Two New Shallow-water Species of *Agathotanaïs* (Crustacea: Tanaidacea) from Japan

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We describe two shallow-water species of *Agathotanaïs*, *A. misakiensis* sp. nov. and *A. toyoshioae* sp. nov., from Japan. *Agathotanaïs misakiensis* was collected from 211–493 m depth in the Sagami Sea, North Pacific Ocean. It closely resembles *A. ghilarovi* Kudinova-Pasternak, 1989, but differs in having shorter pereonites 3 and 4, all pleonites narrower than pereonite 6, and a shorter article 3 in the antennule. *Agathotanaïs toyoshioae*, collected from 95 m depth in the Genkai Sea, Sea of Japan, is very similar to *A. spinipoda* Larsen, 1999. The former can be distinguished from the latter by its narrower pleonites, the presence of a ventral keel on pleonites 1 and 2, and the presence on the basis and absence on the carpus and propodus of small spines on pereopods 4–6.

Key Words: Tanaidacea, Agathotanaidae, *Agathotanaïs*, new species, Japan, key.

Introduction

The tanaidacean family Agathotanaidae consists of six genera (Błażewicz-Paszkowycz and Bamber 2012; Józwiak and Jakiel 2012), one of which is *Agathotanaïs* Hansen, 1913. *Agathotanaïs* differs from the other five genera in having one or two articles in the antenna, and fine setae covering the body and appendages. It seems to be a bathyal and abyssal taxon; as all previous studies have reported *Agathotanaïs* from deeper than 400 m depth, except for a single specimen of *Agathotanaïs ingolfi* Hansen, 1913 reported by Holdich and Jones (1983) from shallower than 200 m (Fig. 1, asterisk). Three species have been reported from around Japan, collected from the Kurile-Kamchatka and Japan Trenches: *A. hadalis* Larsen, 2007 from 5473–5484 m depth; *A. ingolfi* from 4895–5240 m depth; and *A. splendidus* Kudinova-Pasternak, 1970 from 5441 m depth (Kudinova-Pasternak 1970; Larsen 2007) (Fig. 1).

During faunal surveys in the Sagami Sea (Pacific Ocean) and the Genkai Sea (Sea of Japan), specimens of *Agathotanaïs* collected from comparatively shallow waters, at a minimum depth of 95 m, proved to belong to two undescribed species. In this paper we describe these species and present a key to the species of *Agathotanaïs*.

Materials and Methods

The animals from the Sagami Sea were collected in 2012 and 2014 by RV *Rinkai-maru* (Misaki Biological Marine Station, University of Tokyo) by means of a biological dredge

at depths of 211–493 m; the specimen from the Genkai Sea was obtained in 2014 by TRV *Toyoshio-maru* (Hiroshima University) with a biological dredge from 95 m depth. Type specimens fixed in 70–99% ethanol and preserved in 99% ethanol were deposited in the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan (ZIHU). Methods of dissection, specimen preparation, light microscopy, scanning electron microscopy (SEM), and drawing were as described in Kakui and Angsupanich (2012). Orientation and morphological terminology here follow Larsen (2003), except that the term “plumose sensory seta(e)” (PSS; Bird 2011) is used instead of “broom seta(e)”. Body length (BL) and cephalothorax length were measured from the base of the antennules to, respectively, the tip of the pleotelson and the posterior edge of the carapace; body width was measured at the widest portion of the carapace (*i.e.*, =carapace width: CW); pereonite width was measured across the “pereopod shoulders” (Larsen 1999b), which are lateral projections on the pereonites where the pereopods attach. Measurements were made axially: dorsally on the body, antennules, antennae, and uropods; laterally on the pereopods and pleopods. All measurements in the text are in millimeters, unless noted otherwise. Length and width in congeners were measured from original illustrations, except for the illustrations in Bird and Holdich (1988) for *A. ingolfi*. The suffixes in the newly proposed Japanese names, *viz.*, ‘-ka’ and ‘-zoku’, represent the taxonomic ranks family and genus, respectively, in the Japanese language.

