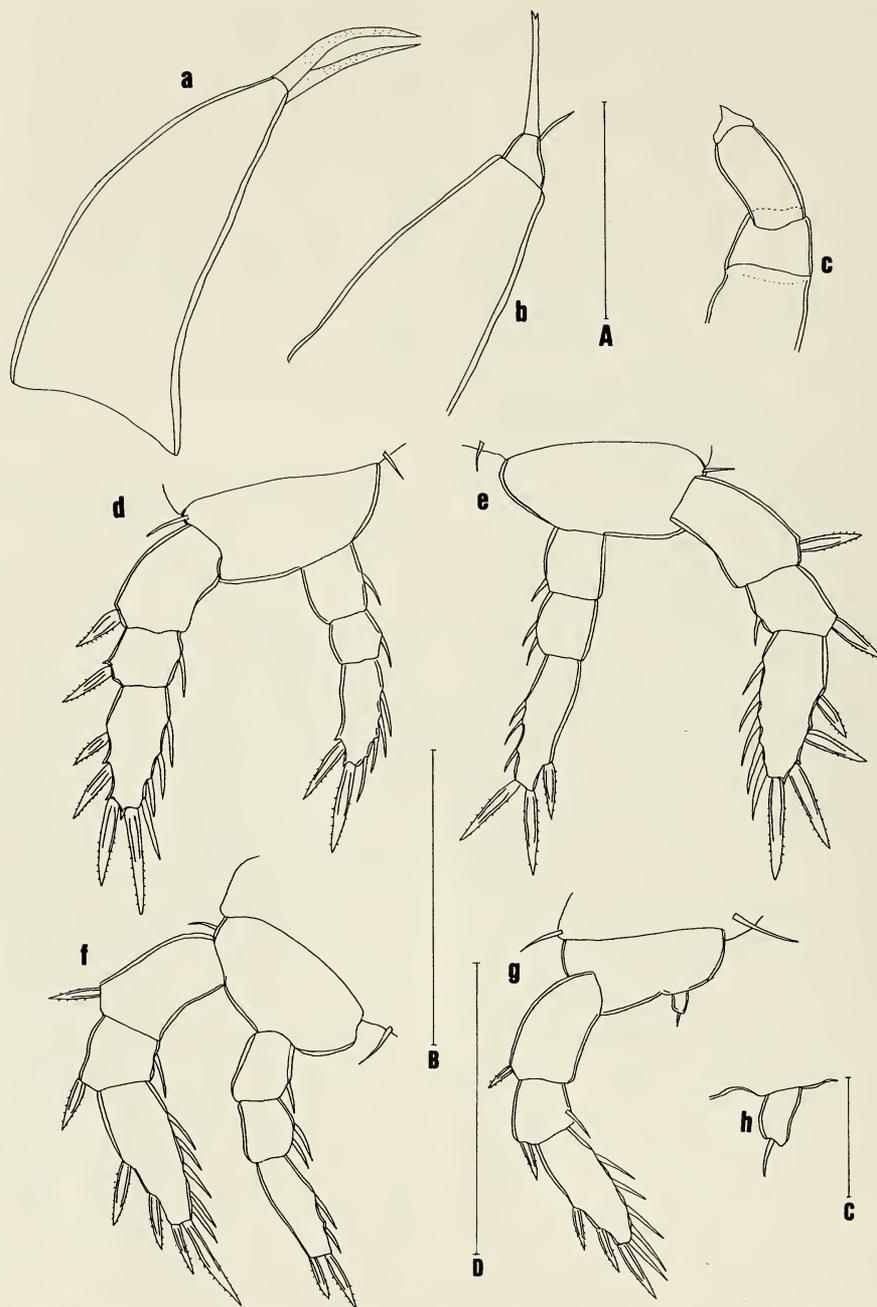


Fig. 2. *Heteranthesius hoi*, new species. Female. Holotype: a, first maxilla (A); b, second maxilla (D); c, maxilliped (D); d, leg 1, anterior (B); e, leg 2, anterior (B); f, leg 3, anterior (B); g, leg 4, anterior (B); h, leg 4 endopodite, anterior (C). Scale bars: A, 35 μm ; B, 200 μm ; C, 30 μm ; D, 100 μm .

Table 1.—Comparison of the armature of legs 1–4 of the known females of *Heteranthesius*. (Roman numerals = spines; arabic numerals = setae; exp = exopodite; enp = endopodite.)

