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A new species of *Fageapseudes* (Crustacea: Peracarida: Tanaidacea) from California, with comments on the systematics of the family Apseudidae

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Abstract

Examination of material housed at the Los Angeles County Museum of Natural History revealed a new species of *Fageapseudes* from 4100 m depth off California, the first record of the genus in the eastern North Pacific. *Fageapseudes pluma* **n. sp.** is very similar to the Japanese species *Fageapseudes brachyomos* Bamber, but can be distinguished by differences in setation and by having fewer articles in the antennal flagellum and uropodal exopodite. It is unique for the genus and subfamily in having the inner caudo-distal seta of the maxillipedal endite "feather-like" instead of "leaf-like" or simply setulose. Problems with the current classification of the Apseudidae are briefly discussed, and new diagnoses are established for the subfamily Leviapseudinae and the genus *Fageapseudes*.

Key words: Apseudidae, Leviapseudinae, new species, *Fageapseudes pluma*, California

Introduction

Examination of specimens from the Los Angeles County Museum of Natural History (LACM) labeled as *Carpoapseudes* sp. revealed that they are a new species of *Fageapseudes*. The species was taken at 4100 m depth off California. It is very similar to the Japanese species, *Fageapseudes brachyomos* Bamber, 2007, from the Kurile-Kamchatka Trench at 5473–5762 m depth. Three other species of *Fageapseudes* are known, the type species *F. retusifrons* (Richardson, 1912) from the Gulf of Cadiz and the western Mediterranean (220–740 m), *F. suprema* (Jóźwiak and Błażewicz-Paszkowycz, 2007) from Drake Passage (southern tip of South America) at 3804 m, and another from the western North Pacific, *F. bicornis* (Kudinova-Pasternak, 1973) from the Sea of Okhotsk at *ca* 3300 m.

The two major (i.e. most species-rich) apseudid subfamilies, Apseudinae and Leviapseudinae, are currently distinguished by the nature of the dactylus of the fourth pereopod and the inner caudo-distal seta of the maxillipedal endite. The dactylus of the Leviapseudinae is often reduced and the caudo-distal seta of the maxillipedal endite is "leaf-shaped", while in the Apseudinae the dactylus is not reduced and the caudo-distal seta is simple. The presence of a "leaf-shaped" seta in *Fageapseudes brachyomos* caused Bamber (2007) to transfer the genus from the Apseudinae to the Leviapseudinae. It is shown here, and in other papers (Bamber, 1999; Błażewicz-Paszkowycz and Larsen, 2004), that the seta of the maxillipedal endite is problematic in the classification of apseudids, and a phylogenetic analysis might indicate its homoplasious nature.

Taxonomy

Suborder Apseudomorpha Sieg, 1980

Superfamily Apseudoidea Leach 1814

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Family Apseudidae Leach, 1814

Subfamily Leviapseudinae Sieg, 1983

Leiopidae Lang, 1970: 603.
Leiopinae: Guțu, 1972: 302.
Leviapseudidae Sieg, 1980: 411, 412 [nomen nudum].
Leviapseudinae Sieg, 1983: 163.

Diagnosis. (Modified after Larsen, 2005). Maxillipedal endite with or without inner caudodistal leaf-shaped seta. Cheliped and pereopod 1 with or without exopod. Pereopod 1 coxa with forward-pointing spine. Pereopod 1 dactylus and unguis not fused. Pereopod 4 dactylus often reduced and modified, more so in the male. Pereopods 5 and 6 propodus often with a ventral row of short setae. Pleopods present, reduced, or absent in females and present in males.

Type genus. *Leviapseudes* Sieg, 1983 [= *Leiopus* Beddard, 1886].

Genera included. *Carpoapseudes* Lang, 1968; *Colobocladus* Guțu, 2006; *Eliomosa* Guțu, 2006; *Fageapseudes* Băcescu & Guțu, 1971; *Leviapseudes* Sieg, 1983.

Remarks. Larsen (2005) and Guțu (2006) gave accounts of the taxonomic history of this subfamily and emphasized the difficulty distinguishing it from the subfamily Apseudinae. Members of this subfamily mostly inhabit deep waters.

Genus *Fageapseudes* Băcescu & Guțu, 1971

Apseudes Leach, 1814 (in part): Norman and Stebbing: 88; Stephensen, 1915: 28.
Collossella Jóźwiak and Błażewicz-Paszkowycz, 2007: 8.

