

# A revised key to *Stenhelia* (*Stenhelia*) (Copepoda: Harpacticoida) including two new species from the Pacific\*

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*Accepted for publication October 1977*

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Two new *Stenhelia* (*Stenhelia*) species are described: *S. (S.) diegensis* from 1200 m depth in San Diego Trough, California and *S. (S.) asetosa* from the intertidal of Nanaimo Estuary, British Columbia. *S. (S.) diegensis* differs from previously known species in having but one seta on the terminal segment of the P<sub>1</sub> endopod. *S. (S.) asetosa* lacks inner setae on the first segments of the P<sub>2</sub>–P<sub>4</sub> exopods. A table listing the salient morphological features of the species of *Stenhelia* (*Stenhelia*) is given as is a new key to the subgenus.

KEY WORDS: – *Stenhelia* – new species – Diosaccidae.

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\* Contribution No. 10 from the Quagmire Expedition, Scripps Institution of Oceanography. Contribution No. 207 from the Belle W. Baruch Institute for Marine Biology and Coastal Research, University of South Carolina.

## INTRODUCTION

During an investigation of the ecology of deep-sea harpacticoid assemblages in San Diego Trough, the senior author collected several specimens of a *Stenhelia* (*Stenhelia*) here described as *(S.) diegensis* **sp. nov.** Further, an analysis of harpacticoid assemblages in Nanaimo Harbor, British Columbia, by Pacific Biological Station personnel (Fisheries and Marine Service, Canada) revealed another undescribed species of *Stenhelia* (*Stenhelia*) here described as *S. (S.) asetosa* **sp. nov.**

Although the entire *Stenhelia* complex (i.e. the two subgenera *Stenhelia* and *Delavalia*) had 41 species, only six belonged to *Stenhelia* (*Stenhelia*). Furthermore, while there has been an explosion of species descriptions in *Delavalia* (16 species and two subspecies since 1964), *S. (S.) diegensis* and *S. (S.) asetosa* are only the second and third species to be described since 1939 (see Table 1) in *Stenhelia* (*Stenhelia*).

The diagnostic difference between *Stenhelia* (*Stenhelia*) and *S. (Delavalia)* is the number of segments in the endopod of the first pereopod. From the position of the setae on the endopods in the two subgenera, the transition from *S. (Stenhelia)* to *S. (Delavalia)* appears to have occurred by the loss of the articulation between the distal two segments of the endopod of the first pereopod. The selective advantage of this change is unknown, but the *Stenhelia* line with a two-segmented first pereopod endopod appears to have been much more successful than that with a three-segmented endopod (35 species versus 6 species). *Stenhelia (S.) diegensis* has an unusual first pereopod endopod in that the distal segment is modified, being elongate, slender and terminating in a single seta. This morphology may be an alternative solution to the problem of making a *Stenhelia* with a two-segmented endopod.

The nomenclature and descriptive terminology used throughout are adopted from Lang (1948, 1965). All figures have been prepared using a camera lucida. The abbreviations used are A<sub>1</sub>, antennule; A<sub>2</sub>, antenna; Md, mandible; Mx, maxilla; Mxl, maxillula; Mxp, maxilliped. P<sub>1</sub>-P<sub>6</sub>, pereopods 1-6. All length measurements of the new species do not include the rostrum, antennules and caudal setae. The caudal rami length/width ratios listed in Table 1 are calculated by measuring the published figures given in the original text; the width was measured at the widest portion of the ramus. These measurements are not necessarily the same as listed by the author or those who cite the author but are consistent throughout.

## DESCRIPTION OF NEW SPECIES

Family Diosaccidae Sars 1909

Genus *Stenhelia* Boeck 1864

Subgenus *Stenhelia* Lang 1948

*Stenhelia (Stenhelia) diegensis* **sp. nov.**

(Figs 1, 2)

*Synonymy.* None.

