REDESCRIPTION OF *PSEUDOSTENHELIA WELLSI* COULL & FLEEGER, 1977 (COPEPODA, HARPACTICOIDA) FROM A TROPICAL COASTAL LAGOON IN THE SOUTHEASTERN GULF OF CALIFORNIA (MEXICO)

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ABSTRACT

The male and female of *Pseudostenhelia wellsi* are redescribed from a number of specimens collected in a coastal lagoon in northwestern Mexico (Ensenada del Pabellón lagoon, State of Sinaloa), during a short-term study on the effects of organic enrichment on the distribution and abundance of meiofauna. Some amendments to the original description of *P. prima*, and to the chaetotaxy tables published by some other authors for this species, are also presented.

RESÚMEN

Se redescriben la hembra y el macho de *Pseudostenhelia wellsi*, a partir de cierto número de especímenes hallados en muestras de sedimento de una laguna costera ubicada en el noroeste de México (laguna Ensenada del Pabellón, Sinaloa), durante un estudio acerca de los efectos del enriquecimiento orgánico sobre la distribución y abundancia de la meiofauna. Adicionalmente se presentan algunas enmiendas a la descripción original de *P. prima*, y a las tablas de fórmula setal de esta especie presentadas por otros autores.

INTRODUCTION

The genus *Pseudostenhelia* Wells, 1967, is one of the less diverse genera within the Diosaccidae. It is composed of 3 species: *P. prima* Wells, 1967 from Mozambique, *P. secunda* Wells, 1971 from the Vellar River near Porto Novo (Madras State, India) and Lake Kolleru (east coast of India) (Ranga Reddy, 1984), and *P. wellsi* Coull & Fleeger, 1977 from North Inlet (Georgetown, South Carolina, U.S.A.), and the northwestern coast of Mexico (present contribution).

During a one-year study on the effects of organic enrichment on the distribution of meiofauna in a tropical coastal lagoon (Gómez-Noguera & Hendrickx, 1997), the genus *Pseudostenhelia* was found to constitute a relatively important part of the meiobenthic community in organically enriched muddy sediments.

During the analysis of the Mexican specimens of *Pseudostenhelia*, a number of differences was found between these specimens and the description of *P. wellsi* presented by Coull & Fleeger (1977). However, since Coull & Fleeger (1977) did not mention whether the description of *P. wellsi* was based on dissected or whole specimens, and since their description lacks the required detail for taxonomic purposes, analysis of the type material was considered to be essential, whence the holotype (USNM-168183) and paratypes (USNM-168184) were borrowed from the National Museum of Natural History (USNM), Washington, D.C.

After detailed analysis, it was concluded that the Mexican specimens are identical to those on which Coull & Fleeger (1977) based their description and that redescription of this species as well as amendment of the tables and figures presented by Wells (1967: 270, 272, fig. 42C, D), Coull & Fleeger (1977: 335, table I) and Ranga Reddy (1984: 155, table I) was necessary.

MATERIAL AND METHODS

Triplicate sediment samples were taken during a one-year study on the abundance and distribution of the meiofauna from Ensenada del Pabellón lagoon (Sinaloa, northwestern Mexico), using a 3 cm (internal) diameter plastic corer. Meiofauna was separated from macrofauna using 500 and 63 μm sieves. Harpacticoids were picked out under a dissecting microscope, counted, and stored in 70% ethanol. Dissected parts of the harpacticoids were mounted in glycerin with sealed coverglasses. Observations and drawings were made at 1250× magnification with a Leitz Periplan phase contrast compound microscope equipped with a drawing tube. The terminology proposed by Lang (1948) was adopted. Abbreviations used in the text and tables: P1-P6, first to sixth leg; EXO, exopodite; END, endopodite; BEND, baseoendopodite.

In order to analyse the material on which Coull & Fleeger (1977) based their description of *P. wellsi*, the type material of this species was studied. Observations of this material were made from whole organisms using the microscope and magnification mentioned above.

RESULTS

Pseudostenhelia Wells, 1967

Pseudostenhelia wellsi Coull & Fleeger, 1977 (figs. 1-8)

Pseudostenhelia wellsi Coull & Fleeger, 1977: 332-337, figs. 1-3, table I.

Material examined. — Eighty alcohol preserved and ten dissected females, and eighteen alcohol preserved and two dissected males.

Redescription of the female (figs. 1-5). — Habitus presented in fig. 1A, B; length 482 to 596 μm from tip of rostrum to posterior edge of caudal rami; body gradually tapering posteriorly; with maximum width in middle of cephalothorax, this body part nearly 1/3 body length. Rostrum (fig. 3A) set off, triangular, with trifid apex and a pair of sensilla. First three pedigerous somites smooth, except for short median, transverse row of minute spinules on third somite. First urosomite with some transverse rows of spinules, with additional row of small spinules near posterior edge. Genital double-somite (figs. 1A, B, 2) with suture represented by a chitinous strip dorsolaterally; with some transverse rows of spinules on dorsal surface of genital somite close to suture and posterior margin; ventrally plain, with two unconnected and highly chitinized lateral parts. Fourth urosomal somite with 2 median rows of spinules dorsally, and 2 rows of longer elements near posterior margin dorsolaterally. Fifth urosomal somite smooth except for some transverse rows of spinules; ventrally with long spinules close to posterior margin. Anal somite with spinules close to articulation with caudal rami; anal operculum lancet-like, furnished with minute fringing elements on posterior margin; ventrally with long spinules along posterior edge. Caudal rami about 3 times as long as wide, with 7 setal elements that are smooth, with the exception of the outer and inner terminal setae.

