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Family *incertae cedis* *

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Abstract

A heterogeneous collection of tanaidomorphan species that are no longer assigned to existing families is recorded in the Kurile-Kamchatka Trench and the Japan Trench, belonging to six genera: *Akanthophoreus*, *Chauliopleona*, *Exspina*, *Leptognathia sensu lato*, *Leptognathioides* and *Robustochelia*. Three new species of *Akanthophoreus* Sieg, 1986 are described, and four putative taxa are outlined to facilitate consistent identification in future studies.

Key words: Tanaidacea, *Akanthophoreus*, *Chauliopleona*, *Exspina*, *Leptognathia*, *Leptognathioides*, *Robustochelia*, Kurile-Kamchatka Trench, the Japan Trench

Introduction

Complexity, instability and seemingly irreducible inconsistency have characterized the taxonomy of tanaidomorphan tanaidaceans for many years, especially at family level (Larsen & Wilson 2002). The longest period of stability existed for about thirteen years, between the writings of Sieg (1973 - or 1976 for published date) and Sieg (1986a), after which a new classification was established. For the family Leptognathiidae *sensu* Sieg, 1973, this was largely, although not solely, based on an analysis of pereopod setation, in particular the presence or absence of spiniform setae, or 'spines', on the carpus of pereopod 1 (Sieg 1986a); this resulted in the establishment of two subfamilies (Akanthophoreinae Sieg, 1986a and Leptognathiinae Sieg, 1973) within a greatly expanded Anarthruridae Lang, 1971. This was all overturned following a phylogenetic analysis of Paratanoidea genera based on representative species, by Larsen & Wilson (2002). Part of its outcome, aside from the establishment of several new families such as the Colletteidae and Tanaellidae, was the removal of many genera from new and existing families into a state of *incertae cedis*. Their reduced status was attributed largely to poor or inadequate descriptions but it was accepted that some of the vagueness in the analysis was due to insufficient character states. It is also evident that a proportion of the characters used in the analysis, or their given states for particular taxa, were inappropriate or invalid. Additional complexity, and factors that have mislead earlier authorities, are intrusion by extensive homoplasies, apparent character-state reversals and convergent evolution. At some point this will require a new analysis.

Of direct relevance to the present study of Kurile-Kamchatka Trench and the Japan Trench tanaidaceans is the recording of many species that belong to this large *incertae cedis* category, several of which were omitted from the listing given by Larsen & Shimomura (2007). Among them are several which belong to a genus that is equally complex and controversial, *Akanthophoreus* Sieg, 1986a. Three new species are described and three putative species are outlined, along with accounts of species belonging to the genera *Chauliopleona* Dojiri & Sieg, 1997, *Exspina* Lang, 1968, *Leptognathioides* Bird & Holdich, 1984, *Robustochelia* Kudinova-Pasternak, 1983 and *Leptognathia sensu lato*.

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Methods

Terminology follows Larsen (2003). Measurements of body length are from tip of the rostrum to the apex of the pleotelson. Drawings were made with the aid of a camera-lucida attachment.

Systematics

Family *incertae cedis* Larsen & Wilson (2002)

Remarks. From the list given by Larsen & Wilson (2002: 206**)** the following are now housed in existing families: *Anarthrura* G.O. Sars, 1882, *Anarthruropsis* Lang, 1968 and *Siphonolabrum* Lang, 1972 in the Anarthruridae Lang, 1971 (Bird 2004); *Leptognathia* G.O. Sars, 1882 in Leptognathiidae Sieg, 1973 (Larsen & Wilson, 2002) and *Meromonakantha* Sieg, 1986a in the Nototanaidae Sieg, 1976 (Larsen 2005).

Genus Akanthophoreus Sieg, 1986a

(Restricted synonymy and bibliography)

Akanthophoreus Sieg, 1986a: 21–24. Guerrero-Kommritz, 2004: 8–10. Larsen & Wilson, 2002: 2, 14.

Leptognathia G.O. Sars, 1882 (*partim*): Hansen, 1913 [for *A. gracilis*, *A. inermis*, *A. longiremis* and *A. multiserratus* listed below].

Paraleptognathia Kudinova-Pasternak, 1981 (*partim*): Guerrero-Kommritz, 2004 [for species listed below]. Sieg, 1986a: 40–44 [synonymy of *P. antarctica* with *A. antarctica* (Vanhöffen, 1914) listed below].

Scoloura Sieg & Dojiri, 1991: 1495–1501. Dojiri & Sieg, 1997: 228–231. Larsen & Wilson, 2002: 2, 14.

Type species: *Tanais gracilis* Krøyer, 1842, by designation (Sieg 1986a).

Species included (Japanese and Kurile-Kamchatka species in bold): *A. antarctica* (Vanhöffen, 1914), East Antarctica; *A. australis* (Beddard, 1886) Antarctica, sub-Antarctica, Kerguelen Islands; ***A. crassicauda* n.sp.**; ***A. gracilis*** (Krøyer, 1842) [?]; ***A. imputatus* n.sp**; *A. inermis* (Hansen, 1913), Arctic Ocean; ***A. longiremis*** (Lilljeborg, 1864) [?], NE Atlantic; *A. multiserratus* (Hansen, 1913) Iceland, Faeroe Islands; ***A. undulatus* n.sp**; *A. weddellensis* Sieg, 1986a, Antarctica, sub-Antarctica. Other species that probably belong in this genus but were transferred *directly* from *Leptognathia* to *Paraleptognathia*, or have *Paraleptognathia* as their primary generic name (Guerrero-Kommritz 2004; Dojiri & Sieg 1997) are excluded here until a formal review/decision is presented.

Diagnosis (modified after Sieg 1986a). *Female*. Antennule four-articled. Antenna six-articled, article 4 often with a suture line (pseudo-articulation). Molar process thick, with several terminal spines. Maxillule endite with nine terminal spiniform setae. Epignath ends with a long, thick seta. Maxilliped basis with long seta near articulation with palp; palp article 2 with two inner plumose setae and a long plain seta, and outer spiniform seta; article 3 with two inner plumose setae. Pereopods 1–3 with, pereopod 4–6 without, coxa. Merus of pereopod 1 with one spiniform seta, carpus with two. Carpus of pereopod 3 with three spiniform setae. Dactylus of pereopods 4–6 long and grooved, with double row of small spines; carpus of pereopods 4–6 with three spiniform setae and smaller seta. Pleopod biramous, exopod inner row with strong proximal setae. Uropod biramous, endopod and exopod two-articled. Marsupium of four pairs of oostegites.

Preparatory male. Generally as above but antennule thicker, four or five-articled. Pleon and pleopods proportionately larger.

Natatory male (when present). Habitus quite distinct from female, with enlarged pleon and shorter pereon (pereonites much broader than long). Antennule seven-articled, with numerous aesthetascs. Mouthparts reduced, with remnants of maxilliped, maxillule palp, maxilla and epignath.

Remarks. Considerable confusion and generic transfers have accompanied this genus, the establishment of which was originally a much-needed initiative by Sieg (1986a) in separating the taxon from the 'dustbin' that *Leptognathia* had become. This had been exacerbated by Lang (1968) with the synonymising of several genera with *Leptognathia*. Three separate issues have conspired to create a near-intractable taxonomic and nomenclatural status, overlaying the already complex morphological character-state distributions. First, it was unfortunate that Sieg selected *Leptognathia gracilis* (Krøyer, 1842) as the type species for *Akanthophoreus*, since this is itself an apparently complex taxon, the original description was poor (but of its time), and the type specimen is damaged, incomplete and barely recognizable.

Secondly, it is clear that Krøyer's original species (type locality 'Spitsbergen'), is identical to *Leptognathia longiremis sensu* Sars (1896), itself synonymous with *Leptognathia sarsi* Hansen, 1909. This is a large and robust species characterized primarily by lateral pleotelson spurs as well as crenulated margins on the cheliped propodus and dactylus. Because Sieg's view of *Akanthophoreus gracilis* (e.g. Sieg 1986a) did not match the *longiremis sensu* Sars/*sarsi* taxon, a new genus, *Scoloura* Sieg & Dojiri, 1991, was established for a Californian species with pleotelson spurs. Rather than mention the obvious similarity with *Leptognathia longiremis sensu* Sars/*sarsi*, comparisons were made with *Mimicaraphura* Sieg, 1986a and *Paraleptognathia* Kudinova-Pasternak, 1981. It is possible that Sieg was also influenced by the perceived discrepancy in the number of maxillule endite spines – up to eleven in the known species of *Akanthophoreus* but only nine in *Scoloura*.

Thirdly, scarce mention was made of the genus *Scoloura* by Guerrero-Kommritz (2004) in his revision of *Paraleptognathia*, with which *Akanthophoreus* was synonymized – only to remark that the resemblance was "very intriguing". This revision, and probably for the same motive that Sieg had earlier (and without published reasons) switched generic names from *Akanthophoreus* to *Paraleptognathia*, was based on the five-articled antennule expressed in preparatory (sub-adult) males in some species of *Akanthophoreus* that appeared to be directly homologous with that of the species *Paraleptognathia typica* Kudinova-Pasternak, 1981. That (i), this character also appears in other genera, including the very close sibling taxon *Chauliopleona*, (ii) not all species of *Akanthophoreus* have five-articled antennules in preparatory males and (iii) *Paraleptognathia* was inadequately described by Kudinova-Pasternak and appears to have highly modified chelipeds, with dentition on the proximal part of the fixed finger, a highly expanded carpal shield and with extensive surface ornamentation/armament, makes this synonymy untenable.

It is also becoming apparent that the genus *Akanthophoreus* itself may be masking several genus-level species groups and the overlap of characters within these and the closely related genera *Chauliopleona* and *Paraleptognathia sensu* Guerrero-Kommritz needs further investigation. However, while it is not the intention to fully revise either *Akanthophoreus* or *Paraleptognathia* here, it is unavoidable that synonymies are briefly mentioned; a new look at the *A. gracilis-A. longiremis* complex from Icelandic/Faroese/west European waters is also in preparation (Bird *ined.*)

***Akanthophoreus crassicauda* n.sp.**

Figures 1–3

Material examined. Holotype, 1 non-ovigerous female (KMNH IvR 500.194), station XR-12, 41º37.67'–41º37.08'N 146º54.19'–146º52.72'E, 5473–5484 metres, 4 m ORE beam trawl, 23 September 2001.

Paratypes: 1 ovigerous female, 1 post-ovigerous male (partially dissected) and 1 preparatory male (KMNH IvR 500.195), same locality.

Diagnosis. *Akanthophoreus* with all pereonites shorter than broad. Pleotelson without lateral spurs. Cheliped carpus with weak shield; propodus and dactylus without crenulations. Dactylus/unguis of pereopods 1–3 short, half as long as propodus. Uropod stout, endopod articles three or four times as long as broad.

Etymology. From combination of Latin *crassus* 'thick' or 'stout' and *cauda*, 'tail', referring to the diagnostic uropods.

Description, *non-ovigerous female*.

Body (Fig. 1A). Fairly slender, 6.9 times as long as broad (Holotype), length 2.61 mm.

Carapace. Just shorter than pereonites 1–2 together (excluding pereonal gap), 1.3 times as long as broad, with parallel margins for posterior two-thirds portion; rostrum a slight sub-triangular process.

Pereonites. With weakly convex lateral margins, pereonite 1 slightly narrower posteriorly, pereonites 1–6 0.55, 0.59, 0.68, 0.69, 0.67, 0.62 times as long as broad, respectively.

Pleon (Fig. 1B). Shorter than preceding two pereonites, 14.6% of body length, all pleonites much wider than long, with long seta on epimeral margin; each pleonite sternum rounded in lateral profile.

Pleotelson (Figs 1C). Longer than two preceding pleonites, shorter than broad, with rounded posterior margin in dorsal view obscuring deflected apex; four setae (two sensory) on posterior margin.

Antennule (Fig. 1D). Slender, about 0.75 times as long as carapace. Article 1 just over half of total length, 3.1 times as long as broad (mid-length), with disto-outer seta and sensory setae and more proximal group of three sensory setae. Article 2 sub-rectangular, 1.24 times as long as broad, with a long disto-outer seta and one smaller inner seta. Article 3 half as long as article 2, with two setae. Article 4 twice as long as article 3, 2.8 times as long as broad, with four long, quite thick setae, one small seta and one aesthetasc.

Antenna (Fig. 1E). Slender, about 0.74 times as long as antennule. Articles 1–3 short, but article 2 larger than article 3, both with dorsal seta, two on article 2. Article 4 almost half as long as antenna, about five times as long as broad, with pseudo-articulation near mid-point, accompanied by a sensory seta, terminally with two long setae and at least three sensory setae. Article 5 slender, three times as long as broad, with terminal seta. Article 6 small, with four unequal setae.