Diagnosis. (Modified after Băcescu & Guțu, 1971). Body slender; pereonites 2–6 with anterolateral spine-like apophyses; pleonites with posterolateral spine-like apophyses; pleotelson longer than wide; pereonites with ventral hyposphenia; pleonites without ventral hyposphenia. Rostrum absent. Maxillipedal endite with a leaf or feather-shaped inner caudodistal seta. Cheliped and pereopod 1 exopodites present or absent. Chelipeds not showing extreme sexual dimorphism. Pereopod 1 merus longer or shorter than carpus. Pereopod 4 dactylus reduced or not reduced. Pereopods 5 and 6 propodus with a ventral row of short setae. Males with 5 pairs of fully formed pleopods; female pleopods fully formed, reduced, or absent.

Type species. *Apseudes retusifrons* Richardson, 1912.

Species included. *Fageapseudes bicornis* (Kudinova-Pasternak, 1973); *Fageapseudes brachyomos* Bamber, 2007; *Fageapseudes pluma* **n. sp.**; *Fageapseudes retusifrons* (Richardson, 1912); *Fageapseudes suprema* (Jóźwiak and Błażewicz-Paszkowycz, 2007).

Remarks. Bamber (2007) transferred this genus from the Apseudinae to the Leviapseudinae based on the inner caudodistal seta of the maxillipedal endite being leaf-shaped in *F. brachyomos*. It is shown here that this seta in *F. pluma* n.sp. is feather-shaped, while it is simply setulose in *F. retusifrons* (see Błażewicz-Paszkowycz *et al.*, 2011: Fig. 11I') and *F. suprema* (Jóźwiak and Błażewicz-Paszkowycz, 2007: Fig. 5K); this character is unknown in *F. bicornis*. Błażewicz-Paszkowycz *et al*. (2011) redescribed *F. retusifrons* from near the type locality. *Fageapseudes pluma* and *F. brachyomos* differ from *F. retusifrons*, *F. bicornis*, and *F. suprema* in several characters (i.e., slight sexual dimorphism of chelipeds; pereopod 1 carpus longer than merus; pereopod 4 dactylus reduced) that may warrant splitting this genus into two genera, but this can only be determined after a detailed morphological examination and a phylogenetic analysis. It must also be noted that *F. retusifrons* is the only species without exopodites on the chelipeds and pereopod 1. *Fageapseudes suprema* has exopodites on the chelipeds but not on the first pereopods.

***Fageapseudes pluma* n.sp.**
Figures 1–5

Material examined. Holotype: male (LACM CR1991-2166), cruise Pulse IX, R/V *New Horizon*, station 907M, 34º 43' N, 123º 07' W (California), 4100 m, coll. K.L. Smith Jr, 1 August 1991. **Allotype:** female with empty marsupium (LACM CR1991-2167), same locality as holotype. **Paratypes:** 17 males, seven females with oostegites, and one female with empty marsupium (LACM CR1991-2168), same locality as holotype.

Diagnosis. Carapace with concave anterior edge; second pereonite wider than long; maxillule inner endite with middle seta shaped differently from other setae; maxillipedal endite with feather-like inner caudodistal seta; sexual dimorphism of chelipeds restricted to armature of the fixed finger cutting edge and size of spiniform seta on basis; carpus of pereopod 1 longer than merus; exopodites of cheliped and pereopod 1 present with two plumose setae; pleopod basis with plumose setae.

Etymology. Pluma (L.) = feather. The name alludes to the feather-like seta on the maxillipedal endite.

Description of male. *Body* (holotype, Fig. 1A) slender and elongate, approximately 9 mm long (anterior edge of carapace to posterior tip of pleotelson), eight times as long as wide, narrower posteriorly.

Cephalothorax (Figs. 1A, B) subrectangular, approximately 1.15 times as long as wide, naked, anterior margin medially concave, without rostrum. Eyes absent; eyelobes present as spine-like apophyses directed anteriorly and around bases of antennules.

Pereonites (Figs. 1A, B). Pereonite 1 shortest, approximately one-third as long as cephalothorax, lateral margins uniformly convex. Pereonites 3 and 6 subequal, wider than long. Pereonites 4 and 5 equal, about as long as wide. Pereonites 2 to 6 with anterolateral spine-like apophyses. Pereonites 1 to 5 with ventral hyposphenia (Fig. 1B), shortest on pereonite 2 and longest on pereonite 3. Pereonite 6 with mid-ventral penial tubercle.

Pleon (Fig. 1A) of five free subequal pleonites with posterolateral spine-like apophyses bearing a short seta.

Pleotelson (Fig. 1A) long and slender, as long as last three pleonites, approximately 2.8 times as long as wide, laterally expanded at attachment of uropods, and with rounded posterior tip.