*Holotype.* Adult female (0.35 mm long) from off California, U.S.A., Quagmire Expedition Sta. E47WMab (32° 34.75' N, 117° 29.00' W), dissected, parts mounted on slide (USNM No. 169872), urosome lost. Named for the type locality, San Diego Trough.

Table 1. Summary of salient morphological characters of *Stenhelia* (*Stenhelia*)

Species	No. Segs A <sub>1</sub> ♀	Ratio P <sub>1</sub> to Enp. 1 P <sub>1</sub> Enp. 2-3	Setal formula												
			P <sub>1</sub>		P <sub>2</sub>		P <sub>3</sub>		P <sub>4</sub>		P <sub>5</sub> ♀		CR L/W Ratio	P <sub>5</sub> ♂	
			Exp.	Enp.	Exp.	Enp.	Exp.	Enp.	Exp.	Enp.	Benp.	Exp.		Benp.	Exp.
<i>aemula</i> (T. Scott 1893)	8	0.9	0.0.022	1.1.3	1.1.223	1.2.121	1.1.323	1.1.321	1.1.323	1.1.221	4-5	6	1.7	2	4*
<i>asetosa</i> sp. nov.	8	1.0	0.0.022	1.1.3	0.1.123	1.2.310	0.1.223	1.1.321	0.1.323	1.1.221	5	6	1.1	2	4
<i>curviseta</i> Lang 1936	8	1.3	0.0.022	1.1.3	1.1.123	1.2.121	1.1.223	1.1.221	1.1.323	1.1.221	5	6	2.2	unknown	
<i>diegensis</i> sp. nov.	8	0.9	0.1.022	1.1.1	1.1.223	2.1.121	1.1.323	1.1.221	1.1.323	1.1.221	4	5	6.9	unknown	
<i>divergens</i> Nicholls 1939	8	1.6	0.1.022	1.1.3	1.1.123	1.2.221	1.1.223	1.1.321	1.1.323	1.1.221	5	6	1.9	unknown	
<i>gibba</i> Boeck 1864	8	2.3	0.0.022	1.1.3	1.1.123	1.2.121	1.1.223	1.1.221	1.1.323	1.1.221	5	6	1.9	2	4
<i>peniculata</i> Lang 1965	8	2.2	0.0.022	1.1.3	1.1.123	1.2.121	1.1.223	1.1.321	1.1.323	1.1.221	5	6	1.3	2	4
<i>proxima</i> Sars 1906	8	2.2	0.0.022	1.1.3	1.1.123	1.2.121	1.1.223	1.1.221	1.1.323	1.1.221	5	6	1.8	2	4

\* Male data from Bodin (1970).

