Gulf and Caribbean Research

Volume 14 | Issue 1

January 2002

Tanaidacea (Crustacea: Peracardia) of the Gulf of Mexico. X. The Question of Being Male

Kim Larsen
Texas A&M University

DOI: 10.18785/gcr.1401.04

Gulf and Caribbean Research Vol. 14, 53–66, 2002 Manuscript received August 3, 2001; accepted January 10, 2002

TANAIDACEA (CRUSTACEA: PERACARIDA) OF THE GULF OF MEXICO. X. THE QUESTION OF BEING MALE

Kim Larsen
Department of Oceanography, Texas A&M University 3146, College Station, Texas 77843-3146, USA, Phone: 979-845-4092, E-mail: tanaids@hotmail.com

ABSTRACT Three new species *Parafilitanais mexicana*, *Collettea elongata*, and *Paragathotanais medius* are described from deep-sea localities in the Gulf of Mexico. The male of *Parafilitanais* does not vary conspicuously from the female, except for possessing pleopods. Male *Paragathotanais* reveal that the mouthparts display some degree of sexual dimorphism. Males of all 3 species possess functional mouthparts. The problems identifying male Tanaidacea are discussed. The number of terminal spiniform setae on the maxillule is considered invalid as a diagnostic character. Keys to the species of *Parafilitanais* and *Paragathotanais* are given.

Introduction

During a study on the comparative biodiversity of the Tanaidacea in the Gulf of Mexico (Larsen, in progress), a large number of new deep-sea species were discovered, including one new species belonging to each of the genera *Parafilitanais* Kudinova-Pasternak, 1989, *Collettea* (G.O. Sars, 1882), and *Paragathotanais* Lang, 1971.

The study of Tanaidacea becomes seriously impaired when dealing with males (for review see Larsen 2001), and large holes in our understanding of the reproductive strategies in Tanaidacea exist. It is clear that in some shallow-water taxa (e.g., Leptocheliidae) several morphologically different males with rudimentary mouthparts exist in a given species, while in other taxa (Tanaididae, Apseudomorpha) there is only one male which generally resembles the female and retains functional mouthparts. When focus is directed on the deep-sea taxa, the picture becomes unclear. Neotanaidomorphans have two male morphs and the male mouthparts are rudimentary (Gardiner 1975). The tanaidomorphans have been considered either parthenogenetic or as having morphologically different males with rudimentary mouthparts (Sieg 1984). However, observing the penes of male tanaidomorphans is exceedingly difficult and thus males have to be sexed using other characters.

Male leptognathids differ substantially from females (Wilson 1987) and the two sexes share no species characters. Whether more than one type of male is involved is not known at this stage but has never been documented for any species. It seems unlikely that more than one type of male exists for each species, given the low ratios of males to females found in deep-sea samples. Agathotanaids, in contrast to the leptognathids, appear to have only one type of male, which differs from the female only in the presence of pleopods and a thicker antennule (Bird and Holdich 1988, Larsen 1999). Larsen (1999) reported mouthpart reduction in the adult male of *Agathotanais spinipoda* Larsen, 1999 but re-examination revealed that this was a mistake based on a bad dissection. The same pattern of limited sexual dimorphism is found in the deep-sea genus *Collettea* (Larsen 2000), and no non-feeding terminal male stage has been identified in any of these genera. It is not known if these males are, in fact, “subadult” or if a terminal and morphologically different stage has escaped observation. This is highly unlikely given that an enormous amount of material is available for these taxa, particularly that of *Agathotanais* Hansen, 1913. Lang (1968) mentioned that several “subadult males” are identical to the female, except for the presence of pleopods and a thicker antennule. Sieg (1986) questioned the validity of these ‘subadult’ males and suggested that they might be separate female morphs or species. Sieg (1986) also disputed the male characters presented by Lang (1968) and suggested that mature males would lack mouthparts. During the present study, the kind of male characters identified by Lang (1968) were observed in males of all three species, and despite the large amount of material available to me, no non-feeding terminal male stage was observed from the genera mentioned here or from *Tanaella* Norman and Stebbing, 1886 or *Agathotanais*. The same “male characteristics” have been identified in *Tanaella* (G. Bird, personal communication, West Dayton, Middlesex, UK). It is here suggested that in the genera *Parafilitanais*, *Paragathotanais*, *Tanaella*, *Agathotanais*, and *Collettea*, males retain functional mouthparts and that the “subadults” described by Lang, Kudinova-Pasternak, and others are, in fact, fully mature males. This condition is possibly true for several additional genera/species and it must be expected that several leptognathids described as females with pleopods are actually just males.

Parafilitanais was erected by Kudinova-Pasternak (1989) to accommodate *P. caudatus* Kudinova-Pasternak, 1989. *Parafilitanais mexicana*, described herein, is only the third species and the first male to be described for this deep-sea genus.

The Genus *Paragathotanais* was erected by Lang (1971) and later revised by Bird and Holdich (1988) but still contains only five species. *Paragathotanais* was initially described as having a 5-articulated antenna (Lang 1971), but Bird and Holdich (1988) re-diagnosed the genus as having a 6-articulated antenna. *Paragathotanais* is thus separated from *Agathotanais* by having a 6- (or 5-) articulated antenna, a 4-articulated antennule and uropodal endopod not fused to the protopod (Lang 1971). *Agathotanais* has a reduced antenna, a 3-articulated antennule, and a uropodal endopod fused to the protopod. However, Larsen (1999) found significant variation in the reduction of the antenna in *Agathotanais*; the new species *Paragathotanais medius*, described herein, also displays reduction in the antenna. Since *P. medius* has a 4-articulated antennule and the uropodal endopod is not fused to the protopod, it belongs to *Paragathotanais* with the modified generic diagnosis provided herein.

The Genus *Collettea*, recently revised by Larsen (2000) and currently containing 14 species, has proved to be a cosmopolitan genus present in most deep-sea collections.

Holotype material is deposited in the National Museum of Natural History, Washington, DC, USA. Paratypes and other material are deposited in the collection of the Gulf Coast Research Laboratory (GCRL). Material was collected by Texas A&M University staff.

SYSTEMATICS

Parafilitanais Kudinova-Pasternak, 1989

Diagnosis. (Modified after Kudinova-Pasternak1989). Female: Body elongated and cylindrical. Antennule with 4 articles. Antenna with 5–6 articles. Mandible molar pointed. Labium consists of 1 pair of lobes without lateral or medial processes. Maxilliped basis fused distally, endites not fused, narrower than basis and with 1 minute distal denticle. Chelipeds attached ventrally. Pereopods 1–3 with coxa, dactylus, and terminal setae shorter than propodus. Pereopod 4–6 without coxa; dactylus and terminal seta as long or longer than propodus, not fused to a claw. Pleopods absent. Uropods long and uniramous, endopod consists of 2 articles.

Male: Body shorter than female. Functional mouthparts present in adult males, resembling but not identical to female. Antennule only marginally thicker than female. Pleonites with reduced pleopods with simple setae (juvenile male pleopods without setae).

Remarks. *Parafilitanais* may represent a case of reverse evolution from the *Tanaella* type (completely reduced uropodal exopod) towards the *Leptognathia* type (reduced mandibular molar). It is unlikely that a uropodal exopod will reappear once lost, while it is reasonable to expect the mandibular molar to alter shape depending on diet. The decrease in body size, elongated cheliped, and pointed mandible molar could all be adaptations for deep-sea dwelling.

Parafilitanais mexicana sp. nov. (Figures 1–4)

Material examined. 1 non-ovigerous female. Holotype, body length 1.6 mm. Station C4-1. 31 May 00. 27°27.5640'N, 89°47.1391'W. Depth 1455 m. Paratypes: 1 non-ovigerous female. Same locality. 1 male. Station C7-2. 30 May 00. 27°43.971'N, 89°58.6211'W. Depth 1070 m.

Other material.—1 non-ovigerous female, 1 manca. Station C4-1. 31 May 00. 27°27.5640'N, 89°47.1391'W. Depth 1455 m.—1 non-ovigerous female Station. C7-1. 30 May 00. 27°43.6967'N, 89°58.7782'W. Depth 1080 m.—1 male, 3 non-ovigerous females. Station MT2-1. 17 Jun 00. 28°27.0646'N, 89°40.3563'W. Depth 676 m.—1 non-ovigerous female. Station MT4-1. 15 Jun 00. 27°49.6198'N, 89°09.9526'W. Depth 1401 m.—1 non-ovigerous female. Station NB4-1. 11 May 00. 26°15.2711'N, 92°23.6978'W. Depth 2030 m.—1 male, 1 non-ovigerous female, 2 mancas. Station S35-1. 11 Jun 00. 29°20.0500'N, 87°03.3758'W. Depth 658 m.—4 non-ovigerous females. Station W2-1. 14 May 00. 27°24.8008'N, 93°20.2579'W. Depth 625 m.—3 non-ovigerous females. Station W3-1. 14 May 00. 27°10.3711'N, 93°19.3081'W. Depth 860 m.—1 non-ovigerous female. Station W12-1. 05 May 00. 27°19.3945'N, 91°33.3486'W. Depth 1168 m.—13 non-ovigerous females. Station C7-2. 30 May 00. 27°43.9713'N, 89°58.6211'W. Depth 1070 m.—7 non-ovigerous females. Station S35-2. 11 Jun 00. 29°19.9897'N, 87°02.9021'W. Depth 667 m.—2 non-ovigerous females. Station S42-2. 10 Jun 00. 28°15.1070'N, 86°25.0209'W. Depth 768 m.