Antennule (fig. 3B), five-segmented; segments smooth except for two rows of spinules on first one; third segment about twice as long as wide; fourth segment narrow; all setae smooth except for one feathered element on ultimate segment.

Antenna (fig. 3C), typically with allobasis. The latter ornamented with rows of long spinules near base of exopodite and articulation with coxa, with one inner smooth seta. Second endopodal segment with inner row of long spinules, 2 subdistal flagellate spines, and a small setal element; with 7 distal setal elements. Exopodite three-segmented; first segment with row of strong spinules and 1 seta, second segment with 1 seta, third segment with 1 subdistal and 3 distal elements; all elements bipinnate and with thickened proximal part.

Mandible (fig. 3D), with biting edge armed with strong teeth and a smooth seta; coxa-basis elongated, surface with rows of spinules and three terminal setae. Endopodite with 2 inner and 6 terminal setae (2 confluent at base). Exopodite with 1 proximal, 1 subdistal, and 2 terminal elements. All elements smooth except for one of the confluent terminal setae of endopodite.

Maxillule (fig. 3E), praecoxal arthrite with two surface setae, 6 terminal strong, curved spines, and 2 innermost brush-like elements; coxa small with three terminal setae; basis massive, with 7 elements. Exopodite and endopodite confluent

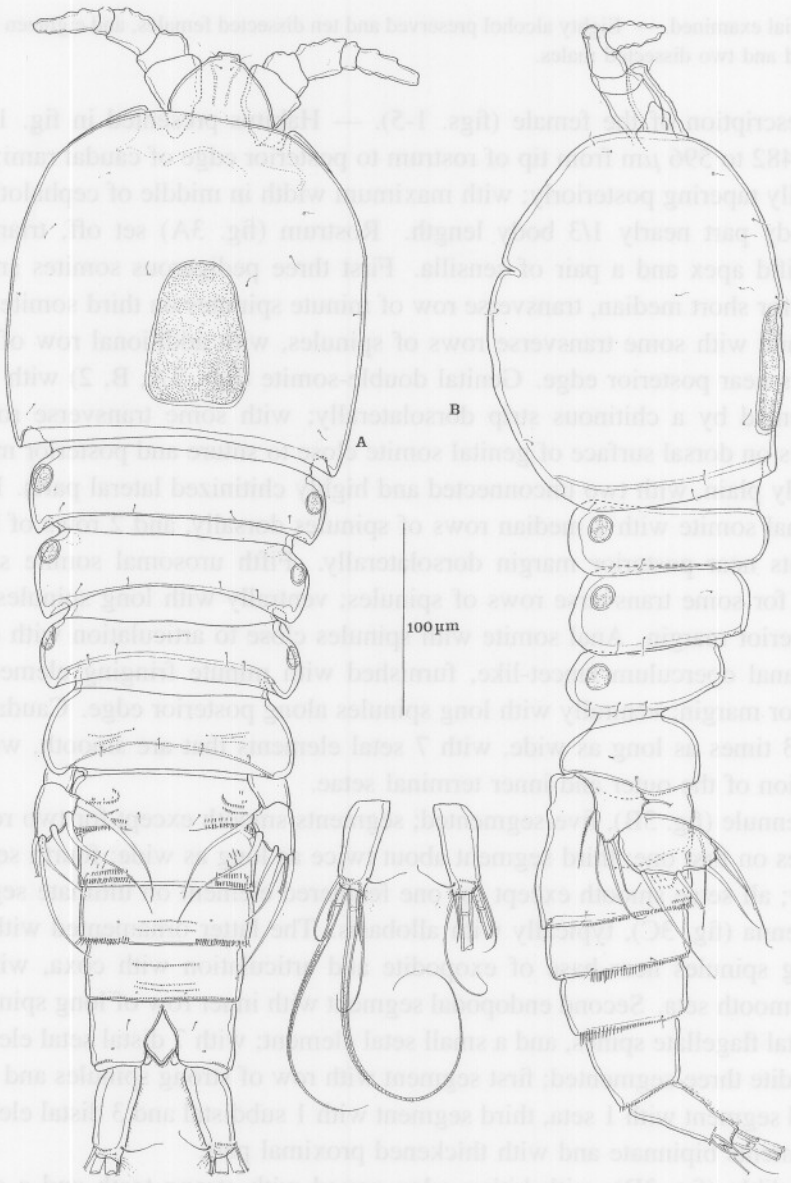

Fig. 1. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, female. A, habitus, dorsal, showing caudal rami separately; B, habitus, lateral.

at base, with two and four elements, respectively. All elements smooth except for 1 on coxa and 1 on exopodite.