Fig. 1. Map showing the global distribution of *Agathotanaeis*. Circles, *A. hanseni* (blue), *A. spinipoda* (light blue), and *A. ingolfi* (red); triangles, *A. hadalis* (purple) and *A. ahyongi* (orange); inverted black triangles, *A. splendidus* (1), *A. ghilarovi* (2), *A. manganicus* (3), and *A. brevis* (4); green stars, *A. misakiensis* sp. nov. (Am), and *A. toyoshioae* sp. nov. (At); asterisk, the shallow-water (< 200 m) site of Holdich and Jones (1983). Based on data from Hansen (1913); Barnard (1920); Kudinova-Pasternak (1970, 1989, 1990); Lang (1971); Holdich and Jones (1983); Bird and Holdich (1988); Larsen (1999a, b, 2005, 2007); Bird (2010); and this study.

Family **Agathotanaidae** Lang, 1971

[New Japanese name: Kubire-tanaisu-ka]

Genus **Agathotanaeis** Hansen, 1913

[New Japanese name: Kubire-tanaisu-zoku]

Agathotanaeis misakiensis sp. nov.

[New Japanese name: Misaki-kubire-tanaisu]

(Figs 2–9)

Material examined. Holotype. Female, ZIHU-4948, BL 3.88, CW 0.53, 4 slides and 1 vial, RV *Rinkai-maru*, off Misaki, Sagami Sea, North Pacific Ocean, 35°06.086'N, 139°34.232'E to 35°05.807'N, 139°34.089'E, 238–291 m depth, 19 February 2014, coll. by K. Kakui.

Allotype. Male, ZIHU-4949, BL 2.79, CW 0.41, 4 slides and 1 vial, same collection data as for holotype.

Paratypes. 10 females: ZIHU-4950, BL 3.37, CW 0.47, 4 slides and 1 vial; ZIHU-4951, BL 3.17, CW 0.45, 4 slides and 1 vial; ZIHU-4952, 3 slides and 1 vial; ZIHU-4953, 4 slides and 1 vial; ZIHU-4954, BL 3.12, CW 0.41, 1 vial (body and detached antennule and antenna); ZIHU-4955, BL 3.18, CW 0.44, 1 vial (body and detached antennule and pereopod); ZIHU-4956, BL 3.12, CW 0.44, 1 vial (body and detached antennule); ZIHU-4957, BL 3.03, CW 0.40, 1 vial (body and detached antennule); ZIHU-4958, 1 SEM stub and 1 vial; ZIHU-4959, BL 3.08, CW 0.43, 1 SEM stub. 3 males: ZIHU-4960, BL 2.66, CW 0.38, 1 vial (body and detached antennule); ZIHU-4961, BL 2.68, CW 0.39, 1 vial (body and detached antennule); ZIHU-4962, BL 2.72, CW 0.39, 1 vial (body and detached antennule). 4 females (including 2 anterior parts) and 4 males, ZIHU-4963, 1 vial. ZIHU-4960: RV *Rinkai-maru*, 35°07.084'N, 139°34.000'E to 35°07.112'N,

139°34.146'E, 258–211 m depth, 23 January 2014, coll. by H. Kohtsuka. ZIHU-4950–3, 4958, 4959, 4963: same collection data as for holotype. ZIHU-4954–4957, 4961, 4962: RV *Rinkai-maru*, 35°07.301'N, 139°33.365'E to 35°07.327'N, 139°32.978'E, 250–493 m depth, 24 February 2012, coll. by M. Shimomura.

Diagnosis. Body narrow (BL/CW more than 6.50); cephalothorax length longer than CW; length/width of pereonites 3 and 4 0.90–1.00 and 0.95–1.10, respectively; pleonites narrower than pereonite 6; pleonites 1 and 2 without ventral keel. Antennular article 3 1.80–2.05 (female) or 2.20–2.60 (male) times as long as antennular article 2. Antenna with one article. Fixed finger with one ventral simple seta. Basis of pereopods 1–6 lacking dorsal small spines. Carpus of pereopods 1–3 with one dorsodistal simple seta; that on carpus of pereopod 2 short (shorter than two-thirds of propodus length). Dactylus of pereopods 1–3 naked. Carpus and propodus of pereopods 4–6 with two and three distal spiniform setae, respectively, but lacking ventral small spines. Uropod with one articulation between basal article and tip.

Etymology. The specific name is an adjective referring to the type locality.

Description of females. Based primarily on holotype, with some observations from paratype ZIHU-4950.