Mouthparts. Labrum (Fig. 2A) of sub-conical or sub-triangular lateral profile. Labium (Fig. 2B) typical of genus. Maxilla not recovered. Mandibles (Figs 2C–D) strong, with dentate incisor and molar with acuminate shape, terminally with about eight unequal spines, longer apically; left mandible with at least bicuspid lacinia mobilis. Maxillule (Fig. 2E) palp with two setae and endite with nine spiniform setae, two of which are pectinate. Maxilliped (Figs 2F–G) basis fused and longer than endites, with long seta at base of each palp; endites unfused, each with weakly lobed distal margin, minutely setose lateral processes and distal seta; palp with stout articles 1–3, article 2 with three inner and one outer seta; article 3 with two long and two smaller setae; article 4 with four long and one smaller setae.

Cheliped (Figs 2H–I). With distinct pre-basal sclerite attachment. Basis with rounded free posterior margin and outer seta. Merus sub-triangular, with ventral seta. Carpus 1.9 times as long as broad, with very weak shield, two ventral setae and two dorsal setae. Propodus and terminal spine longer than carpus, 0.47 times as deep as long, dorsal crest with two processes (Fig. 2I) with four inner spiniform setae and one outer seta near articulation with dactylus. Fixed finger with two ventral setae, and three unequal setae near incisive margin, the latter with three unequal teeth, central one bifid. Dactylus strong, without crenulations.

Pereopod 1 (Fig. 3A). Coxa annular, with seta. Basis about 3.8 times as long as broad, with dorsal plumose setae. Ischium with seta. Merus with inner slender seta and outer spiniform seta. Carpus as long as merus, rectangular, 2.2 times as long as broad, with one dorsal and one ventral terminal spiniform seta. Propodus slender, largely devoid of small spinules, 1.5 times as long as carpus, with disto-ventral spiniform seta and terminal fringe of small setae. Dactylus and unguis together just over half as long as propodus, unguis as long as dactylus, with spatulate tip.

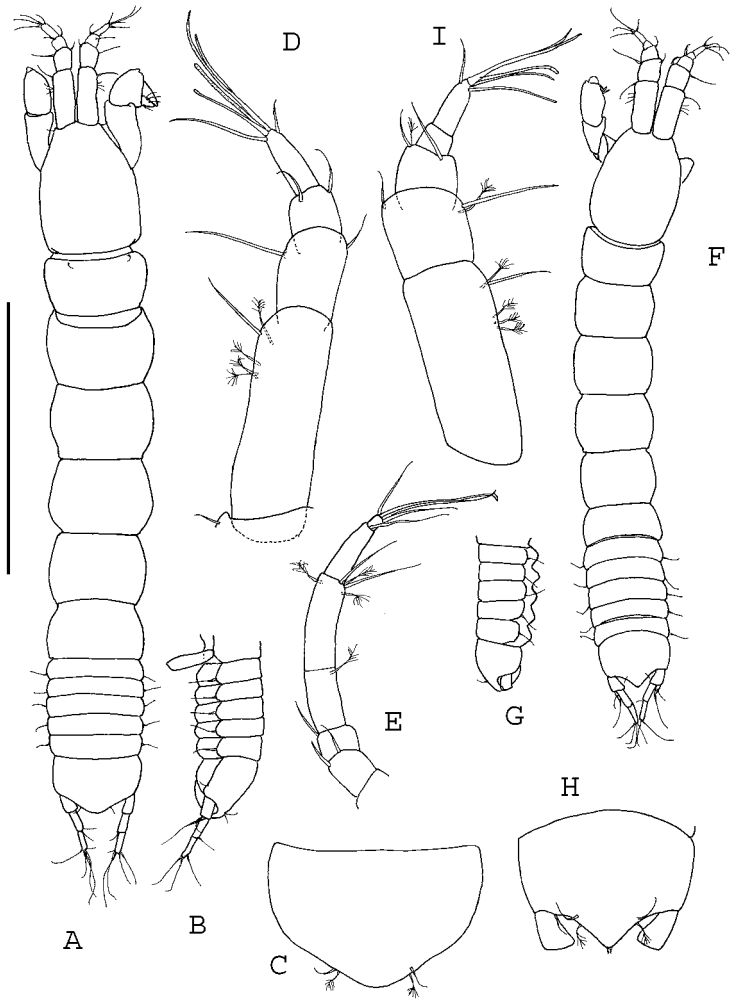

FIGURE 1. *Akanthophoreus crassicauda* n.sp. A–E, non-ovigerous female. A, habitus; B, pleon, lateral view (pleopods omitted for clarity); C, pleotelson; D, left antennule; E, antenna; F–I, preparatory male; F, habitus; G, pleon, lateral view (pleopods omitted for clarity); H, pleotelson, full profile of apex; I, right antennule. Scale bar = 1 mm for A, B, F and G, 0.42 mm for C and H, 0.23 mm for D and E.

Pereopod 2 (Fig. 3B). Similar to pereopod 1 but carpus with three spiniform setae. Propodus with a few ventral spinules.

Pereopod 3 (Fig. 3C). Similar to pereopod 2 but basis without sensory seta. Dactylus with accessory seta (possibly present on pereopods 1–2).

Pereopod 4 (Fig. 3D). With no discrete coxa. Basis slightly longer than in pereopods 1–3. Ischium with two setae. Merus with two unequal spiniform setae. Carpus rectangular, longer than merus, with three long spiniform setae and one smaller rod-like dorsal seta. Propodus longer than carpus, with two ventro-distal pectinate setae and one dorso-distal spiniform seta. Dactylus and unguis as long as propodus, dactylus with double row of spinules on inferior margin.

Pereopod 5 (Fig. 3E). Similar to pereopod 4.

Pereopod 6 (Fig. 3F). Similar to pereopods 4–5 but propodus with two additional dorso-distal spiniform setae.

Pleopod (Fig. 2J). Relatively small compared to pereopods, both rami sub-ovate. Endopod with five terminal setae. Exopod two-articled, with five terminal setae and one on small article 1.

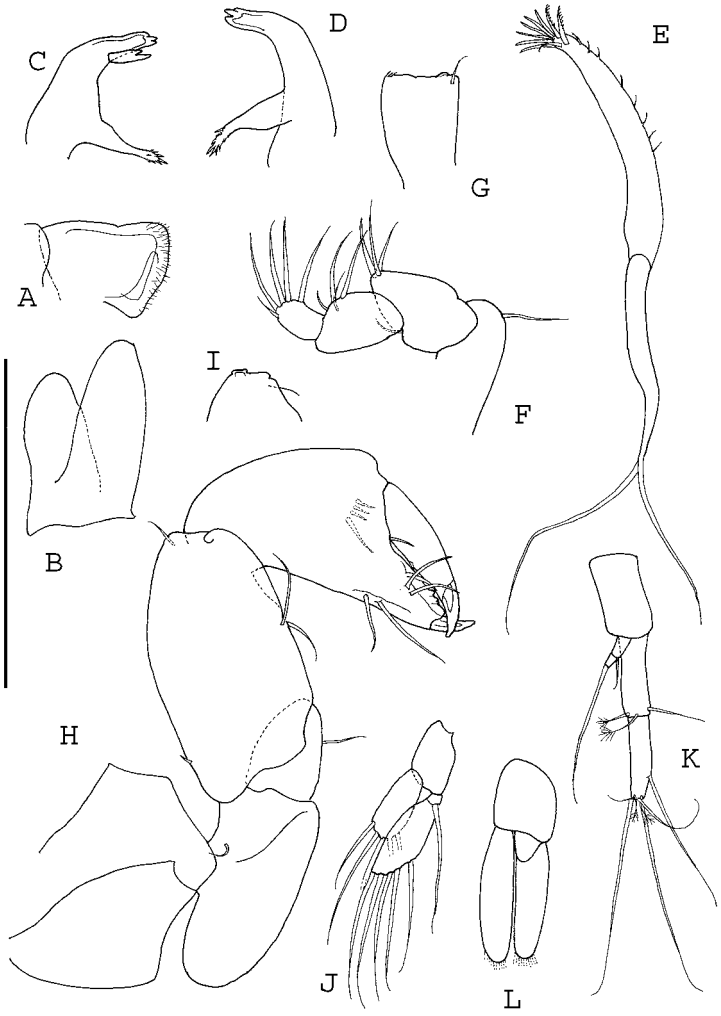

FIGURE 2. *Akanthophoreus crassicauda* n.sp. A–K non-ovigerous female. A, labrum, lateral view; B, labium; C–D, left and right mandibles, respectively; E, maxillule; F, maxilliped palp and distal basis in lateral view; G, maxilliped endite; H, right cheliped; I, cheliped propodal crest, dorsal view; J, pleopod; K, uropod; L, pleopod, preparatory male, for comparison with Fig. 2J. Scale bar = 0.33 mm for H and K, 0.25 mm for J and L, 0.2mm for A-G.

Uropod (Fig. 2K). Relatively stout (for genus), only as long as pleotelson and half of preceding pleonite. Basal article about twice as long as broad. Exopod two-articled, barely half as long as article 1 of endopod, with one seta on article 1 and one long seta on article 2. Endopod two-articled, article 1 just over half total length of endopod, as long as basal article, just over three times as long as broad, with one long distal seta and two distal sensory setae, article 2 as long as article 1, about four times as long as broad, with one distal seta and four unequal terminal setae, with two sensory setae.

Ovigerous female. Generally as non-ovigerous female, but pereon more dorso-ventrally compressed, with four pairs of oostegites; length 2.24 mm.

Post-ovigerous female. As ovigerous female but lacking oostegites, length 2.22 mm.

Preparatory male.

Body (Fig. 1F) generally as non-ovigerous female, but *pleon* (Figs 1F–G) slightly larger, 17% of body length, length 2.12 mm.

Pleotelson similar, but specimen shows full profile of triangular apex (Fig. 1H).

Antennule (Fig.1I) stouter, five-articled, i.e. with additional short article.

Pleopod (Fig. 2L) proportionately larger.

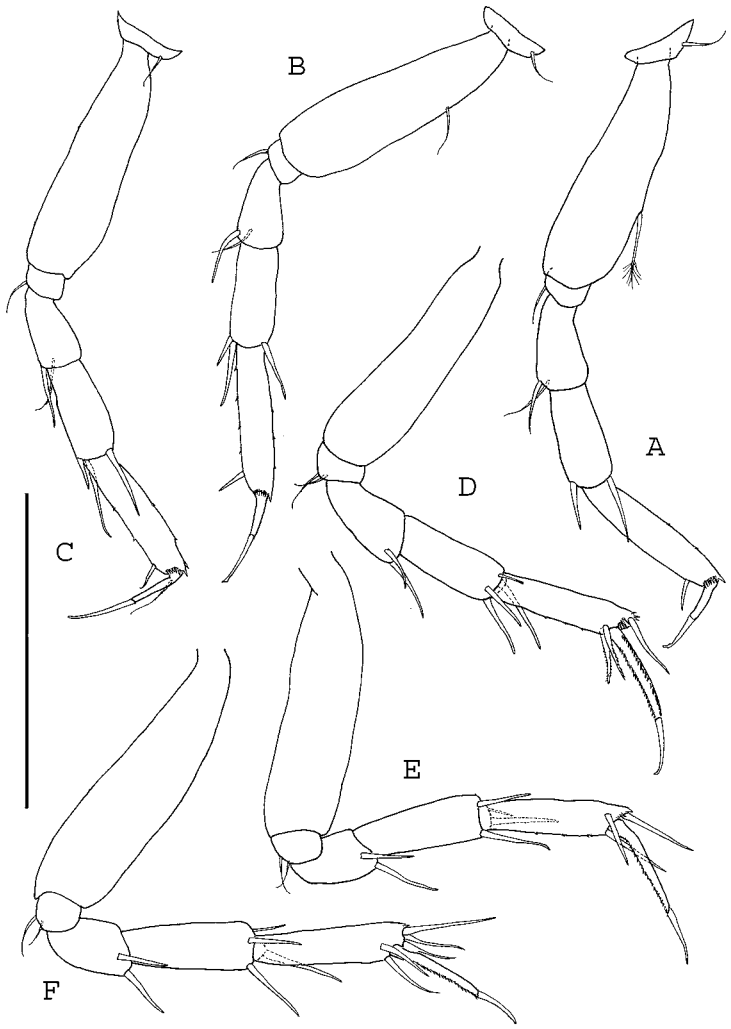

FIGURE 3. *Akanthophoreus crassicauda* n.sp. Non-ovigerous female. A–F, pereopods 1–6, respectively. Scale bar = 0.25 mm for A-F.

Remarks. This species is easily distinguished from other sympatric *Akanthophoreus* taxa by its relatively stout uropods, 'ordinary' chelipeds, short dactylus/unguis in pereopods 1–3 and the latter with a relatively 'smooth' carpus and propodus. A very similar, or possibly conspecific, species remains undescribed from the Iceland-Greenland region, some specimens of which were identified by Hansen (1913) as *Leptognathia hanseni* (i.e. the type material is a mixture of two species – Bird *ined.*) .

