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A new species of *Dynoides* Barnard, 1914 (Crustacea, Isopoda, Sphaeromatidae) from Canada, with notes on geographic distribution of the north-eastern Pacific Ocean species

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ABSTRACT

Dynoides canadensis sp. nov. is described from the south-western coast of British Columbia, Canada. This species differs from its closely related species, *D. elegans* (Boone, 1923), by the presence of a smooth pleotelson without prominent rounded tubercle on the basal part of the pleotelsonic sinus, its sinus wall lacking crenulation; in having the penial processes length $7.7 \times$ basal width and acute distal apex instead of $2.3 \times$ basal width and rounded and blunt distal apex in *D. elegans*. This new species also has an appendix masculina with the distal apex extending somewhat beyond its base, instead of not reaching the base as is the case for *D. elegans*. A map of the distribution for the north-eastern Pacific species of *Dynoides* Barnard, 1914 (*D. elegans* (Boone, 1921); *D. crenulatus* and *D. saldanai* Carvacho & Haasmann, 1984; and *D. dentisinus* Shen 1929) in the north-eastern Pacific is provided. The new species is abundant in the western coastal zone of British Columbia. A revised generic diagnosis is provided for the genus *Dynoides*.

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Introduction

The genus *Dynoides* Barnard, 1914 has 18 accepted species (Boyko et al. 2008 onwards), which mostly occur in the Pacific Ocean from the north-eastern to the western Pacific intertidal and shallow water habitats. However, three species are known from the Indian Ocean: *Dynoides serratisinus* Barnard, 1914 from South Africa; *Dynoides indicus* Müller, 1991 from Sri Lanka; and *Dynoides amblysinus* Pillai, 1954 from India. Only *Dynoides castroi* Loyola and Silva, 1960 is reported from the South Atlantic Ocean (Brazil).

In the north-eastern Pacific, four species are known: *D. crenulatus* Carvacho and Haasman 1984, *D. saldanai* Carvacho and Haasmann, 1984 both from the Pacific Coast of Mexico; *D. elegans* (Boone, 1923) from the California coasts; and *D. dentisinus* Shen, 1929 from San Francisco Bay, which was originally described from the coast of North China. Additionally, *Dynoides* sp. also occurs in Mexico, Baja California Sur, Bahia de Concepcion (Wetzer et al. 2018). During the present study specimens of *Dynoides* collected along the west coast of Canada, off British Columbia, either

incorrectly identified as *Dynamenella perforata* or only identified at the genus level (i.e. *Dynoides*), were reexamined. The specimens are morphologically distinct from any of the already described species of *Dynoides*. A new species of *Dynoides* is described herein.

Materials and methods

All specimens examined for this study are from British Columbia (Figure 1), and were deposited in the Crustacea Collection of the Canadian Museum of Nature (Natural Heritage Campus, Gatineau, Quebec, Canada). Drawings were made with the aid of a camera lucida on Olympus BX51 compound microscope and illustrations were electronically inked with Corel Draw (version X6). Colour images of the specimens were taken using a Zeiss AxioCam ERc5s camera mounted on a Zeiss stereo microscope (Stemi 508).

Terminology of the morphological characters broadly follows Wetzer & Mowery (2017). Abbreviations: CMNC – Canadian Museum of Nature, Canada;