Diagnosis. Female: Body not tapering distally. Carapace shorter than combined length of 2 pereonites. Maxillule with 2 bifurcate terminal setae. Cheliped dac-

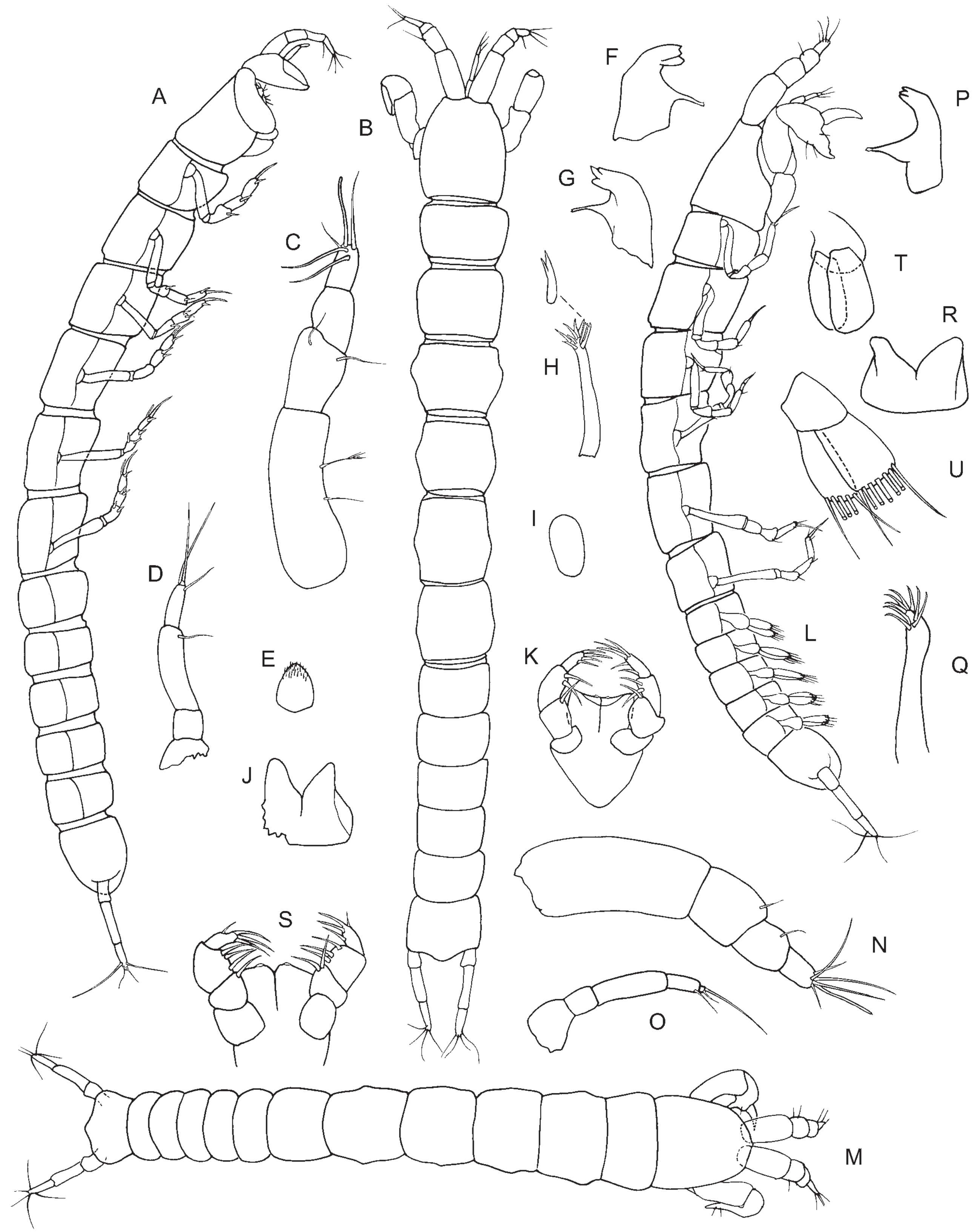

Figure 1. ***Parafilitanais mexicana*. A. Female holotype, lateral view. B. Same, dorsal view. C. Female antennule. D. Female antenna. E. Female labrum. F. Female left mandible. G. Female right mandible. H. Female maxillule. I. Female maxilla. J. Female labium. K. Female maxilliped. L. Male paratype, lateral view. M. Same, dorsal view. N. Male antennule. O. Male antenna. P. Male right mandible. Q. Male maxillule. R. Male labium. S. Male maxilliped. T. Juvenile male pleopod. U. Mature male pleopod.**

tylus marginally longer than fixed finger. Pleotelson apex not acute.

Male. As female except cheliped dactylus not longer than fixed finger and maxillule without bifurcate setae.

Etymology. Named after the locality, the Gulf of Mexico

Description. Adult female.

Body. (Figures 1A, B) Elongated, 10 times longer than broad.

Cephalothorax. Shorter than combined length of pereonite 1 and 2. Eye lobes absent.

Pereonites. Pereonites 1, 2, 3, 4, and 6 wider than long. Pereonite 5 as wide as long.

Pleon. All pleonites subequal, slightly narrower than pereon and half as long. Pleotelson (Figure 2H) only marginally longer than individual pleonites, apex blunt, almost flat.

Antennule. (Figure 1C) As long as cephalothorax. Article 1 as long as rest of antennule, with 1 simple seta and 1 sensory medial seta. Article 2 shorter than 1/2 of article 1, with 2 simple distal setae. Article 3 length 2/3 article 2, smooth. Article 4 marginally shorter than article 3, with 3 thick, long setae, 1 simple distal seta and 1 aesthetasc.

Antenna. (Figure 1D) Half as long as antennule. Article 1 broken but broader than following articles. Article 2 length 1/3 article 3, smooth. Article 3 longer than other articles, with 1 simple distal seta. Article 4 half as long as article 3, with 1 simple distal seta. Article 5 minute with 2 long distal setae.

Mouthparts. Labrum (Figure 1E) setose and hood-shaped. Mandibular molar process pointed and longer than incisor, with small distal denticles. Left mandible (Figure 1F) lacinia mobilis almost as broad as incisor; incisor with 2 pointed denticles. Right mandible (Figure 1G) incisor broad, with 3 large, blunt denticles (medial denticle anteriorly directed). Maxillule (Figure 1H) endite with 8 distal spiniform setae, of which 2 are bifurcate. Palp not recovered. Maxilla (Figure 1I) ovoid. Labium (Figure 1J) apex rather pointed and smooth. Maxilliped (Figure 1K) endites with 1 small denticle. Basis fused. Palp article 1 broader than other articles and smooth. Article 2 with 1 thick seta on inner margin. Article 3 with 2 thick setae. Article 4 with 4 distal thick setae. Epignath not recovered.