Distribution. Kurile-Kamchatka Trench, 5473–5484 metres.

Akanthophoreus cf *gracilis* (Krøyer, 1842)

(Restricted synonymy and bibliography)

Leptognathia gracilis (Krøyer, 1842): Kudinova-Pasternak, 1970: 354–355, fig. 8 [an uncertain synonym]. Kudinova-Pasternak, 1976: 118–119, [an uncertain synonym]. Kudinova-Pasternak, 1984: 829 [an uncertain synonym]. Lang, 1957: 13–30, figs G–M, O–P.

Leptognathia longiremis (Lilljeborg, 1864): G.O. Sars, 1896: 27, plate XII (not *longiremis sensu* Lilljeborg, 1864.

Leptognathia Sarsii Hansen, 1901: Hansen, 1909: 229–231, plate V fig 3a–b.

Paraleptognathia gracilis (Krøyer, 1842): Guerrero-Kommritz, 2004: 25–30, figs 9–10.

See Sieg (1983) for the very complex synonymy and bibliography up to date of publication.

Remarks. In the Japanese region, under the name *Leptognathia gracilis*, this species has been recorded from the Kurile-Kamchatka Trench at 4895–6710 metres (Kudinova-Pasternak 1970), the Japan Trench, 7370 metres (Kudinova-Pasternak 1976), and more widely from the shelf and bathyal of the Sea of Japan, 200–1900 metres (Kudinova-Pasternak 1984). It is very probable that species such as *Akanthophoreus undulatus* n.sp. and *Akanthophoreus* sp.KK#1 could have (understandably) accounted for the earlier abyssal and hadal records, which should now perhaps be regarded with scepticism. Because of the complexity of this taxon and related species, further study of the shallower Japanese tanaidacean fauna is also required to validate or disregard these records of *A. gracilis*.

***Akanthophoreus imputatus* n.sp.**
Figures 4–6

Material examined. Holotype: 1 non-ovigerous female (KMNH IvR 500.196), station XR-12, 41º37.67'–41º37.08'N 146º54.19'–146º52.72'E, 5473–5484 metres, 4 m ORE beam trawl, 23 September 2001.

Paratypes: 1 non-ovigerous female (KMNH IvR 500.197), same locality; 1 non-ovigerous female, 1 ovigerous female (KMNH IvR 500.198), station TD-8, 39º15.54'–39º17.01'N 144º45.37'–144º42.46'E, 5762–5733 metres, 4 m ORE beam trawl, 29 September 2001.

Diagnosis. *Akanthophoreus* with pereonites all shorter than broad. Pleotelson without lateral spurs. Cheliped carpus and pereopods 1–6 merus, carpus and propodus with numerous spinules. Cheliped propodus and dactylus without crenulation; carpus with weak shield. Dactylus/unguis of pereopods 1–3 0.75 times as long as propodus.

Etymology. From the Latin adjective *imputatus* 'unpruned' or 'untrimmed', referring to the cheliped carpus and pereopods.

Description, non-ovigerous female.

Body (Fig. 4A). Fairly slender, 6.75 times as long as broad (Holotype), cuticle with honeycomb ornamentation, length 3.05–3.52 mm.

Carapace. Just longer than pereonites 1–2 together (excluding pereonal gap), 1.3 times as long as broad, with slightly convex lateral margins for posterior two-thirds portion; rostrum a very slight sub-triangular process.

Pereonites. With nearly parallel or weakly convex lateral margins. Pereonite 1 very slightly narrower posteriorly. Pereonites 1–6 0.48, 0.72, 0.66, 0.67, 0.70, and 0.46 times as long as broad, respectively.

Pleon. Just shorter than pereonites 5–6, 14.4% of body length, all pleonites much wider than long, with long seta on epimeral margin; each pleonite sternum fairly high, rounded or sub-triangular in lateral profile (Fig. 4B).

Pleotelson. Longer than two preceding pleonites, shorter than broad, with rounded posterior margin in dorsal view obscuring deflected apex; four setae (two sensory) on posterior margin.

Antennule (Figs 4C–E). Slender, about 0.7 times as long as carapace. Article 1 just over a half of total length, 2.6 times as long as broad (mid-length), with disto-outer seta more proximal group of three sensory setae. Article 2 sub-rectangular, 1.5 times as long as broad, with one long disto-outer seta, three sensory setae and one smaller inner seta. Article 3 less than half length of article 2, with two unequal setae. Article 4 twice as long as article 3, 2.8 times as long as broad, with four long, quite thick setae, one shorter seta and one aesthetasc.

Antenna (Fig. 4F). Slender, about 0.73 times as long as antennule. Articles 1–3 short, but article 2 larger than article 3, both with dorsal setae, two on article 2. Article 4 over half length of antenna, about five times as

long as broad, with pseudo-articulation near mid-point, accompanied by a sensory seta, terminally with two long setae and at least three sensory setae. Article 5 slender, three times as long as broad, with terminal seta. Article 6 small, with six unequal setae.

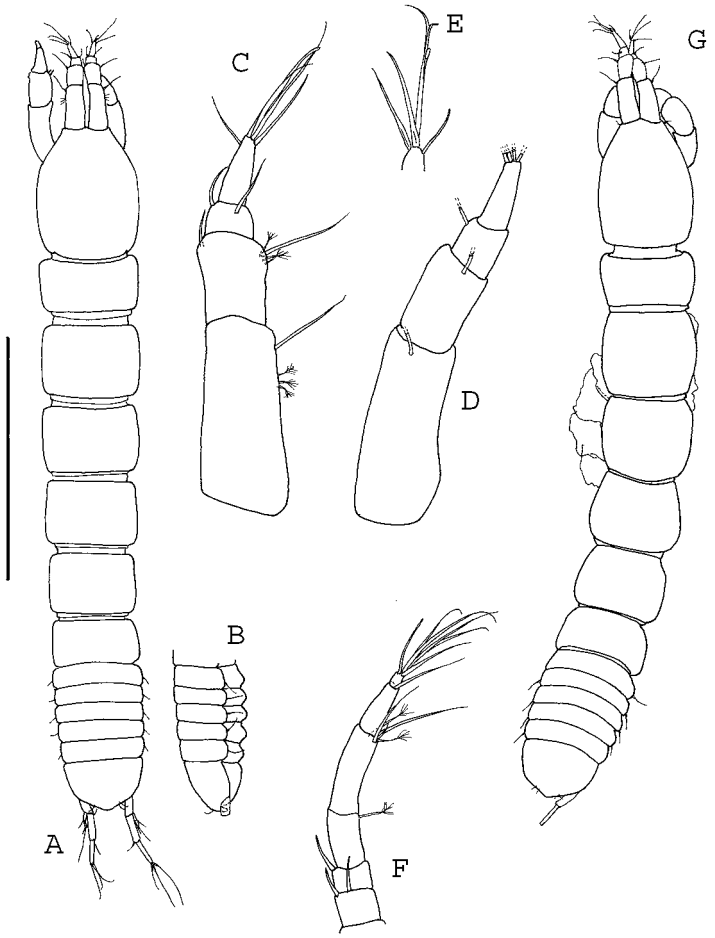

FIGURE 4. *Akanthophoreus imputatus* n.sp. A–F, non-ovigerous female. A, habitus; B, pleon, lateral view (pleopods and uropod rami omitted for clarity); C, right antennule; D, same, lateral view, setation simplified for clarity; E, antennule terminal setation; F, antenna; G, ovigerous female, habitus. Scale bar = 1 mm for A, B and G, 0.25 mm for C-F.

Mouthparts. Labrum (Fig. 5A) of sub-conical or sub-triangular lateral profile, finely setose, distally. Labium (Fig. 5B) typical of genus, with numerous small setules. Maxilla (Fig. 5C) tongue-shaped, with small terminal seta. Mandibles (Figs 5D–E) strong, with dentate incisor and molar with acuminate shape, terminally with about ten unequal spines, longer apically; left mandible with strong lacinia mobilis. Maxillule (Fig. 5F) palp with two setae and endite with nine spiniform setae, at least one of which is pectinate. Maxilliped (Fig. 5G) basis fused and longer than endites, with long seta at base of each palp; endites unfused, each with weakly lobed distal margin, minutely setose lateral process and distal-medial seta; palp with stout articles 1–3, article 2 with three inner and one outer seta; article 3 with two long and two smaller setae; article 4 with three long and two smaller setae.

Cheliped (Figs 5H). With distinct pre-basal sclerite attachment. Basis with rounded free posterior margin and outer seta. Merus sub-triangular, with ventral seta. Carpus stout, 1.7 times as long as broad, with distinct, but shallow, shield, two ventral setae, several small dorso-proximal setae and one dorso-distal seta. Propodus and terminal spine just longer than carpus, 0.45 times as deep as long, dorsal crest with several small setae (Fig. 5I), inner face with comb of four spiniform setae and group of smaller setae, and one outer seta near articulation with dactylus. Fixed finger with two ventral setae, and three unequal setae near incisive margin,

the latter with three irregularly-shaped teeth. Dactylus strong, without crenulation, with spine on incisive margin and small inner seta.

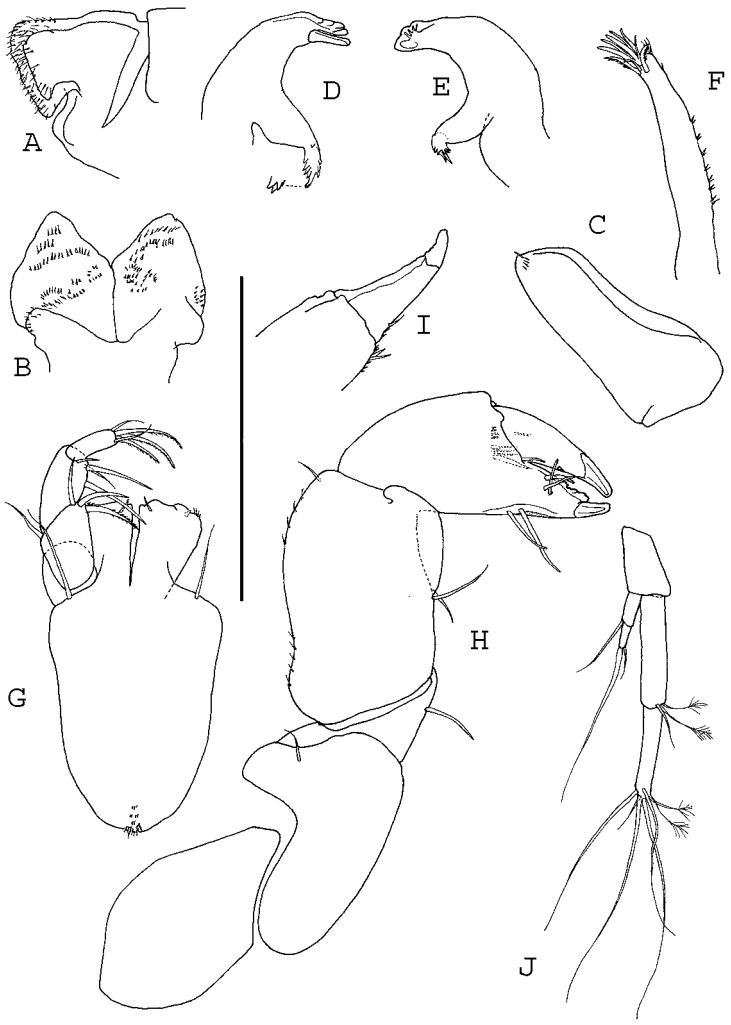

FIGURE 5. *Akanthophoreus imputatus* n.sp. Non-ovigerous female. A, labrum, lateral; B, labium; C, maxilla; D–E, left and right mandibles respectively; F, maxillule endite; G, maxilliped, one palp omitted for clarity; H, right cheliped; I, left cheliped propodal dorsal crest and dactylus; J, uropod. Scale bar = 0.36 mm for H and J, 0.25 mm for A-G and I.

Pereopod 1 (Fig. 6A). Coxa annular, with seta. Basis about 3.4 times as long as broad, with dorso-distal sensory seta. Ischium with one seta. Merus twice as long as broad, ventral margin with a few spinules, with inner slender seta and outer spiniform seta nearly reaching end of carpus. Carpus just longer than merus, rectangular, 2.3 times as long as broad, ventral margin with numerous spinules, with two long spiniform pectinate setae (dorsal and ventral). Propodus slender, 1.3 times as long as carpus, ventral and dorsal margins with rows of small spinules, with disto-ventral spiniform seta, dorso-distal seta and terminal fringe of small setae. Dactylus and unguis together 0.75 times as long as propodus, dactylus with accessory seta, unguis as long as dactylus, with spatulate tip.

Pereopod 2 (Fig. 6B). Similar to pereopod 1 but basis without sensory seta. Merus and carpus shorter and carpus with three spiniform setae.

Pereopod 3 (Fig. 6C). Similar to pereopod 2 but basis slightly shorter.