Leg		<i>H. scotti</i> Bocquet et al., 1959	<i>H. furcatus</i> Stock, 1971	<i>H. hoi</i> , new species
1st	exp:	I-0; I-0/I-1; II,I,3/III,I,4	I-0; I-1; III,I,4	I-0; I-1; III,I,4
	enp:	0-0; 0-0; II,4	0-0; 0-1; II-4	0-1; 0-1; II-4
2nd	exp:	I-0; 0-0; II,I,5/II,I,4	I-0; I-1; III,I,5	I-0; 0-1; II,I,5
	enp:	0-0; 0-0; III,3/III,0	0-0; 0-2; III-3	0-1; 0-2, III-3
3rd	exp:	I-0; I-1; III,I,5	I-0; I-1; III,I,5	I-0; 0-1; III,I,5
	enp:	0-0; 0-2; II,2/I,0	0-0; 0-2; III,2	0-1; 0-2; II-2
4th	exp:	I-0; I-1; III,I,5	I-0; I-1; III,I,5	I-0; I-1; II,I,5
	enp:	I-0	II-0	I-0

produced into 2 spinulose lashes. First lash long; second smaller and apparently partly fused to long lash.

First maxilla (Fig. 2a) unilobated and elongate with 2 terminal setae subequal in length. Second maxilla (Fig. 2b), 2-segmented, first segment unarmed, second trapezoidal, small with a strong terminally bifid spine (13.8 μm) and one seta (6.3 μm). Maxilliped (Fig. 2c) 3-segmented. First and second segments unarmed, third small and pointed.

Legs 1–4 (Figs. 2d,g) with 3-segmented rami, except leg 4 endopodite (Fig. 2h) which consists of single small segment with one seta shorter than segment. Formula for armature as in Table 1. Setae of leg rami, basis and coxae small and naked.

Leg 5, represented by 2 naked setae in other species of genus, not observed here.

Male: Body cyclopiriform (Fig. 3a). Pediger 1 fused with cephalosome, remaining pedigers clearly defined. Length (excluding setae on caudal rami) 1.4 mm, greatest width 423 μm , based on one specimen in 70% ethanol. Ratio length to width of prosome 2:1. Ratio length of prosome to that urosome 1.6:1.

Leg 5 (Fig. 3c) small, 11 \times 18 μm , and bearing two setae. Genital segment (Fig. 3b) as long as wide. Four postgenital segments from anterior to posterior 74 \times 143, 52 \times 134, 35 \times 95, and 69 \times 95 μm .

Caudal ramus resembling that of female,

122 \times 52 μm , length/width ratio 2.3:1. Setae plumose, except dorsal seta. Rostrum rounded posteroventrally. First antenna (Fig. 3e) similar to that of female, formula for armature 4, 11+2 aesthetes, 3, 3+1 aesthete, 2, 7+1 aesthete. Second antenna (Fig. 3f) similar to that of female, but terminal claws more slender and longer. Labrum (Fig. 3g) and paragnaths as in female.

Mandible (Figs. 3h, 5b) more slender than that of female, with lashes well separated. First maxilla (Fig. 4a) smaller than that of female, with length of both setae similar to length of segment. Second maxilla (Fig. 4b) similar to female; second segment bearing a long (not bifid) spine and one seta.

Maxilliped (Fig. 4c) 4-segmented; first, second and third segments unarmed; last segment transformed into long curved claw with one seta at basis. Inner surface of claw with spinules.

Legs 1–4 (Fig. 4d–g) with 3-segment rami. Leg 4 endopodite reduced unisegmented with one long seta 3.8 times as long as segment. Formula for armature as in Table 2. Setae of rami and coxae of legs plumose; those on basis naked.

Leg 5 (Fig. 3c) with 2 naked setae, subequal in length.

Leg 6 (Fig. 3d) consisting of two scarcely plumose setae 47 μm and 44.5 μm .

Spermatophore not observed.

