Gnathia bermudensis (Crustacea, Isopoda, Gnathiidae), a new species from the mesophotic reefs of Bermuda, with a key to Gnathia from the Greater Caribbean biogeographic region

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Gnathia bermudensis (Crustacea, Isopoda, Gnathiidae), a new species from the mesophotic reefs of Bermuda, with a key to *Gnathia* from the Greater Caribbean biogeographic region

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Abstract

Gnathia bermudensis **sp. nov.** is described from mesophotic coral ecosystems in Bermuda; it is distinguished by pronounced and pointed supraocular lobes, two superior frontolateral processes and a weak bifid mediofrontal process, pereonite 1 not fused dorsally with the cephalosome, and large eyes. This is the first record of a species of *Gnathia* from Bermuda. A synopsis and key to the other *Gnathia* species from the Greater Caribbean biogeographic region is provided.

Keywords

Atlantic Ocean, benthic, ectoparasite, Nekton Mission, taxonomy

Introduction

Gnathiid isopods are temporary ectoparasites that occur in a variety of habitats ranging in depth, water currents, temperature, climate and salinity (Smit and Davies 2004). The parasitic juveniles feed on the blood and lymph of their fish hosts, while the non-feeding free-living adults are usually hidden in cavities, corals, or sponges (Hadfield et al. 2009). The taxonomic classification of these isopods is based almost exclusively on the morphology of the adult males, and this makes studies reliant on accurate species identification problematic as males can be difficult to obtain. Currently, there are 12 genera in the family Gnathiidae Leach, 1814 (Smit et al. 2019). Of these, the most speciose genus is *Gnathia* Leach, 1814, with 126 valid species (Boyko et al. 2008 onwards). To date, there are 14 known species of *Gnathia* from the Greater Caribbean biogeographic region (see Table 1 for a summary of known information on these species). In 1993, Müller (1993) proposed *Gnathia puertoricensis* Menzies & Glynn, 1968 as a junior synonym for *G. virginalis* Monod, 1926 based on the variation in the characters that separated these two species (granulation and tubercles on the anterior pereonites and cephalon). Although not recognised in subsequent publications on gnathiids from this region (George 2003; Farquharson et al. 2012), this synonymisation appears to still be valid and the information regarding both species is combined in Table 1.

Recently, there has been a growing interest in gnathiids from this region specifically regarding their role in cleaner interactions (Artim et al. 2017), food web ecology (Demopoulos and Sikkel 2015), and their role as potential vectors of blood parasites (Cook et al. 2015). However, all of this work has focused on a single species, *G. marleyi* Farquharson, Smit & Sikkel, 2012, and therefore it is also the only species from this region with known hosts for the parasitic larval stage. These host fishes include *Acanthurus bahianus* Castelnau, 1855; *Chaetodon capistratus* Linnaeus, 1758; *Epinephelus guttatus* (Linnaeus, 1758); *Haemulon flaviolineatum* (Desmarest, 1823); *H. plumieri* (Lacepede, 1801); *H. sciurus* (Shaw, 1803); *Holocentrus rufus* (Walbaum, 1792); *Lutjanus apodus* (Walbaum, 1792); *L. griseus* (Linnaeus, 1758); *Scarus taeniopterus* Desmarest, 1831; *Sparisoma aurofrenatum* (Valenciennes, 1840); *Stegastes diencaeus* (Jordan & Rutter, 1897); and *S. planifrons* (Cuvier, 1830) (see Farquharson et al. 2012).

Bermuda forms part of this Greater Caribbean biogeographic region in the North Atlantic Ocean (Robertson and Cramer 2014). It is situated on the western side of the Sargasso Sea (high salinity, high temperatures and high biodiversity), and has the most northern coral reef system in the world. As part of the Nekton Foundation/XL-Catlin Deep-Ocean Survey – Mission 1 (www.nektonmission.org), fish (Stefanoudis et al. 2019a), zooplankton (Stefanoudis et al. 2019b), black corals (Wagner and Shuler 2017), macroalgae (Schneider et al. 2018, 2019) and other benthic communities (NVS pers. obs.) were studied. Macrofaunal collections from mesophotic reef ecosystems of Bermuda (MCEs) contained several specimens of a gnathiid isopod that did not correspond to currently described species. This isopod is here described as a new species of *Gnathia* and is the first gnathiid isopod to be recorded from Bermuda.

Table 1. Summary of the location, depth, size and references of 15 *Gnathia* species from the Greater Caribbean biogeographic region, including the 14 previously known species and the new species, *Gnathia bermudensis* sp. nov.