Antennule (Fig. 1C). Basal article approximately 4.5 times as long as wide; last three peduncle articles decreasing in length distally. Main flagellum of 14 articles, with most articles bearing one to four aesthetascs. Accessory flagellum broken off (every available specimen had the flagellum broken off).

Antenna (Fig. 1D). Inner process on basal article naked and with smooth margin. Article 2 with few setae on inner margin and one seta on outer distal corner; squama nearly reaching distal margin of fourth peduncle article, with six simple setae. Peduncle article 3 short, with one seta on inner distal corner. Peduncle articles 4 and 5 subequal, approximately three times as long as article 3. Flagellum of six articles.

Mouthparts. Labrum not examined. Epistome (Fig. 1B) present. Left mandible (Fig. 1E) with five-toothed incisor process, four-toothed lacinia mobilis, setiferous lobe with six setae; mandibular palp (Fig. 1F) of three articles, basal article short and round with single seta, article 2 approximately three times as long as article 1 with 18 bipinnate setae of varying lengths, article 3 more than half length of article 2 with ten inner and two longer distal denticulate setae. Right mandible (Fig. 1G) with six-toothed incisor process and setiferous lobe with seven setae; mandibular palp (Fig. 1H) nearly identical to that of left mandible. Labium (Fig. 1I) with denticulate outer margin and anterior margin finely setose; palp with setose inner and outer margins and three bi- or trifurcate stout distal setae. Maxillule (Fig. 2C) inner endite with four distal setulose setae and one trifurcate seta; outer endite with 11 long and one short distal spiniform setae and two subdistal setae, lateral margins setose; palp biarticulate with serrate outer margin and three long and three short distal denticulate setae with hooked tips. Maxilla (Figs. 2A, B) outer lobe of moveable endite with about six long serrate setae; inner lobe of moveable endite with simple setae; outer lobe of fixed endite with four multifurcate spiniform setae, a few setulate setae, and one subdistal seta; inner lobe of fixed endite with posterior row of six serrate spiniform setae, and anterior row with 24 setae. Maxilliped (Fig. 2D) basis with small inner distal seta, outer margin setulose; palp article 1 with small seta on outer distal corner, long seta on inner distal corner; palp article 2 with short bipinnate and longer simple setae on inner margin, one long and one short simple setae on distal margin; palp article 3 with four long simple setae on inner margin; palp article 4 with five distal setae. Endite (Figs. 2D, E) with feather-like inner caudodistal seta, seven pappose setae on inner margin; several short, forked, simple and setulose setae on distal margin, four coupling hooks. Epignath with setose distal seta (Fig. 2F).