Sexual dimorphism.—The body is transformed with an inflated prosome in the fe-

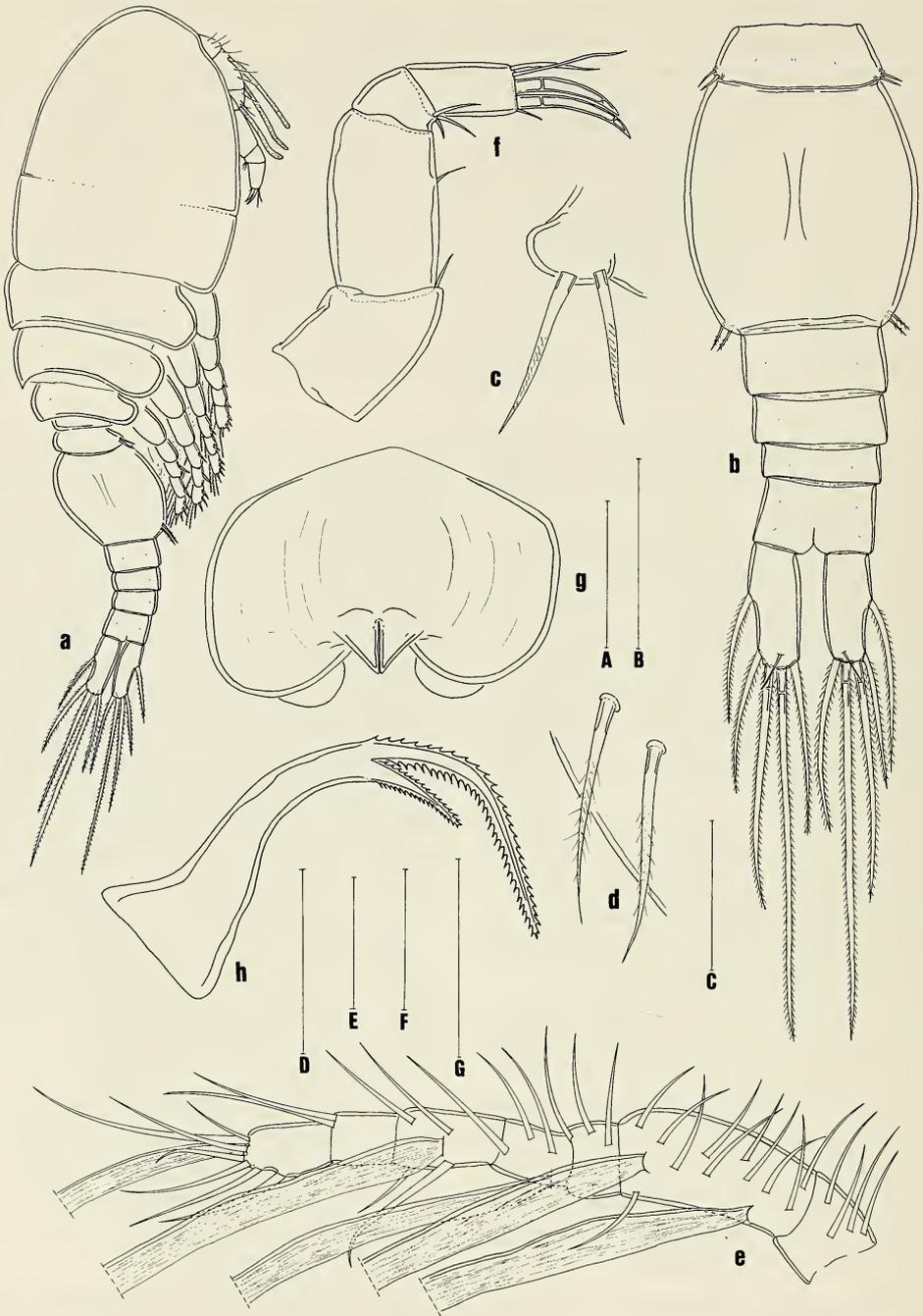


Fig. 3. *Heteranthesius hoi*, new species. Male. Allotype: a, dorsolateral (A); b, urosome, dorsal (B); c, leg 5, dorsal (C); d, leg 6, ventral (C); e, first antenna (D); f, second antenna (E); g, labrum, ventral (F); h, mandible (G). Scale bars: A, 300 μ m; B, 200 μ m; C, 30 μ m; D, 100 μ m; E, 100 μ m; F, 50 μ m; G, 30 μ m.