Body (Figs 2A, a1, C, 8, 9) cylindrical, 7.35 times as long as wide, pitted and setulate on cephalothorax and pereon (e.g., Fig. 8A, B). Cephalothorax 0.15 times as long as BL, 1.20 times as long as wide, oval in dorsal view; rostrum triangular; eye lobes absent; posterior region with shallow median ventral groove (cf. Fig. 8A). Length ratio of pere-

Fig. 2. *Agathotanaeis misakiensis* sp. nov. A, C, holotype, female; B, D, allotype. A, B, body, dorsal view; a1, b1, pereonite 6 and pleon of same specimens, dorsal view; C, D, body, lateral view. Scale bars: 1 mm.

onites 1–6 1.00:1.20:1.20:1.20:1.20:0.90; length/width of pereonites 1–6 0.75, 0.95, 1.00, 1.05, 1.05, and 0.85, respectively. Pleon setulate, 0.15 times as long as BL. Pleonites 0.75 times as wide as pereonite 6, 0.60 times as wide as CW, all wider than long, similar in shape; segmental articulations posterior to articulation between pereonites 5 and 6 all obscure (cf. Fig. 9A); pleonite 5 with two pairs of lateral simple setae. Pleotelson setulate, 0.80 times as long as wide, as wide as pleonites; distal region with two pairs of simple setae and one pair of PSS; apical margin straight.

Antennule (Fig. 3A) as long as cephalothorax; length ratio of articles 1–3 1.00:0.20:0.40. Article 1 3.50 times as long as wide, with one dorsomedial and two distal simple setae, and several middle and distal PSS. Article 2 with two distal simple setae and one distal PSS. Article 3 with six distal simple setae, one distal PSS, and one distal aesthetasc. Antenna (Fig. 3B) uniarticulate, 0.15 times as long as antennule, bearing two distal simple setae.

Labrum (Fig. 4A) with fine distal setae as illustrated. Mandibles (Figs 4B, C, 8C, D) with membranous molar process bearing small distal projection. Left mandible's incisor (Figs 4B, 8C) with blunt teeth; lacinia mobilis round, fused

to body of mandible. Right mandible's incisor (Figs 4C, 8D) with broad triangular apex. Labium (Fig. 4D) with one pair each of lateral setulate projections and distal setulate rounded projections. Maxillule (Fig. 4E, e1) with palp bearing two setae; endite with nine spiniform setae. Maxilla (Fig. 4F) naked. Maxillipeds (Fig. 4G) with domed, cordate bases, each bearing one simple seta at insertion of palp; distal regions of bases separated, covered by fine setae, with one pair of simple setae. Palp article 1 naked; article 2 with two simple setae and one plumose seta; article 3 with one simple seta and two plumose setae; article 4 with one outer subdistal simple seta and five distal setulate setae. Epignath (Fig. 4H) narrow, curved, with one terminal seta.

Cheliped (Fig. 3E) with basis bearing small outer ventro-proximal process (Fig. 3E, arrow; Fig. 8A, arrow); portion proximal to process inserted into ventral surface of posterior region of cephalothorax. Merus with one ventral simple seta. Carpus 3.00 times as long as wide, with one dorsodistal simple seta and slight ventromedial projection bearing two simple setae. Chela 1.15 times as long as carpus, 3.00 times as long as wide; propodal palm 1.30 times as long as fixed finger, with one inner simple seta, and one simple seta at

Fig. 3. *Agathotanaïs misakiensis* sp. nov. A, B, E, holotype, female; C, D, F, allotype. A, C, left antennule; B, D, left antenna; E, F, left cheliped. Arrow, small outer ventroproximal process on basis. Scale bars: 0.1 mm.

Fig. 4. *Agathotanaïs misakiensis* sp. nov. A–G, holotype, female; H, paratype (ZIHU-4950), female. A, labrum; B, left mandible; C, right mandible; D, labium; E, left maxillule; e1, same, tip of endite; F, left maxilla; G, maxillipeds; H, right epignath. Scale bars: A–H, 0.1 mm; e1, 0.05 mm.