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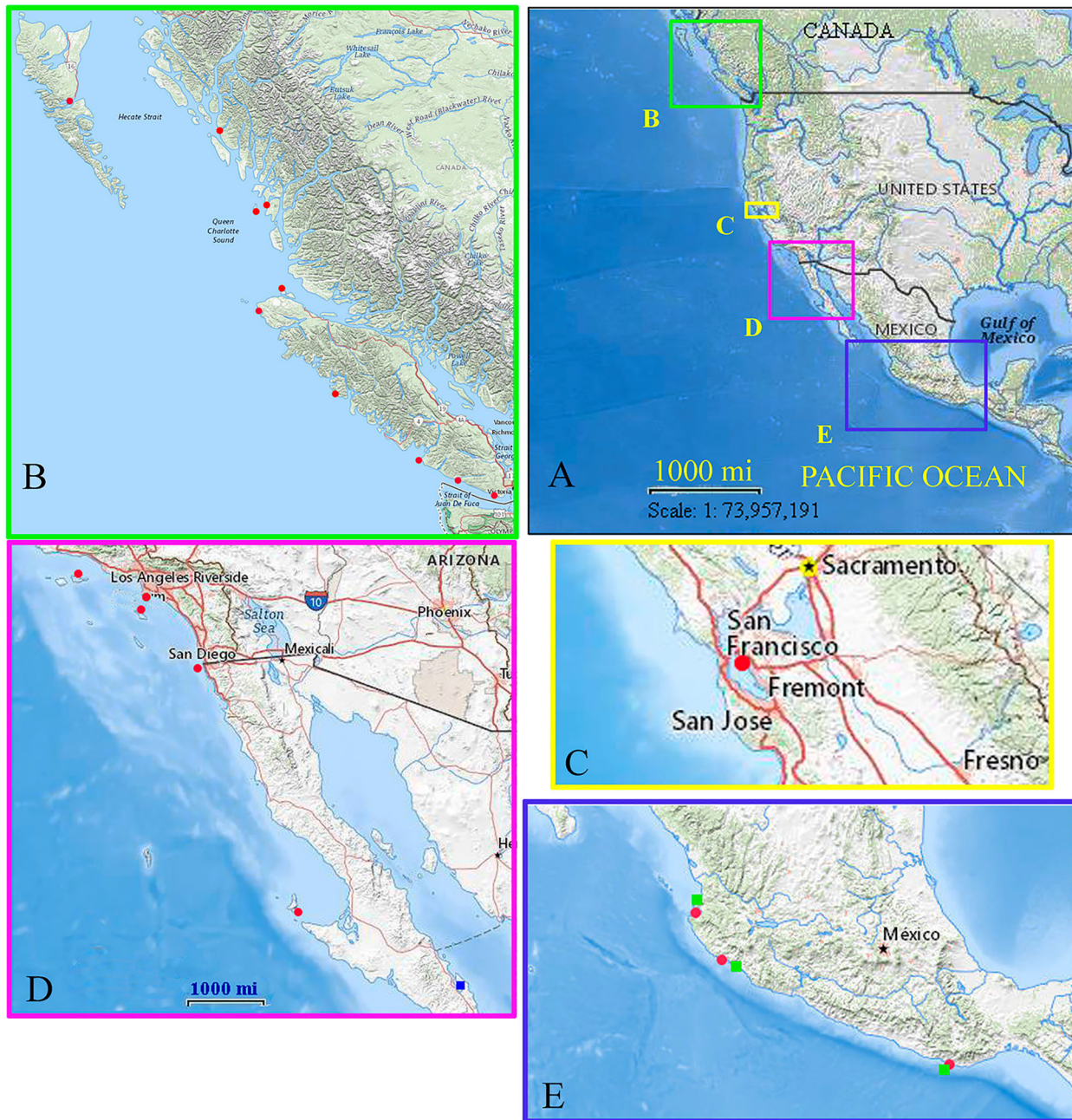


Figure 1. Map of the geographic distribution of the genus *Dynoides* Barnard, 1914, in the north-eastern Pacific. A, species distribution on the north-eastern Pacific coast; B, locations of *Dynoides canadensis* sp. nov. distribution; C, location of *D. dentisinus* distribution; D, location of *D. elegans* (red circle) and *Dynoides* sp. (blue square); E, *D. crenulatus* (red circle) and *D. saldanai* (green square).

RS – robust seta/e; SPS – sensory palmate setae; PMS – plumose marginal setae.

Systematics

Family Sphaeromatidae Latreille, 1825

Genus *Dynoides* Barnard, 1914

The full synonymy for the genus was provided by Li (2000).

Type species: *Dynoides serratisinus* Barnard, 1914 from Natal and Mozambique (by monotypy).

Generic diagnosis

Body dorsal surfaces smooth, covered with small tubercles and setosed in some species. Head longer than broad, with small median rostral process. Pereonites 2–7 without coxal plate sutures. Pleon with or

without median prominent dorsal process, posterior margin with two separate sutures on either side. Pleotelson wider than long, posterior margin with a slit, sinus, notch, or foramen. Epistome anteriorly and posteriorly rounded. Maxilliped palp articles 2–4 medial margins slightly extended. Maxillula mesial endite with four long comb setae. Maxilla with four 4 curved pectinate RS on middle and lateral endites. Left mandible incisor and lacinia mobilis with 3–4 cusps, spine row present; palp articles 2 bearing two biserrate setae on distolateral margin in most of known species. Pereopods 1–7 ambulatory, inferior margins of merus to propodus bearing dense fine setae fringe. Penial processes long, entirely fused along the basal third to half of their length. Appendix masculina elongate, about twice the length of the endopod; distal third to more than distal half-length doubled back on proximal part. Pleopod 3 exopod without transverse suture. Pleopods 4 and 5 endopods bearing thickened transverse ridges, exopods thickened transverse ridges absent. Uropods with both rami broad and lamellar, subequal in length.