Species	Location	Depth (m)	Size (mm)	Substratum	References
G. beethoveni Paul & Menzies, 1971	Venezuela	95	3	mangrove roots; muddy and sandy bottoms; algae; seaweed; tunicates; seagrass	Paul and Menzies 1971; Dias et al. 2013
	Colombia (Santa Marta)	13–30		coral rubble	Müller 1988a
	Tobago				Kensley and Schotte 1994
	Mexico (Puerto Morelos)	3–12	1.8	coral rubble	Monroy-Velázquez and Alvarez 2016; Monroy-Velázquez et al. 2017
G. bermudensis sp. nov.	Bermuda	56–90	1.7–2.2	loose gravel and sediment (associated with corals); algae; sponges; rodoliths	Present study
G. brucei George, 2003	USA (North Carolina)	1000–1020	2.8–3.2		George 2003
G. calsi Müller, 1993	Martinique, French Antilles	0–2	1.9	dead corals	Müller 1993
G. gonzalezi Müller, 1988	Colombia (Santa Marta)	12–30	1.5	coral rubble	Müller 1988a
G. hemingwayi Ortiz & Lalana, 1997	Cuba (Cojímar Bay)	2	3	wood pile	Ortiz and Lalana 1997
G. johanna Monod, 1926	US Virgin Islands (St. John)	29–46	2–2.16		Monod 1926; Müller 1988b
	Colombia				Kensley and Schotte 1990
	Venezuela			seagrass beds; muddy bottom	Díaz et al. 2013
G. magdalenensis Müller, 1988	Colombia (Santa Marta)	6–30	2.8	coral rubble	Müller 1988a
	Belize				Kensley and Schotte 1989
	Mexico (Puerto Morelos)	3–12		coral rubble	Monroy-Velázquez et al. 2017
G. marleyi Farquharson, Smit & Sikkel, 2012	St. John, US Virgin Islands; Bahamas; British Virgin Islands (Guana Island); Puerto Rico; Saba (Lesser Antilles)	3–5	2.6–3.7	several host fish	Farquharson et al. 2012
G. micheli Ortiz, Winfield & Varela, 2012	Cuba (Cayo Matias)	20	2.6–3.3	algae	Ortiz et al. 2012
G. rathi Kensley, 1984	Belize (Carrie Bow Cay)	0.5–128	1.6–1.9	rubble	Kensley 1984
G. samariensis Müller, 1988	Colombia (Santa Marta)	30	1.7	coral rubble	Müller 1988a
G. triospathiona Boone, 1918	USA (Florida)	200	8.8		Boone 1918
G. vellosa Müller, 1988	Colombia (Santa Marta)	25–30	1.5	sponges and hydroids	Müller 1988a
	Venezuela			seagrass beds; mangrove roots; algae	Dias et al. 2013
	Mexico (Puerto Morelos)	6–12	2.7	coral rubble	Monroy-Velázquez and Alvarez 2016; Monroy-Velázquez et al. 2017
G. virginalis Monod,1926	US Virgin Islands	29	2.2		Monod 1926
Syn: *G. puertoricensis* Menzies & Glynn, 1968	Puerto Rico	0–3	3		Menzies and Glynn 1968
	Cuba				Ortiz 1983; Müller 1988a
	Belize (Carrie Bow Cay)			rubble	Kensley 1984
	Colombia (Santa Marta)	0–30	2	coral rubble; under stones; fouling on harbour pilings	Müller 1988a
	Martinique, French Antilles	0.5–2		seagrass beds; dead corals; under stones	Müller 1993
	Venezuela			mangrove roots; seagrass beds; muddy bottom; algae	Dias et al. 2013
	Mexico (Puerto Morelos)	6–12	2.2	coral rubble	Monroy-Velázquez and Alvarez 2016; Monroy-Velázquez et al. 2017

Materials and methods

All benthic samples were collected from 17 July to 14 August 2016 aboard the R/V "Baseline Explorer". Mesophotic benthic surveys and sampling were conducted using Trimix rebreathing divers from the Global Underwater Explorers (**GUE**) down to 94 m around the edge of the Bermuda platform. The sampling sites North Northeast (**NNE**), Plantagenet Bank, Spittal, and Tiger, were selected along the northeast, southeast and southern slopes of the Bermuda platform, respectively (Figure 1). During the same mission, two two-person Triton Class Submersibles (Nomad and Nemo; Vero Beach, FL, United States) equipped with an arm manipulator assisted in sample collection down to 300 m. Divers collected macroalgae, loose gravel, bottom sediment, rhodoliths, sponges, and hard and soft corals to characterise the biodiversity of the Bermudian mesophotic reefs. The depth range for each sample was noted. Once the substrata were brought onto the research vessel, they were placed on a 0.063 μm sieve and washed thoroughly with filtered water. Meiofauna and macrofauna associated with the substrata were captured on the 0.063 μm sieve and preserved in > 95 % ethanol. The preserved samples were sorted, placed in 95 % ethanol, and stored at -20 °C until further processing. Research permits for Bermuda were issued by the Department of Environment and Natural Resources, Bermuda (No. 2016070751).