Fig. 5. *Agathotanaeis misakiensis* sp. nov., holotype, female. A–F, left pereopods 1–6, outer views; a1, b1, c1, distal parts of propodi of pereopods 1–3, respectively, inner views; G, left uropod. Scale bars: A–G, 0.1 mm; a1, b1, c1, 0.05 mm.

insertion of dactylus; fixed finger with one simple seta on ventral margin and two outer simple setae, one arched spiniform seta, and one distal projection on cutting surface; dactylus as long as fixed finger, with two spiniform setae on cutting surface.

Pereopods 1–6 cylindrical, setulate, with length ratio of 1.10:1.00:1.00:0.90:0.85:0.95. Pereopod 1 (Fig. 5A, a1) 0.23 times as long as BL, with length ratio of basis, ischium, merus, carpus, propodus, and dactylus-unguis 3.6 5:0.25:1.00:1.55:1.95:1.65. Basis without dorsal spines. Ischium with one ventral simple seta. Merus with two ventral simple setae. Carpus with one dorsodistal and two ventrodistal simple setae. Propodus with one ventro-subdistal simple seta, one dorso-subdistal seta, and inner distal row

of complex spiniform setae (Fig. 5a1). Dactylus and unguis subequal in length, naked. Pereopod 2 (Fig. 5B, b1) with length ratio of articles from basis to dactylus-unguis 4.50:0.25:1.00:1.60:2.10:1.80; similar to pereopod 1, except merus with just one ventral simple seta. Dorsodistal simple seta of carpus short (shorter than two-thirds propodus length). Pereopod 3 (Fig. 5C, c1) with coxa bearing one simple seta. Length ratio of articles from basis to dactylus-unguis 4.45:0.20:1.00:1.70:2.00:1.70; similar to pereopod 2, except basis with one dorsal and one ventral PSS, merus with two ventral simple setae, and carpus with one inner distal simple seta. Pereopod 4 (Fig. 5D) with length ratio of articles from basis to dactylus-unguis 4.00:0.30:1.00:1.70:1.85:1.00. Basis with one dorsal and two ventral PSS. Ischi-

Fig. 6. *Agathotana misakiensis* sp. nov., allotype, male. A, labrum (partly broken); B, left mandible; C, right mandible; D, labium; E, left maxillule; e1, same, tip of endite; F, left maxilla; G, maxillipeds; H, left epignath. Scale bar: A–D, F–H, 0.1 mm; E, 0.2 mm; e1, 0.05 mm.

um with two ventral simple setae. Merus with two ventral simple setae. Carpus with one outer and one inner simple setae and two ventrodistal spiniform setae. Propodus with three distal spiniform setae. Dactylus naked. Unguis with row of short setae. Pereopod 5 (Fig. 5E) with coxa naked. Length ratio of articles from basis to dactylus-unguis 4.20:0.20:1.00:1.25:1.05:1.45; similar to pereopod 4 except basis with just one ventral PSS. Pereopod 6 (Fig. 5F) with length ratio of articles from basis to dactylus-unguis 3.95:0.25:1.00:1.20:1.00:1.25; similar to pereopod 5.

Pleopods absent.

Uropod (Figs 5G, 9) with exopod fused to basal article, slight, not expanded laterally, bearing two simple setae. Endopod fused to basal article, but with one distal articulation (Fig. 9a1, arrow) between 'proximal' and 'distal' articles; proximal article with two PSS; distal article with five simple setae and two PSS.

Description of males. Based on the allotype.

Body (Fig. 2B, b1, D) similar to female but slightly stouter (6.85 times as long as wide) and with relatively shorter pereonite 6 and wider pleonites. Pereonites 1–6 with length ratio of 1.00:1.15:1.15:1.15:1.15:0.70; length/width of pereonites 1–6 0.70, 0.90, 0.95, 1.00, 1.00, and 0.55, respectively. Pleon length 0.2 times BL. Pleonites 0.80 times as wide as pereonite 6, 0.70 times as wide as CW; articulations evident between all segments. Pleotelson narrower than pleonites.

Antennule (Fig. 3C) as long as cephalothorax, thick-

er than that of female; length ratio of articles 1–3 1.00:0.20:0.55. Articles 1–3 similar to those of female, except article 3 with groove in middle region. Antenna (Fig. 3D) similar to that of female but relatively longer (0.25 times as long as antennule).

Mouthparts (Fig. 6) similar to those of female.

Cheliped (Fig. 3F) similar to that of female, except propodal palm with two inner simple setae, and dactylus with one inner proximal simple seta.