Cheliped. (Figure 2A) Basis divided unequally by sclerite, as long as carpus. Merus triangular with 2 ventral setae. Carpus shorter than propodus including

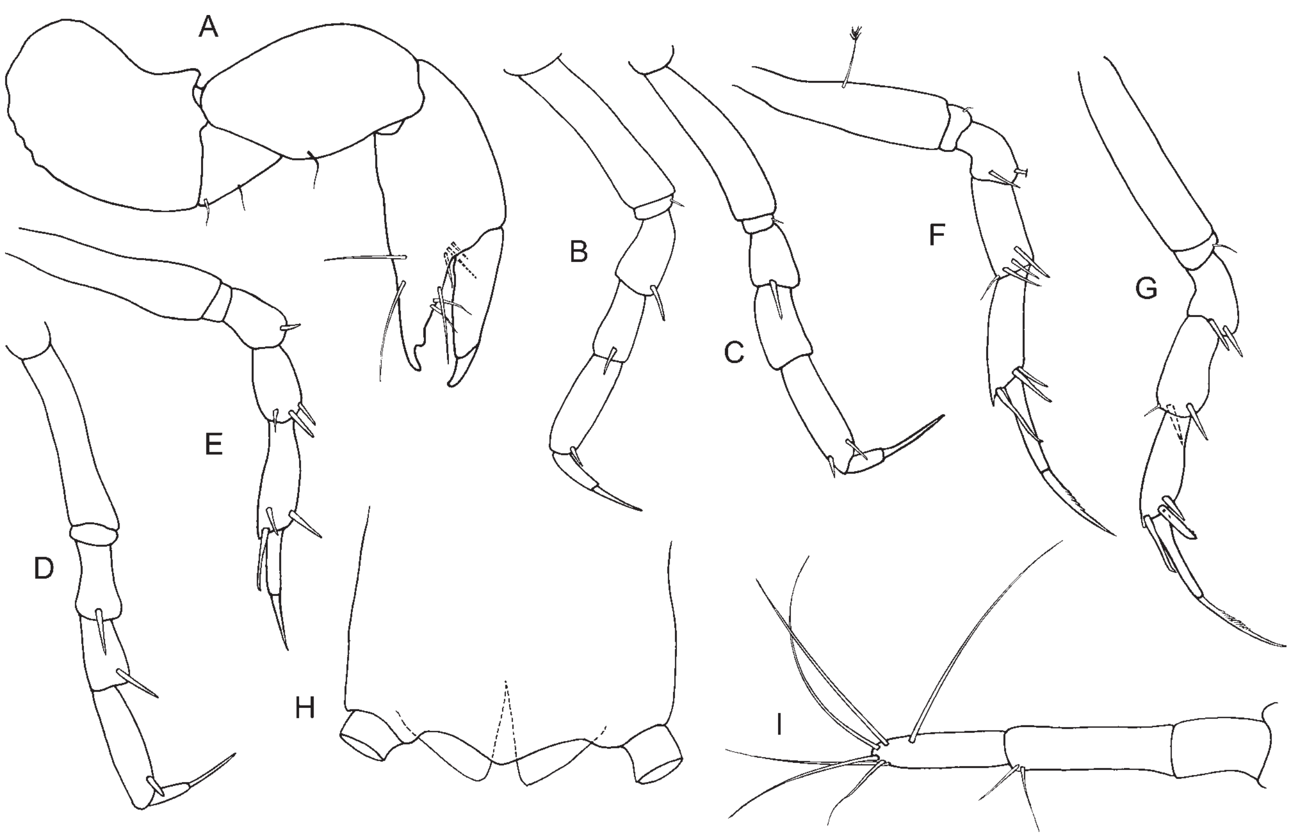

Figure 2. ***Parafilitanais mexicana*, female. A. Cheliped. B. Pereopod 1. C. Pereopod 2. D. Pereopod 3. E. Pereopod 4. F. Pereopod 5. G. Pereopod 6. H. Pleotelson. I. Uropod.**

the fixed finger, with 1 ventral seta. Propodus slender, with 3 setae near dactylus insertion. Fixed finger with 2 ventral setae, 3 on inner margin. Dactylus marginally longer than fixed finger.

Pereopod 1. (Figure 2B) Coxa deep and circular, smooth. Basis as long as 3 succeeding articles combined, smooth. Ischium with 1 small ventral seta. Merus longer than carpus, widening distally and with 1 spiniform distal seta. Carpus 2/3 length of propodus, with 1 spiniform distal seta. Propodus longer than 1/2 the length of basis, with 1 spiniform distal seta. Dactylus and terminal seta only marginally shorter than propodus.

Pereopod 2. (Figure 2C) As pereopod 1 except carpus smooth and longer than merus. Propodus with 2 spiniform setae. Dactylus and terminal setae clearly shorter than propodus.

Pereopod 3. (Figure 2D) As pereopod 1 except ischium smooth. Dactylus and terminal setae clearly shorter than propodus.

Pereopod 4. (Figure 2E) Basis smooth, longer than 3 succeeding articles combined. Ischium smooth. Merus shorter than carpus, with 1 spiniform distal setae. Carpus with 3 spiniform distal setae. Propodus with 2 spiniform and 1 elongate, hook-shaped distal seta. Dactylus and terminal seta longer than propodus, not fused to a claw.

Pereopod 5. (Figure 2F) as pereopod 4 except basis with 1 sensory medial seta. Ischium with 1 simple seta. Merus with 2 spiniform distal setae. Propodus with 2 spiniform and 1 elongate, hook-shaped distal seta and dorsal spine. Terminal seta with medial serration.

Pereopod 6. (Figure 2G) Similar to pereopod 5 except basis without sensory seta. Carpus with 3 spiniform distal setae.

Uropods. (Figure 2I) Protopod more than 1/2 the length of endopod article 1, smooth. Endopod article 1 longer than article 2, with 2 simple distal setae; article 2 with 6 long, simple distal setae. Exopod reduced to a small process on protopod.

Description. Adult male (when different from female).

Body. (Figures 1L, M) Elongated, 7.5 times longer than broad.

Pleon. All pleonites subequal and bearing pleopods, as wide as pereon. Pleotelson laterally widening distally, only marginally longer than individual pleonites.

Antennule. (Figure 1N) Only marginally wider than female.

Mouthparts. Right mandible (Figure 1P) as in female but medial denticle smaller and not anteriorly directed. Maxilliped (Figure 1S) endite denticles larger than female. Palp article 4 with 3 thick distal setae on inner margin and 1 smaller seta on outer margin.

Cheliped. (Figure 3A) Dactylus not longer than fixed finger.

Pleopod. (Figures 1T, U) Protopod widening distally, smooth. Endo- and exopod with 5 and 7 simple setae, respectively. Juvenile male pleopods without setae.

Remarks. *Parafilitanais mexicana* can easily be separated from the other species in the genus, *P. caudatus* Kudinova-Pasternak, 1989 and *P. similis* Kudinova-Pasternak, 1990, by the flat apex of the pleotelson and by the fact that the body is not tapering distally. The cheliped dactylus of the female *P. mexicana* is also longer than that of *P. caudatus.* The antenna of *P. caudatus* appears to be 6-articulated, while 5-articulated in *P. mexicana*, but this character is not given much weight here since it is considered to be unreliable (Larsen, research in progress). Unfortunately not much can be said about *P. similis*, which is inadequately described and illustrated.

KEY TO *PARAFILITANAIS*

1. Pleotelson apex flat. Cheliped dactylus of female longer than fixed finger. Body not tapering distally .... *P. mexicana*

Pleotelson apex pointed. Cheliped dactylus of female not longer than fixed finger. Body tapering distally ... 2

2. Pereonite 1 about 2/3 length of pereonite 2. Pleon about 1/4 of total body length.......................... *P. similis*

Pereonite 1 about 9/10 length of pereonite 2. Pleon about 1/3 of total body length...................... *P. caudatus*

Genus *Collettea* (G.O. Sars, 1882)
C. elongata sp. nov. (Figures 5-7)

Material examined. 1 non-ovigerous female holotype, body length 1.7 mm. Station. WC8 5445-3. 27°50.23'N, 90°44.01'W. Depth 550 m.1 non-ovigerous female paratype. Station WC5-5425-1. 27°47.13'N, 91°46.12'W. Depth 291 m. 1 male. Station C12-2. 14 May 00. 27°24.7019'N, 93°20.3849'W. Depth 625 m. 1 non-ovigerous female. Station NB2-1. 07 May 00. 27°08.0243'N, 91°59.9584'W. Depth 1530 m.

Other material.—2 non-ovigerous females. Station WC6-5436-6. 27°42.37'N, 91°33.04'W. Depth 554 m.—2 non-ovigerous females. Station WC6-5432-2. 27°42.43'N, 91°33.02'W. Depth 580 m.—1 non-ovigerous female. Station WC7-5437-1. 27°45.37'N,