From these samples, several gnathiids were cleaned and prepared for scanning electron microscopy (SEM; PhenomWorld). Gnathiids were also observed and drawn using an Olympus BX41 compound microscope and an Olympus SZX7 dissecting microscope with a camera lucida. Appendages were removed with the aid of dissecting needles and forceps and stained using lignin pink.

The species description was prepared in DELTA (DEscriptive Language for TAxonomy) using a general Gnathiidae character set (as used in Svavarsson and Bruce 2012). The description is based on the adult male gnathiid. Terminology follows Monod (1926), Cohen and Poore (1994) and Svavarsson and Bruce (2012, 2019). Isopod classification follows that of Brandt and Poore (2003).

Material is deposited in the Natural History Museum of Bermuda.

Taxonomy

Suborder Cymothoida Wägele, 1989
Superfamily Cymothooidea Leach, 1814
Family Gnathiidae Leach, 1814

Genus *Gnathia* Leach, 1814, restricted syn.

Gnathia Leach, 1814: 386–402; Monod 1926: 326–329 (part); Cohen and Poore 1994: 343–346.
Anceus Risso, 1816: 8.

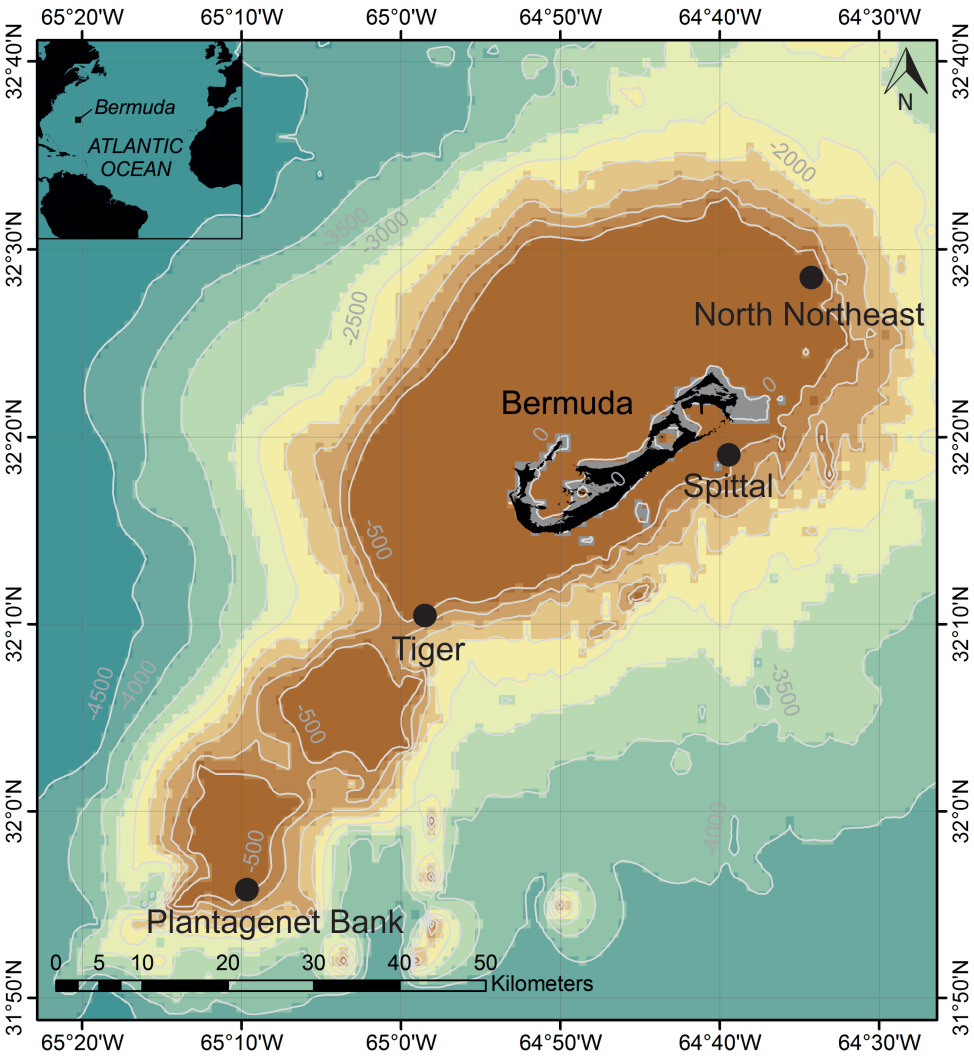

Figure 1. Map of collection sites around Bermuda. Data overlay GEBCO_2014 Grid which provides 30 arc-second global grid of elevations. Depth contours in meters.

Praniza Latreille, 1817: 54.
Zuphea Risso, 1826: 104.
Gnathia (*Gnathia*) s.s.: Monod 1926: 329 (part).
Gnathia (*Perignathia*): Monod 1926: 554–555 (not *Perignathia* Monod, 1922).