Pereopods 1–6 (Fig. 7A–F) with length ratio of 1.15:1.05:1.00:0.95:1.00:1.00; pereopod 1 0.25 times as long as BL. Pereopods similar to those of female, except: merus of pereopods 1 and 3 with just one ventral simple seta; carpus of pereopod 2 with just one inner distal simple seta.

Pleopods (Fig. 7G) all similar. Basal article naked. Endo- and exopods fused to basal article; endopod with six distal and one inner subdistal spiniform setae; exopod with eight distal spiniform setae.

Uropod (Fig. 7H) similar to that of female, except proximal article with three PSS.

Variation. BL/CW 7.00–7.55 in females ($n=7$), 6.85–6.95 in males ($n=4$). Length/width of pereonites 3 and 4 0.90–1.00 and 0.95–1.10, respectively. Relative length of antennular article 3 to article 2 1.80–2.05 in females, 2.20–2.60 in males. Measurement data for these three characters listed in Table 1.

Chelipedal basis with one dorsal simple seta in four para-

Fig. 7. *Agathotanaeis misakiensis* sp. nov., allotype, male. A–F, left pereopods 1–6, outer views; a1, b1, c1, distal parts of propodi of pereopods 1–3, respectively, inner views; G, left pleopod 2; H, left uropod. Scale bars: A–H, 0.1 mm; a1, b1, c1, 0.05 mm.

types. Chelipedal carpus with one dorsomedial simple seta in four paratypes. Merus of pereopod 2 with two ventral simple setae in three paratypes. Carpus of pereopod 2 with one inner distal simple seta in three paratypes and allotype. Basis of pereopod 4 with two ventral PSS in three paratypes and allotype.

Maxillular endite with nine spiniform setae in holotype, allotype and one paratype, and 10 in three paratypes.

Distribution. So far known only from type locality, at depths of 211–493 m.

Remarks. *Agathotanaeis misakiensis* sp. nov. is the tenth species described in this genus. In having an articulation between the uropodal basal article and the tip of the endopod, this species closely resembles *A. ghilarovi* Kudinova-Pasternak, 1989. The former differs from the latter (see Kudinova-Pasternak 1989) in having shorter pereonites (especially pereonites 3 and 4: length/width of both pereonites is about 1.00 in *A. misakiensis* but about 1.50 in *A. ghilarovi*); narrower pleonites (pleonites narrower than pereonite 6 in *A. misakiensis* but as wide as pereonite 6 in *A. ghilarovi*); a shorter antennular article 3 (in *A. misakiensis*, 1.80–2.05 times longer than article 2 in females, 2.20–2.60 times longer in males; comparable values for *A. ghilarovi* 3.05 in females and 3.35 in males); and the setation of the merus and

carpus of pereopod 4 (in *A. ghilarovi*, the merus has four ventral setae, and the carpus lacks ventral setae).

***Agathotanaeis toyoshioae* sp. nov.**

[New Japanese name: Toyoshio-kubire-tanaisu]

(Figs 10–14)

Material examined. Holotype. Female with developed oostegites but lacking eggs or embryos, ZIHU-4964, BL 2.25, CW 0.30, 7 slides and 1 vial, TRV *Toyoshio-maru*, Genkai Sea, Sea of Japan, 34°04.911'N, 129°58.444'E to 34°04.891'N, 129°58.479'E, 95 m depth, 26 May 2014, coll. by S. Ohtsuka.

Diagnosis. Body narrow (BL/CW more than 6.50); cephalothorax longer than CW; length/width of pereonites 3 and 4 1.05 and 1.15, respectively; pleonites narrower than pereonite 6 (pleonite width 0.65 times pereonite-6 width, 0.45 times CW); pleonites 1 and 2 with ventral keel. Antennular article 3 2.35 (female) times as long as antennular article 2. Antenna with one article. Fixed finger with one ventral simple seta. Basis of pereopods 1–6 with dorsal small spines. Carpus of pereopods 1–3 with one dorsodistal simple seta; that on carpus of pereopod 2 short (shorter than two-thirds of propodus length). Dactylus of pereopods 1–3 naked.