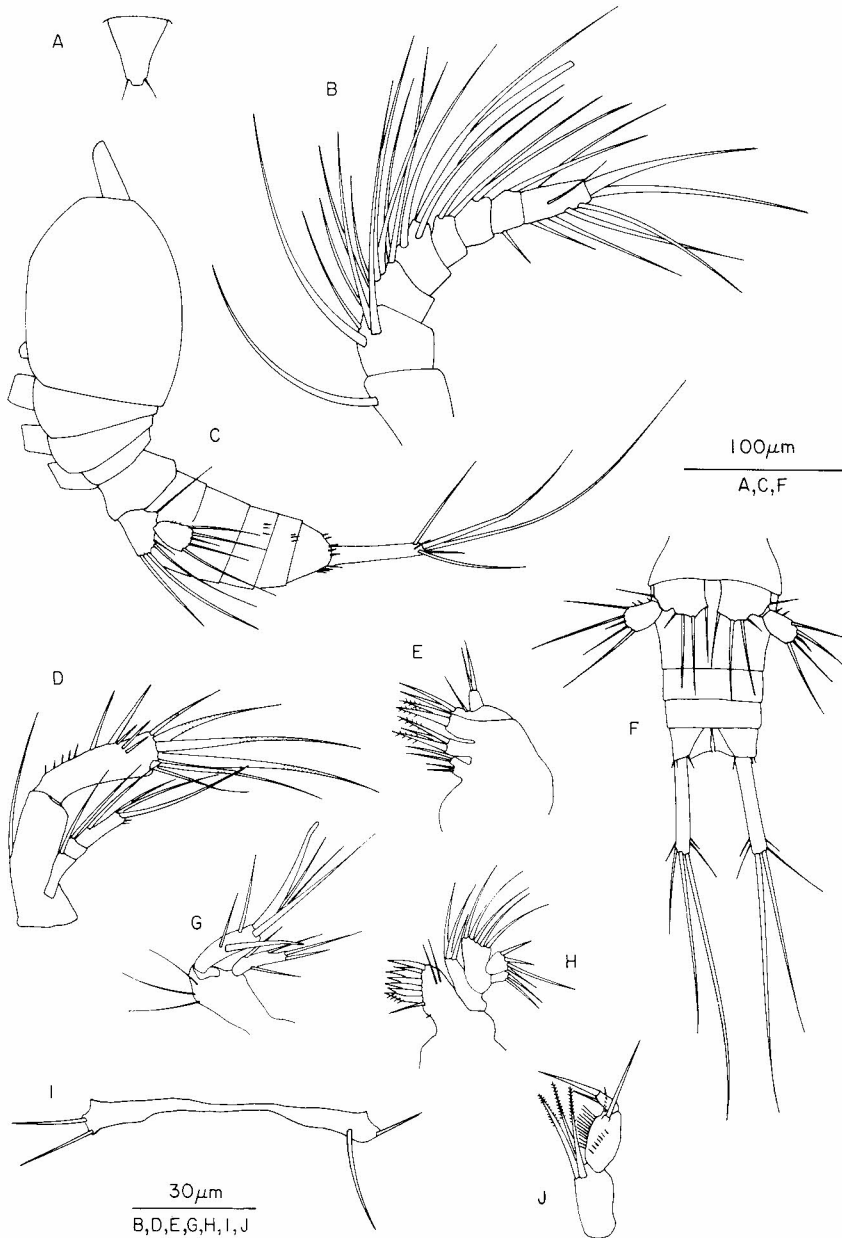


Figure 1. *Stenhelia (S.) diegensis* sp. nov.: A, rostrum; B, antenna 1; C, habitus; D, antenna 2; E, maxilla; F, urosome, ventral view; G, mandible, excl. praecoxa; H, maxillula; I, genital field; J, maxilliped. A–E, G, H, J, from holotype; F, I, from paratype female.

*Paratypes.* Five adult females from the same locality. USNM No. 169873-74.

*Description.* Based on holotype except for urosome. No ovigerous individuals known. Cephalothorax broad, tapering posteriorly into narrow urosome (Fig. 1). Rostrum set off, not bifid. Anal operculum rounded. Caudal rami 6.9 times as

long as wide; with 2 principal terminal setae, the inner seta longer; 2 inner setae and 2 lateral setae at  $5/6$  the length.

A<sub>1</sub> (Fig. 1B) 8-segmented, aesthetasc on segment 4.

A<sub>2</sub> (Fig. 1D) Endopod 2-segmented, exopod 3-segmented.

Md (Fig. 1G) Coxa-basis with 3 distal setae. Exopod with 2 lateral, 2 terminal and 1 inner seta. Endopod with 7 setae.

Mxl (Fig. 1H) Arthrite of praecoxa with 2 surface setae and 8 distal setae. Coxa with 3 apical setae; basis with 5 apical setae; exopod with 2 setae; endopod with 4 setae.

Mx (Fig. 1E) Syncoxa with 3 endites. Proximal endite with 4 setae, middle with 3 and distal endite with 2 setae. Basis with 2 terminal setae. Endopod 1-segmented with 2 terminal setae.