Type species. *Gnathia termitoides* Leach, 1814, by monotypy (see Cohen and Poore 1994).

Diagnosis. Frontal margin of cephalosome generally straight (not deeply excavated), with frontal processes. Mandibles not elongate, usually with mandibular incisor and dentate mandibular blade. Paraocular ornamentation and/or a dorsal sulcus may

be present on cephalosome. Pereonite 1 possibly immersed in cephalosome. Pylopod broad and distinct, with two or three articles, operculate; article 1 enlarged, generally with dense external margin of plumose setae; article 3 reduced or absent.

Remarks. *Gnathia* can be identified by the presence of frontal processes, a straight frontal border, a broad 2 or 3 articled pylopod, and non-extended mandibles with a dentate blade.

It is the most speciose genus in the family Gnathiidae (currently with 126 valid species). *Gnathia* is a cosmopolitan genus, commonly found in coral-reef habitats, and its parasitic larvae have been reported from both teleost and elasmobranch hosts (Smit and Davies 2004). The most recent revision of this genus was by Cohen and Poore (1994).

Gnathia bermudensis sp. nov.

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Figures 2–4

Material examined. ***Holotype.*** Bermuda • 1 ♂ (2.2 mm TL); Plantagenet Bank (31°56.55'N, 65°09.29'W); 56 m; 12 Aug 2016; Diver 2, from sediment; Sample ID BEX 2016-449 (BAMZ 2016-338-147).

Paratypes. Bermuda • 3 ♂♂ (1.9–2.1 mm TL) (one dissected), 1 ♂ used for SEM (1.8 mm TL), 1 ♀ (1.6 mm TL); same info as holotype (BAMZ 2016-338-148).

Other material. Bermuda • 4 ♂♂ (1.8–1.9 mm TL) (one dissected); Spittal (32°19.119'N, 64°39.437'W); 45 m; 3 Aug 2016; sediment from *Montastraea cavernosa* (Linnaeus, 1767) corals, Divers 39; Sample ID BEX 2016-227, Parent BEX2016-225 (sediment from several *Montastraea cavernosa* colonies) (BAMZ 2016-338-149) • 1 ♂ (2.0 mm TL); NNE (32°28.59'N, 64°34.46'W); 90 m; 4 Aug 2016; Event Divers; Sample ID BEX 2016-250, Parent BEX2016-248 (BAMZ 2016-338-150) • 1 zuphea (Z1) (0.45 mm TL); NNE (32°28.59'N, 64°34.46'W); 4 Aug 2016; algae substrate; Sample ID BEX 2016-251 • 1 ♂ used for SEM (1.7 mm TL); Spittal (32°19.119'N, 64°39.437'W); from rhodolith collected between 82–152 m; 7 Aug 2016; Dive 22, Nomad 1 (a Triton Submersible); Sample ID BEX 2016-299, Parent BEX2016-0265 • 1 ♂ (2.0 mm TL), 1 ♀ (1.9 mm TL), 1 zuphea (0.8 mm TL); Tiger 4 (32°11.17'N, 64°58.36'W); 7 Aug 2016; Divers 12, from sediment; Sample ID BEX 2016-304, Parent BEX2016-0282 (rhodolith with red encrusting sponge, > 40 m) (BAMZ 2016-338-151) • 2 ♂♂ (1.9–2.0 mm TL); Spittal (32°19.119'N, 64°39.437'W); 77 m; 11 Aug 2016; wash from rhodolith; Sample ID BEX 2016-428 • 1 ♂ (2.0 mm TL), 1 praniza (P3) (2.3 mm TL), 1 zuphea (Z1) (0.5 mm TL); Spittal (32°19.119'N, 64°39.437'W); 77 m; 11 Aug 2016; Diver 30; Sample ID BEX 2016-430 • 4 zuphea (Z1) (0.5 mm TL); Plantagenet Bank (31°56.55'N, 65°09.29'W); 56 m; 12 Aug 2016; Divers 2; Sample ID BEX 2016-450 • 2 ♂♂ (1.7–1.9 mm TL) (one used for SEM); Plantagenet Bank (31°56.55'N, 65°09.29'W); 56 m; 12 Aug 2016; Divers 6; Sample ID BEX 2016-451. All samples were collected by GUE technical divers except Sample ID BEX 2016-299, Parent BEX2016-0265, which was collected by a Triton Submersible.