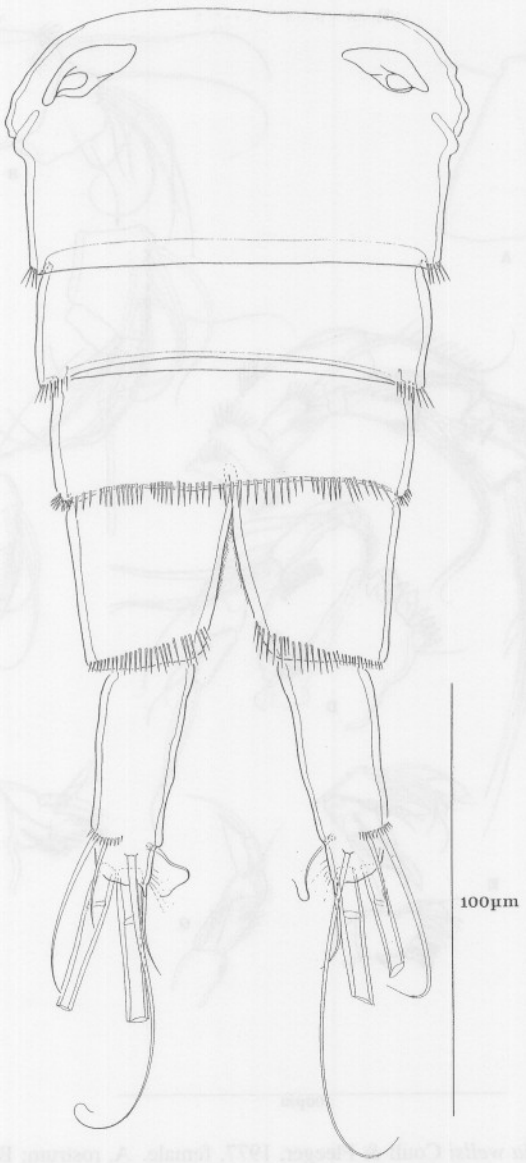

Fig. 2. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, female. Urosome, ventral (P5 bearing-somite omitted).

Maxilla (fig. 3F), syncoxa with 2 endites, bearing 3 setae each; basis with strong terminal claw armed with fine spinules, with 3 accompanying setae. Endopodite with 3 setae.

Maxilliped (fig. 3G), basis with some spinules and 2 distal setae. First endopodal segment with 2 outer rows of spinules and 2 terminal setae; second

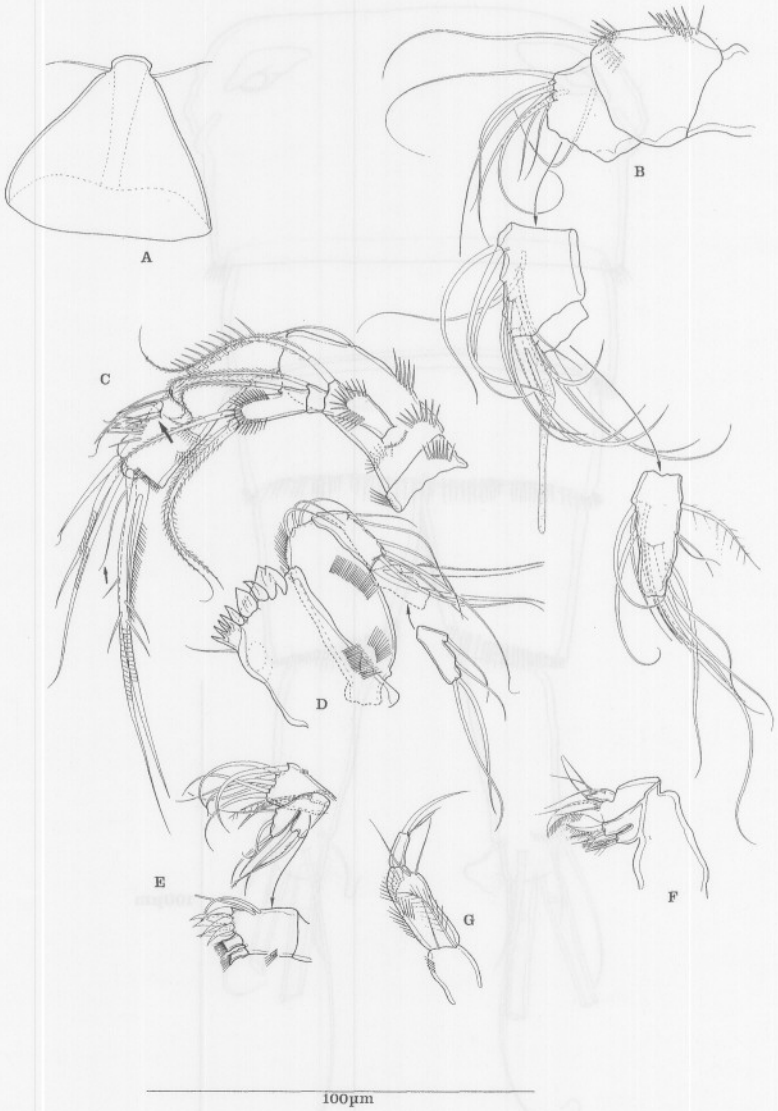

Fig. 3. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, female. A, rostrum; B, antennule, exploded view; C, antenna; D, mandible; E, maxillule; F, maxilla; G, maxilliped.

segment small, with 2 accompanying setae and a smooth, slender distal claw. All elements smooth except for bipinnate element on basis.