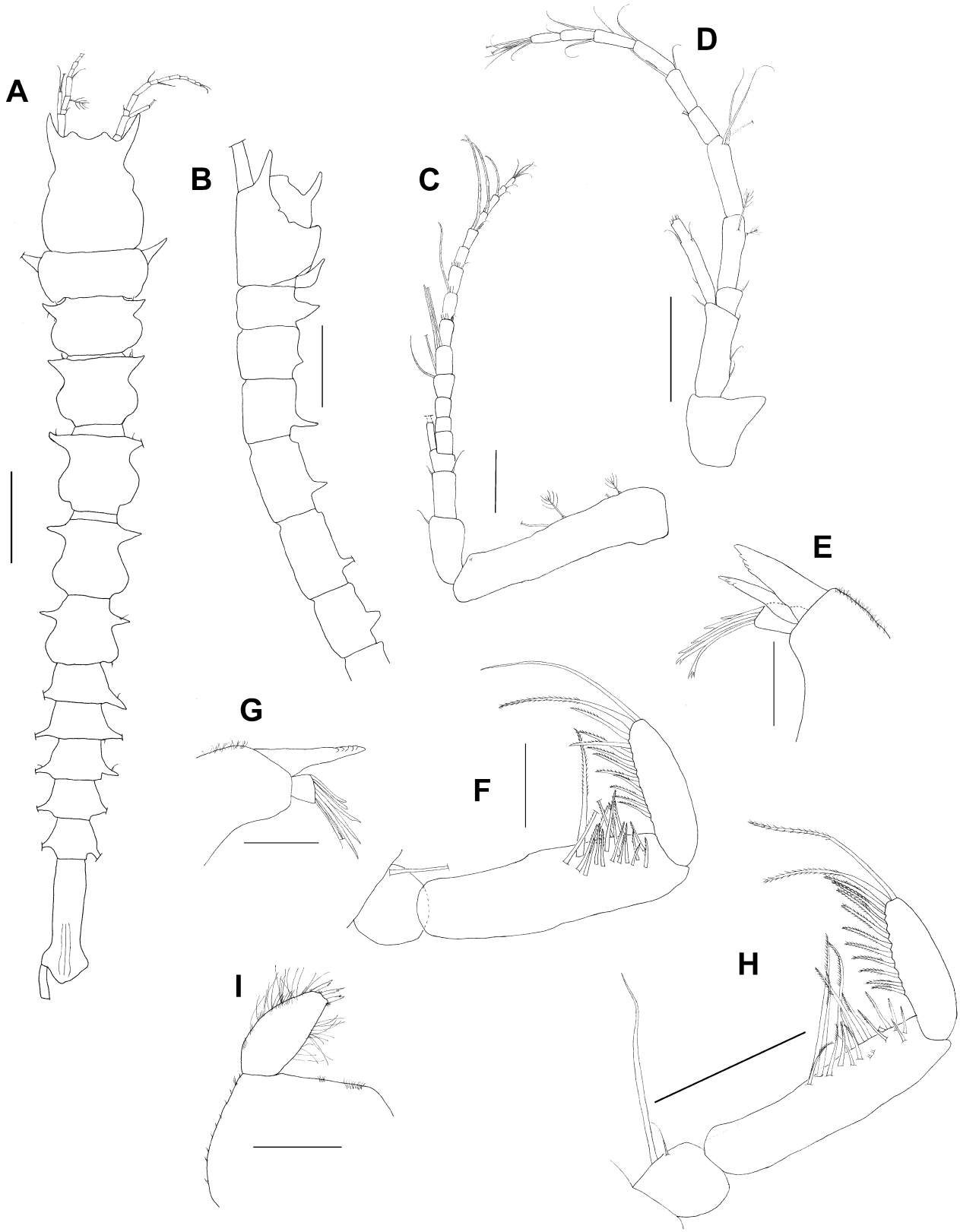

FIGURE 1. *Fageapseudes pluma* **n. sp.,** adult male holotype (A); adult male (B–I). A, dorsal view of body; B, lateral view of head and pereon; C, antennule; D, antenna; E, left mandible incisor process, lacinia mobilis, and setiferous lobe; F, left mandibular palp; G, right mandible incisor process and setiferous lobe; H, right mandibular palp; I, labium. Scale bars: A, B = 1.0 mm; C, D = 0.3 mm; E–G, I = 0.1 mm; H = 0.2 mm.