Fig. 8. *Agathotanais misakiensis* sp. nov., paratypes (A, B, ZIHU-4959; C, D, ZIHU-4958), females, SEM images. A, posterior region of cephalothorax, ventral view; B, pereonite 3 showing pitted surface, right view; C, D, left and right mandibles with membranous molar process (arrowheads), respectively. Arrow, small outer ventroproximal process on basis of left cheliped. Asterisks, peritrich ciliates. Scale bars: A, B, 0.1 mm; C, D, 0.02 mm.

Carpus and propodus of pereopods 4–6 with one and three distal spiniform setae, respectively but lacking ventral small spines. Uropod with no articulation between basal article and tip.

Etymology. The species is named after TRV *Toyoshio-maru*, the ship from which the type specimen was collected.

Description of female. Body (Figs 10, 14) cylindrical, 7.50 times as long as wide, pitted and setulate on cephalothorax and pereon (cf. Fig. 14). Cephalothorax 0.15 times as long as BL, 1.30 times as long as wide, acorn-shaped in dor-

sal view; rostrum rounded; eye lobes absent; posterior region with shallow median ventral groove (Fig. 14A). Pereonites 1–6 with length ratio of 1.00:1.20:1.20:1.30:1.30:1.00; length/width of pereonites 1–6, 0.75, 0.95, 1.05, 1.15, 1.20, and 1.05, respectively. Pleon setulate, 0.15 times as long as BL. Pleonites 0.65 times as wide as pereonite 6, 0.45 times as wide as CW, all wider than long, similar in shape; segmental articulations posterior to that between pereonites 5 and 6 all obscure; pleonites 1 and 2 each with ventral keel; pleonites 3 and 4 slightly narrower than others; pleonite 5 with one pair

Fig. 9. *Agathotanaeis misakiensis* sp. nov., paratype (ZIHU-4959), female, SEM images. A, pleon, left view; a1, higher magnification view showing one articulation in uropod (arrow). Scale bars: A, 0.1 mm; a1, 0.01 mm.

Table 1. Variations in measurements among type specimens.

ZIHU	BL/CW	Length/width of pereonites						Relative length of article 3 to article 2 in antennule
		1	2	3	4	5	6	
FEMALES								
4948 ^a	7.35	0.75	0.95	1.00	1.05	1.05	0.85	1.95
4950	7.25	0.80	1.00	1.00	0.95	0.95	0.75	1.85
4951	7.00	0.75	0.95	1.00	1.05	1.10	0.75	1.95
4954	7.55	0.85	0.90	1.00	1.10	1.05	0.70	2.05
4955	7.30	0.80	0.95	0.95	1.00	1.05	0.75	1.95
4956	7.10	0.75	0.85	1.00	1.05	1.10	0.80	1.80
4957	7.50	0.80	0.95	1.00	1.10	1.05	0.75	1.90
MALES								
4949 ^b	6.85	0.70	0.90	0.95	1.00	1.00	0.55	2.60
4960	6.95	0.75	0.85	0.90	0.95	0.90	0.55	2.20
4961	6.95	0.75	0.90	0.95	1.00	0.90	0.55	2.35
4962	6.95	0.75	0.90	0.95	0.95	0.95	0.50	2.50

^a Holotype, ^b allotype.

of lateral simple setae. Pleotelson setulate, 0.80 times as long as wide, wider than pleonites; distal region with two pairs of simple setae; apical margin straight.

Antennule (Fig. 11A) 1.10 times as long as cephalothorax; length ratio of articles 1–3 1.00:0.15:0.35. Article 1 thick proximally, with one dorsomedial and two distal simple setae, several middle and distal PSS, and several small spines. Article 2 with two distal simple setae and one distal PSS. Article 3 with six distal simple setae, one distal PSS,

and one distal aesthetasc. Antenna (Fig. 11B) uniarticulate, 0.20 times as long as antennule, bearing two distal simple setae.

Labrum (Fig. 12A) with fine distal setae as illustrated. Mandibles (Fig. 12B, C) with membranous molar process bearing small distal projection. Left mandible's incisor (Fig. 12B) with blunt teeth; lacinia mobilis triangular, fused to body of mandible. Right mandible's incisor (Fig. 12C) with blunt teeth. Labium (Fig. 12D) with one pair each of lateral

Fig. 10. *Agathotanais toyoshioae* sp. nov., holotype, female. A, body, dorsal view; a1, pereonite 6 and pleon, dorsal view; B, body, lateral view. Scale bar: 0.5 mm.