Pereopod 4 (Fig. 6D). With no discrete coxa. Basis slightly longer than in pereopod 3. Ischium with two unequal setae. Merus ventral margin with small spinules, with two spiniform setae. Carpus rectangular, longer

than merus, ventral margin with small spinules, with three long spiniform setae and one smaller rod-like dorsal seta. Propodus just longer than carpus, with two long ventro-distal spiniform setae and one dorso-distal spiniform seta. Dactylus and unguis (Fig. 6G) just longer than propodus, dactylus with double row of spinules on inferior margin.

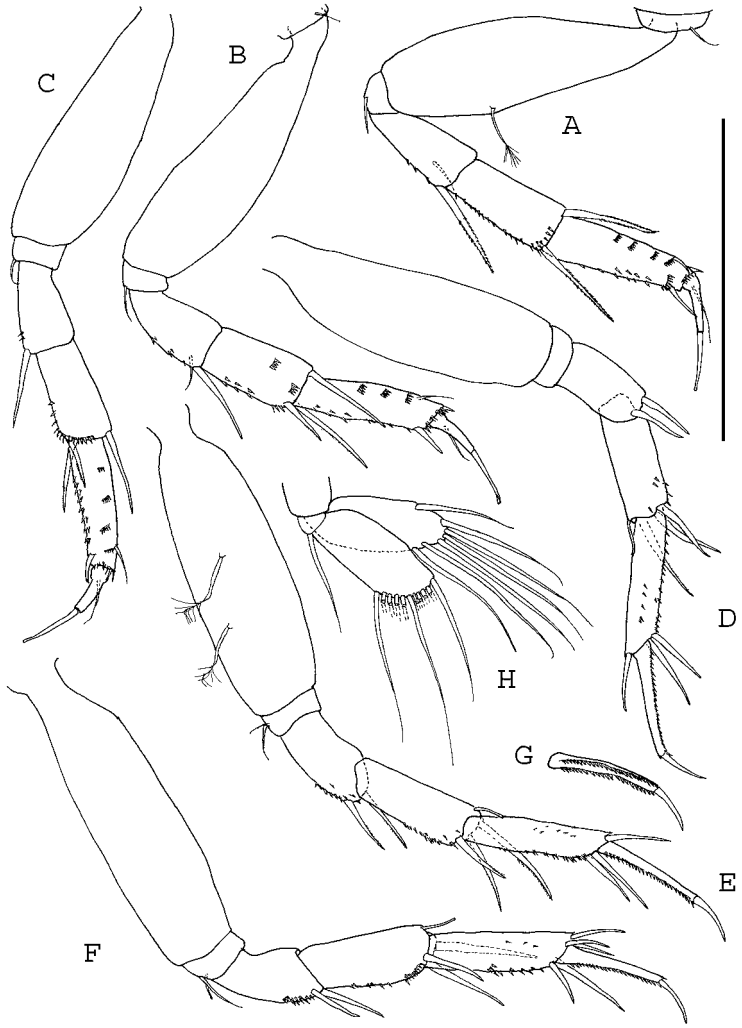

FIGURE 6. *Akanthophoreus imputatus* n.sp. Non-ovigerous female; A–F, pereopods 1–6, respectively; G, dactylus/unguis of pereopods 4–6; H, pleopod. Scale bar = 0.25 mm for A-H.

Pereopod 5 (Fig. 6E). Similar to pereopod 4, basis with two sensory setae.

Pereopod 6 (Fig. 6F). Similar to pereopods 4–5 but propodus with two additional dorso-distal spiniform setae.

Pleopod (Fig. 6H). Relatively small compared to pereopods, both rami sub-ovate. Endopod with one distal and six terminal setae. Exopod two-articled, with eleven terminal setae and one on small article 1.

Uropod (Fig. 5J). As long as pleotelson and preceding pleonite 5. Basal article about twice as long as broad. Exopod two-articled, half as long as article 1 of endopod, with one seta on article 1 and two unequal setae on article 2. Endopod two-articled, article 1 just over half total length of endopod, nearly twice as long as basal article, just over four times as long as broad, with three distal seta (two sensory), article 2 0.8 times as long as article 1, about five times as long as broad, with five unequal terminal setae, with two sensory setae.

Ovigerous female. Generally as non-ovigerous female (Fig. 4G), but pereon more dorso-ventrally compressed, pereonites 2–3 proportionately longer, with four pairs of oostegites; length 3.06 mm.

Remarks. *Akanthophoreus imputatus* n.sp. is a relatively 'non-descript' and stout species, with setose pereopods. It generally resembles *A. longiremis sensu* Lilljeborg, (= *sensu* Hansen, = *sensu* Lang) from the NE Atlantic, but the spinules on the propodus of pereopods 1–3 are smaller and more numerous and the pleonal sternal processes are less well-developed. It is distinguishable from the previous species, *A. crassicauda* n.sp., by its longer uropods and more setose chelipeds and pereopods. A close relative, or even conspecific taxon, remains undescribed from the abyssal Arctic Ocean (Bird *ined*.), although the 're-description' of *A. longiremis* given by Guerrero-Kommritz (2004) may also be this species.

Distribution. Kurile-Kamchatka Trench and the Japan Trench, 5473–5762 metres.

Akanthophoreus cf *longiremis* (Lilljeborg, 1864)

(restricted synonymy and bibliography)

Tanais longiremis Lilljeborg, 1864: Lilljeborg, 1865: 23–25.

Leptognathia longiremis: G.O. Sars, 1896: 27, plate XII (= *L. gracilis* (Krøyer, 1842) not *longiremis sensu* Lilljeborg, 1864). Hansen, 1913: 69–70, 74–76, plate VII figs 3a–e. Lang, 1957: 49, fig N. Kudinova-Pasternak, 1977: 125 [an uncertain synonymy].

Akanthophoreus longiremis (Lilljeborg, 1864): Sieg, 1986a; 23, 28, fig 10 (*partim*, not those derived from G.O. Sars 1896).

Paraleptognathia longiremis (Lilljeborg, 1864): Guerrero-Kommritz, 2004: 33–38, figs 13–15 [an uncertain synonymy].

See Sieg (1983) for the very complex synonymy and bibliography up to date of publication.

Remarks. This is an *Akanthophoreus* species with a very unfortunate taxonomic history, largely because of the error in depicting *A. gracilis* as this species in the canonical account of Norwegian tanaidaceans (G.O. Sars 1896). The figure given by Hansen (1913) remains the best overall illustration of the species, along with Lang (1957) for cheliped and pereopod variation. Actually a fairly scarce species from shelf and shallow bathyal western European waters at the interface of cold Arctic and warmer Atlantic water-masses (Bird 2001; *ined*.), *A. longiremis* has been *(*doubtfully) recorded from the Izu-Ogasawara Trench, 6770–6890 metres (Kudinova-Pasternak 1977). It is possible that the following species, *A. undulatus* n.sp., is the basis for this record, if Kudinova-Pasternak's view of *L. longiremis* was that of G.O. Sars.

Akanthophoreus undulatus n.sp.

Figures 7–10

Material examined. Holotype: 1 non-ovigerous female (KMNH IvR 500.199), station XR-7, 42°12.87'–42°12.10'N 145°33.93'–145°32.05'E, 3853–3858 metres, 17 September 2001. **Allotype**: 1 preparatory male (KMNH IvR 500.200), same locality. **Paratype**: 1 ovigerous female (partially dissected; KMNH IvR 500.201), station TD-4, 39°27.08'–39°29.15'N 143°37.79'–143°38.52'E, 3272–3146 metres, 26 September 2001.

Diagnosis. *Akanthophoreus* with lateral pleonal spurs. Cheliped propodus with dorsal nodules, fixed finger with lateral row of nodules, dactylus crenulate. Pereopods 1–6 basis, merus, carpus and propodus with undulated or crenulated margins. Pereopods 1–3 merus with one thin and one spiniform seta. Dactylus/unguis of pereopods 1–3 at least as long as propodus.

Etymology. From the Latin adjective *undulata* 'crenulate' or 'wavy', referring to the pereopods.

Description, non-ovigerous female.

Body (Fig. 7A). Slender, 8.3 times as long as broad (extended holotype), length 5.32mm.

Carapace. As long as pereonites 1–2 together (excluding pereonal gap), 1.4 times as long as broad, with parallel margins for posterior two-thirds portion; rostrum a moderately developed sub-triangular process.

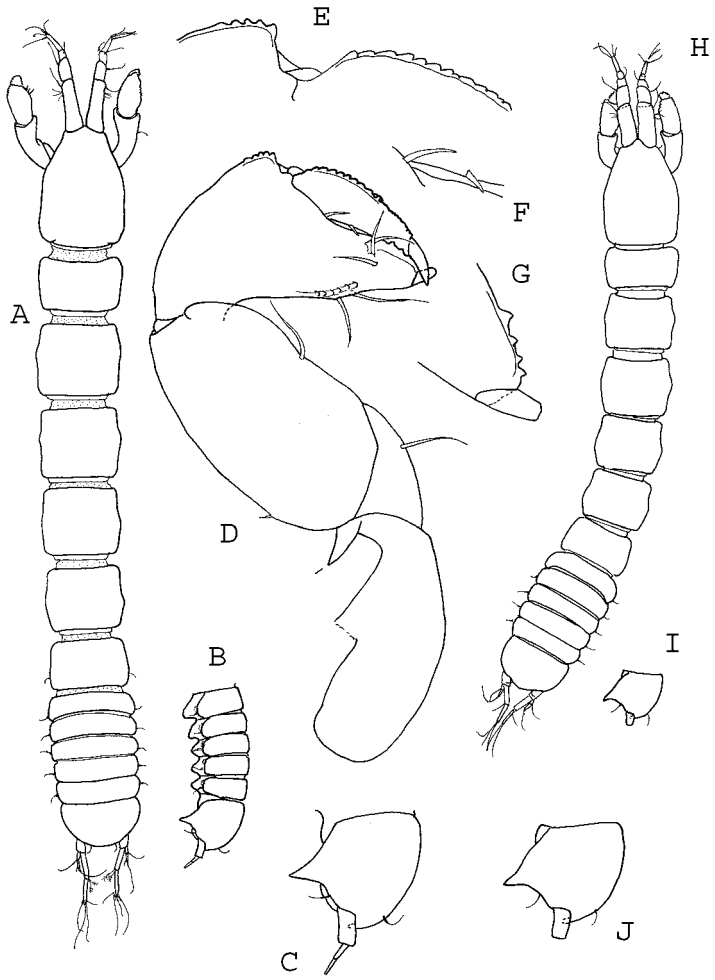

FIGURE 7. *Akanthophoreus undulatus* n.sp. A–G, holotype non-ovigerous female. A, habitus; B, pleon/pleotelson, lateral view (pleopods omitted for clarity); C, pleotelson, lateral view, enlarged; D, right cheliped; E, dorsal crest of cheliped propodus and proximal dactylus; F, setae of cheliped propodus and proximal dactylus; G, distal of cheliped fixed finger; H–J, allotype preparatory male. H, habitus; I–J, pleotelson, lateral, to scale and enlarged. Scale bar = 2 mm for A, B, H and I, 0.94 mm for C, D and J, 0.47 for E-G.

Pereonites. Sub-rectilinear with slight bulge over pereopodal insertion. Pereonite 1 slightly narrower posteriorly. Pereonites 1–6 0.58, 0.85, 0.84, 0.84, 0.81 and 0.61 times as long as broad, respectively.

Pleon. As long as preceding two pereonites, 16–18% of body length (of extended and contracted length respectively), all pleonites much wider than long, with seta on epimeral margin; each pleonite sternum produced into lobiform process (Fig. 7B), decreasing in size from pleonite 1 to pleonite 5.

Pleotelson (Figs 7B–C). As long as two preceding pleonites, shorter than broad, with rounded posterior margin in dorsal view obscuring deflected apex, and lateral margins with an extended, acutely triangular process; two setae on posterior margin and seta anterior of each uropod basal article.

Antennule (Fig. 8B). Slender, about 0.8 times as long as carapace. Article 1 just over half total length, 3.3 times as long as broad (mid-length), with disto-outer seta and sensory seta and more proximal group of three sensory setae. Article 2 sub-rectangular, 1.6 times as long as broad, with a long disto-outer seta and three sensory setae. Article 3 less than half length of article 2, with two unequal setae, inner smaller of two. Article 4 slender, 4.5 times as long as broad, about as long as article 2, with four long, quite thick setae, one aesthetasc and at least one sensory seta.