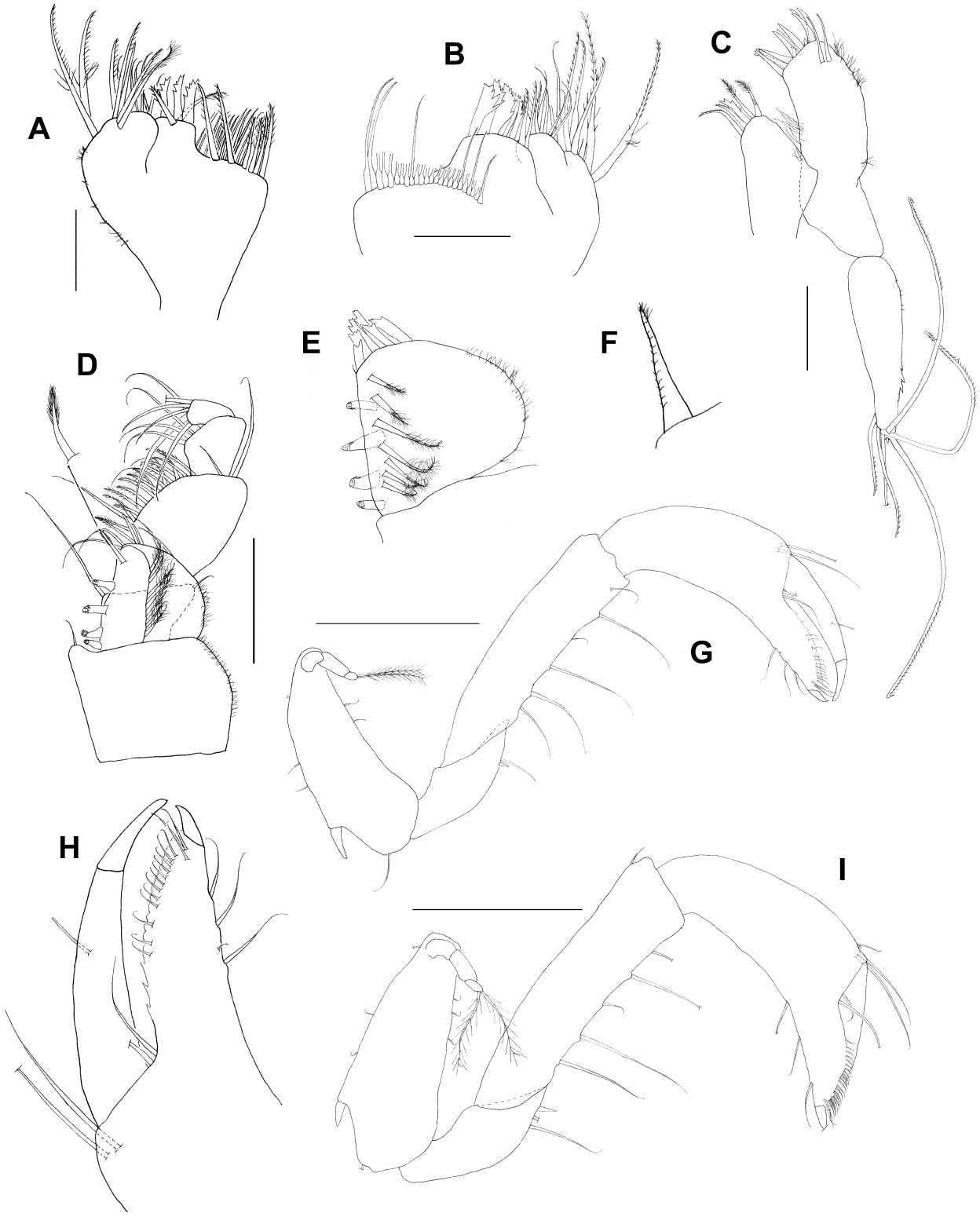

FIGURE 2. *Fageapseudes pluma* **n. sp.,** adult male (A–H); adult female (I). A, maxilla; B, maxilla; C, maxillule; D, maxilliped; E, maxillipedal endite; F, epignath seta; G, male cheliped; H, male chela; I, female cheliped. Scale bars: A–C = 0.1 mm; D = 0.2 mm; G, I = 0.5 mm.