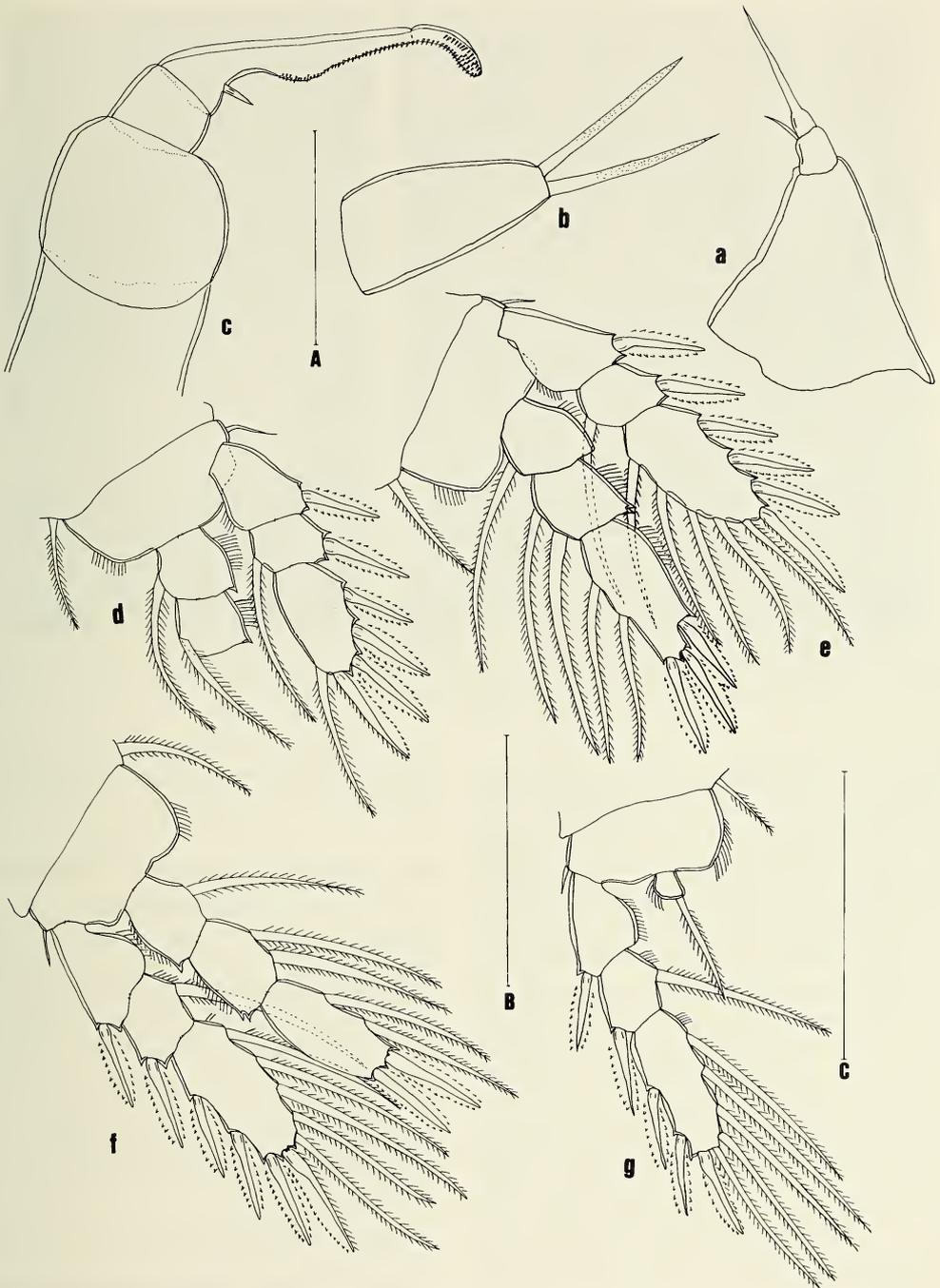


Fig. 4. *Heteranthesius hoi*, new species. Male. Allotype: a, second maxilla (B); b, first maxilla (A); c, maxilliped (B); d, leg 1, anterior (C); e, leg 2, anterior (C); f, leg 3, anterior (C); g, leg 4, anterior (C). Scale bars: A, 40 μm ; B, 100 μm ; C, 200 μm .