Fig. 11. *Agathotanais toyoshioae* sp. nov., holotype, female. A, right antennule; B, right antenna; C, right cheliped. Scale bar: 0.1 mm.

and distal setulate projections. Maxillule (Fig. 12E, e1) with palp bearing two setae; endite with 10 spiniform setae. Maxilla (Fig. 12F) naked. Maxillipeds (Fig. 12G) with domed, cordate bases, each bearing one simple seta at insertion of palp; distal regions of bases separated, covered by fine setae, with one pair of simple setae. Palp article 1 naked; article 2 with three simple setae; article 3 with two plumose setae; article 4 with five distal simple setae. Epignath (Fig. 12H) narrow, curved, with one simple terminal seta.

Cheliped (Fig. 11C) with basis bearing small outer ventroproximal process; portion proximal to process inserted into ventral surface of posterior region of cephalothorax. Merus with one ventral simple seta. Carpus 2.15 times as long as wide, with slight ventromedial projection bearing two simple setae, and one dorsomedial and one dorsodistal simple setae. Chela 1.05 times as long as carpus, 2.15 times as long as wide; propodal palm 1.30 times as long as fixed finger, with one inner and one outer simple setae at insertion of dactylus; fixed finger with one simple seta on ventral margin and two outer simple setae, one arched spiniform seta, one distal projection, and several small spines on cutting surface; dactylus as long as fixed finger, with two spini-

form setae on cutting surface.

Pereopods 1–6 cylindrical, setulate, with length ratio of 1.20:1.10:1.00:0.95:1.05:1.05. Pereopod 1 (Fig. 13A, a1) 0.20 times as long as BL, with length ratio of articles from basis to dactylus-unguis 3.70:0.25:1.00:1.40:1.95:1.65. Basis with dorsal small spines. Ischium with one ventral simple seta. Merus with two ventral simple setae. Carpus with one dorsodistal and two ventrodiscal simple setae. Propodus with one ventro-subdistal simple seta and inner distal row of spiniform setae (Fig. 13a1). Dactylus and unguis subequal in length, naked. Pereopod 2 (Fig. 13B, b1) with coxa bearing one dorsal simple seta. Length ratio of articles from basis to dactylus-unguis 3.65:0.25:1.00:1.35:1.80:1.55; similar to pereopod 1, except carpus with just one ventral simple seta. Dorsodistal simple seta on carpus short (shorter than two-thirds propodus length). Pereopod 3 (Fig. 13C, c1) with length ratio of articles from basis to dactylus-unguis 3.70:0.25:1.00:1.30:1.95:1.65; similar to pereopod 2. Pereopod 4 (Fig. 13D) with naked coxa. Length ratio of articles from basis to dactylus-unguis 4.35:0.25:1.00:1.15:1.05:2.00. Basis with one dorsal and two ventral PSS, and dorsal small spines. Ischium with two ven-

Fig. 12. *Agathotanaeis toyoshioae* sp. nov., holotype, female. A, labrum (broken); B, left mandible; C, right mandible; D, labium; E, right maxillule; e1, same, tip of endite; F, right maxilla; G, maxillipeds (body partly broken; setae on right palp-article 4 omitted); H, right epigynum. Scale bar: A–D, e1, G, 0.05 mm; E, F, H, 0.1 mm.

tral simple setae. Merus with two ventral simple setae. Carpus with one inner simple seta and one ventrodistal spiniform seta. Propodus with three distal spiniform setae. Dactylus naked. Unguis with row of short setae. Pereopod 5 (Fig. 13E) with length ratio of articles from basis to dactylus-unguis 4.90:0.30:1.00:1.40:1.30:2.35; similar to pereopod 4, except basis with two dorsal PSS. Pereopod 6 (Fig. 13F) with length ratio of articles from basis to dactylus-unguis 4.45:0.30:1.00:1.50:1.20:2.25; similar to pereopod 5, except basis with one dorsal and one ventral PSS.

Pleopods absent.

Uropod (Fig. 13G) with exopod fused to basal article, slight, not expanded laterally, bearing two simple setae. Endopod fused to basal article, with four simple setae and four PSS.

Distribution. So far known only from type locality.