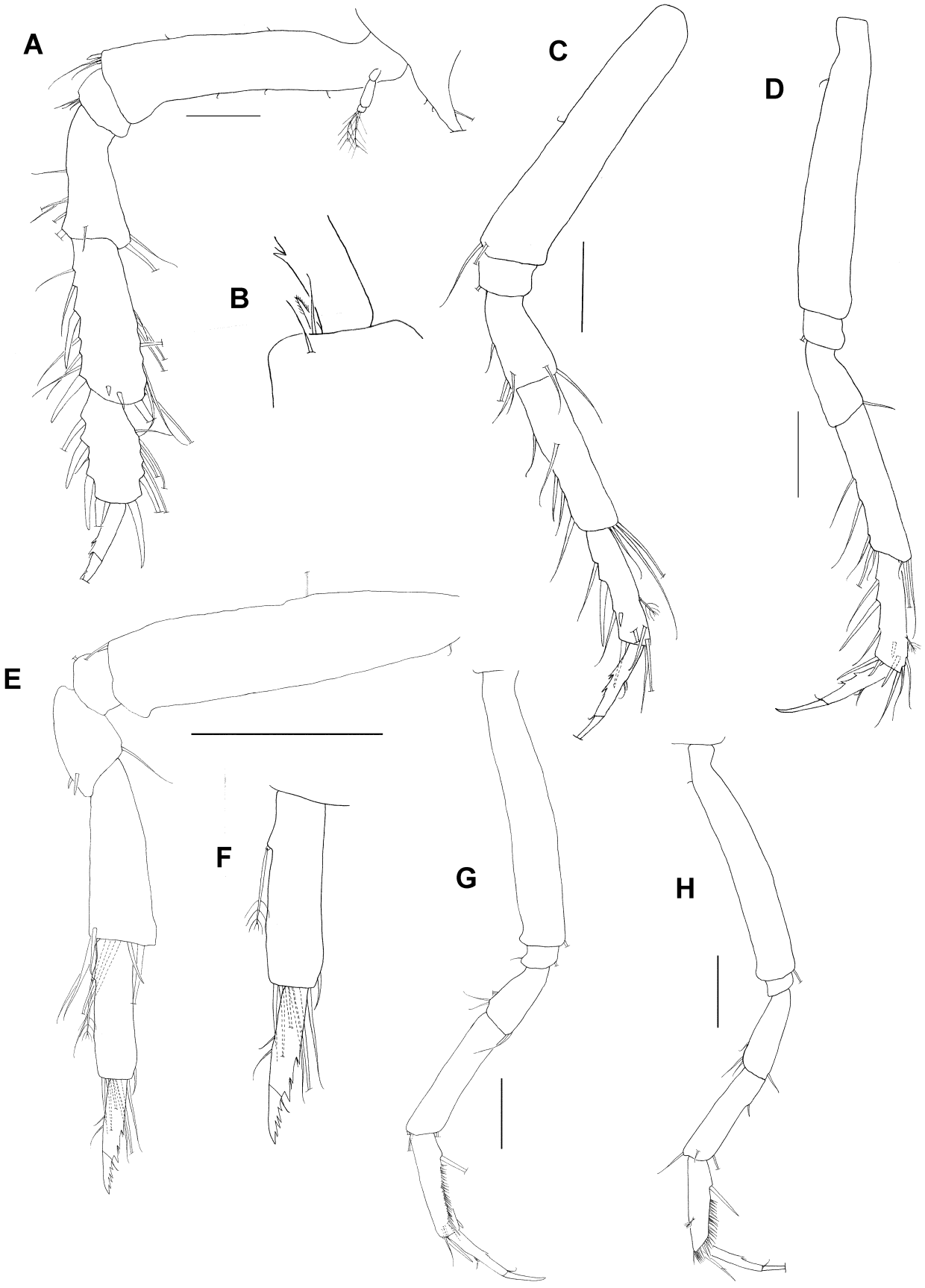

FIGURE 3. *Fageapseudes pluma* **n. sp.,** adult male. A, pereopod 1; B, distal edge of pereopod 1 propodus; C, pereopod 2; D, pereopod 3; E, pereopod 4; F, pereopod 4 dactylus and propodus; G, pereopod 5; H, pereopod 6. Scale bars: A–D, G, H = 0.3 mm; E = 0.5 mm.

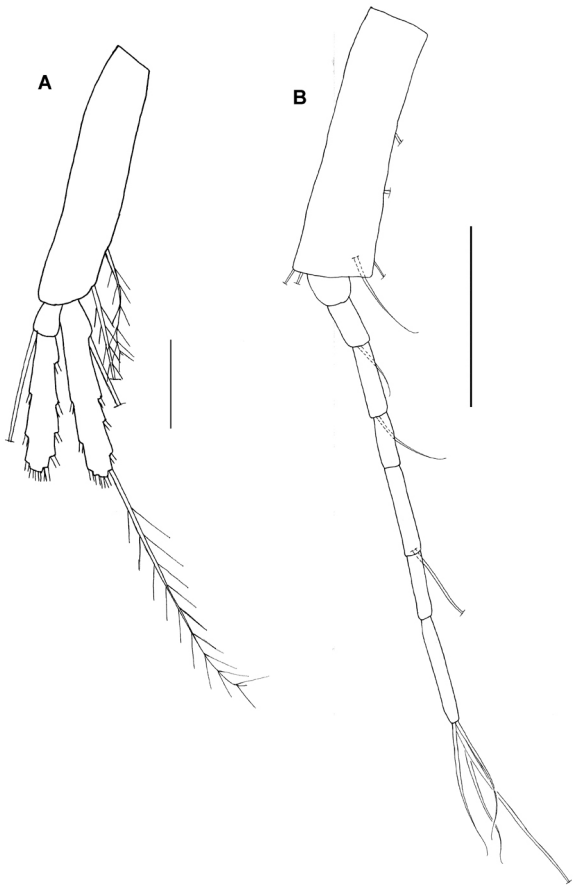

FIGURE 4. *Fageapseudes pluma* **n. sp.,** adult male. A, pleopod 1; B, uropod basis and exopodite. Scale bars: A = 0.2 mm; B = 0.3 mm.