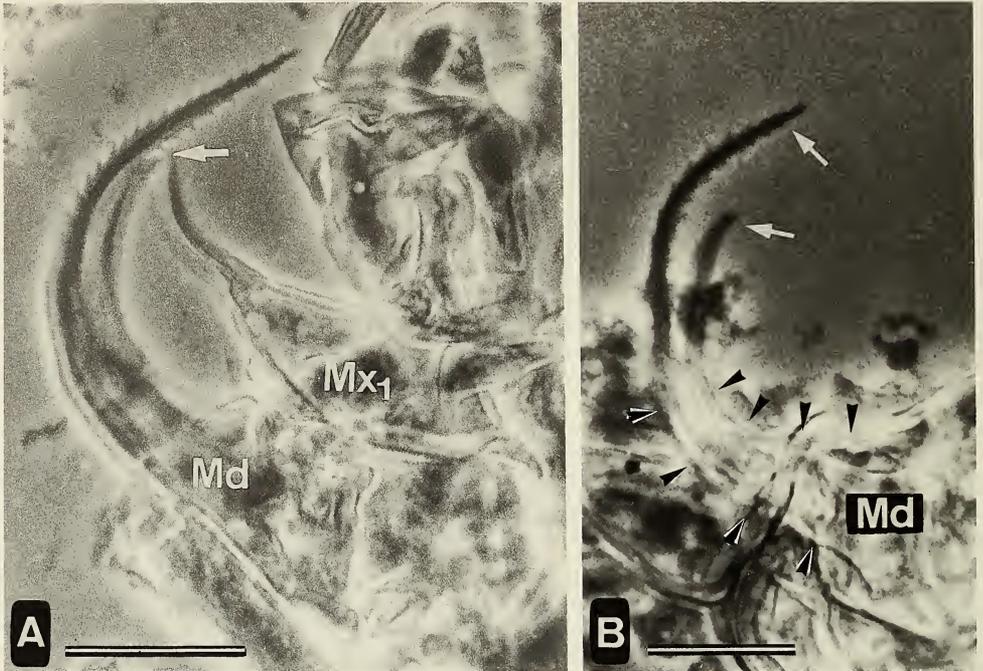


Fig. 5. *Heteranthesius hoi*, new species: A, mandible of female; B, mandible of male. Notice lashes (white arrows) and basal portion (black arrows). Scale bars: 30 μ m.

male, but cyclopiriform in male. The first antenna possesses only one aesthetasc in the female but five in the male. Terminal claws of the second antenna are more slender in the male than in the female. The lashes of the mandible are more divergent in the male than in the female. The elements of the first maxilla are proportionately longer in the male than in the female. The terminal spine of the second maxilla is bifurcated in the female and simple in the male. Sexual dimorphism in the maxilliped is as in other lichomolgoidean genera, 4-segmented and prehensile in the male and very simplified and reduced in the female. The armature of legs 1-4 is reduced in the female and free-swimming type in the male. The caudal rami are longer in the female than the male. Setae of the caudal rami are plumose in the male and naked in the female.

Etymology. — This species is dedicated to Dr. Ju-Shey Ho (Long Beach, California) in recognition of his valuable contributions to

the knowledge of parasitic and commensal copepods.

Key to species of the genus *Heteranthesius*

Known Females

(*Heteranthesius dubius* is not included)

1. Terminal segment of second antenna with 2 claws; third segment of leg 4 exopodite having armature formula II, I, 5 *H. hoi*
 Terminal segment of second antenna with one claw; third segment of leg 4 exopodite having armature formula III, I, 5 2
2. Length/width ratio caudal ramus 3:1 or longer; third segment of maxilliped pointed; single segment of leg 4 endopodite with 2 elements *H. furcatus*
 Length/width ratio of caudal ramus less than 2.3:1; third segment of maxilliped rounded; single segment

of leg 4 endopodite with one element *H. scotti*

Known Males

(*Heteranthesius scotti* and *H. furcatus* are not included)

- 1. Terminal segment of second antenna with 2 claws; third segment of leg 4 exopodite having armature formula II, I, 5 *H. hoi*
- Terminal segment of second antenna with one claw; third segment of leg 4 exopodite having armature formula III, I, 5 *H. dubius*

Discussion

With the discovery of *Heteranthesius hoi*, four species of the genus are now known. The host specificity at the generic level is not clear because hosts of *Heteranthesius dubius* and *H. scotti* are unknown; *H. furcatus* was found in an ascidian and *H. hoi* in a sea-anemone. *Heteranthesius* are rarely found. *H. dubius* is known from the male, and *H. scotti* and *H. furcatus* from the female. Only *Heteranthesius hoi* is known from both sexes.