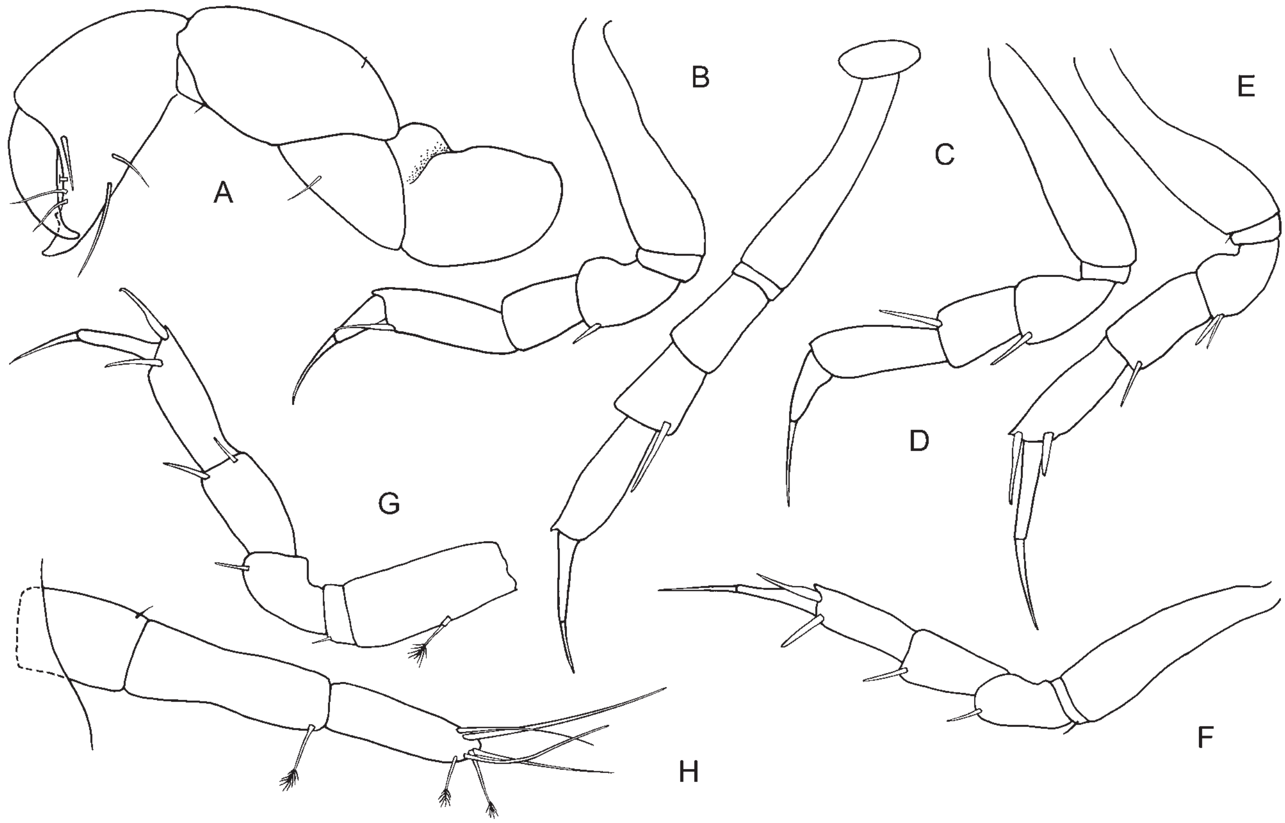

Figure 3. ***Parafilitanais mexicana*, male. A. Cheliped. B. Pereopod 1. C. Pereopod 2. D. Pereopod 3. E. Pereopod 4. F. Pereopod 5. G. Pereopod 6. H. Uropod.**

91°13.07'W. Depth 455 m.—1 non-ovigerous female. Station 3C-4436-6. 27°49.6'N, 90°06.8'W. Depth 853 m.—1 non-ovigerous females. Station E2-4454-4. 28°16.45'N, 86°14.45'W. Depth 622 m.—1 non-ovigerous female. Station. WC8-5467-1. 27°50.30'N, 90°44.07'W. Depth 545 m.—1 non-ovigerous female. Station S36-2. 12 Jun 00. 28°55.0080'N, 87°40.0627'W. Depth 1832 m.—1 non-ovigerous female. Station S43-1. 10 Jun 00. 28°30.1055'N, 86°04.9983'W. Depth 366 m.—1 non-ovigerous female. Station W4-1. 15 May 00. 26°43.9027'N, 93°19.1708'W. Depth 1420 m.—1 non-ovigerous female. Station W12-1. 05 May 00. 27°19.3945'N, 91°33.3486'W. Depth 1168 m.—1 non-ovigerous female. Station C7-1. 30 May 00. 27°43.6967'N, 89°58.7782'W. Depth 1080 m.—1 non-ovigerous female, Station W1-1. 13 May 00. 27°34.7791'N, 93°32.8573'W. Depth 379 m.—1 non-ovigerous female, 1 male, Station W3-1. 14 May 00. 27°10.3711'N, 93°19.3081'W. Depth 860 m.—3 non-ovigerous females Station C4-1. 31 May 00. 27°27.5640'N, 89°47.1391'W. Depth 1455 m.—1 non-ovigerous female, Station RW6-2. 18 May 00. 26°00.142'N, 94°29.381'W. Depth 3015 m.—4 non-ovigerous females, 3 males. Station S36-1. 12 Jun 00. 28°55.1647'N, 87°40.2232'W. Depth 1825 m.—4 non-ovigerous females. Station W2-2. 14 May 00. 27°24.7019'N, 93°20.3849'W. Depth 625 m.

Diagnosis. Body 12 times longer than broad. Antenna article 4 without fusion line. Maxilliped endite without process. Cheliped fixed finger without processes. Cheliped dactylus not longer than fixed finger. Heavy armament with spiniform setae only on pereopod 4–6. Uropods long (>0.3 times pleotelson length).

Etymology. Named to reflect the elongated body-shape, which is unique in the genus (Latin: elongata= female form of elongated)

Description. Adult female.

Body. (Figures 4A, B) 12 times longer than broad.

Cephalothorax. As long as combined length of pereonite 1 and 2.

Pereonites. Pereonites 1 and 6 wider than long. Pereonite 2 as long as wide. Pereonites 3, 4, and 5 longer than wide.

Pleon. All pleonites subequal. Pleotelson longer than combined length of 3 pleonites and tapering into a cone shaped apex.

Antennule. (Figure 5A) With 5 articles. As long as cephalothorax. Article 1 longer than rest of antennule,

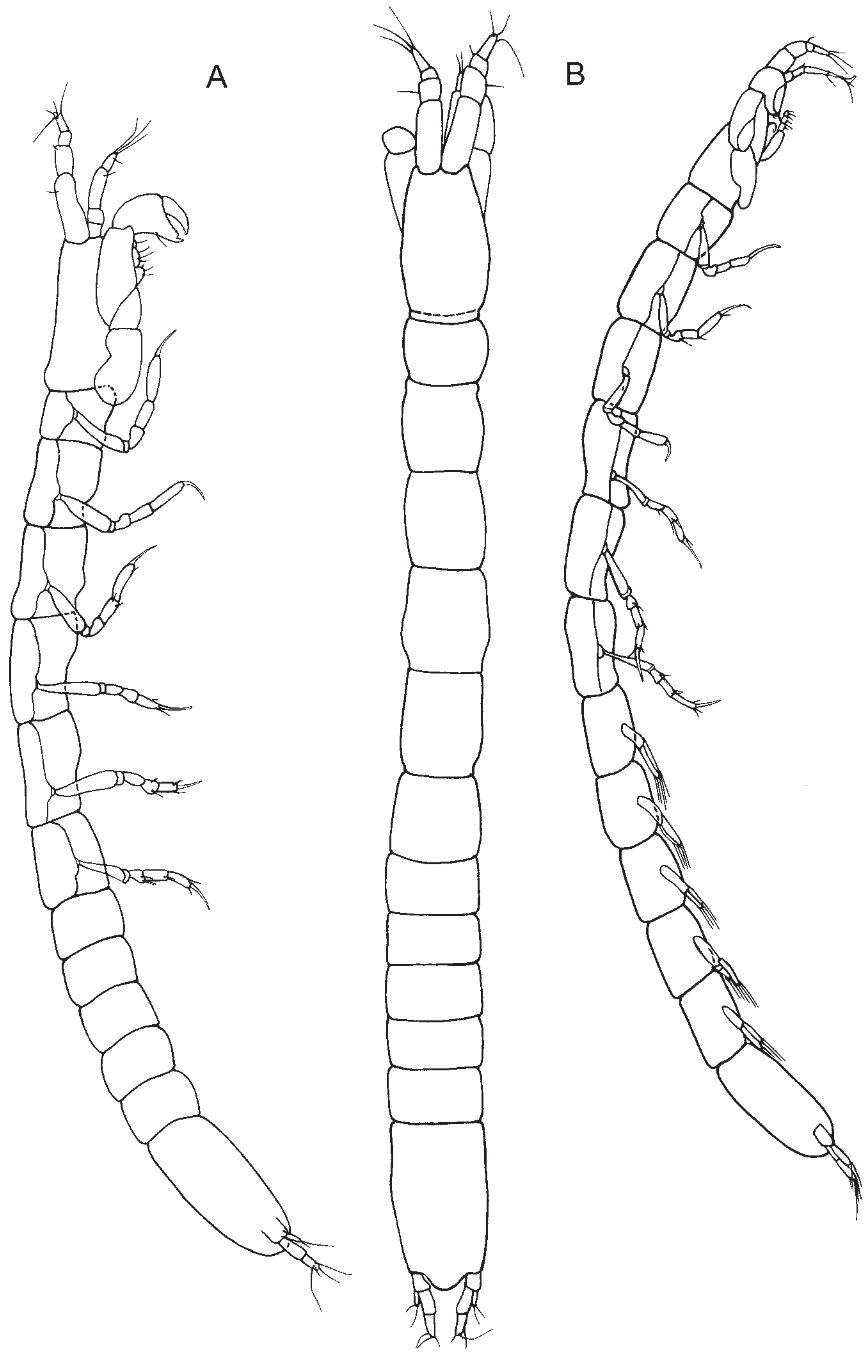

Figure 4. ***Collettea elongata*. A. Female holotype, dorsal view. B. Same, lateral view. C. Male paratype, lateral view.**

smooth. Article 2 as long as article 4, with 1 simple distal seta. Article 3 half as long as article 2, with 2 simple distal setae. Article 4 length nearly 3 times as long as article 3, with 3 simple distal setae. Article 5 minute and partly obscured under extension of article 4, with 1 simple seta.