***Dynoides canadensis* sp. nov.**

(Figures 1–5)

Material examined

Holotype. ♂ (4.2 mm), Canada, British Columbia, Barclay Land District, Cape Beale, coll. Bousfield, Edward L., 19 July 1970 (CMNC 1985-0667.1).

Paratypes. 4 ♂♂ (up to 4.2 mm), 18 ♀♀ (up to 4.3 mm), 1 ovigerous ♀ (4.5 mm), same data as holotype, (CMNC 1985-0667.2). 2 ♂♂ (up to 5 mm), 2 ovigerous ♀♀ (3.5 mm); 2 ♀♀ (3.5 mm), British Columbia, Sooke Land District, Sooke Harbour, Whiffin Spit, coll. Bousfield, Edward L., 17 August 1955 (CMNC 1990-0064). 3 ♀♀ (up to 5 mm), British Columbia, Rupert Land Distr., Vancouver Island, Cape Scott, coll. Bousfield, Edward L., 18 July 1959 (CMNC 1990-0066). 20 ♂♂♀, British Columbia, Renfrew Land Distr., Vancouver Island, Port Renfrew, coll. Bousfield, Edward L., 1 August 1970 (CMNC 1990-0068). 1 ♀ (3 mm), British Columbia, Queen Charlotte Islands Land Distr., Graham Island, 27 July 1957 (CMNC 1990-0067). 5 ♂♂ (up to 4.9), 6 ♀♀ (up to 4.2), British Columbia, Barclay Land District, British Columbia, Barclay Land Distr., Trevor Channel, Tzartus Island, coll. Bousfield, Edward L., 21 July 1970 (CMNC 1985-0664). 4 ♂♂ (up to 4.5 mm), 5 ♂♂ (up to 4.2 mm), British Columbia, Metchosin Land Distr., Sooke Basin, Becher Bay, coll. Bousfield, Edward L., 31 July 1970 (CMNC 1990-0057). 4 ♂♂ (up to 4.5 mm), 2 ♀♀ (3 mm), British Columbia, Nootka Land Distr., Nootka Island, coll. Bousfield,

Edward L., 20 August 1959 (CMNC 1990-0059). 1 ♂ (4.2 mm), 1 ♂ (3.5 mm), British Columbia, Rupert Land Distr., Hope Island, coll. Bousfield, Edward L., 22 August 1959 (CMNC 1990-0060). 1 ♂ (5.1 mm), 5 ♂♂ (up to 4 mm), 1 juvenile, British Columbia, Range 2 Coast Land Distr., Goose Island, coll. Bousfield, Edward L., 6 August 1964 (CMNC 1990-0061). 6 ♀♀ (up to 3 mm), British Columbia, Range 2 Coast Land Distr., Hunter Island, coll. Bousfield, Edward L., 8 August 1964 (CMNC 1990-0063). 8 ♂♂ (up to 5 mm), 20 ♀♀ (up to 4.1 mm), 10 juveniles, British Columbia, Range 3 Coast Land Distr., Princess Royal Island, coll. Bousfield, Edward L., 20 July 1964 (CMNC 1990-0065).

Description (based on holotype male)

Body smooth, 1.84 times as long as greatest width, widest at pereonite 5 (Figure 2A). Head with small rostral point. Pereonites 2–7 coxal plates fringed with small marginal setae; coxae of pereonite 6 reaching as far back as to overlap lateral parts of pereonite 7. Pleonite 1 with 2 anterolateral visible sutures (Figure 2B). Pleon without median dorsal process. Pleotelson about 1.6 times as long as width, with a clear dorsal dome, pleotelsonic sinus with straight-sided margins, and slightly raised.

Epistome (Figure 2C) with rounded anterior and posterior margins; lateral margins concave.

Antennula (Figure 2D) not extending to posterior of pereonite 1; peduncle article 1, 2.6 times as long as article 2, inferior distal margin with 1 palm setae; peduncle article 2 inferior distal margin with 3 palm and some simple setae; peduncle articles 3 longer than article 2, inferior distal margin with 2 palm and 3 simple setae; flagellum with 9 articles, articles 2–8 each bearing an aesthetasc.

Antenna (Figure 2E) extending to posterior of pereonite 1; peduncle articles 1 and 3 and peduncle articles 2 and 4 sub-equal in length; peduncle article 5 longest, with some palm setae on distal margin; flagellum with 14 articles.

Maxillula (Figure 2F) lateral endite with 10 simple and serrated RS; mesial endite with 4 long comb and 1 small simple setae, 1 submarginal simple seta present.

Maxilla (Figure 2G) lateral and middle endites each with 4 curved pectinate RS; mesial endite with 4 long rarely plumose and 3 long robust comb and 2 slender simple setae.