P1 (fig. 4A), coxa with row of spinules near inner edge and close to articulation with basis, the latter with long, geniculate outer and inner seta, each with spinules at base and between rami. With three-segmented exopodite and two-segmented endopodite, both rami of about the same length. Chaetotaxy as in table I.

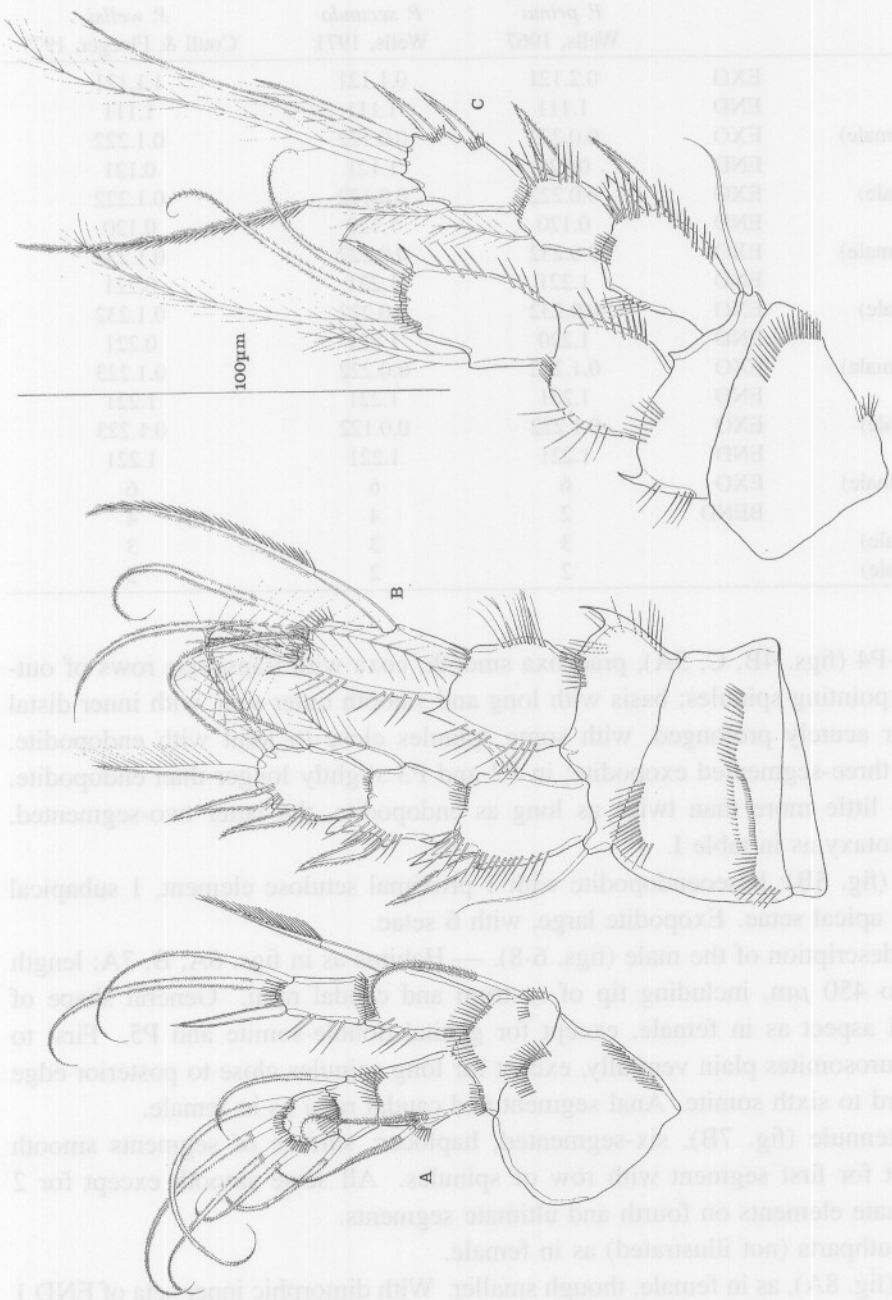

Fig. 4. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, female. A, P1; B, P2; C, P3.