Antenna. (Figure 5B) Length 4/5 of antennule. Article 1 quadrate, smooth. Article 2 length 2 1/2 times longer than article 3, with 1 simple distal seta. Article 3 length 1/4 the length of article 4, with 2 distal setae. Article 4 longer than 2 preceding articles combined, with 2 simple distal setae. Article 5 length 2/3 article 2, with 1 distal simple seta. Article 6 minute with 3 distal setae.

Mouthparts. Labrum (Figure 5C) hood shaped, smooth. Labium not recovered. Mandible molar process longer than incisor and relatively broad. Left mandible (Figure 5D) lacinia mobilis broad and larger than incisor; incisor with 2 denticles. Right mandible (Figure 5E) incisor with 3 distal denticles and 1 posterior denticle. Maxillule (Figure 5F) endite with 8 spiniform distal setae. Palp not recovered. Maxilla not recovered. Maxil-

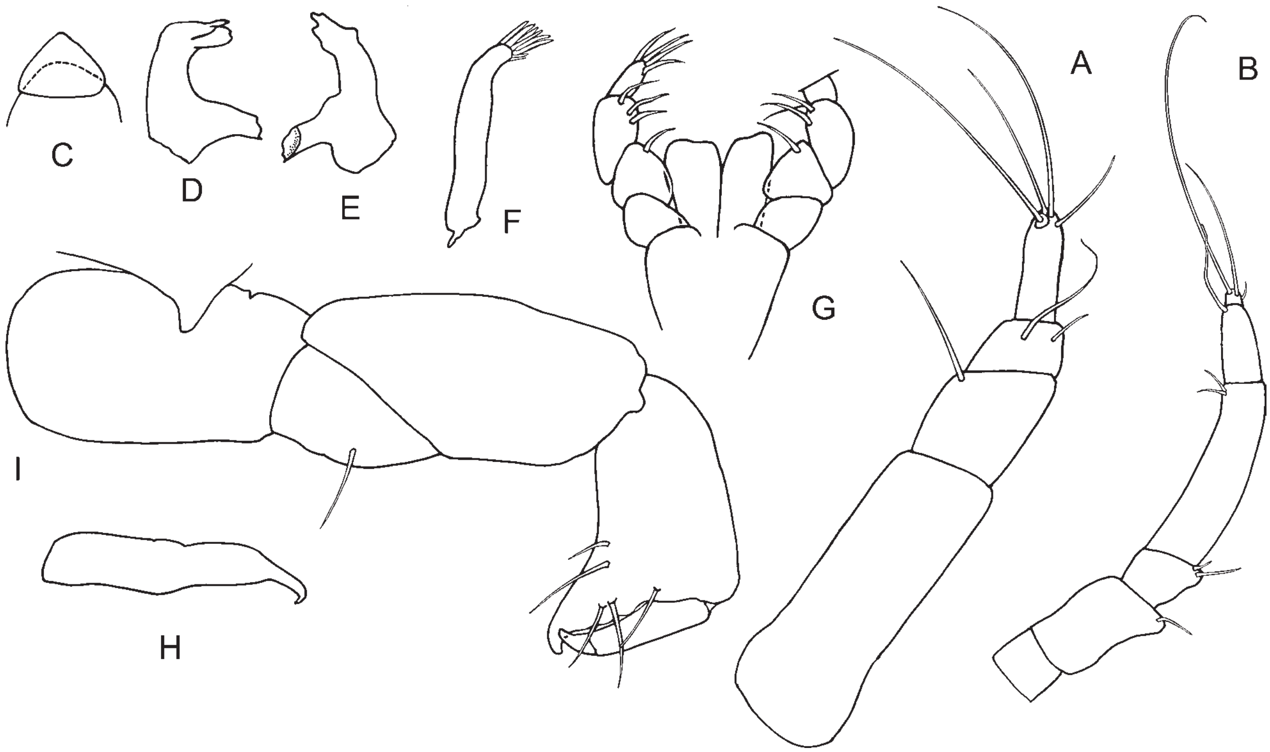

Figure 5. ***Collettea elongata*, female. A. Antennule. B. Antenna. C. Labrum. D. Left mandible. E. Right mandible. F. Maxillule. G. Maxilliped. H. Epignath. I. Cheliped.**

liped (Figure 5G) endites smooth. Palp article 1 smooth. Article 2 with 1 thick seta. Article 3 with 3 thick setae. Article 4 with 4 thick distal setae. Epignath (Figure 5H) as long as maxillule endite, smooth and with hook-shaped apex.

Cheliped. (Figure 5I) Basis divided unequally by sclerite, shorter than carpus. Merus triangular with 1 ventral seta. Carpus longer than propodus including fixed finger, smooth. Propodus with 1 simple seta at dactylus insertion. Fixed finger without serrations, with 2 ventral setae and 2 on inner margin. Dactylus smooth.

Pereopod 1. (Figure 6A) Coxa with 1 simple seta. Basis longer than 3 succeeding articles together, smooth. Ischium with 1 simple seta. Merus shorter than carpus, widening distally and smooth. Carpus shorter than dactylus, smooth. Propodus 2/3 as long as basis, with 1 simple, dorsal distal seta and 1 dorsal distal spine. Dactylus and terminal seta shorter than propodus.

Pereopod 2. (Figure 6B) as pereopod 1 except coxa and ischium smooth. Merus and carpus with 1 simple distal seta. Propodus with 1 simple, ventral distal seta and 1 dorsal spine.

Pereopod 3. (Figure 6C) As pereopod 2 except carpus with 2 simple distal setae.

Pereopod 4. (Figure 6D) As pereopod 3 except merus with 1 simple and 1 thick distal seta. Carpus with 4 thick and 1 simple distal seta. Propodus as long as carpus, with 3 simple distal setae. Dactylus and terminal seta longer than propodus.

Pereopod 5. (Figure 6E) As pereopod 4 except ischium with 1 simple seta. Carpus with 3 thick and 1 simple distal seta.

Pereopod 6. (Figure 6F) As pereopod 4 except merus with 3 distal setae. Carpus with 3 distal setae. Propodus with 4 dorsal and 1 ventral distal seta.

Pleopods. No pleopods on female.

Uropods. (Figure 6G) Protopod smooth. Endopod with 2 articles; article 1 longer than article 2, smooth; article 2 with 5 long, simple distal setae. Exopod about 1/2 as long as endopod article 1, with 2 simple distal setae.

Description. Adult male (when different from female).

Body. (Figure 4C) 13 times longer than broad.

Cephalothorax. Shorter than combined length of pereonite 1 and 2.

Pleon. Pleonites longer than female pleopods. Pleotelson shorter than combined length of 3 pleonites.

Mouthparts. Left mandible (Figure 7D) incisor with more denticles than female

Pleopods. (Figure 7O) Protopod smooth. Endopod rectangular, with 6 simple distal setae. Exopod rectangular, with 8 simple distal setae.