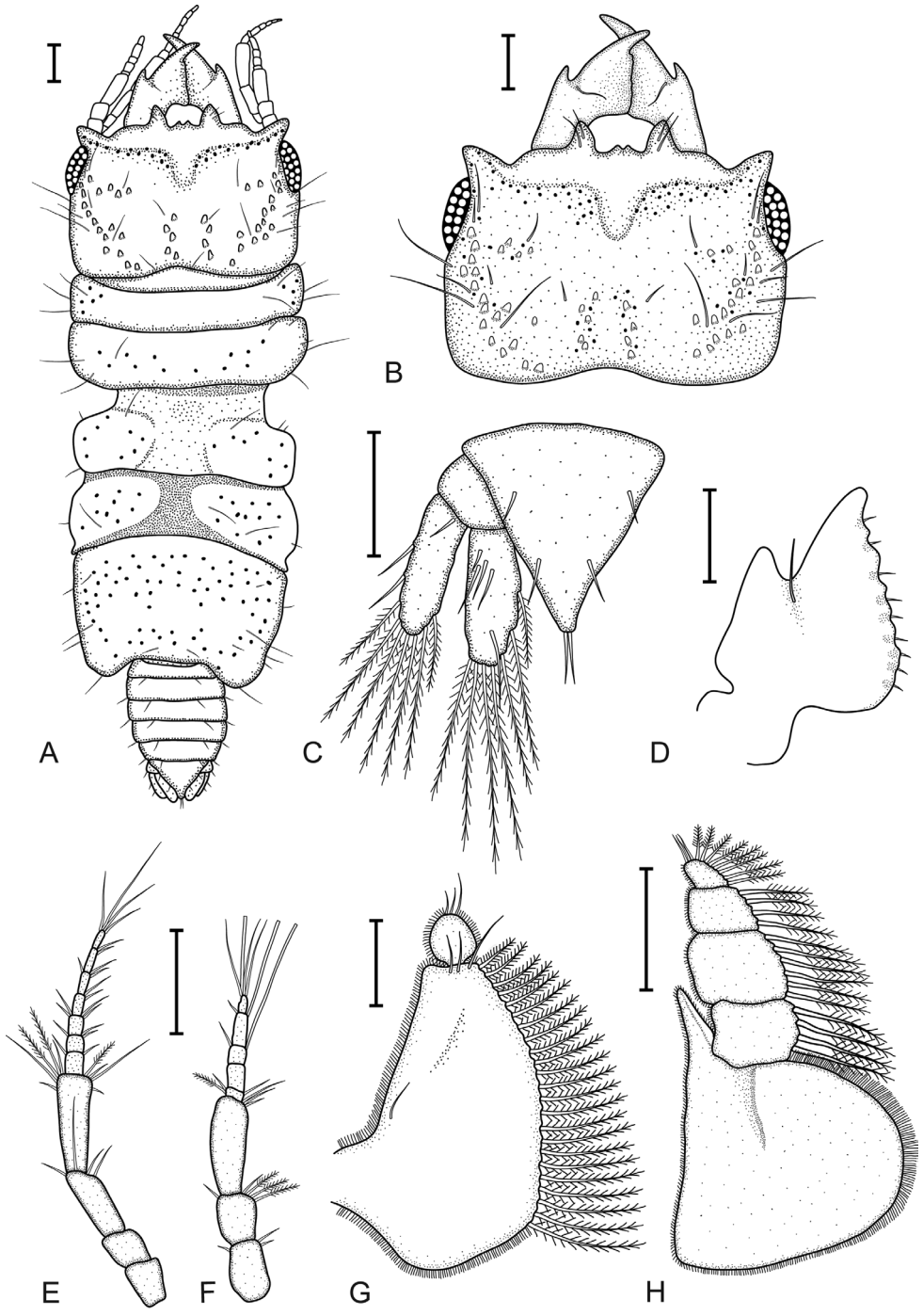

Figure 2. *Gnathia bermudensis* sp. nov. (BAMZ 2016-338-147), male holotype (2.2 mm TL) **A** dorsal view **B** dorsal view of cephalosome **C** dorsal view of pleotelson and uropods **D** dorsal view of mandible **E** antenna **F** antennula **G** pylopod **H** maxilliped. Scale bars: 100 μm.

Description of male. *Body* 2.3 times as long as greatest width, widest at pereonite 3; dorsal surfaces sparsely punctate, sparsely setose. *Cephalosome* quadrate, 0.7 as long as wide, lateral margins sub-parallel; dorsal surface with sparse granules; dorsal sulcus narrow, shallow, short; translucent region absent; paraocular ornamentation strongly developed, posteromedian tubercle present. *Frontolateral processes* present. *Frontal margin* slightly produced. *External scissura* present, wide, shallow. *Mediofrontal process* present, weak, bifid, without fine setae. *Supraocular lobe* pronounced, pointed; accessory supraocular lobe not pronounced. *Superior frontolateral process* present, single, strong, conical, with two long simple setae. *Inferior frontolateral process* absent. *Mesioventral margin* concave. *Eyes* present, elongate, 0.3 times as long as cephalosome length, bulbous, standing out from head surface, ommatidia arranged in rows, eye colour black.