TABLE I
Amendments to the chaetotaxy of the species of *Pseudostenhelia* Wells, 1967

		P. prima Wells, 1967	*P. secunda* Wells, 1971	*P. wellsi* Coull & Fleeger, 1977
P1	EXO	0.2.121	0.1.121	1.1.121
	END	1.111	1.111	1.111
P2 (female)	EXO	0.0.222	0.0.122	0.1.222
	END	0.121	1.121	0.121
P2 (male)	EXO	0.0.222	0.0.122	0.1.222
	END	0.120	1.120	0.120
P3 (female)	EXO	0.0.232	0.0.222	0.1.232
	END	1.221	1.221	0.221
P3 (male)	EXO	0.0.232	0.0.222	0.1.232
	END	1.220	1.221	0.221
P4 (female)	EXO	0.1.222	0.0.222	0.1.223
	END	1.221	1.221	1.221
P4 (male)	EXO	0.1.222	0.0.122	0.1.223
	END	1.221	1.221	1.221
P5 (female)	EXO	6	6	6
	BEND	2	4	4
P5 (male)		3	3	3
P6 (male)		2	2	2

P2-P4 (figs. 4B, C, 5A), praecoxa smooth; coxa with transverse rows of outward pointing spinules; basis with long and smooth outer seta, with inner distal corner acutely prolonged, with some spinules close to joint with endopodite. With three-segmented exopodite; in P2 and P3 slightly longer than endopodite, in P4 little more than twice as long as endopodite, the latter two-segmented. Chaetotaxy as in table I.

P5 (fig. 5B): baseoendopodite with 1 proximal setulose element, 1 subapical and 2 apical setae. Exopodite large, with 6 setae.

Redescription of the male (figs. 6-8). — Habitus as in figs. 6A, B, 7A; length 372 to 450 μm, including tip of rostrum and caudal rami. General shape of dorsal aspect as in female, except for genital double-somite and P5. First to sixth urosomites plain ventrally, except for long spinules close to posterior edge of third to sixth somite. Anal segment and caudal rami as in female.

Antennule (fig. 7B), six-segmented, haplocer; surface of segments smooth except for first segment with row of spinules. All setae smooth except for 2 bipinnate elements on fourth and ultimate segments.

Mouthparts (not illustrated) as in female.

P1 (fig. 8A), as in female, though smaller. With dimorphic inner seta of END 1 and outer spines of exopodite.

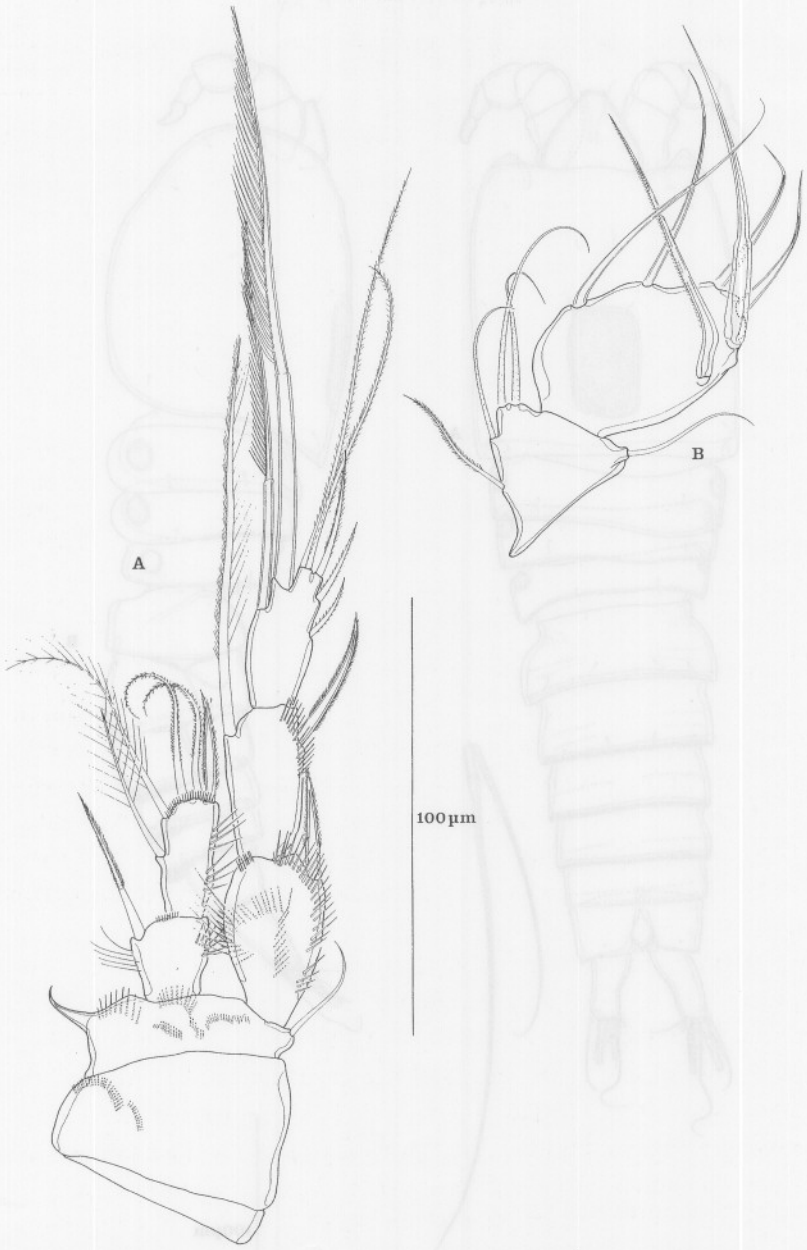

Fig. 5. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, female. A, P4; B, P5.