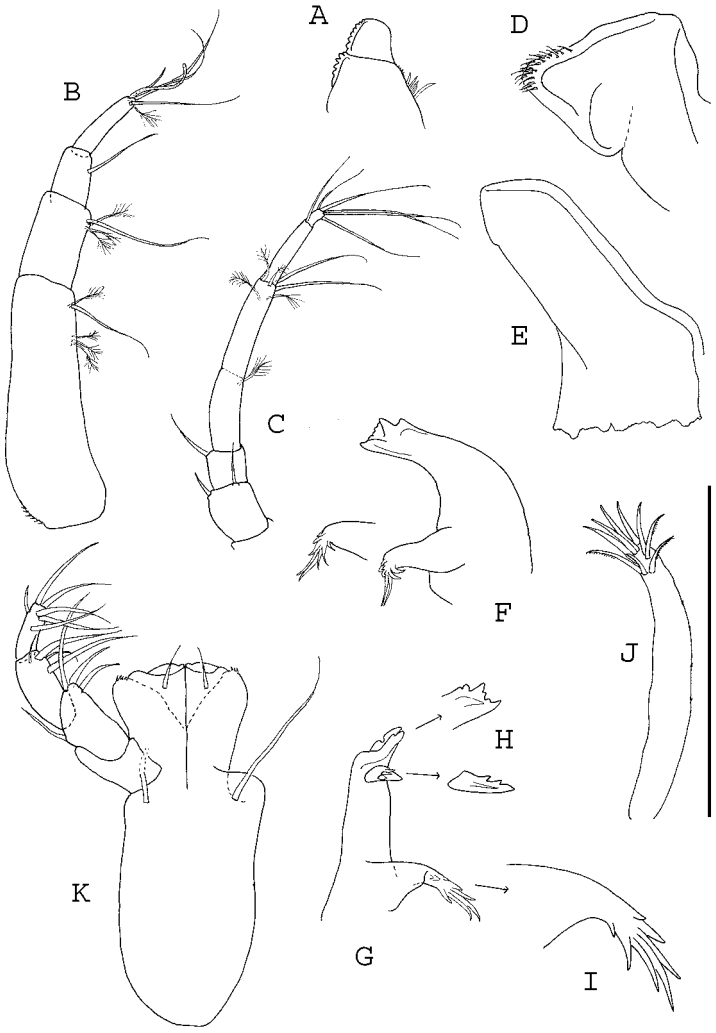

FIGURE 8. *Akanthophoreus undulatus* n.sp. Ovigerous female. A, crenulations of distal propodus/proximal dactylus, dorsal view; B, antennule; C, antenna; D, labrum, lateral view; E, maxilla; F–G, right and left mandibles respectively; H, incisor and lacinia mobilis of left mandible, full profile; I, molar of left mandible, enlarged; J, maxillule endite; K, maxilliped, one palp omitted for clarity. Scale bar = 0.5 mm for B and C, 0.33 mm for K, 0.25 mm for A, D-H and J, 0.125 mm for I.

Antenna (Fig. 8C). Slender, about 0.75 times as long as antennule. Articles 1–2 short, but article 1 larger than article 2, both with dorsal seta. Article 3 almost half length of antenna, about six times as long as broad, with pseudo-articulation near mid-point, accompanied by a sensory seta, terminally with two long setae and four sensory setae. Article 4 slender, five times as long as broad, with terminal seta; article 5 small, with five unequal setae.

Mouthparts. Labrum (Fig. 8D) of sub-conical or sub-triangular lateral profile, with numerous small distal setae. Labium not recovered. Maxilla (Fig. 8E) plate-like, elongate, sub-rectangular. Mandibles (Figs 8F–I) strong, with dentate incisor and molar with acuminate shape, terminally with about eight unequal spines, two of which are clearly longer than the rest and paired; left mandible with acuminate lacinia mobilis (Fig. 8H), with about three cusps or teeth. Maxillule (Fig. 8J) palp with two setae and endite with nine strong spiniform setae, some of which are pectinate. Maxilliped (Fig. 8K) basis fused and longer than endites, with long seta at base of each palp; endites unfused, each with weakly lobed distal margin, minutely setose lateral processes and distal seta; palp articles 1–3 equally long, article 2 with one outer and three inner setae, article 3 with two large and two smaller setae, article 4 with five unequal setae.

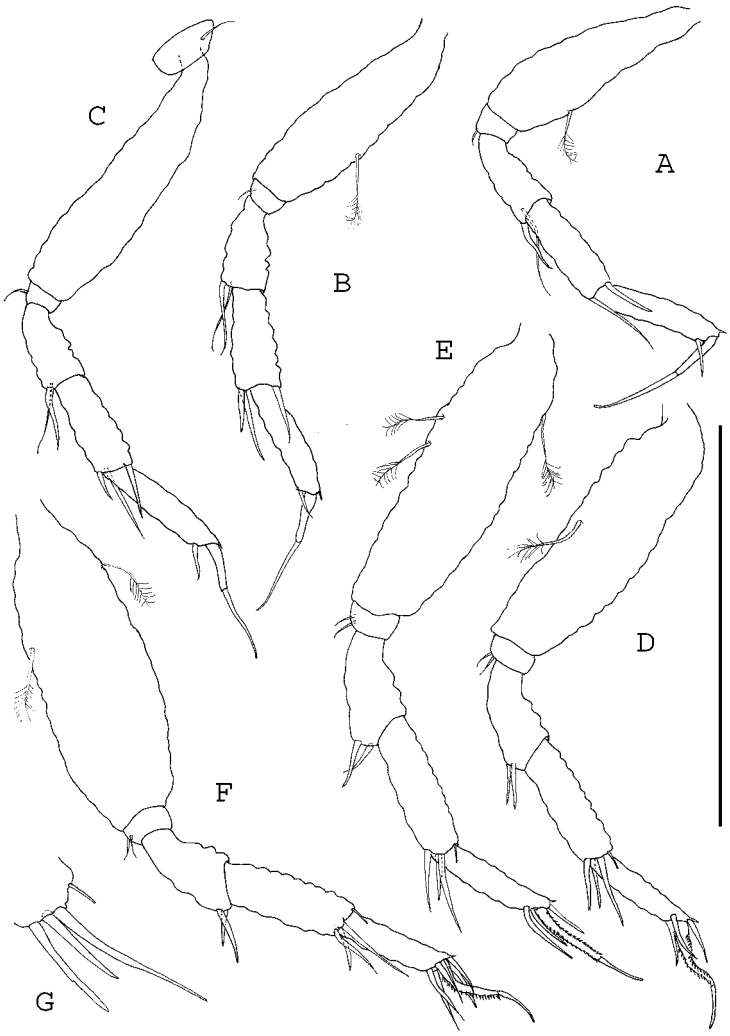

FIGURE 9. *Akanthophoreus undulatus* n.sp. Ovigerous female. A–F pereopods 1–6 respectively, oostegites excluded for clarity; G, detail of carpal setation, pereopods 4–6. Scale bar = 0.5 mm for A-F, 0.25 mm for G.

Cheliped (Figs 7D–G, Fig. 8A). Attached via sclerite. Basis with large, rounded posterior margin. Merus sub-triangular, with ventral seta. Carpus twice as long as broad, with small proximal seta, one ventral seta, shield very shallow, without crenulation. Propodus and spine as long as carpus, twice as long as deep, dorsal crest with about five nodules or crenulations and outer ventral margin with short crenulate ridge, with two setae, small outer seta near dactylus. Fixed finger with four relatively delicate teeth on incisive margin, three outer setae and short, blunt terminal spine. Dactylus with dorsal margin crenulate (about ten–12 nodules), more finely so for distal half, with spine on incisive margin.

Pereopod 1 (Fig. 9A). Coxa annular, with seta. Basis weakly crenulate outline, with dorsal plumose setae. Ischium with seta. Merus more strongly ribbed than basis, with inner slender seta and outer spiniform seta. Carpus ribbed, with one dorsal and one ventral terminal spiniform seta. Propodus weakly ribbed, with disto-ventral spiniform seta. Dactylus and unguis together just longer than propodus, unguis longer than dactylus, with spatulate tip.

Pereopod 2 (Fig. 9B). Similar to pereopod 1 but carpus with three spiniform setae. Dactylus and unguis only as long as propodus.

Pereopod 3 (Fig. 9C). Similar to pereopod 2 but basis slightly longer and without plumose seta.

Pereopod 4 (Fig. 9D). With no discrete coxa. Basis strongly ribbed. Merus and carpus strongly ribbed.

Propodus weakly ribbed. Dactylus with double row of spinules on inferior margin.

Pereopod 5 (Fig. 9E). Similar to pereopod 4 but basis with three sensory setae.

Pereopod 6 (Fig. 9F–G). Similar to pereopod 5 but propodus with additional distal spiniform seta.

Pleopod (Fig. 10A). Relatively small compared to pereopods but setose, both rami sub-ovate. Endopod with one inner-distal seta and about 16 distal setae. Exopod with about 30 setae.

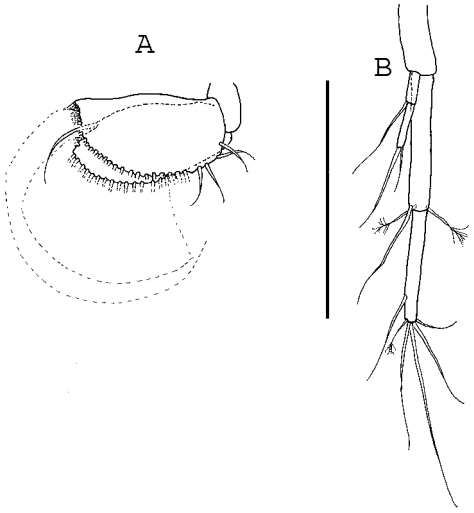

FIGURE 10. *Akanthophoreus undulatus* n.sp. Ovigerous female. A, pleopod; B, uropod. Scale bar = 0.5 mm for B, 0.4 mm for A.

Uropod (Fig. 10B). Long and slender, as long as pleotelson and two preceding pleonites. Exopod two-articled 0.6 times as long as article 1 of endopod, with one seta on article 1 and two unequal setae on article 2. Endopod two-articled, article 1 just over half total length of endopod, about eight times as long as broad, with one long distal seta and two distal sensory setae, article 2 about nine times as long as broad, with one distal seta and four unequal terminal setae, with one sensory seta.

Ovigerous female: generally as neuter but dorso-ventrally compressed, with four pairs of oostegites; length 5.80 mm.

Preparatory male: (Figs 7H–J) generally as neuter/non-ovigerous female, but *antennule* five-articled, broad; length 4.06 mm.

Remarks. This large abyssal species is very similar to *Scoloura phillipsi* Sieg & Dojiri, 1991 from the shelf and bathyal of the western U.S.A but differs in having a smaller cephalothorax, coarser and fewer mandible molar spines, a longer cheliped carpus, a longer pereopod 1 dactylus/unguis, but particularly the crenulate pereopod margins. It differs from *Akanthophoreus gracilis sensu stricto* (=*Leptognathia sarsi*) principally by the last character and its more slender cheliped carpus. The large and impressive *A. multiserratus* from the NE Atlantic also has nodulose/crenulate pereopods, at least on the basis of pereopods 4–6.

It is possible that the earlier records of *Leptognathia gracilis* from the Kurile-Kamchatka Trench and the Japan Trench (Kudinova-Pasternak 1970) and *Leptognathia longiremis* from the Izu-Ogasawara Trench (Kudinova-Pasternak 1977) refer to this species.

Distribution. Kurile-Kamchatka Trench and the Japan Trench, 3146–3858 metres.

***Akanthophoreus* sp.KK#1**

Figure 11–12

Material. 1 non-ovigerous female, station TD-4, 39°27.08'–39°29.15'N 143°37.79'–143°38.52'E, 3272–3146 metres, 26 September 2001.

emarks. A long (4.6 mm) and very slender species of *Akanthophoreus* (even allowing for the relaxed-extended condition of the single specimen), as the pereonites 2–5 are all as long as, or almost as long as, broad (Fig. 11A). Other potentially diagnostic characters (in combination) are the long antennules (Fig. 11C), slight crenulation on anterior-lateral margins of the carapace and pereonites (Fig. 11A), strong pleonal ventral processes (Fig. 11B), crenulate dorsal margin of distal cheliped propodus and dactylus and slight crenulation of carpus near ventral setal insertion (Fig. 11D). The cheliped carpal shield is moderately developed.

The affinities of this species are uncertain, but it approaches *Akanthophoreus multiserratus* in general morphology but lacks the crenulate/ribbed basis of pereopods 4–6 (*cf. undulatus*) that are present in that species and the more extensive cheliped crenulation/nodules. The Antarctic species *Paraleptognathia multiserratoides* Guerrero-Kommritz, 2004 is also very similar, but the ventral margin of the cheliped propodus and disto-ventral margin of the carpus are also crenulate. A possible species-group is evident here.

Distribution. Japan Trench, 3146–3272 metres.