Pereon lateral margins subparallel, with few setae; anteriorly with sparse fine granules. *Pereonite 1* not fused dorsally with cephalosome; dorsolateral margins fully obscured by cephalosome. *Pereonite 2* wider than pereonite 1. *Areae laterales* present on pereonite 5. *Pereonite 6* without lobi laterales; lobuii weak, globular. *Pleon* covered in pectinate scales, epimera not dorsally visible on all pleonites. *Pleonite 1* lateral margins with one pair of simple setae, with one pair of simple setae medially. *Pleotelson* as long as anterior width, covered in pectinate scales. Pleotelson lateral margins finely serrate, anterolateral margins weakly convex, with two submarginal setae; posterolateral margin distally weakly concave, with two submarginal setae; apex with two setae.

Antennula peduncle article 2 0.8 times as long as article 1; article 3 1.9 times as long as article 2, 2.7 times as long as wide; flagellum 1.1 times as long as article 3, with five articles; article 3 with one aesthetasc seta and one simple seta; article 4 with one aesthetasc seta and one simple seta; article 5 terminating with one aesthetasc seta and three simple setae. *Antenna* peduncle article 4 2.5 times as long as wide, twice as long as article 3, and four simple setae; article 5 1.3 times as long as article 4, 2.8 times as long as wide, inferior margin with three penicillate setae, with six simple setae; flagellum 1.5 times as long as article 5, with seven articles.

Mandible 0.4 as long as width of cephalosome, triangular, weakly curved, evenly; apex 42% total length; mandibular seta present. *Incisor* dentate. *Blade* present, dentate, weakly convex, dentate along 100% of margin. *Pseudoblade* absent; internal lobe absent; dorsal lobe absent; basal neck short; erisma present.

Maxilliped 5-articled; article 1 lateral margin with continuous marginal scale-setae; article 2 lateral margin with four plumose setae; article 3 lateral margin with six plumose setae; article 4 lateral margin with four plumose setae; article 5 with eight plumose setae; endite extending to mid-margin of article 3; without coupling setae.

Pylopod first article 1.5 as long as wide, without distolateral lobe; posterior and lateral margins forming rounded curve; lateral margin with 23 large plumose setae; mesial margin with continuous scale-setae; distal margin with three simple setae; second article 1.1 as long as wide.

Pereopods 2–6 with long simple setae and randomly covered in pectinate scales; pereopod 2 with tubercles on carpus and basis to ischium. *Pereopod 2 basis* 2.8 times as long as greatest width, superior margin with five setae, inferior margin with two setae; ischium 0.6 times as long as basis, 2.6 as long as wide, superior margin with one seta,