P2 (fig. 8B, H), as in female, except for second endopodal segment with outer distal corner acutely prolonged, reaching end of third exopodal segment.

P3 (fig. 8C), as in female, except for dimorphic inner spine of END 2.

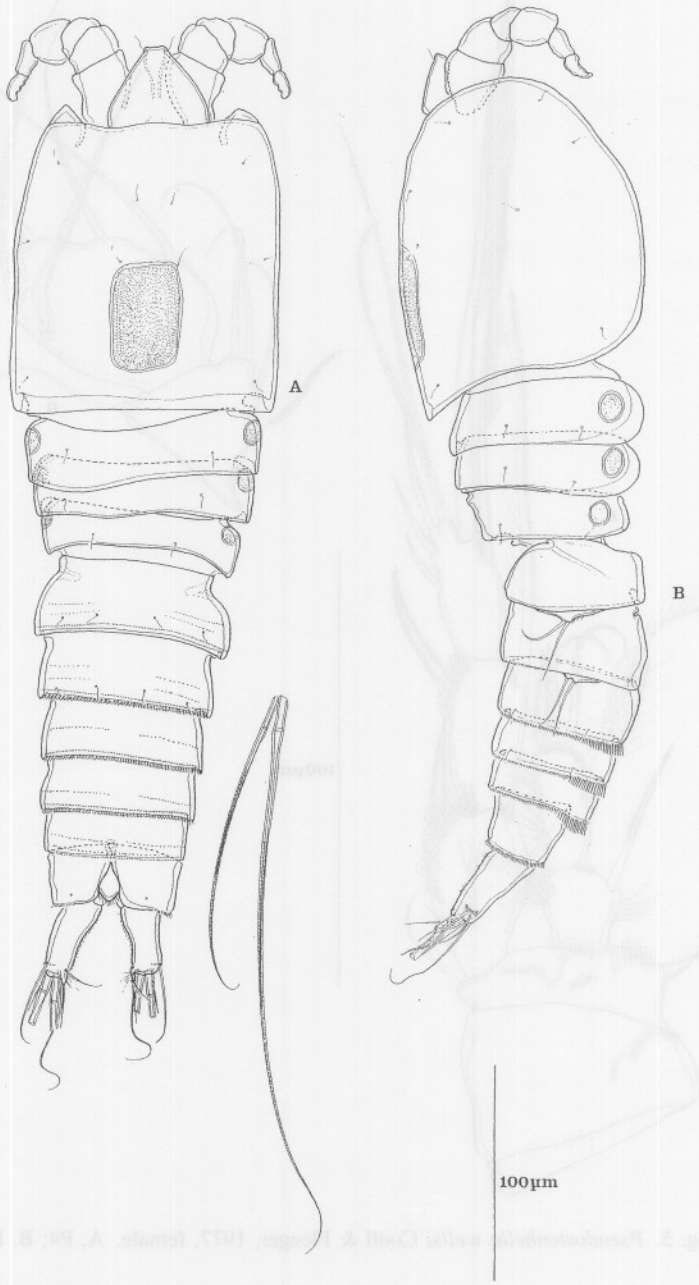

Fig. 6. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, male. A, habitus, dorsal, principal setae of left caudal ramus shown separately; B, habitus, lateral.