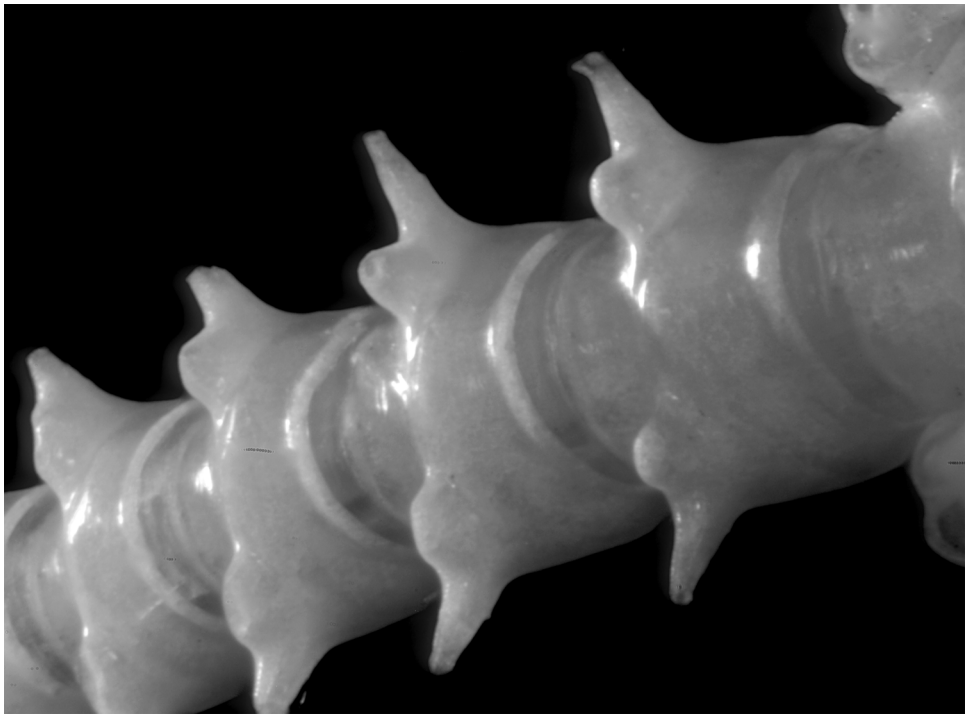

FIGURE 5. *Fageapseudes pluma* **n. sp.**, adult female allotype. Ventral view of the pleon, showing the ventrolateral bulbous processes.

Cheliped (Figs. 2G, H) slender. Basis approximately 2.5 times as long as wide, with short simple setae on dorsal and ventral margins, one stout ventral spiniform seta; exopodite present with three articles and with two distal plumose setae. Ventral margin of merus with one simple seta and one short spiniform seta. Carpus slender and elongate, approximately 4.2 times as long as wide, with five simple setae on ventral margin. Chela slender, ventral margin with three distal setae, two setae near articulation of dactylus; cutting edge of fixed finger with three proximal denticulations and row of short simple setae. Cutting edge of dactylus naked.

Pereopod 1 (Figs. 3A, B) with setose spine-like apophysis on coxa. Basis approximately 3.8 times as long as wide with two simple setae and one small spiniform seta on ventrodistal corner; exopodite present with three articles and with two distal plumose setae. Ischium with three simple ventrodistal setae. Merus widening distally, with four ventral simple setae, one ventrodistal spiniform seta (broken off), two dorsodistal simple setae. Carpus longer than merus, 2.5 times as long as wide, with simple setae on dorsal and ventral margins, two ventral spiniform setae, two small subdistal spiniform setae, and one dorsodistal spiniform seta. Propodus shorter than merus and 1.8 times as long as wide, with two dorsal spiniform setae in distal half, four ventral spiniform setae, and one short distal serrate seta (Fig. 3B). Dactylus with two ventral denticulations with associated seta; unguis (broken off) with ventral seta.

Pereopod 2 (Fig. 3C) slender. Basis approximately 4.3 times as long as wide, with two ventrodistal setae. Ischium with one ventrodistal seta. Merus half as long as carpus, widening distally, with several distal simple setae. Carpus elongate, with several simple ventral setae and tuft of dorsodistal setae. Propodus shorter than carpus, with two ventral spiniform setae and several ventral and dorsodistal simple setae, dorsal margin with broom seta. Dactylus with two ventral denticulations with associated seta, one short seta near base of unguis, and two middorsal setae.

Pereopod 3 (Fig. 3D) very similar to pereopod 2, appearing to be less setose.

Pereopod 4 (Figs. 3E, F) broader than other pereopods. Basis with one dorsodistal simple seta. Ischium with one dorsodistal simple seta. Merus with two small dorsodistal spiniform setae and one ventrodistal simple seta. Carpus with seven distal setae. Propodus shorter than carpus, with several distal simple setae, and one dorsal broom seta. Dactylus reduced and modified with three ventral denticulations; unguis with four ventral denticulations.