Remarks. This species was one of a large number of filiform species found in the deep-sea Gulf samples. The

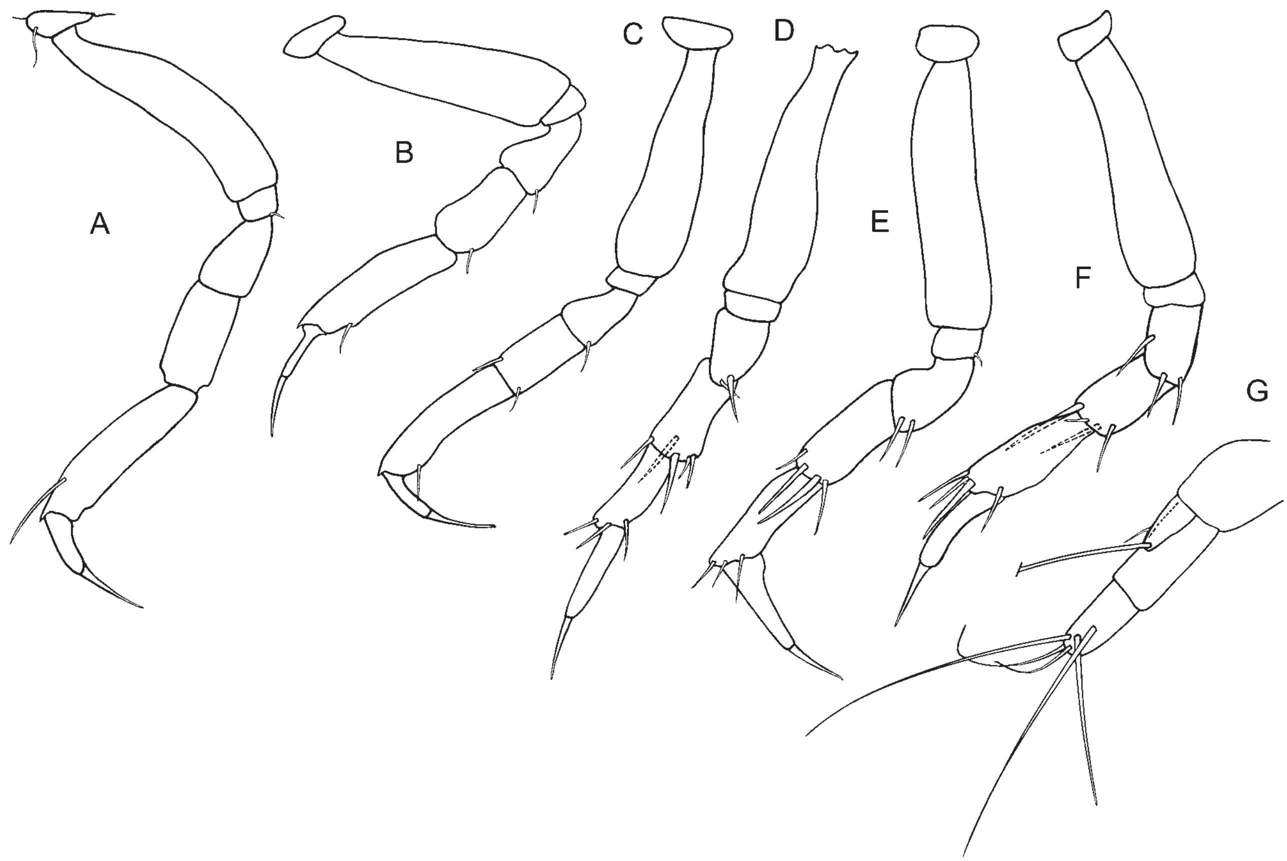

Figure 6. ***Collettea elongata*, female. A. Pereopod 1. B. Pereopod 2. C. Pereopod 3. D. Pereopod 4. E. Pereopod 5. F. Pereopod 6. G. Uropod.**

filiform body-shape does not appear to belong to one natural group; a large number of different evolutionary lines seem to be present (Larsen, research in progress), all having adapted to this niche by turning "worm-like". The difference in length of pleonites in the 2 sexes is puzzling and it cannot be excluded that a "colletteid" species complex of small elongate forms exists.

Paragathotanais Lang, 1971

Diagnosis. (modified after Lang, 1971 and Bird and Holdich, 1988) Female: Antennule with 4 articles. Antenna with 4–6 articles. Mandibles with posteriorly directed pointed molar; lacinia mobilis of left mandible spiniform. Maxillule with 10–11 terminal spiniform setae. Labium with distal processes. Epignath without terminal spine. Cheliped attached with or without pseudocoxa to ventral surface of cephalothorax. Pereopods with coxae. Pleon with 5 free pleonites. Pleonites narrower than pereonites and pleotelson. Uropodal protopod not fused with uniarticulated endopod; exopod reduced to a minute projection, giving rise to one or more setae. Pleotelson with dorsal distal plate. Male: Antennule thicker than that of female. Mouthparts resemble, but are not identical to those, of females; maxillule with fewer terminal spiniform setae. Labium with less pronounced distal processes. Pleopods with simple setae present on all pleonites. Pleonites as thick as other somites.

P. medius sp. nov. (Figures 8–9)

Material examined.—1 non-ovigerous female holotype, body length 1.8 mm. Station C7-2. 30 May 00. 27°43.9713'N, 89°58.6211'W. Depth 1070 m.—Paratypes: 1 non-ovigerous female and 1 male. Same locality.

Other material.—5 non-ovigerous females. Station C7-1. 30 May 00. 27°43.6967'N, 89°58,7782'W. Depth 1980 m. 17 non-ovigerous females. Station MT3-1.16 Jun 00. 28°13.2246'N, 89°29,7679'W. Depth 983 m.—1 non-ovigerous female. Station MT4-1.15 Jun 00. 28°49.6198'N, 89°09,9526'W. Depth 1401 m.—5 non-ovigerous females. Station NB3-2. 08 May 00. 26°33,3912'N, 91°49,4653'W. Depth 1875 m.—3 non-ovigerous females. Station RW1-1. 23 May 00.

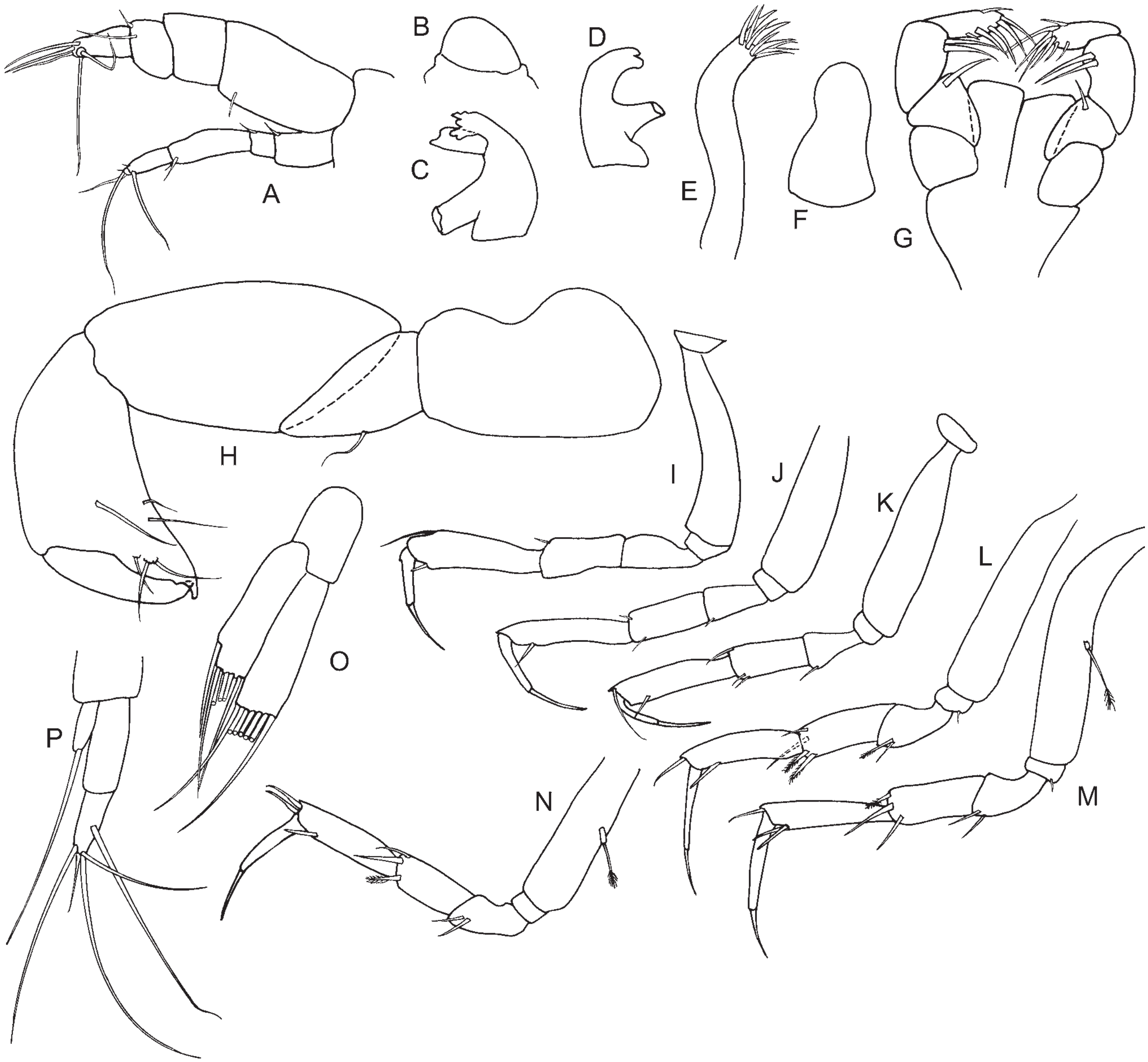

Figure 7. ***Collettea elongata*, male. A. Antennule and Antenna. B. Labrum. C. Left mandible. D. Right mandible. E. Maxillule. F. Maxilla. G. Maxilliped. H. Cheliped. I. Pereopod 1. J. Pereopod 2. K. Pereopod 3. L. Pereopod 4. M. Pereopod 5. N. Pereopod 6. O. Pleopod. P. Uropod.**