Left mandible (Figure 2H) incisor with 4 cusps; lacinia mobilis with 3 cusps; spine row of 6 curved, serrate spines; molar process with serrate teeth; palp

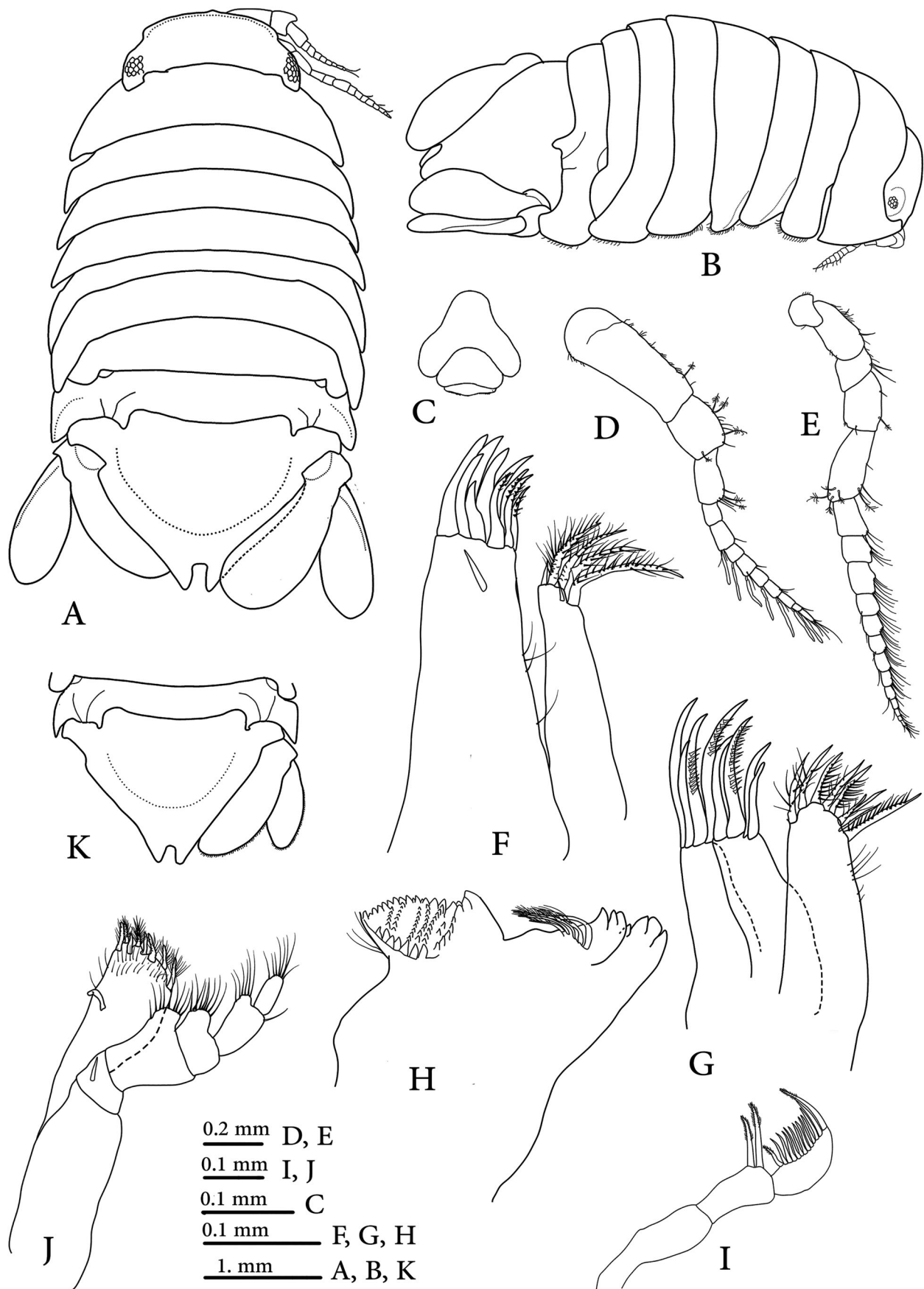


Figure 2. *Dynoides canadensis* sp. nov., holotype (CMNC 1985-0667.1); A, dorsal view; B, lateral view; C, epistome; D, antennula; E, antenna; F, maxillula; G, maxilla; H, left mandible; I, palp of mandible; J, maxilliped; K, ovigerous female (CMNC 1985-0667.2).