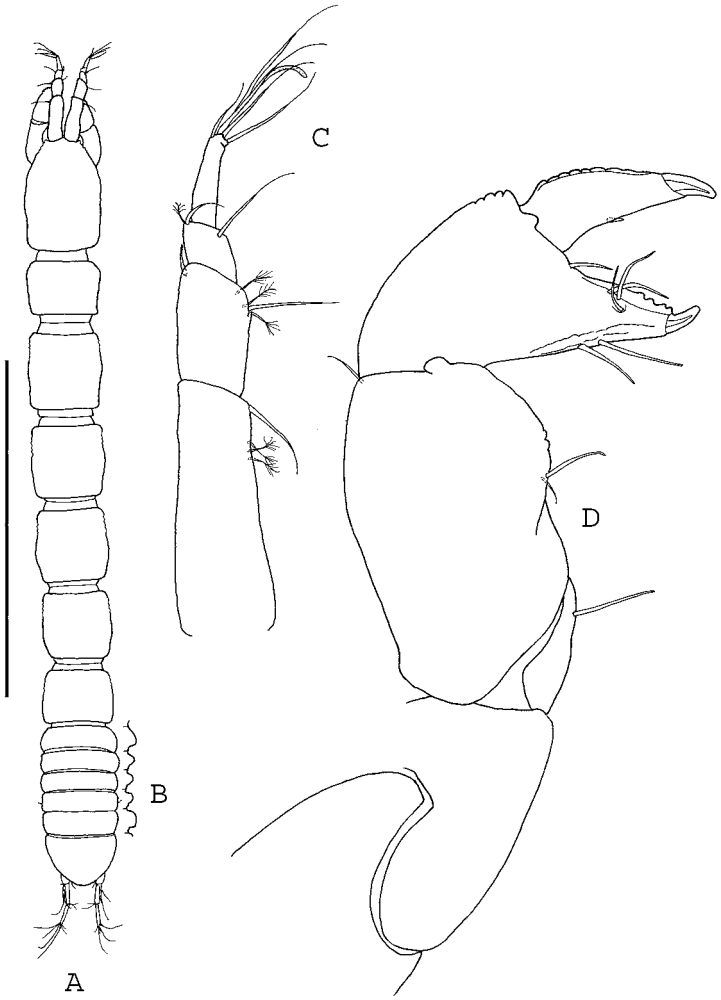

FIGURE 11. *Akanthophoreus* sp.KK#1. A, non-ovigerous female, habitus; B, lateral view of pleonal spurs, pleopods omitted for clarity; C, antennule; D, right cheliped. Scale bar = 2 mm for A and B, 0.67 mm for C and D.

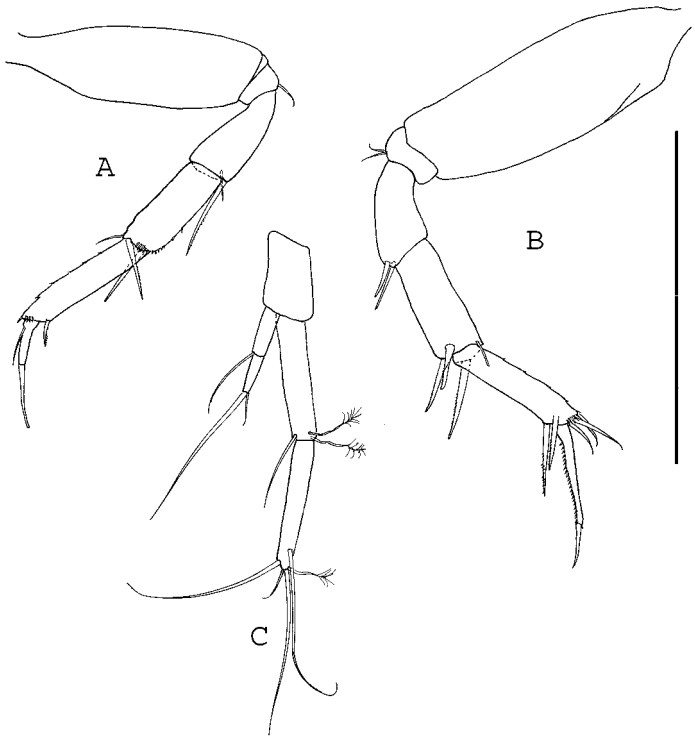

FIGURE 12. *Akanthophoreus* sp.KK#1. Non-ovigerous female. A, pereopod 1; B, pereopod 6; C, uropod. Scale bar = 0.33 mm for A-C.

***Akanthophoreus* sp.KK#3**
Figures 13–14

Material examined. 1 non-ovigerous female (or early preparatory male?), 2.96 mm, station TD-8, 39º15.54'–39º17.01'N 144º45.37'–144º42.46'E, 5762–5733 metres, 4 m ORE beam trawl, 29 September 2001. 1 preparatory male, 2.56 mm, station TD-7, 38°47.93'–38°45.87'N 144°08.07'–144°07.89'E, 7340–7433 metres, 30 September 2001.

Remarks. This is a fairly slender species, 7.2–7.9 times as long as broad, but with a relatively short cephalothorax compared to other *Akanthophoreus* species (Figs 13A). It is further characterized by thick, pectinate, antennular setae (Fig. 13D), an elongate uropod basal article (Fig. 13G) as seen in *Paraleptognathia brachiata* (Hansen, 1913), a cheliped carpus without shield (Fig. 14A), a stout pereopod 1 with very long meral and carpal pectinate spiniform setae (Fig. 14B), these two articles also with a thin dorsal seta, and pereopods 4–6 (Fig. 14C) with long propodal pectinate setae.

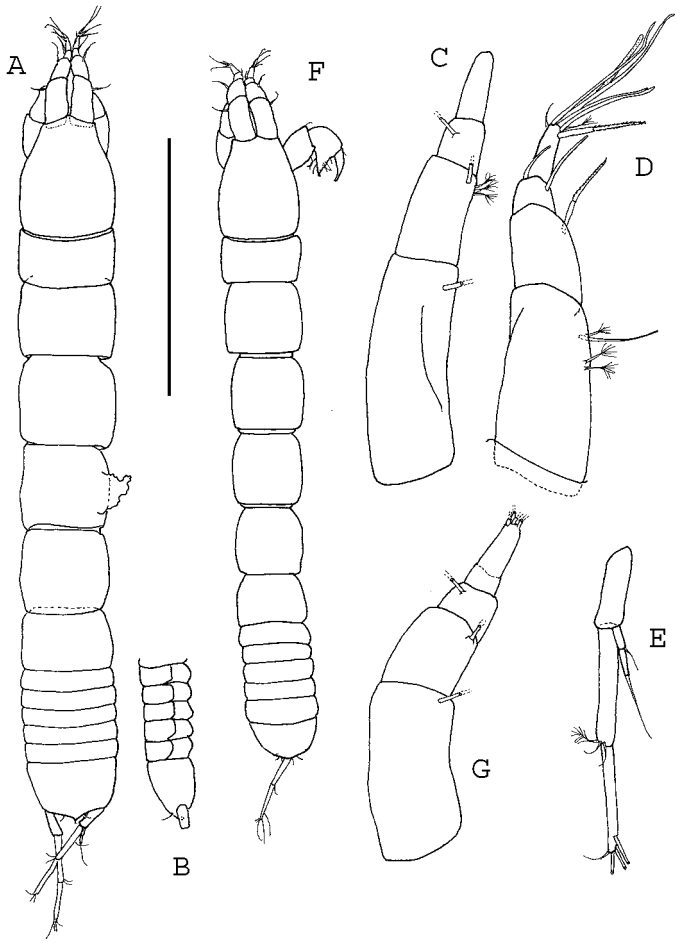

FIGURE 13. *Akanthophoreus* sp.KK#3. A, non-ovigerous female(?), habitus; B, pleon lateral view, pleopods omitted for clarity; C–D, antennule, dorsal and lateral view (setae omitted for clarity); E, uropod; F, preparatory male, habitus; G, antennule, lateral view, (setae omitted for clarity). Scale bar = 1 mm for A, B and F, 0.38 mm for E, 0.25 mm for C, D and G.

Distribution. Japan Trench, 5733–7433 metres.

Largely because of these characters, this species is only provisionally and tentatively assigned to *Akanthophoreus*, as it may represent a separate, but closely related, genus: the most similar described species appears to be the equally hadal *Biarticulata parabranchiata* (Kudinova-Pasternak, 1977) from the Palau Trench, 7000–7170 metres. Another extremely similar, but undescribed species, has been recorded from the abyssal NE Atlantic (as '*Leptognathia brachiata* Hansen, 1913') by Holdich & Bird (1985) and which has *Akanthophoreus*-like mandibular molars, not dissimilar to those of *B. parabranchiata*.

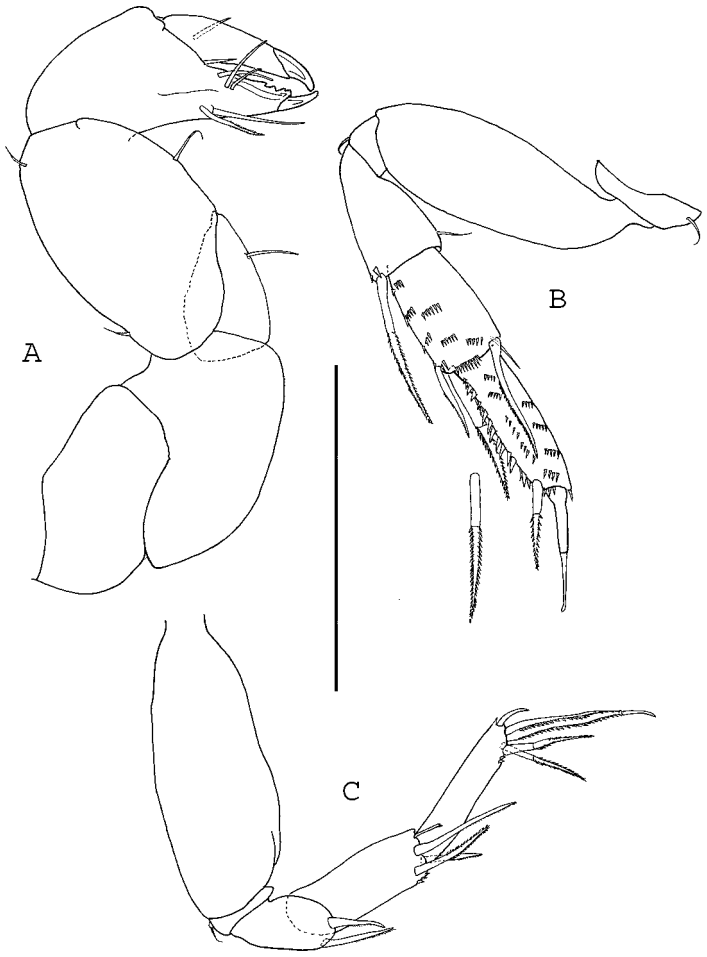

FIGURE 14. *Akanthophoreus* sp.KK#3. Non-ovigerous female. A, cheliped; B, pereopod 1; C, pereopod 5. Scale bar = 0.33 mm for A, 0.25 mm for B and C.

***Akanthophoreus* sp. KK#5**
Figures 15–16

Material examined. 1 non-ovigerous female (3.6 mm), station XR-5, 42°23.83'–42°22.06'N 145°31.06'–145°27.70'E, 3145–3265 metres, 16 September 2001.

Remarks. This is an elongate species (Fig. 15A), 7.8 (contracted) - 8.7 (stretched) times as long as broad, with a long cephalothorax (1.47 times as long as broad), no pleotelson spurs and only low pleonal sternal processes (Fig. 15B). A potentially significant-useful character is the presence of two setae on the pleonite 3 lateral margin. The antennule (Fig. 15C) is slender but is only 0.72 times as long as the cephalothorax. The cheliped (Fig. 16A) is relatively 'ordinary', but has two distinct spurs on the dorsal crest of the propodus (Fig. 16B), weak dorsal crenulation on the dactylus, and a distinct, but weak, carpal shield. Pereopods 1–3 (Fig. 16C) are slender, with sparse minor setation, with a long dactylus/unguis (almost as long as propodus). The posterior pereopods (Fig. 16D) are unremarkable, but pereopod 6 has three dorso-distal spiniform setae. *Akanthophoreus* sp.KK#5 has slender uropods, with a long basal article that is weakly crenulate on the dorsal margin (Fig. 15E).

The closest taxonomic or phylogenetic affinities of this species are not clear but it approaches *A. multiserratus* in general shape and setation, if not in the degree of cheliped crenulation.

Distribution. Kurile-Kamchatka Trench, 3145–3265 metres.