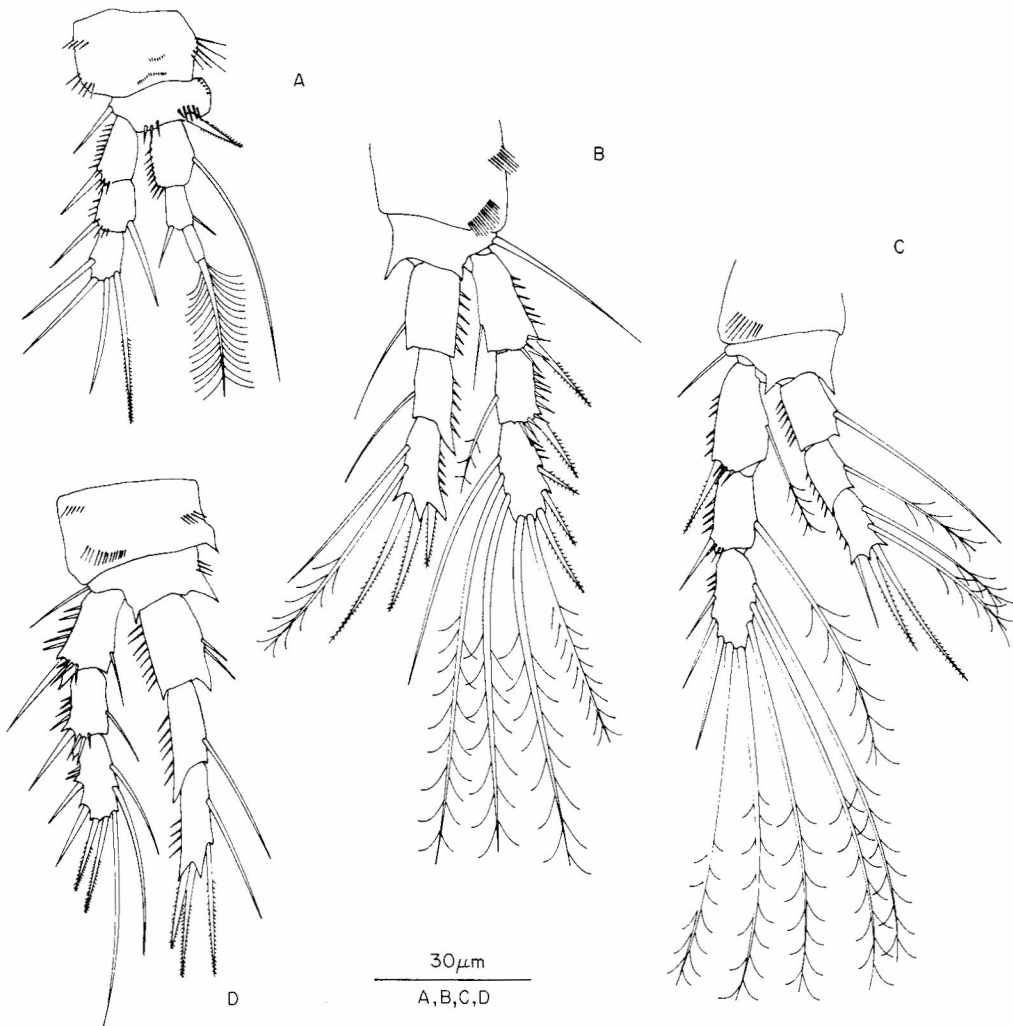


Figure 2. *Stenhelia (S.) diegensis* sp. nov.: A, pereopod 1; B, pereopod 3; C, pereopod 4; D, pereopod 2. From holotype.

Mxp (Fig. 1J) Basis with 3 setae at inner distal corner. First segment with inner and lateral setule rows and 2 setae distally. Segment 2 with 2 setae.

P<sub>1</sub> (Fig. 2A) Both rami 3-segmented and of equal length. Middle segment exopod with an inner seta. First segment endopod slightly shorter than last two segments combined. Terminal endopod segment slender with 1 robust terminal seta. See Table 1 for setal formula.

P<sub>2</sub>–P<sub>4</sub> (Fig. 2B–D) Both rami 3-segmented. Setation as figured and listed in Table 1.

P<sub>5</sub> (Fig. 1) Baseoendopodite separate; inner expansion each side with 4 setae. Exopod spatulate with 5 setae.