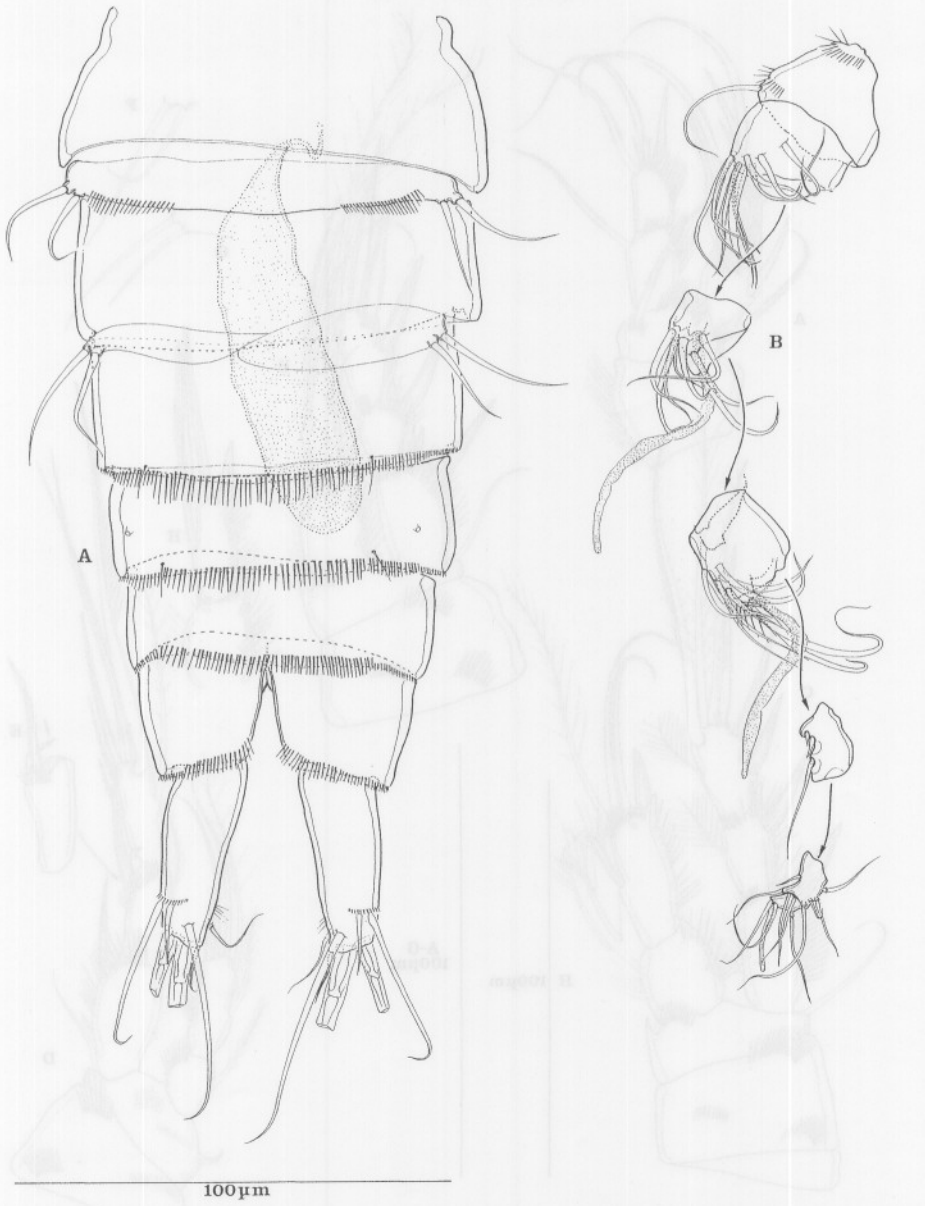

Fig. 7. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, male. A, urosome, ventral; B, antennule, exploded view.

P4 (fig. 8D, E), as in female, except for inner seta of END 1 and EXO 2-3, and outer apophysis of EXO 2.

P5-P6 (fig. 8F, G), resemble each other; with only two smooth setae.