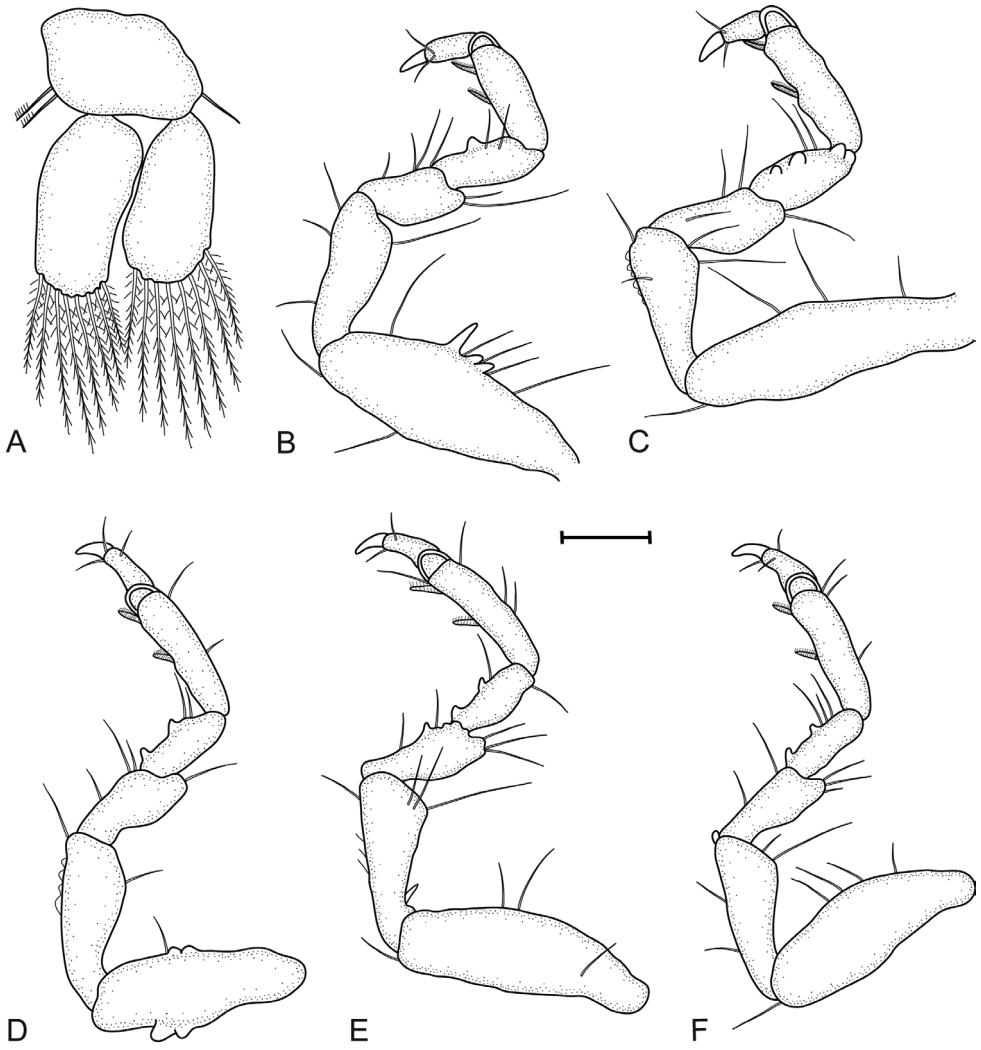

Figure 3. *Gnathia bermudensis* sp. nov. (BAMZ 2016-338-147), male holotype (2.2 mm TL) **A** pleopod 2 **B–F** pereopods 2–6, respectively. Scale bar: 100 μm.

inferior margin with three setae; merus 0.5 as long as ischium, 1.5 as long as wide, superior margin with two setae, inferior margin with four setae; carpus 0.6 as long as ischium, 1.9 as long as wide, superior margin without setae, inferior margin with two setae; propodus 0.8 times as long as ischium, 2.8 times as long as wide, superior and inferior margins without setae, and two robust setae; dactylus 0.7 as long as propodus. *Pereopods 3 and 4* similar to pereopod 2. *Pereopod 5* similar to pereopod 6. *Pereopod 6* with tubercles on merus and carpus; basis 3.1 times as long as greatest width, superior margin with two setae, inferior margin with two setae; ischium 0.7 as long as basis, 2.7 as long as greatest width, superior margin with three setae, inferior margin with four setae; merus 0.6 as long as ischium, 2.1 times as long as wide, superior margin with three setae, inferior margin with two setae; carpus 0.6 as long as ischium, 1.7 times as

long as wide, superior margin and inferior margin with one seta; propodus 0.9 as long as ischium, 3.8 times as long as wide, superior margin with three setae, inferior margin with one seta, and two robust setae; dactylus 0.6 as long as propodus.

Penes opening flush with surface of sternite 7.

Pleopod 2 exopod 1.9 as long as wide, distally broadly rounded, with eight plumose setae; endopod 1.9 as long as wide, distally broadly rounded, with eight plumose setae; appendix masculina absent; peduncle 1.5 times as wide as long, mesial margin with two coupling setae, lateral margin with one simple seta.

Uropod rami extending beyond pleotelson, apices narrowly rounded. *Uropod endopod* 2.4 as long as greatest width, dorsally with five setae; lateral margin straight; proximomesial margin weakly convex, with seven long plumose setae. *Uropod exopod* not extending to end of endopod, 2.9 times as long as greatest width; lateral margin straight, with two simple setae; proximomesial margin straight, distally convex, mesiodistal margin with seven long plumose setae.

Etymology. The epithet *bermudensis* is for the country Bermuda, being the first *Gnathia* record from this island nation.

Distribution. Bermuda.

Hosts. Not known.

Remarks. *Gnathia bermudensis* sp. nov. may be identified by the produced frontal margin; presence of two superior frontolateral processes; a weak and bifid mediofrontal process; and pronounced and pointed supraocular lobes. The uropod rami extend past the posterior point of the pleotelson; pereonite 1 is not dorsally fused with the cephalosome; large eyes (0.3 as long as cephalosome length); and a weakly curved, dentate mandible.

This species is from a moderate depth of 56–90 m and was collected from several habitat types (algae, loose gravel, rhodoliths, sediment associated with scleractinian corals, muddy sand, and sponges) encompassing the mesophotic reef ecosystems of Bermuda. The Mesophotic Coral Ecosystems (MCEs) of Bermuda represent the most northern coral reef systems of the Atlantic; they are visually dominated by scleractinian corals at the upper depth limits, which are replaced gradually at greater depths by rhodoliths, macroalgae beds and fossilised reefs (Goodbody-Gringley et al. 2019). The new gnathiid species has been found on the mesophotic slopes of the main seamount (i.e., the main island of Bermuda) and the smaller seamount Plantagenet (Figure 1); therefore, it is expected to be found throughout the deeper reefs of Bermuda. Only four other species of *Gnathia* have been collected from greater depths in this region.