Genital field (Fig. 1I) Bears 2 setae laterally.

Male. Unknown.

*Remarks.* *Stenhelia* (*S.*) *diegensis* differs from all other *S.* (*Stenhelia*) species in the shape and setation of the P<sub>1</sub> endopod, setation of the female P<sub>5</sub> and length of the caudal rami (see Table 1). These are specific differences in such a conservative subgenus and, therefore, *S.* (*S.*) *diegensis* is described as a new species. We consider the P<sub>1</sub> endopod to be 3-segmented although it could be viewed as 2-segmented with a massive, articulated distal seta.

*Stenhelia* (*S.*) *diegensis* is known only from the type locality at 1200 m in San Diego Trough.

*Stenhelia* (*Stenhelia*) *asetosa* sp. nov.

(Figs 3, 4)

*Synonymy.* None.

*Holotype.* Oviparous female (0.6 mm long) from Nanaimo Harbor, British Columbia, Canada (49° 08.5' N, 123° 54.5' W) dissected, parts mounted on slide (USNM No. 169875). Named for the missing inner seta on first segment P<sub>2</sub>–P<sub>4</sub> exopods.

*Allotype.* Adult male from same location, dissected and mounted on slide (USNM No. 169876).

*Paratypes.* 12 adult females, 1 fifth stage copepodite from same locality as holotype (USNM No. 169877).

*Description.* Female. Based on holotype. All oviparous females carry two egg sacs. Body broadened at cephalothorax, tapering posteriorly into narrow urosome. Rostrum set off, not bifid. Anal operculum rounded. Caudal rami short, length and width subequal, bear two principal terminal setae, the medial seta longest; two subterminal lateral setae, one subterminal medial seta, and one subterminal ventral seta.

A<sub>1</sub> (Fig. 3A) 8-segmented, aesthetasc on segment 4.

A<sub>2</sub> (Fig. 3B) Endopod 2-segmented, exopod 3-segmented.

Md (Fig. 3E) Coxa-basis with 3 distal setae. Exopod with 3 lateral, 2 terminal and 1 inner setae. Endopod with 7 setae.

Mxl (Fig. 3G) Arthrite of praecoxa with 8 distal setae. Coxa with 3 apical setae; basis with 7 apical setae; exopod with 2 setae; endopod with 4 setae.

Mx (Fig. 3J) Syncoxa with 3 endites. Proximal endite with 3 setae, middle with 2 setae, distal with 1 seta. Basis with 2 terminal claw-setae. Endopod 1-segmented with 4 terminal setae.