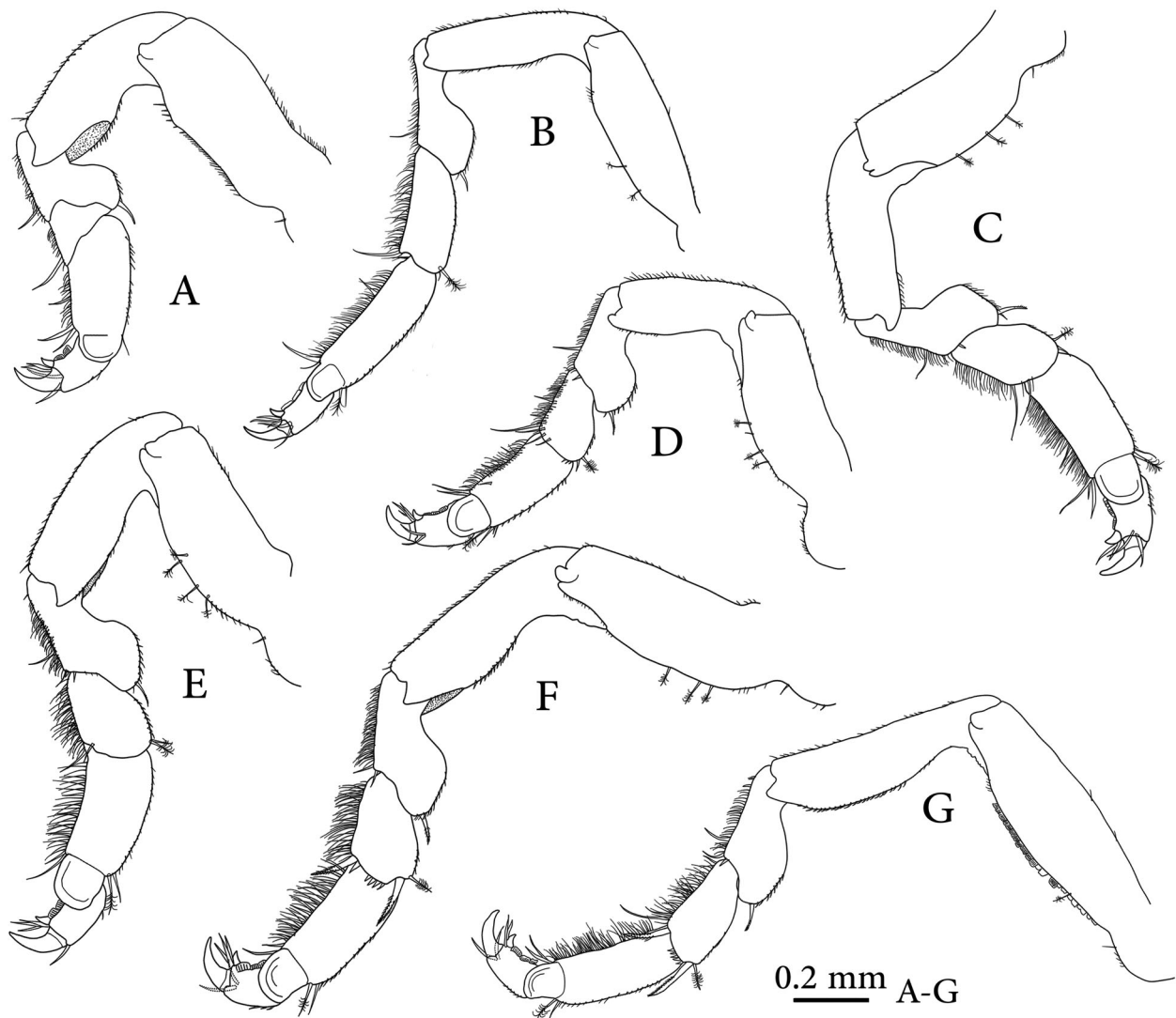


Figure 3. *Dynoides canadensis* sp. nov., holotype (CMNC 1985-0667.1); A–G, pereopods 1–7.

articles 2 with 2 biserrate setae, palp article 3 with 13 biserrate setae (Figure 2I).

Maxilliped (Figure 2J) endite lateral margin sinuate, distomesial margin with single coupling hook, distal margin with 4 long circumplumose, 2 densely circumplumose and 2 simple RS; palp articles 2–4 with weak distally lobe; palp article 4 with single long seta on superiodistal angle.

Pereopod 1 (Figure 3A) basis about 2.5 times as long as greatest width, superior margin fringed with short, acute scale-setae; ischium, merus and propodus superior margin fringed with acute scale-setae; merus superodistal angle with single long RS; carpus triangular, inferodistal angle with single long RS; propodus 2.4 times as long as wide, inferodistal angle with 2 long RS, superodistal corner with single sensory palmate seta; dactylus inferior margin with cuticular scales, secondary unguis simple, with 2 simple setae

at base, distal margin with 2 simple sub-marginal setae.