Pereopod 5 (Fig. 3G) slender. Basis six times as long as wide, with one ventrodistal seta. Ischium with one ventrodistal and one dorsodistal setae. Merus with three dorsal setae and one ventrodistal seta. Carpus approximately twice as long as merus, with several distal setae. Propodus shorter than carpus, with two ventral and one dorsodistal spiniform setae, ventral row of 25 short setae in distal two-thirds. Dactylus with one ventral denticulation, two dorsal setae, and one seta near base of unguis; dactylus and unguis together as long as propodus.

Pereopod 6 (Fig. 3H) very similar to pereopod 5.

Pleopods (Fig. 4A). Five pairs, all alike. Basis slender and elongate, with two outer subdistal plumose setae. Endopod with proximal articulation. Endopod with 12, exopod with 11 plumose setae.

Uropod (Fig. 4B). Basal article with several simple setae on distal and outer margins. Exopod with seven articles. Endopod broken off.

Adult female. Very similar to male but with the following differences:

Antennule (not illustrated) with fewer aesthetascs.

Cheliped (Fig. 2I) with shorter ventral spiniform seta on basis and without proximal denticulations on cutting edge of fixed finger.

Pereopods 1–4 with oostegites.

Pleopods. The ventral view of the pleon is shown in figure 5, and the pleopods are absent. However, it is possible that the ventrolateral bulbous processes are attachment sites for pleopods that were broken off during collection and/or processing. Pleopods are absent in all the females examined.

Intraspecific variation. The left mandibular palp showed variation in the number of setae. Specimens had either one or two long simple setae on the first article and 12–17 setae on the last article. The dactyli of pereopods 1 and 4 can have two or three ventral denticulations.

Geographic distribution. Known only from type locality.

Remarks. *Fageapseudes pluma* **n. sp.** is very similar to the Japanese species *F. brachyomos* but can be distinguished by having more prominent posterolateral apophyses on the pleonites, fewer articles in the antennal flagellum (six in *F. pluma* and eight in *F. brachyomos*), many more setae on the last two articles of the mandibular palp, denticulations on the cheliped fixed finger cutting edge instead of a round protuberance, two plumose setae

on the cheliped exopodite (three in *F. brachyomos*), plumose setae on the basal article of the pleopods (absent in *F. brachyomos*), and fewer articles in the uropodal exopod (seven in *F. pluma* and nine in *F. brachyomos*). The number of plumose setae on the exopodites of the cheliped and pereopod 1 seems to be a consistent character, as was also revealed in the family Kalliapseudidae (Drumm and Heard, 2011). The setation on the labial palp and inner lobe of the maxillule endite appear to be different in these two species, and *Fageapseudes pluma* has the inner caudodistal seta of the maxillipedal endite feather-like instead of leaf-like. It can be distinguished from the other three described species of *Fageapseudes* (*F. retusifrons, F. bicornis,* and *F. suprema*) by the shape of the second pereonite and by having the carpus of pereopod 1 longer than the merus. *Fageapseudes retusifrons* and *F. bicornis* also show greater sexual dimorphism of the chelipeds (the male is unknown in *F. suprema*). The female pleon of *F. pluma* was shown to possess ventrolateral bulbous processes. Pleopods were not found on any of the examined females, but it cannot be ruled out that they were broken off during collection and/or processing. The central depressions of the processes do indeed look like they could be attachment points for pleopods. *Fageapseudes retusifrons*, which possesses reduced pleopods, does not have these ventrolateral processes (M. Guțu, Grigore Antipa Romanian Museum of Natural History, pers. comm., 2013), and it was discovered that the pleopods are easily detached and quite variable (Błażewicz-Paszkowycz and Bamber, 2011).

The shape of the inner caudodistal seta of the maxillipedal endite is the main characteristic used to separate the subfamilies Apseudinae and Leviapseudinae. However, this character appears to be homoplasious. Within *Fageapseudes* the seta ranges from leaf-shaped in *F. brachyomos,* to simple but setulose in *F. retusifrons* and *F. suprema,* to feather-like in *F. pluma.* Błażewicz-Paszkowycz and Larsen (2004) showed that this seta in *Leviapseudes tenuimanus* (subfamily Leviapseudinae) is intermediate between the truly original leaf-shaped seta and the rather simple seta of *Apseudes* (subfamily Apseudinae). Bamber (1999) discovered that this seta in *Apseudopsis bruneinigma* (subfamily Apseudinae) resembles that of the Leviapseudinae. Members of the families Whiteleggidae and Parapseudidae (*Pakistanapseudes* and *Saltipedis*) also have a "leaf-shaped" seta (Guțu, 1996, 2006). It is suggested that these subfamilies are perhaps defined by arbitrary means, and a phylogenetic analysis and revision will be necessary to resolve the systematics of the Apseudidae.

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