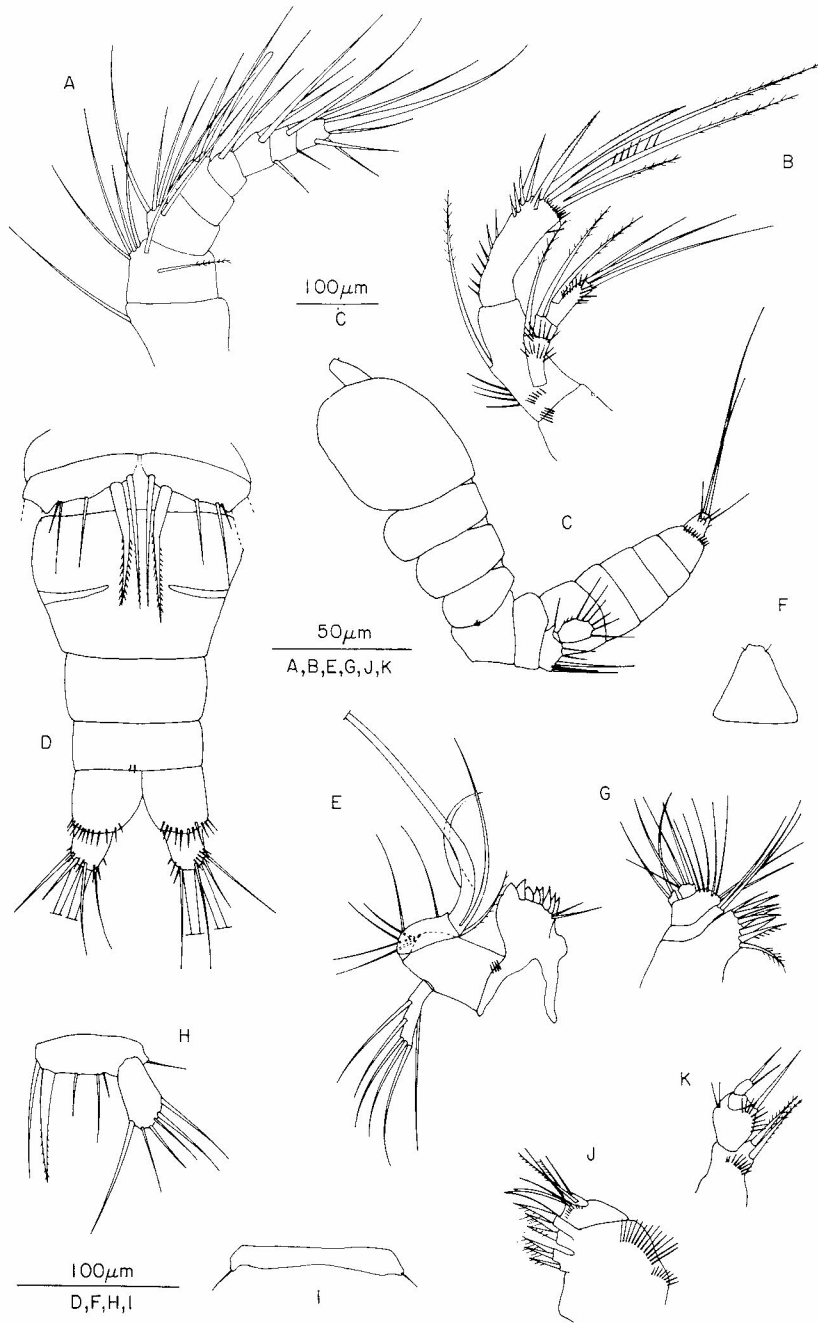


Figure 3. *Stenhelia (S.) asetosa* sp. nov.: A, antenna 1; B, antenna 2; C, habitus; D, urosome, ventral view; E, mandible; F, rostrum; G, maxillula; H, pereopod 5; I, genital field; J, maxilla; K, maxilliped. A–E, H–K, from holotype; G, from allotype.