Pereopod 2 (Figure 3B) basis about 3.2 times as long as greatest width, with 2 small SPS; ischium, merus, carpus and propodus superior margin fringed with acute scale-setae; ischium about 3.6 times as long as width; merus subequal in length to carpus, superodistal and inferodistal angles with 1 long simple seta; carpus inferodistal angle with a long SPS, superodistal angle with a long simple RS; propodus about 1.5 times as long as carpus, inferodistal angle with a long SPS; dactylus inferior margin with cuticular scales, secondary unguis simple, with 3 simple setae at base, distal margin with 2 simple sub-marginal setae.

Pereopod 3 (Figure 3C) basis about 2.25 times as long as greatest width, with 3 small SPS; merus longer than carpus, inferodistal angles with 1 long

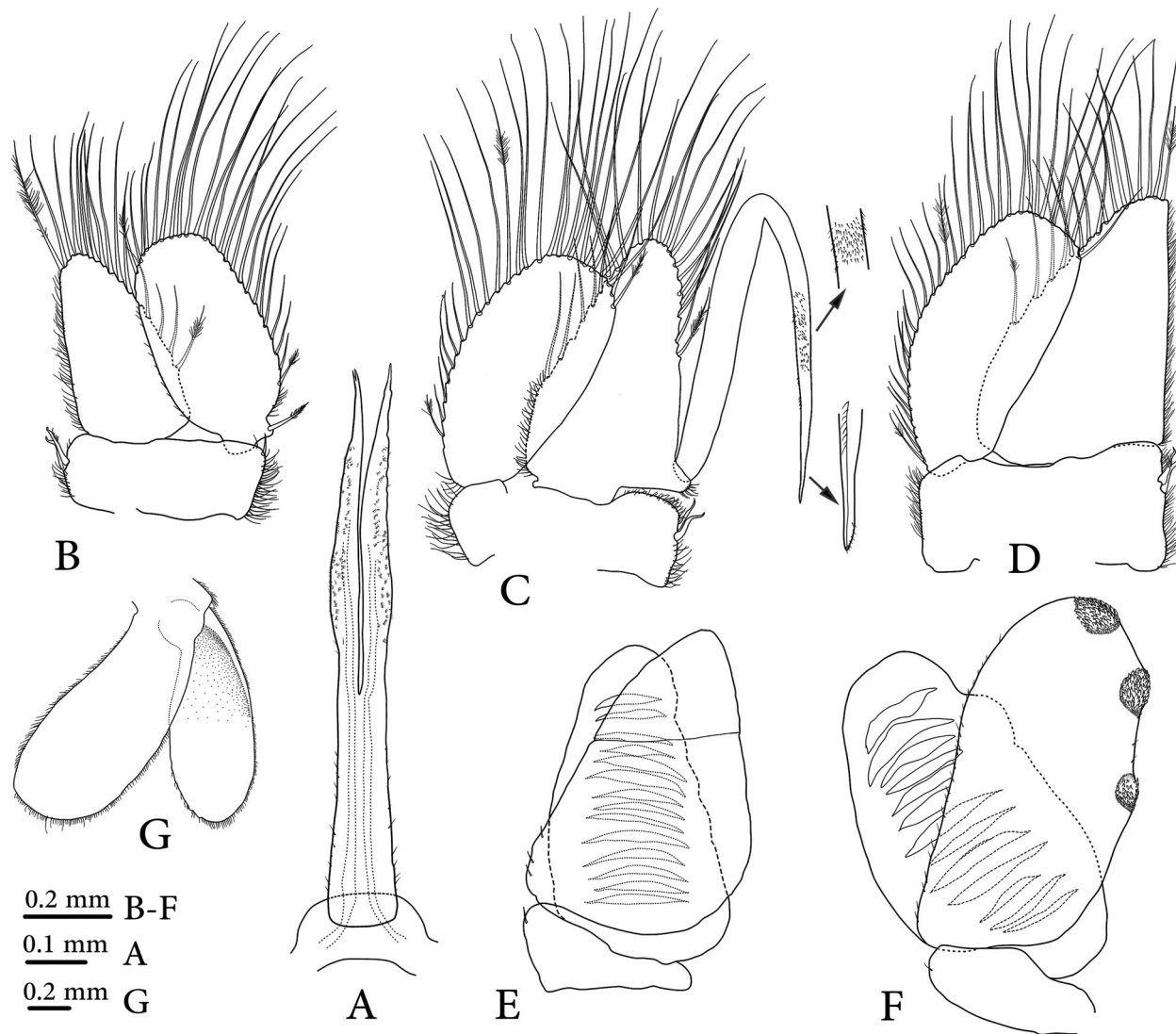


Figure 4. *Dynoides canadensis* sp. nov., holotype (CMNC 1985-0667.1); A, penes; B–F, pleopods 1–5; G, uropod.

serrated RS; carpus inferodistal angle with 1 SPS, superodistal angle with a long simple RS; propodus about 2 times as long as carpus, inferodistal angle with a long SPS; dactylus inferior margin with cuticular scales, secondary unguis simple.