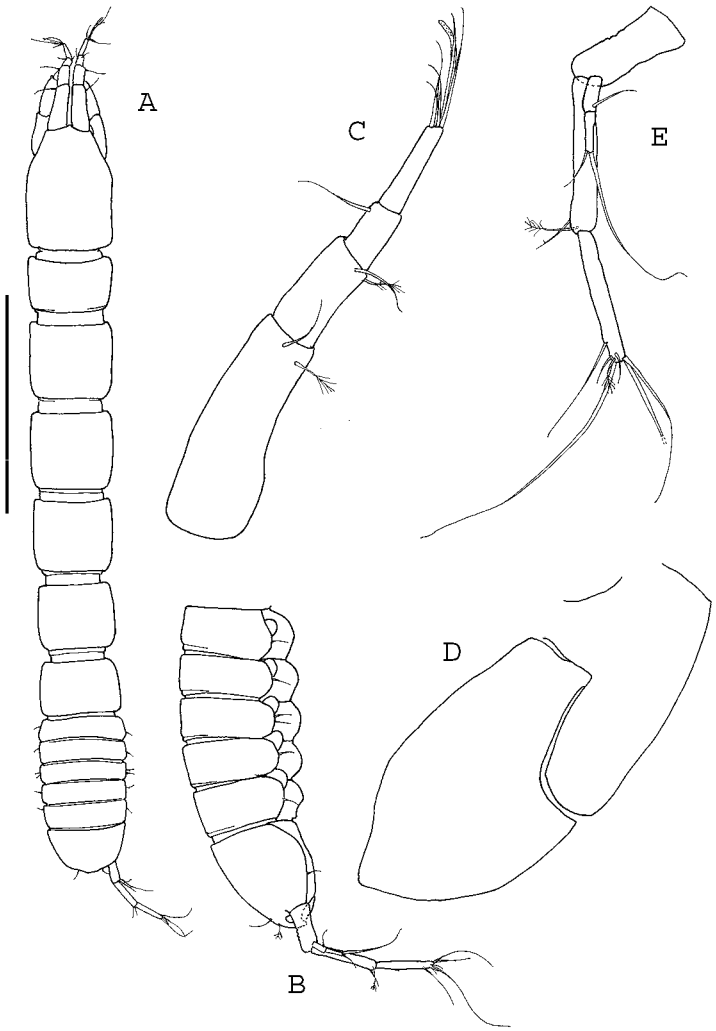

FIGURE 15. *Akanthophoreus* sp.KK#5. A, non-ovigerous female, habitus; B, pleon and uropods, lateral view (pleopods omitted for clarity); C, right antennule, lateral view, setation simplified for clarity; D, cheliped basis and posterior sclerite; E, uropod. Scale bar = 1 mm for A, 0.5 mm for B, 0.21 mm for C-E.

(restricted synonymy and bibliography)
Chauliopleona Dojiri & Sieg, 1987: 231. Guerrero-Kommritz, 2005: 11–79–1180. Larsen & Shimomura, 2007: 31–32.
Leptognathia G.O. Sars, 1882 (*partim*): Hansen, 1913: 79–82 (for species *amdrupii*, *armata* and *hastata* listed below).
Type species: *Chauliopleona dentata* Dojiri & Sieg, 1997 by monotypy.

Species included (Japanese waters, Kurile-Kamchatka Trench and the Japan Trench species in bold): *C. amfti* Guerrero-Kommritz, 2005, Angola Basin; ***C. armata*** (Hansen, 1913) [?], NE Atlantic; *C. amdrupi* (Hansen, 1913), Arctic, NW & NE Atlantic; *C. dentata*, California; ***C. hansknechti*** Sieg & Shimomura, 2007; *C. hastata* (Hansen, 1913), Arctic Ocean; *C. nickeli* Guerrero-Kommritz, 2005, Weddel Sea; *C. paradoxa* Guerrero-Kommritz, 2005, Peru Basin.

Diagnosis. See Larsen & Shimomura 2007.

Remarks. Although the type species of the genus *C. dentata* was described from Californian waters, the most familiar names are those formerly of Hansen's *Leptognathia* group "a", subdivision 'γ', characterized by

a sternal spur on pleonite 5. A revision of the genus by Guerrero-Kommritz (2005) added several new species and confirmed the distinct identity of *C. armata* and *C. hastata* that had been considered to be synonymous by several authorities. Recently, Larsen & Shimomura (2007) have described a shallow-water Japanese species, *C. hansknechti*, and commented that the genus may belong to the family Leptognathiidae. Whichever family *Chauliopleona* is eventually assigned to, after a phylogenetic analysis, it will be the same as that for *Akanthophoreus*.

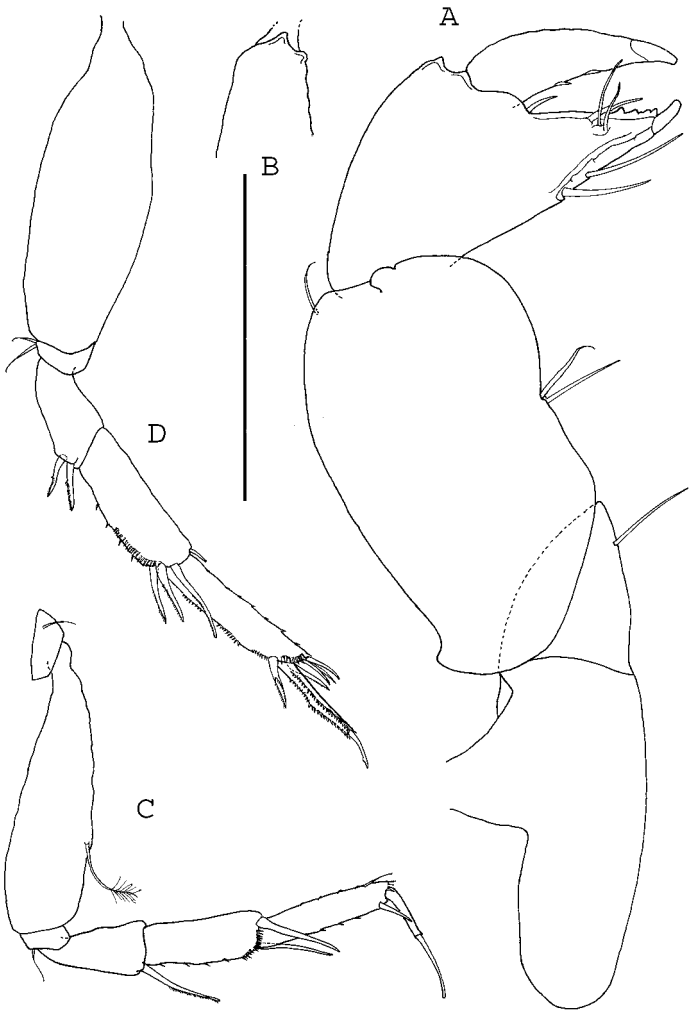

FIGURE 16. *Akanthophoreus* sp.KK#5. Non-ovigerous female. A, right cheliped; B, right cheliped propodal crest and base of dactylus, dorsal view; C, perepod 1; D, pereopod 6. Scale bar = 0.25 mm for A-D.

Chauliopleona Dojiri & Sieg, 1987
Chauliopleona cf *armata* (Hansen, 1913)

(restricted synonymy and bibliography)
Leptognathia armata Hansen, 1913: 80–81, plate VIII figs1a–f.
Leptognathia armata Hansen, 1913**:** Kudinova-Pasternak, 1970: 353. Kudinova-Pasternak, 1984: 829 [uncertain synonymies].
Chauliopleona armata (Hansen, 1913: Guerrero-Kommritz, 2005: 1188–1191.
See Sieg (1983) for complete synonymy and bibliography up to that date.

Remarks. Apart from numerous records from other areas in the Pacific and Atlantic (but see above) this species has been recorded from the Sea of Japan at shelf to bathyal depths, 100–2220 metres (Kudinova-Pasternak 1984) and abyssal depths, 3385–4895 metres from the Kurile-Kamchatka Trench (Kudinova-Pasternak 1970). The most likely candidate species for the shallow-water records is the recently described *C. hansknechti*, while the abyssal records may be attributable to either of the two putative species outlined below.

Chauliopleona spp.

Material examined. 1 manca-III, station XR-12, 41º37.67'–41º37.08'N 146º54.19'–146º52.72'E, 5473–5484 metres, 4 m ORE beam trawl, 23 September 2001. 1 non-ovigerous female, station XR-5, 42°23.83'–42°22.06'N 145°31.06'–145°27.70'E, 3145–3265 metres, 16 September 2001. 1 post-ovigerous female, station XR-7, 42°12.87'–42°12.10'N 145°33.93'–145°32.05'E, 3853–3858 metres, 17 September 2001.

Remarks. Only three specimens of *Chauliopleona* were obtained in the present study, two of them damaged (but not so far as to be totally unidentifiable) and one a small manca-III stage. Two species may be present: one from stations XR-12 (manca-III, length 1.72 mm) and XR-5 (non-ovigerous female, length 3.8 mm) and the other from XR-7 (post-ovigerous female, 4.9 mm). The first has a weakly crenulated cheliped dactylus and, in the larger individual, a very long *ventrally*-directed pleonal spur. It also possesses a coarsely ornamented cuticle. The second putative species lacks cheliped crenulations, a *posteriorly*-directed pleonal spur, and has more slender pereopods and uropods. Both species have a relatively shallow cheliped carpal shield. Further study (and, ideally, additional specimens) is required to formally identify or name these taxa, although they do not easily match any described species.

Exspina typica Lang, 1968

(restricted synonymy and bibliography)

Exspina typica Lang,1968: 188–192, fig 117, plate 8f–g. Kudinova-Pasternak, 1970: 374–375, 379, fig. 23. Kudinova-Pasternak, 1975; 222. Kudinova-Pasternak & Pasternak, 1978: 183, fig.7. Sieg, 1979: 189–190, fig.1. Thurston *et al*., 1987: 11–15, fig.1. Larsen, 2005; 260.

Remarks. A very charismatic and distinctive abyssal species, which has been linked to a possible symbiotic relationship with holothurians such as *Amperima rosea*, *Deima validum* and *Oneirophanta mutabilis* (Thurston *et al* 1987). Formerly part of the Family Leptognathiidae *sensu* Sieg, 1973, and latterly in the sub-family Leptognathiinae (Anarthruridae) it was excluded after a phylogenetic analysis (Larsen & Wilson 2002).

It is widely distributed in the world's oceans (Thurston *et al*. 1987) including the Kurile-Kamchatka Trench, 2400–4829 metres (Kudinova-Pasternak 1970) but has not been recorded in the present study.

Leptognathia birsteini Kudinova-Pasternak, 1965

Leptognathia birsteini Kudinova-Pasternak, 1965: 84–88, figs 5–6. Kudinova-Pasternak, 1966: 532. Kudinova-Pasternak, 1970: 355. Larsen & Shimomura, 2007: 2, 15.

Remarks. A highly characteristic body shape marks out this taxon from most other '*Leptognathia*' species, deriving from the small and sub-triangular cephalothorax and short and wide pereonites 1–2. A very similar species, *L. microcephala* Kudinova-Pasternak, 1977 differs slightly in body proportions, pleotelson shape and other details (see below). It is very highly probable that *L. birsteini* and *L. microcephala* belong in the genus *Latitanais* Kudinova-Pasternak, 1987, currently positioned in the Subfamily Cryptocopinae Sieg, 1973 of the

Family Pseudotanaidae Sieg, 1976 after a phylogenetic analysis (Larsen & Wilson 2002). However, although this decision has not been made formally *L. birsteini* and *L. microcephala* have at least been correctly removed from *Leptognathia sensu stricto* and the Leptognathiidae by Larsen & Shimomura (2007).

It an abysso-hadal species which has been recorded from the Kurile-Kamchatka Trench at 4895 metres (Kudinova-Pasternak 1970), with earlier records from the widely separated Bougainville Trench, 6920–7657 metres (Kudinova-Pasternak 1965) and the North-west Pacific Basin, 6051 metres (Kudinova-Pasternak 1966). Three specimens of the *birsteini-microcephala* group from the present study seem referable to the latter species.

Leptognathia microcephala Kudinova-Pasternak, 1977

Figures 17–18

Leptognathia microcephala Kudinova-Pasternak, 1977: 122–124, figs 4–5. Larsen & Shimomura, 2007: 15.

Material examined. 1 preparatory male, two mancae-III, station XR12, 41°37.67'–41°37.08'N, 146°54.19'–146°52.72'E. 5473–5484 metres, 22–23 September 2001.