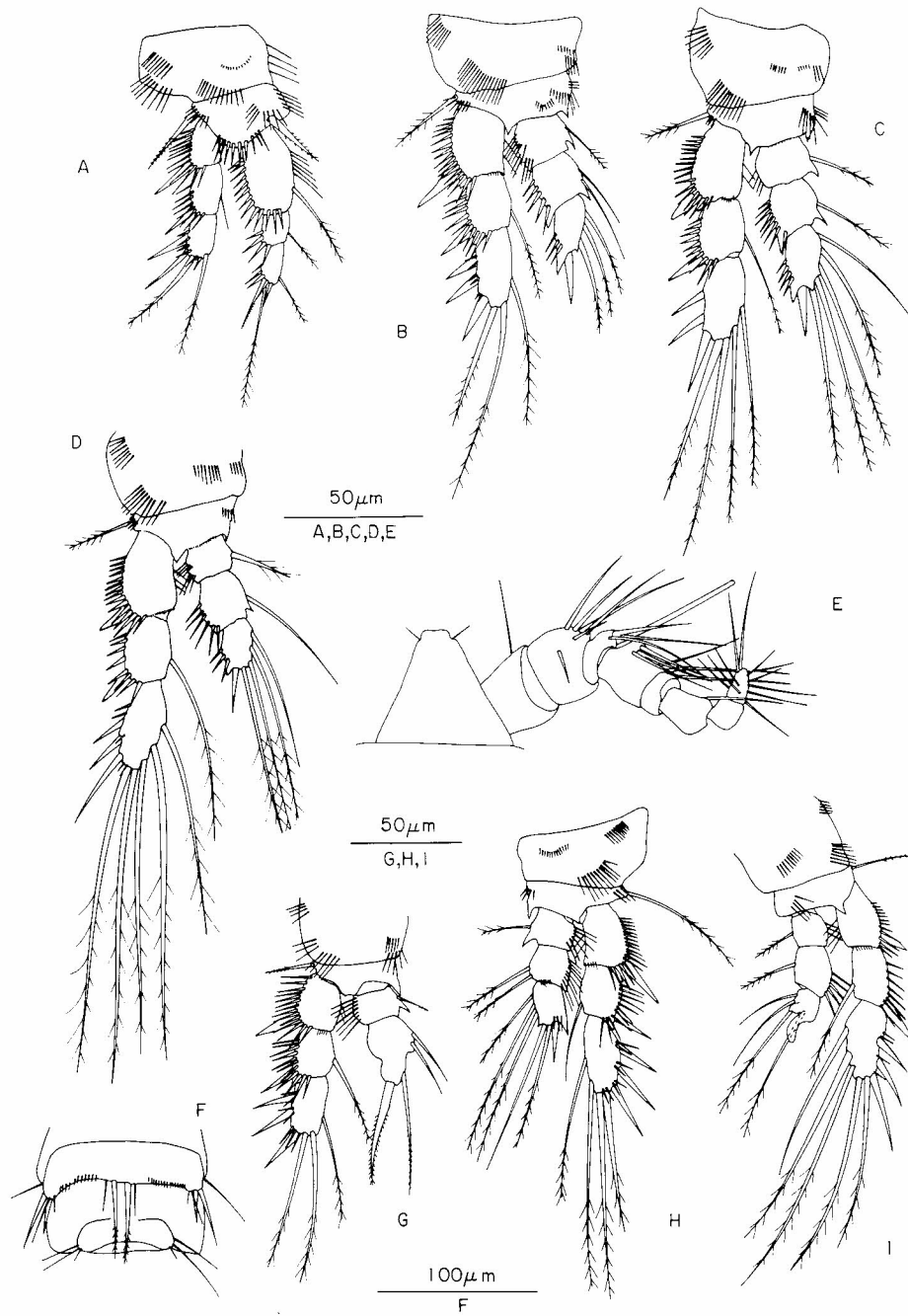


Figure 4. *Stenelia (S.) asetosa* sp. nov.: A, pereopod 1; B, pereopod 2; C, pereopod 3; D, pereopod 4; E, antenna 1; F, pereopods 5 and 6; G, pereopod 2; H, pereopod 3; I, pereopod 4. A-D from holotype; E-I from allotype.



Mxp (Fig. 3K) Basis with 2 setae at inner distal corner. First segment with 1 seta; second segment with 2.

P<sub>1</sub> (Fig. 4A) Both rami 3-segmented, endopod longer. Middle segment exopod with inner seta. Endopod segment-1 length greater than length of two distal segments combined. See Table 1 for setal formula.

P<sub>2</sub>-P<sub>4</sub> (Fig. 4B-D) Both rami 3-segmented. Setation as figured and listed in Table 1.

P<sub>5</sub> (Fig. 3H) Baseoendopodites separate; inner expansion each side with 5 setae; medial 2 robust, lateral 3 slender, exopod spatulate with six setae.

Genital field (Fig. 3I).

*Male.* Based on allotype. Differs from female in size, A<sub>1</sub>, P<sub>2</sub> endopod, P<sub>3</sub> endopod setation, P<sub>4</sub> endopod, P<sub>5</sub>.

A<sub>1</sub> (Fig. 4E) 8-segmented and haplocer.

P<sub>2</sub> (Fig. 4G) Exopod 3-segmented, like female. Endopod 2-segmented, proximal segment with inner seta, distal segment with 3 medial and one terminal setae.