Pereopods 4 and 5 (Figures 3D and E) are similar to pereopod 3 as illustrated.

Pereopod 6 (Figure 3F) basis about 3 times as long as greatest width, superior margin with 3 SPS; ischium, merus, carpus and propodus superior margin fringed with acute scale-setae; merus superodistal margin with 1 biserrate RS, inferior margin with 2 RS; carpus superodistal margin with 1 biserrated RS and 1SPS, inferior margin with 1 biserrate RS, distomedial margin with 4 robustacutic scale-setae; propodus 1.6 times as long as carpus, superodistal corner with 1 slender and 1 SPS.

Pereopod 7 (Figure 3G) basis about 4 times as long as greatest width, superior margin fringed with

cuticular scale; ischium, merus, carpus and propodus are similar to pereopod 6 as illustrated.

Penial processes (Figure 4A) about 7.7 times as long basal width entirely fused along basal 0.42 of length, distal margin bearing setules on most of surface except on apical parts, proximal lateral margin with some scale setae.

Pleopod 1 (Figure 4B) exopod and endopod with 25 and 17 PMS respectively, endopod shorter than exopod; exopod proximal lateral corner with single biserrated seta. Sympodite mesial margin with 2 coupling hooks.

Pleopod 2 (Figure 4C) exopod and endopod subequal in length, with 27 and 25 PMS respectively; appendix masculina proximally slightly swollen, distally narrowing, extending beyond endopod apex, more than distal half length doubled back on the proximal half and extending somewhat beyond its base; distal half bearing setules on most of surface medially,