27°30,0242'N, 96°00,1437'W. Depth 213 m.—5 non-ovigerous females. Station RW1-2. 23 May 00. 27°29,9333'N, 96°00,2164'W. Depth 213 m.—5 non-ovigerous females. Station S37-1. 13 Jun 00. 28°33.4054'N, 87°45.7357'W. Depth 2388 m.—1 non-ovigerous female. Station S39-1. 06 Jun 00. 27°29.9500'N, 87°00.0849'W. Depth 3007 m.—6 non-ovigerous females. Station S42-1. 09 Jun 00. 28°15.1557'N, 86°25.0663'W. Depth 767 m.—3 non-ovigerous females. Station W2-1. 14 May 00. 27°24.8008'N, 93°20.2579'W. Depth 625 m.—1 non-ovigerous female. Station W2-2. 14 May 00. 27°24.7019'N, 93°20.3849'W. Depth 625 m.—1 non-ovigerous female. Station W3-1. 14 May 00. 27°10.3711'N, 93°19.3081'W. Depth 860 m.—1 non-ovigerous female. Station W5-1. 16 May 00. 26°15.967'N, 93°21.680'W. Depth 2755 m.—1 non-ovigerous female. Station W12-1. 05 May 00. 27°19.3945'N, 91°33.3486'W. Depth 1168 m.—1 non-ovigerous female. Station B1-2. 06 May 00. 27°12.1374'N, 91°24.1806'W. Depth 2255 m.—2 non-ovigerous females. Station B3-2. 10 May 00. 26°09.7884'N, 91°43.9954'W. Depth 2580 m.—8 non-ovigerous females. Station C7-2. 30 May 00. 27°43.9713'N, 89°58.6211'W. Depth 1070 m.—1 non-ovigerous female. Station MT5-1. 03 Jun 00. 27°19.9308'N, 88°40.0690'W. Depth 2275 m.—4 non-ovigerous females. Station NB2-2. 07 May 00. 27°08.2040'N, 91°59.9207'W. Depth 1530 m.—2 non-ovigerous females. Station NB4-2. 11 May 00. 26°14.9693'N, 92°23.4731'W. Depth 2050 m.—3 non-ovigerous females. Station NB5-2. 09 May 00. 26°15.0855'N, 91°12.7524'W. Depth 2060 m.—2 non-ovigerous females. Station S35-2. 11 Jun 00. 29°19.9897'N, 87°02.9021'W. Depth 667 m.—1 non-ovigerous female. Station S37-2. 13 Jun 00. 28°33.4292'N, 87°45.6441'W. Depth 2382 m.—3 non-ovigerous females. Station S42-2. 10 Jun 00. 28°15.1070'N, 86°25.0209'W. Depth 768 m.

Diagnosis. Antenna with 4 articles; article 3 with distal fusion line.

Etymology. Named to reflect that the structure of the antenna of this species is intermediate between that of *Agathotanais* and *Paragathotanais*, (Latin *medius* = intermediate).

Description. Adult female

Body. (Figures 8A, B) 6.5 times longer than broad.

Cephalothorax. Shorter than combined length of pereonite 1 and 2.

Pereonites. Pereonites with clearly defined shoulders. Pereonites 1, 2, and 6 wider than long. Pereonite 3 length subequal to width. Pereonites 4 and 5 longer than wide.

Pleonites. Narrower than pereonites and pleotelson.

Pleon. All pleonites subequal and lacking pleopods. Pleotelson with dorsal distal plate.

Antennule. (Figure 8E) Length shorter than cephalothorax. Article 1 longer than rest of antennule, with 1 simple and 3 sensory setae. Article 2 longer than article 3, with 1 simple distal seta. Article 3 longer than article 4, with 2 simple distal setae. Article 4 length 1/4 that of article 1, with 4 simple distal setae.

Antenna. (Figure 8F) With 4 articles. Marginally longer than antennule article 1. Article 1 twice as long as article 2, smooth. Article 2 square, smooth. Article 3 longer than combined length of other antenna articles, with distal fusion line, 1 distal and 2 simple subdistal setae. Article 4 minute with 2 distal setae.

Mouthparts. Labrum (Figure 8I) hood shaped, setose. Left mandible (Figure 8K) lacinia mobilis short and spiniform, incisor broad and bifurcate, molar apparently without denticles. Maxillule (Figure 8N) endite with 10 distal spiniform setae, palp not recovered. Maxilla not recovered. Maxilliped (Figure 8O) endites with uneven distal margin and no setae. Basis only marginally wider than endites. Palp article 1 smooth. Article 2 with 2 thick setae. Article 3 with 3 thick setae on inner margin. Article 4 with 4 thick distal setae. Epignath not recovered.

Cheliped. (Figure 9A) Basis divided into a pseudocoxa as long as basis proper. Merus triangular, with both ventral and dorsal margin visible, smooth. Carpus shorter than propodus, with 2 dorsal setae and 1 ventral seta. Propodus slender and smooth. Fixed finger with 1 distal process, 2 ventral setae and 3 on inner margin. Dactylus smooth.

Pereopod 1. (Figure 9B) Coxa smooth. Basis longer than 3 succeeding articles together, smooth. Ischium smooth. Merus shorter than carpus, widening distally, with 2 thick, simple ventral setae. Carpus shorter than propodus, rectangular, with 3 distal setae, 2 thick and 1 simple. Propodus longer than half of basis, with 1 simple seta on each margin and dorsal distal spine. Dactylus and terminal setae as long as propodus.

Pereopod 2. (Figure 9C) As pereopod 1 except ischium and merus with 1 simple seta. Carpus with 3 distal setae, 2 spiniform and 1 serrate. Propodus with 1 simple ventral seta and blunt dorsal spine.

Pereopod 3. (Figure 9D) As pereopod 1 except basis with 1 dorsal sensory seta. Propodus with 1 simple ventral seta and dorsal spine.

Pereopod 4. (Figure 9E) Basis not apparently wider than on pereopod 1–3, with 1 sensory seta, Ischium smooth. Merus with 2 simple distal setae, shorter than carpus. Carpus with 4 thick distal setae. Propodus with 4 distal setae, 3 thick and 1 thick, serrate; 1 dorsal spine. Dactylus and terminal seta, longer than propodus.

Pereopod 5. (Figure 9F) As pereopod 4 except basis with 2 sensory setae. Ischium with 1 ventral seta. Carpus with 3 thick distal seta.

Pereopod 6. (Figure 9G) As pereopod 5 except basis smooth. Carpus with 2 thick distal setae.

Pleopods. All pereonites lacking pleopods on female.

Uropods. (Figure 8U) Protopod less than 1/2 the length of article 2, with 0–1 simple distal seta. Endopod with 2 long distal setae.

Description. Adult male (when varying from female).

Body. (Figures 8C, D) Somewhat shorter than female.

Pereonites. Pereonites 1, 2, 3, and 6 wider than long. Pereonites 4 and 5 length subequal to width.

Pleonites. As wide as pereonites and pleotelson.

Antennule. (Figure 8G) With 5 articles. Article 1 shorter than rest of antennule, with 5 simple setae. Article 5 minute with 3 simple setae and 1 aesthetascs.

Mouthparts. Left mandible (Figure 8L) lacinia mobilis shorter than females. Incisor with more denticles than female. Maxillule (Figure 8M) endite with 8 spiniform distal setae.