P<sub>3</sub> (Fig. 4H) Both rami 3-segmented; endopod middle segment with 2 medial setae.

P<sub>4</sub> (Fig. 4I) Both rami 3-segmented. Endopod terminal segment with 4 setae and recurved terminal spine.

P<sub>5</sub> (Fig. 4F) Exopods fused to baseoendopodites; baseoendopodites fused, each side with 4 lateral setae and two medial setae.

P<sub>6</sub> (Fig. 4F) Fused, three lateral setae on each side.

*Remarks.* *Stenhelia (S.) asetosa* sp. nov. differs from the known species by lacking an inner seta on the proximal segments of P<sub>2</sub>-P<sub>4</sub> exopods (see Table 1) which justifies its description as a new species. The species is known only from two intertidal stations in Nanaimo Estuary, British Columbia, where it occurs abundantly in the upper 1 cm of sediment.

Coull (1976) gives a key to the known species of *Stenhelia (Delavalia)*: below we provide a key to *Stenhelia (Stenhelia)*. The distinction between *S. (S.) curviseta* Lang and *S. (S.) proxima* Sars is based on the shape of the female P<sub>5</sub> baseoendopodite setae. The difference between these species is less than that generally found in the genus and may not stand. For now, we prefer to leave these species separate hoping that *S. (S.) curviseta* will be rediscovered.

#### KEY TO THE SPECIES OF *STENHELIA (STENHELIA)*

(modified from Lang, 1965)

1. First segment Enp. P<sub>1</sub> as long as entire Exp. . . . . 2  
First segment Enp. P<sub>1</sub> shorter than entire Exp. . . . . 3
2. One seta Benp. ♀ and ♂ P<sub>5</sub> terminating in a broad semioval excavation with fine hairs (resembling a whisk) *S. (S.) peniculata* Lang  
No seta Benp. ♀ and ♂ P<sub>5</sub> resembling a whisk, but some with sharp triangular points, like an arrowhead . . . . . *S. (S.) gibba* Boeck
3. Terminal segment Enp. P<sub>1</sub> with 3 setae . . . . . 4  
Terminal segment End. P<sub>1</sub> with 1 setae . . . . . *S. (S.) diegensis* sp. nov.
4. First segment Exp. P<sub>2</sub>-P<sub>4</sub> with an inner seta . . . . . 5  
First segment Exp. P<sub>2</sub>-P<sub>4</sub> without an inner seta . . . . . *S. (S.) asetosa* sp. nov.

5. Terminal segment Exp. P<sub>2</sub> and P<sub>3</sub> with 1 and 2 inner setae respectively  
 . . . . . 6  
 Terminal segment Exp. P<sub>2</sub> and P<sub>3</sub> with 2 and 3 inner setae respectively  
 . . . . . *S. (S.) aemula* (T. Scott)
6. Middle segment Exp. P<sub>1</sub> without an inner seta; terminal segment Exp.  
 P<sub>2</sub> and P<sub>3</sub> with 4 and 5 setae respectively . . . . . 7  
 Middle segment Exp. P<sub>1</sub> with an inner seta; terminal segment Exp. P<sub>2</sub>  
 and P<sub>3</sub> with 5 and 6 setae respectively . . . . . *S. (S.) divergens* Nicholls
7. Innermost seta Benp. P<sub>5</sub> normal; innermost but one seta with sharp  
 triangular point like arrowhead . . . . . *S. (S.) proxima* Sars  
 Innermost seta Benp. P<sub>5</sub> kinked; innermost but one seta normal  
 . . . . . *S. (S.) curviseta* Lang

## ACKNOWLEDGEMENTS

We thank Dr Robert R. Hessler, project coordinator, and the participants in Expedition Quagmire for help in collecting. Expedition Quagmire was supported by National Science Foundation grant GA 40322. Dr John Sibert, Ms Beverly Kask, and Ms Barbara Windecker of the Pacific Biological Station, Nanaimo, British Columbia, Canada provided specimens for which we are grateful.

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