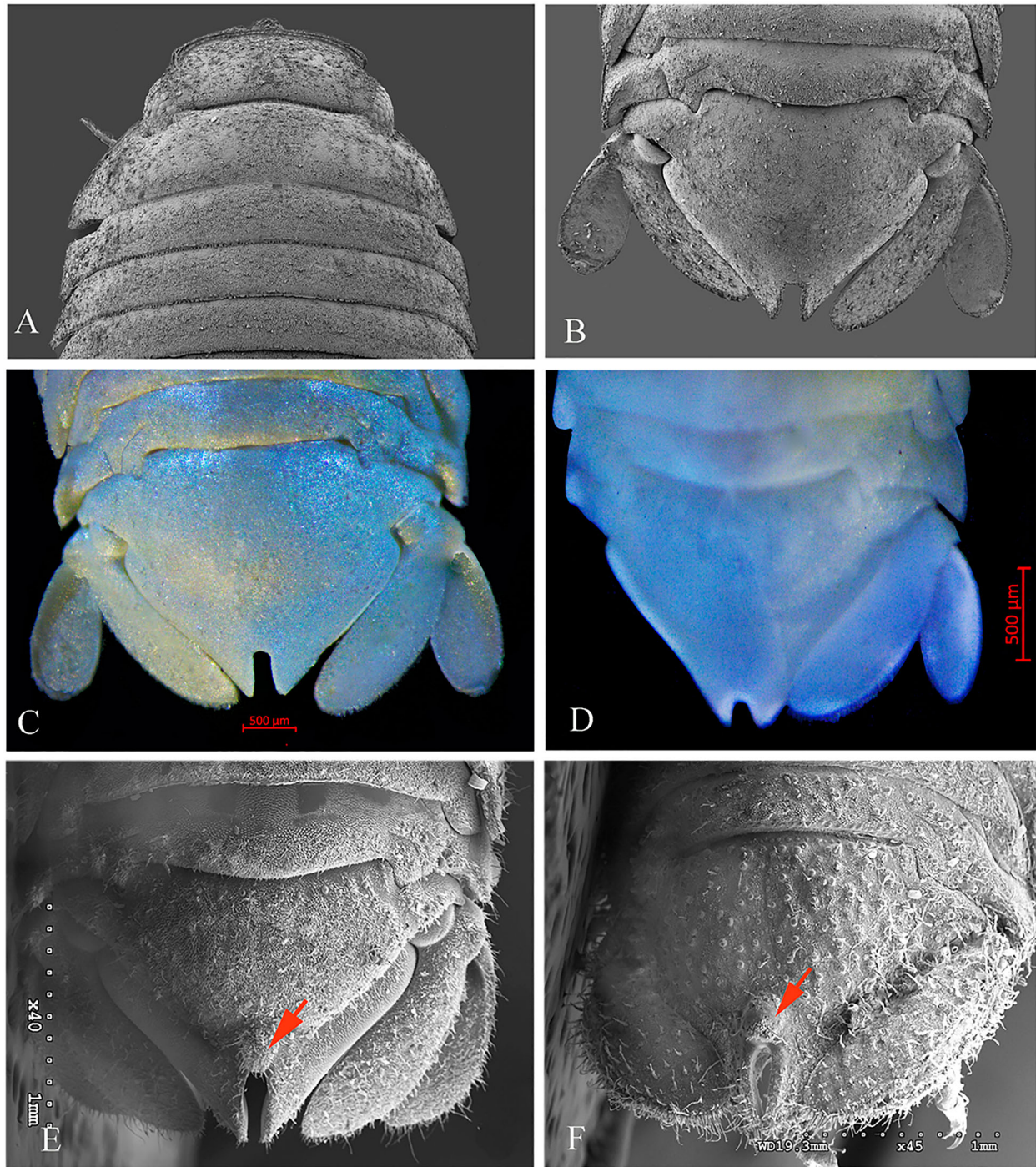


Figure 5. *Dynoides canadensis* sp. nov.; A, male, anterior dorsal; B, male, posterior dorsal; C, male, paratype, pleotelson; D, Ovigerous female, paratype, pleotelson; E, *Dynoides elegans*, male, pleotelson (after Wetzer & Mowery, 2017); F, *Dynoides elegans*, female, pleotelson (after Wetzer & Mowery, 2017). Red arrows show a prominent rounded tubercle on the base of pleotelsonic sinus.

apex with some setules laterally; sympodite mesial margin with 2 coupling hooks.

Pleopod 3 (Figure 4D) exopod and endopod subequal in length, with 34 and 16 PMS respectively; sympodite mesial margin with 2 coupling hooks.

Pleopod 4 (Figure 4E) both rami subequal in length, exopod wider than endopod, with transverse suture, transverse folds absent.

Pleopod 5 (Figure 4F) exopod with 3 scale patches, lateral margin with slender simple marginal setae.

Uropodal rami (Figure 4G) extending just beyond pleotelsonic apex, fringed with dense small marginal setae.

Female: Similar to male except in sexual characters; body smooth, 1.9 times as long as greatest width; (Figures 2K, 5D). Uropod not extending to posterior margin of pleotelson.

Etymology

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

Remarks

Dynoides canadensis sp. nov. is most similar to *D. elegans* from California and *D. saldanai* and *D. crenulatus* from Mexico, Oaxaca. Based on the redescription of *D. elegans* given by Wetzer et al. (2018), this new species differs from *D. elegans*, in having the penial processes length $7.7 \times$ basal width and acute distal apex (instead of $2.3 \times$ basal width and rounded and blunt distal apex), the doubled back part on the proximal half of the appendix masculina extending somewhat beyond its base (instead of not reaching the base). The pleotelson of *D. elegans* is covered with small tubercles, has a pleotelsonic sinus with a prominent rounded tubercle on the base of sinus and the sinus walls are finely crenulated (Figure 5E, F). Conversely, the new species has a pleotelson without small tubercles on dorsal surface, lacking a prominent rounded tubercle on the basal part of the pleotelsonic sinus and its sinus wall has no crenulation. *Dydoides crenulatus* is readily distinguished from this new species by its highly setose and more slender body. The other species from Mexico, *D. saldanai*, can be easily recognized by the heart-shaped slit on the pleotelson apex.

The analyses of 16S rDNA by Wetzer et al. (2018) clearly support the existence of two distinct *Dynoides* species along the coastal zone of California area; *Dynoides elegans* from Southern California, USA, and *Dynoides* sp. from Baja California Sur, Mexico. Based on distribution report of *Dynoides* species in the Mexican Pacific by Espinosa-Pérez and Hendrickx (2001), *Dynoides* sp. could be *D. crenulatus* or its sympatric species, *D. saldanai*.

Comments on the geographic distribution

Based on the previous studies, four species of *Dynoides* are distributed in the north-eastern Pacific: *D. crenulatus* is sympatric with *D. saldanai* in most localities and distributed in the coastal zone of the south-west of Mexico from Oaxacan to near the Gulf of California (Figure 1E); *D. dentisinus* occurs in San Francisco Bay, Western California (Figure 1C); *D. elegans* reported from Cedros Island in Baja California Norte to Santa Cruz Island in Santa Barbara County, Southern California (Figure 1D). The new species is

distributed along the western coasts of British Columbia from Victoria area to Graham Island (Figure 1B).

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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