Remarks. *Agathotanaeis toyoshioae* sp. nov. is the eleventh species described in this genus. Seven congeners similarly have a uniarticulate antenna and uropods without articulations between the basal article and the tip. Among these, *A. toyoshioae* most closely resembles *A. spinipoda*

Larsen, 1999 in having: 1) all pleonites narrower than pereonite 6; 2) a short dorsodistal simple seta on the carpus of pereopod 2 (shorter than two-thirds of the propodus length); and 3) the carpus and propodus of pereopods 4–6 with one and three distal spiniform setae, respectively. *Agathotanaeis toyoshioae* differs from *A. spinipoda* in having 1) narrower pleonites (*i.e.*, pleonite width 0.65 times width of pereonite 6 and 0.45 times CW in *A. toyoshioae*, but 0.75 times and 0.65 times respectively in *A. spinipoda*); 2) a ventral keel on pleonites 1 and 2; 3) the bases of pereopods 1–6 with dorsal small spines; and 4) no ventral small spines on the carpus and propodus of pereopods 4–6 (see Larsen 1999b).

Key to the species of *Agathotanaeis* (females)

1. Antenna with two articles..... *A. manganicus* Larsen, 1999
- Antenna with one article 2
2. Uropod with one articulation between basal article and tip..... 3

Fig. 13. *Agathotanaeis toyoshioae* sp. nov., holotype, female. A–F, right pereopods 1–6, outer views; a1, b1, c1, distal parts of propodi of pereopods 1–3, respectively, inner views; G, right uropod. Scale bar: A–G, 0.1 mm; a1, b1, c1, 0.05 mm.

- Uropod without articulations between basal article and tip 4
- 3. Length/width of pereonites 3 and 4 about 1.50; pleonites as wide as pereonite 6 *A. ghilarovi*
- Length/width of pereonites 3 and 4 almost 1.00; pleonites narrower than pereonite 6 *A. misakiensis* sp. nov.
- 4. Fixed finger with two ventral simple setae; carpus of pereopods 1–3 lacking dorsodistal seta; pleonites narrower than pereonite 6 *A. ahyongi* Larsen, 1999
- Fixed finger without ventral seta; carpus of pereopods 1 and 3 (no data for pereopod 2) with one dorsodistal seta; pleonites as wide as pereonite 6 *A. splendidus*
- Fixed finger with one ventral simple seta; carpus of pereopods 1–3 with one dorsodistal seta; pleonites narrower than pereonite 6 5
- 5. Dorsodistal simple seta on carpus of pereopod 2 long (longer than two-thirds of propodus length) 6
- Dorsodistal simple seta on carpus of pereopod 2 short (shorter than two-thirds of propodus length) 8
- 6. Body stout (BL/CW 5.30); cephalothorax length equal to CW *A. brevis* Kudinova-Pasternak, 1990
- Body narrow (BL/CW more than 6.50); cephalothorax length longer than CW 7
- 7. Pereonite 3 shorter than wide, pereonite 4 longer than wide (length/width 0.90 and 1.10, respectively); dactylus of pereopods 1–3 naked *A. ingolfi*
- Pereonites 3 and 4 longer than wide (length/width 1.15 and 1.30, respectively); dactylus of pereopods 1–3 with

Fig. 14. *Agathotanaeis toyoshioae* sp. nov., holotype, female, microphotographs showing pitted surface. A, pereonites 1 and 2, image from stereoscopic microscope, ventral view; B, pereonite 4, image from compound microscope, left view. Scale bars: 0.1 mm.

- one simple seta *A. hanseni* Lang, 1971
8. Carpus and propodus of pereopods 4–6 with three and two distal spiniform setae, respectively *A. hadalis*
- Carpus and propodus of pereopods 4–6 with one and three distal spiniform setae, respectively 9
9. Pleonites narrow (pleonite width 0.75 times pereonite-6 width and 0.65 times CW); basis of pereopods 1–6 without dorsal small spines; carpus and propodus of pereopods 4–6 with ventral small spines *A. spinipoda*
- Pleonites very narrow (pleonite width 0.65 times pereonite-6 width and 0.45 times CW); basis of pereopods 1–6 with dorsal small spines; carpus and propodus of pereopods 4–6 without ventral small spines *A. toyoshioae* sp. nov.

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