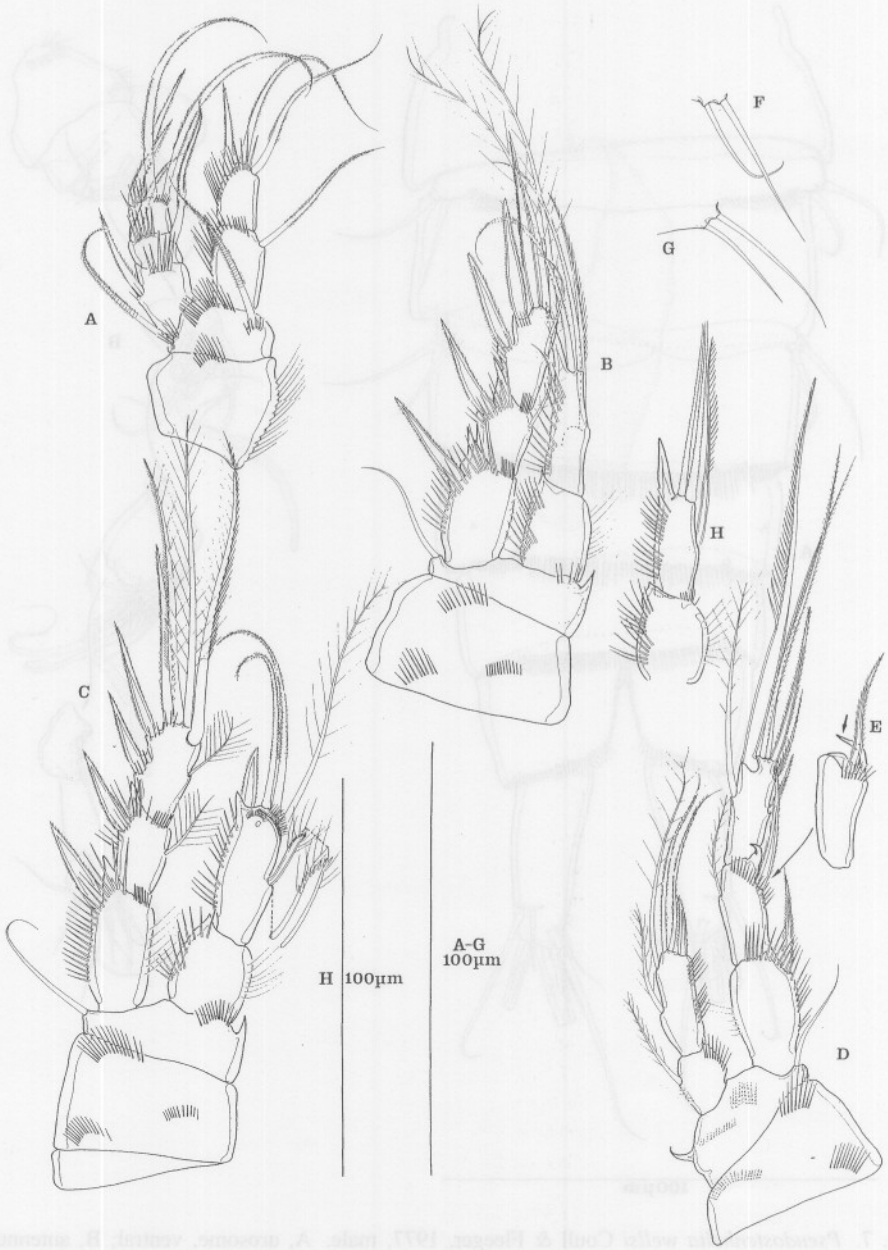

Fig. 8. *Pseudostenhelia wellsi* Coull & Fleeger, 1977, male. A, P1; B, P2; C, P3; D, P4; E, P4 EXO 2; F, P5; G, P6; H, P2 END.

Distribution. — Mexico: south-eastern Gulf of California (present study); U.S.A.: South Carolina (Coull & Fleeger, 1977), Louisiana (Chandler & Fleeger, 1983, 1984; Fleeger et al., 1984; Sun & Fleeger, 1991; Pace & Carman, 1996).

DISCUSSION

Since the description of the genus *Pseudostenhelia* (cf. Wells, 1967), to accommodate *P. prima* from Mozambique, two species have been added: *P. secunda* (cf. Wells, 1971), from the Vellar river near Porto Novo, Madras State (India), and *P. wellsi* (cf. Coull & Fleeger, 1977), from an intertidal zone of mud flats associated with *Spartina alterniflora* (Loisel.) Merr. marshes in North Inlet, Georgetown (South Carolina). Although the original description of *P. secunda* was based only on male specimens (Wells, 1971) and the female remained unknown for more than a decade, Ranga Reddy (1984) provided a more detailed description of both male and female from Lake Kolleru (east coast of India).

The three known species of *Pseudostenhelia* have been found to constitute part of the meiobenthic communities in localities characterized by brackish conditions and substrates enriched by organic material (Wells, 1967, 1971; Coull & Fleeger, 1977; Chandler & Fleeger, 1983, 1984; Fleeger et al., 1984; Sun & Fleeger, 1991; Pace & Carman, 1996), and this was also the case for the Mexican specimens. It is noteworthy that Ranga Reddy (1984) gathered some specimens of *P. secunda* from surface and subsurface plankton samples from a predominantly freshwater lake.

Although the Mexican specimens clearly belong to *P. wellsi*, some differences were observed when compared with the illustrations presented by Coull & Fleeger (1977). The observed differences are mainly in the chaetotaxy of the antennal second endopodal segment and allobasis, the chaetotaxy of coxa-basis and endopodite of the mandible, the number of maxillular endites, the armature of the maxilliped, the ornamentation of female P1 and P2, the chaetotaxy of female P4 and P5, the sexual dimorphism in male P1 and P3-P4, and the chaetotaxy of the caudal rami.

In order to verify such differences, the type material was studied. After detailed analysis of this material it was concluded that the Mexican specimens are identical to those on which Coull & Fleeger (1977) based their description. It has to be noted that Wells (1967: 270, 272, fig. 42C, D) confused P3 and P4 both in his description of *P. prima* and in the setal formula that he presented. The same error was made by Coull & Fleeger (1977: 335, table I) and by Ranga Reddy (1984: 155, table I).

It is interesting to point out the presence of one intersex individual. This phenomenon is rare in harpacticoids. To my knowledge, it has only been observed in a single specimen of *Amphiascoides debilis* (Giesbrecht, 1881) (cf. Klie, 1944), in 28 out of 30 specimens of *Paramphiascella hyperborea* (T. Scott, 1903), in some specimens of *Stenhelia gibba* Boeck, 1864, and some *Halectinosoma similidistinctum* Lang, 1965 (cf. Moore & Stevenson, 1991). The massive oc-

currence of intersexuality could be due, as sugggested by Moore & Stevenson (1991), to pollution and parasitism. Pollution as the causal agent of intersexuality could also be the most likely hypothesis for explaining the occurrence of this phenomenon in the Ensenada del Pabellón lagoon, as this system is subject to agro-industrial sewage discharges.

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