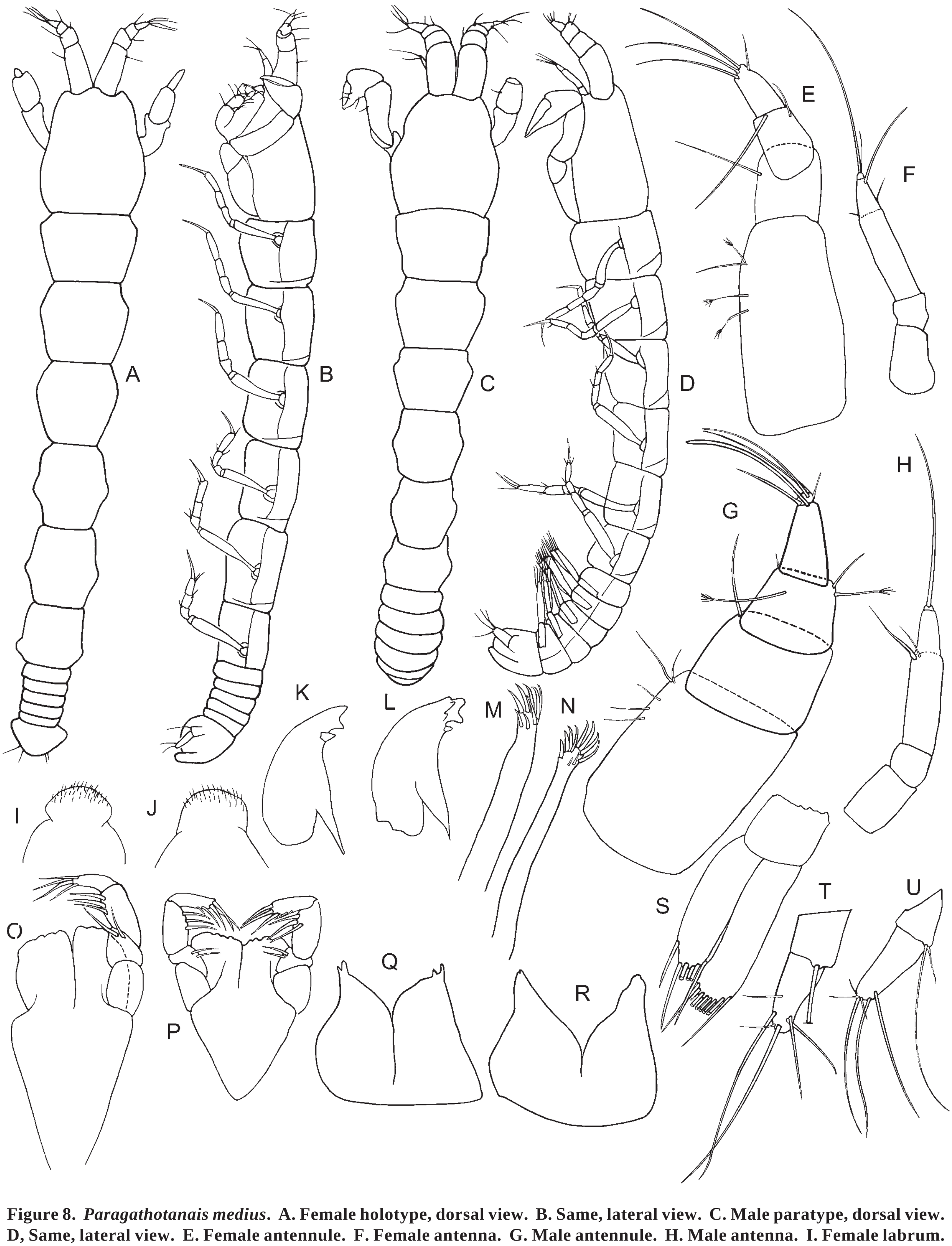

Figure 8. ***Paragathotanais medius*. A. Female holotype, dorsal view. B. Same, lateral view. C. Male paratype, dorsal view. D, Same, lateral view. E. Female antennule. F. Female antenna. G. Male antennule. H. Male antenna. I. Female labrum. J, Male labrum. K. Female left mandible. L. Male left mandible. M. Male maxillule. N. Female maxillule. O. Female maxilliped. P. Male maxilliped. Q. Male labium. R. Female labium. S. Male pleopod. T. Male uropod. U. Female uropod.**

Figure 9. ***Paragathotanais medius*****. A–G female, H–N male. A. Cheliped. B. Pereopod 1. C. Pereopod 2. D. Pereopod 3. E. Pereopod 4. F. Pereopod 5. G. Pereopod 6. H. Cheliped. I. Pereopod 1. J. Pereopod 2. K. Pereopod 3. L. Pereopod 4. M. Pereopod 5. N. Pereopod 6.**

Cheliped. (Figure 9H) Fixed finger with 1 ventral seta.

Pereopods. (Figures 9I–N) Generally similar to female.

Pleopods. (Figure 8S) Protopod square and smooth. Endopod and exopod armed with 6 and 8 simple distal setae respectively.

Remarks. Besides the reduced antenna, *P. merus* also displays a cheliped with pseudocoxa, a feature not found in other species of *Paragathotanais.* This finding is most surprising and cannot be explained at this time.

KEY TO *PARAGATHOTANAIS*

1. Antenna article 2 with spinules .... *P. gracilis*

   Antenna article 2 without spinules 2

2. Cheliped stout (length-width ratio of carpus 1.5) 3

   Cheliped slender (length-width ratio of carpus 2.3) 4

3. Pleotelson apex smoothly rounded. Cheliped fixed finger with 2 processes. Cheliped dactylus with 2 short spiniform setae .... *P. nanus*

   Pleotelson apex pointed. Cheliped fixed finger with 1 process. Cheliped dactylus without 2 short spiniform setae .... *P. macrocephalus*

4. Antenna with 4 articles. Labium without lateral setae. Cheliped with pseudocoxa .... *P. medius*

   Antenna with 5 or more articles. Labium with lateral setae. Cheliped without pseudocoxa 5

5. Maxillule palp article 3 with inner spine. Cheliped dactylus with 1 short spiniform seta .... *P. typicus*

   Maxillule palp article 3 without inner spine. Cheliped dactylus with 2 short spiniform setae .... *P. robustus*

ACKNOWLEDGMENTS

Funding was provided by the Danish Natural Science Council. Material used in this report was provided by Texas A&M University under a contract (1435-01-99-CT-30991) to them from the Minerals Management Service, Department of the Interior. Thanks to G. Rowe and G.F. Hubbard, Texas A&M University, for overseeing the collection and processing of the specimens and for their encouragement and support during this project. Also thanks to J. McLelland, Department of Coastal Sciences, The University of Southern Mississippi, who kindly reviewed an earlier draft of the manuscript and to R. Ritger for scanning the figures.

LITERATURE CITED

Bird, G.J. and D.M. Holdich. 1988. Deep-sea Tanaidacea (Crustacea) of the north-east Atlantic: The tribe Agathotanaini. Journal of Natural History 22:1591–1621.

Gardiner, L.F. 1975. The systematics, postmarsupial development, and ecology of the deep-sea family Neotanaidae (Crustacea: Tanaidacea). Smithsonian Contributions to Zoology 170:1–265.

Kudinova-Pasternak, R.K. 1989. Tanaidaceés abyssales (Crustacea, Tanaidacea) des parties Nord-Est et Centrale de l´Ocean Indien (d´Aprés des matériaux de l´expédition française *Safari II*). 2. Sous-ordre Tanaidomorpha. Zoologicheskii Zhurnal 68:27–40.

Kudinova-Pasternak, R.K. 1990. Tanaidacea (Crustacea, Malacostraca) of the underwater ridge Naska in the Pacific. Zoologicheskii Zhurnal 69:135–140.

Lang, K. 1968. Deep-sea Tanaidacea. Galathea Report 9:23–209.

Lang, K. 1971. Die Gattungen *Agathotanais* Hansen und *Paragathotanais* n.gen. (Tanaidacea). Crustaceana 21:57–71.

Larsen, K. 1999. Pacific Tanaidacea (Crustacea): Revision of the genus *Agathotanais* with description of three new species. Records of the Australian Museum 51:99–112.

Larsen, K. 2000. Revision of the genus *Collettea* Lang (Crustacea: Tanaidacea). Invertebrate Taxonomy 14:681–693.

Larsen, K. 2001. Morphological and molecular investigation of polymorphism and cryptic species in tanaid crustaceans; implications for tanaid systematics and biodiversity estimates. Zoological Journal of the Linnean Society 131:353–379.

Larsen, K. and G.D.F. Wilson. Tanaidacean phylogeny. The first step: The superfamily Paratanaidoidea. Journal of Zoological Systematics and Evolutionary Research. In press.

Sieg, J. 1984. Neuere erkenntnisse zum natürlichen system der Tanaidacea. Eine phylogenetisch Studie. Zoologica 136:1–132.

Sieg, J. 1986. Crustacea Tanaidacea of the Antarctic and Subantarctic. 1. On material collected at Tierra del Fuego, Isla de los Estados, and the west coast of the Antarctic peninsula. Biology of the Antarctic Seas 45:1–180.

Wilson G.D.F. 1987. Crustacean communities of the manganese nodule province. Report for the National Oceanic and Atmospheric Administration Office of Ocean and Coastal Resource Management (Ocean Minerals and Energy) on contract 40-AANC-701124. Scripps Institution of Oceanography, p. 44.