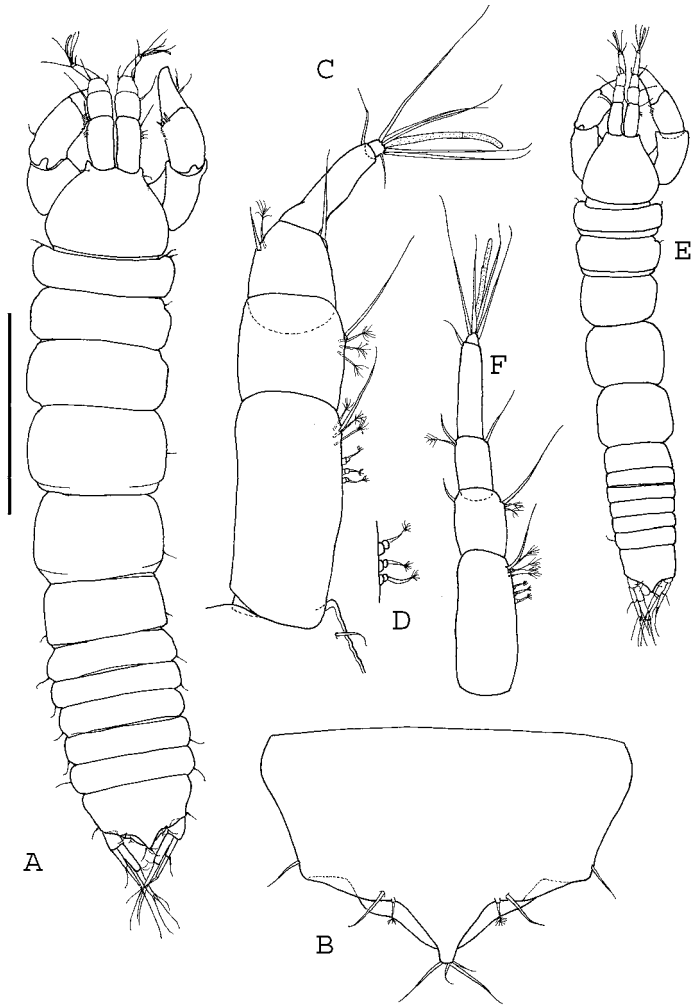

FIGURE 17. *Leptognathia microcephala*. A–D preparatory male. A, habitus; B, pleotelson; C, antennule; D, sensory setae of antennule article 1; E–F, manca-3. E, habitus; F, antennule. Scale bar = 1 mm for A and E, 0.30 mm for B, 0.24 mm for C and F, 0.12 mm for D.

Remarks. The three specimens from the present study agree with Kudinova-Pasternak's description of *L. microcephala*, rather than *L. birsteini* (see above) especially with regard to cephalothorax and pereonite proportions (Fig. 17A) and the shape of the pleotelson (Fig. 17B). The species (and its probable 'congeners') appears to be one of the most morphologically complex tanaidomorphans, with possible exception of the paratanaid genus *Bathytanais* Beddard, 1886. Of particular interest, the antennule is distinctly five-articled, with a small terminal article that could have been overlooked in previous studies. This is not homologous with the *Paraleptognathia-Chauliopleona-Akanthophoreus* configuration and is not linked to sexual development: although the preparatory male (length 3.48 mm) (Fig. 17A) has stout and broad antennules (Fig. 17C), the two mancae (1.92–2.18 mm) (Fig. 17E) also have five-articled antennules, which are slender (Fig. 17F). Unusual sensory setae on article 1 of antennule (Fig. 17D) have a pedestal and articulated basal element.

Other notable characters include: the pleotelson (Fig. 17B) with slightly tapering lateral margins and with long apical process; the cheliped (Fig. 18A) carpus has a large free posterio-dorsal margin, so that the appearance of the cheliped is almost malleolate; the cheliped fixed-finger spine, incisive margin and dactylus are heavily sclerotised; all pereopods, especially pereopod 1 (Fig 18C) are very slender and elongate; the pereopod 1 carpus has a small spatulate seta (Fig. 18D); the uropods (Fig. 18E) are slender, both articles are two-articled, the exopod reaching half length of endopod article 2.

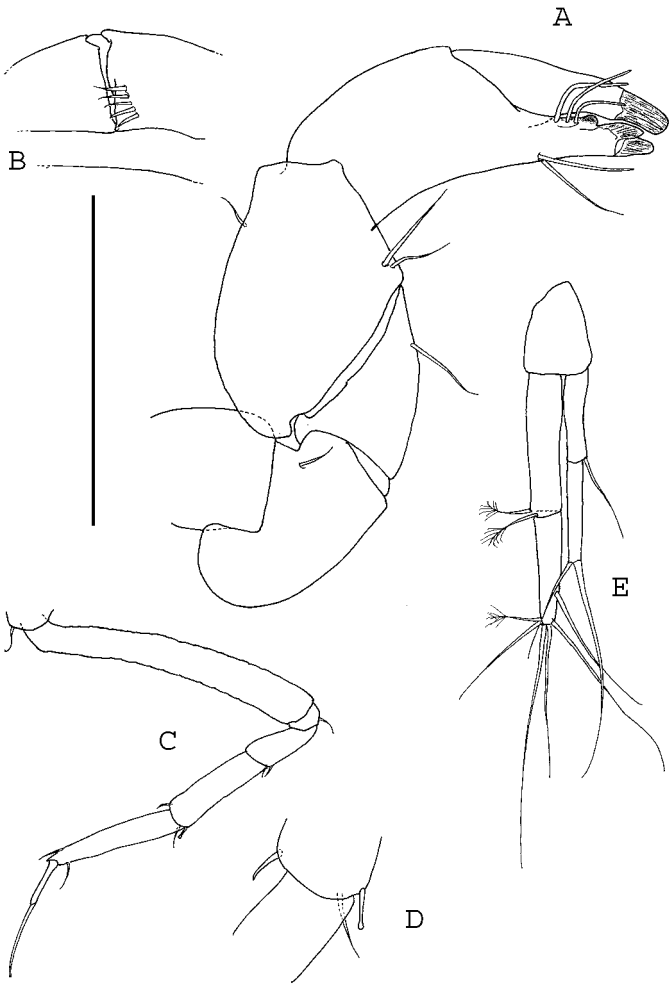

FIGURE 18. *Leptognathia microcephala*. Preparatory male. A, right cheliped; B, inner setal comb of right cheliped propodus; C, pereopod 1; D, pereopod 1 carpal setation, enlarged; E, uropod. Scale bar = 0.5 mm for A-C, 0.4 mm for E, 0.17 mm for D.

To confirm the true generic position of this species, and that of *L. birsteini*, it is desirable that material of *Latitanais beklemishevi* Kudinova-Pasternak, 1987 (type-locality Madagascar Basin, 5040–5069 metres) is obtained to check the number of antennule articles. In addition, new and irrefutable specimens of *L. birsteini* would help clarify distinctions between it and *L. microcephala*.

Distribution. Recorded from the Izu-Ogasawara Trench, 6330 metres (Kudinova-Pasternak 1978) and the Kurile-Kamchatka Trench, 5473–5484 metres in the present study.

Leptognathia vinogradovae Kudinova-Pasternak, 1970

Leptognathia vinogradovae Kudinova-Pasternak, 1970: 357–358, 379, fig. 10. Larsen & Shimomura, 2007: 15.

Remarks. As with the next species, *L. vinogradovae* has been removed from *Leptognathia sensu stricto* and the Leptognathiidae by Larsen & Shimomura (2007). Its true generic and familial attributions remain unknown until new and unequivocal specimens are collected. It is an elongate species, with a long pleon and the uropods lack an exopod. It was originally recorded from the Kurile-Kamchatka Trench at 5240 metres (Kudinova-Pasternak 1970), but is not recorded in the present material.

Leptognathia zenkevitchi Kudinova-Pasternak, 1970

Leptognathia zenkevitchi Kudinova-Pasternak, 1970: 360–361, 379, fig.13. Kudinova-Pasternak, 1973: 157. Larsen & Shimomura, 2007: 15.

Remarks. A small, stout species lacking pleopods, with a single ventral seta on the cheliped propodus and short uropods with one-articled exopod. It has been recently removed from the genus *Leptognathia sensu stricto* (and Family Leptognathiidae) by Larsen & Shimomura (2007), on the grounds that the mandibular molar is broad. Its true place in the new classification remains undecided until new, and unequivocal, specimens are collected. It has been recorded from the Kurile-Kamchatka Trench, 4945 metres (Kudinova-Pasternak 1970), and south of Unimak Island (Aleutian Islands) at 3080 metres (Kudinova-Pasternak 1973) but not recorded in the present material.

Leptognathioides sp.KK#1

Figure 19

Material examined. 1 non-ovigerous female (1.74 mm), station XR12, 41°37.67'–41°37.08'N, 146°54.19'–146°52.72'E. 5473–5484 metres, 22–23 September 2001.

Remarks. Only a single individual was recorded. The body shape (Fig. 19A), cheliped (Fig. 19B) and uropod (Fig. 19D) structure strongly suggest that it belongs in the genus *Leptognathioides* Bird & Holdich, 1984: the robust cheliped is characterized by a short posterior basal process beneath the attachment to the lateral sclerite and a large broad tooth on incisive margin fixed-finger; the uropod exopod is two-articled rather than one-articled in *L. polita* (Hansen, 1913), *L. rectus* Kudinova-Pasternak, 1993, *L. potens* Bird & Holdich, 1984 and *L. vicina* (Hansen, 1913) but has a very short article 2, that may represent a more plesiomorphic state from an earlier evolutionary stage.

Distribution. Kurile-Kamchatka Trench, 5473–5484 metres.

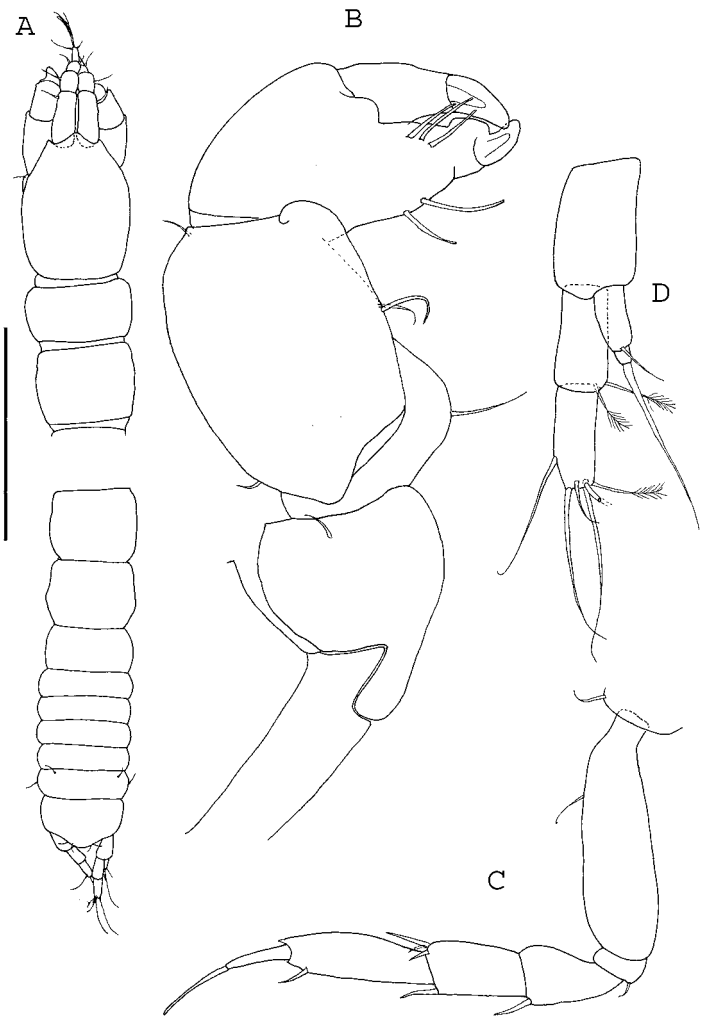

FIGURE 19. *Leptognathioides* sp.KK#1. A, non-ovigerous female, habitus; B, right cheliped; C, pereopod 1; D, uropod. Scale bar = 1 mm for A, 0.11 mm for B-D.

*Robustochelia robusta (*Kudinova-Pasternak, 1970)

Leptognathia robusta Kudinova-Pasternak, 1970: 365–366, fig. 16. Kudinova-Pasternak, 1977: 125.
Tanaissus robustus: Kudinova-Pasternak, 1975: 223.
Robustochelia robusta: Kudinova-Pasternak, 1983: 1171. JóŸwiak & B³a¿ewicz-Paszkowycz, 2007: 27–31, figs 4–6.

Remarks. The genus *Robustochelia* was placed in the subfamily Akanthophoreinae by Sieg (1986a) but was subsequently removed to the *incertae cedis* category by Larsen & Wilson (2002). A generic diagnosis was also given by Larsen (2005), with four known species. A very recent paper by Jóźwiak, & Błażewicz-Paszkowyc (2007) has updated the taxonomy, redescribed the type species *R. robusta*, added a further new species and removed *R. solida* Larsen (2005) from the genus. The cheliped and pereopod morphology, and shape of the mandibular molar (and other mouthparts) suggest a close relationship with *Leptognathioides* (see above) and *Monstrotanais* Kudinova-Pasternak.

The species *Robustochelia robusta* was originally described from material collected from the Kurile-Kamchatka Trench at 4945–5240 metres (Kudinova-Pasternak 1970), but has not been recorded in the present study. It is also reported from the more southerly Izu-Ogasawara Trench, 6770–6850m (Kudinova-Pasternak 1977) and doubtfully from the south Atlantic, at 2600 metres (Kudinova-Pasternak 1975).

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