Two features of the genus *Heteranthesius* are not in a good agreement: the setation of the first antenna and the structure of the mandible. As to the formula of the first antenna, none of the described females of the genus (*H. scotti*, *H. furcatus* and *H. hoi*) has the same setation. The armature of *H. scotti* is 3, 9, 2, 4, 4 + 1, 3, 6; that of *H. furcatus* 3, 12, 4, 3, 4 + 1, 3, 6 + 1, and that of *H. hoi* 4, 12, 2, 4, 4 + 1, 2, 6. The three species have in common only the armature of the fifth segment, which bears 4 setae and 1 aesthete; *H. furcatus* has a second aesthete in the last segment. There is no concordance in the formula of the first antenna between the known males. The setation of *H. dubius* is 1, 5 + 2, 3 + 1, 1, 3 + 1, 2 + 1, 5 + 1 whereas that of *H. hoi* is 4, 11 + 2, 3, 3 + 1, 4 + 1, 2, 7 + 1. Such differences in the setation of the first antenna is rather rare

Table 2.—Comparison of the armature of legs 1–4 of the known males of *Heteranthesius*. (Roman numerals = spines; arabic numerals = setae; exp = exopodite; enp = endopodite.)

Leg		<i>H. dubius</i> (T. Scott, 1903)	<i>H. hoi</i> , new species
1st	exp:	I-0; I-1; III,I,4	I-0; I-1; III,I,1(?)
	enp:	0-I; ?; ?	I-0; 0-1; ?
2nd	exp:	?; ?; ?	I-0; I-1; III,I,5
	enp:	0-1; 0-2; III-3	0-1; 0-2; III-2
3rd	exp:	I-0; I-1; III,I,5	I-0; 0-1; III,I,5
	enp:	0-1; 0-2; III-2	0-1; 0-2; II-2
4th	exp:	I-0; I-1; III,I,5	I-0; I-1; II,I,5
	enp:	0-0	0-1

for the genera Lichomolgoidea, they usually differ only in the number of aesthetes. These dissimilarities in the armature of the first antenna (including differences between male and female) may indicate that *Heteranthesius* is highly a variable genus as reported for the genera *Amarda* Humes & Stock, 1972 and *Indomolgus*, Humes & Ho, 1966 (Humes & Stock 1973).

The genus *Paranthesius* Scott, 1903 was erected for *P. dubius*, which has two lashes on the mandible. However, *Heteranthesius scotti* and *H. furcatus* were described with a single lash. The study of both sexes in *H. hoi* has allowed us to corroborate the existence of two lashes in this structure (Fig. 5). As these lashes may be partially fused or overlapping in the female, the mandibles of *H. scotti* and *H. furcatus* should be re-examined. Until then, the diagnosis of the superfamily Lichomolgoidea Humes & Stock, 1972 must be slightly modified to accommodate the mandible of the *Heteranthesius* species as follow: "Mandible simple, without terminal elements, but often attenuate into a slender lash, rarely two lashes." *Heteranthesius hoi* may be easily distinguished from the remaining species of the genus by the presence of two claws on the terminal segment of the second antenna and the third segment of the leg 4 exopodite having II, I, 5. The female of *Heteranthesius hoi* differs from *H. scotti* and *H. furcatus* in the ar-

mature of legs 1–4 (see Table 1), particularly in the endopodal segments of legs 1–3 and terminal segment of leg 4 exopodite. The labrum of a *Heteranthesius* species is described and illustrated for the first time. Setae on the segments of the second antenna are larger in *H. hoi* than in the remaining species. *Heteranthesius hoi* is similar to *H. scotti* in the shape of the first maxilla. The second maxilla of *H. hoi* has a smaller basal segment than that in the remaining species. The maxilliped of *H. hoi* and *H. furcatus* are acuminate terminally, but rounded in *H. scotti*. The caudal ramus is equal to or more than 3:1 longer than wide in *H. hoi* and *H. furcatus*, and 2.2:1 in *H. scotti*.

The male *Heteranthesius hoi* differs from *H. dubius* in the armature of legs (see Table 2). On inner margin of the third exopodite segment of the first leg, only one seta was observed in *H. hoi*. Because the right side of the copepod was damaged, the actual difference in the armature of this segment is impossible to ascertain. The unisegmented leg 4 endopodite is slightly larger in *H. hoi* than in *H. dubius*. This segment also bears a long plumose seta which is lacking in *H. dubius*. The mandible is longer and slender in *Heteranthesius hoi* than *H. dubius*, and the two basal elements present in *H. dubius* are lacking in *H. hoi*. The first maxilla carries two moderately long elements, longer in *H. hoi* than in *H. dubius*.

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