Gnathia bermudensis sp. nov. is most similar to *G. beethoveni* Paul & Menzies, 1971, *G. calsi* Müller, 1993, *G. johanna* Monod, 1926, *G. magdalenensis* Müller, 1988, and *G. virginalis* Monod, 1926 from the region. The frontal margin of *G. beethoveni* differs from *Gnathia bermudensis* in having less pronounced supraocular lobes, four frontolateral processes, a shallow median notch, and the cephalosome is lacking dorsal tubercles. *Gnathia calsi* also has a deeply notched mediofrontal process with two lobes (and setae), and well developed but angular supraocular lobes, not seen in *Gnathia bermudensis* sp. nov. *Gnathia johanna* is narrower than *Gnathia bermudensis* sp. nov., with less pronounced supraocular lobes and a single convex mediofrontal process (with setae) between the supe-

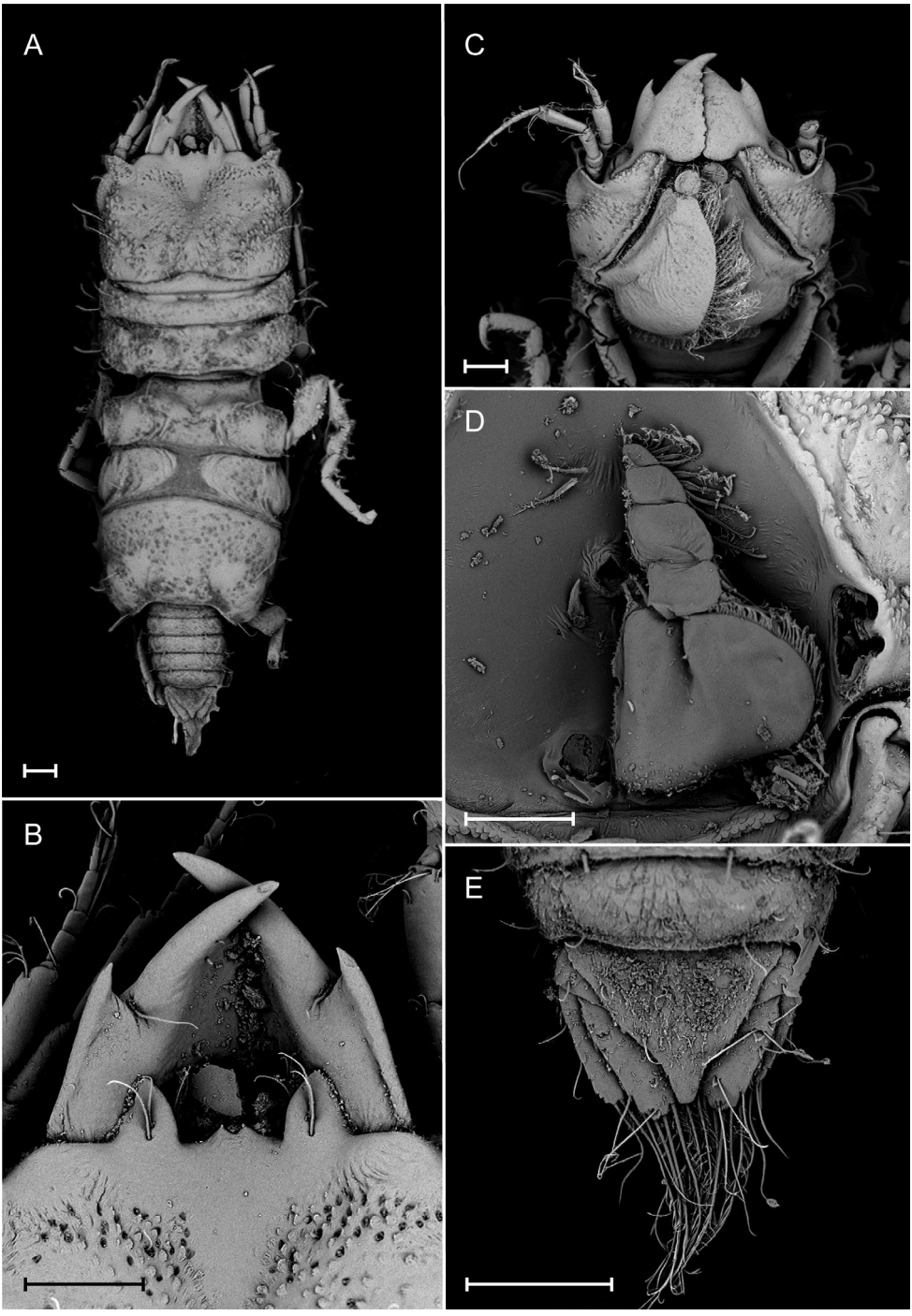

Figure 4. *Gnathia bermudensis* sp. nov. (BAMZ 2016-338-148), male paratype (1.8 mm TL) Scanning Electron Microscope (SEM) images. **A** dorsal view **B** frontal margin and mandibles **C** ventral view of cephalosome **D** maxilliped **E** dorsal view of pleotelson and uropods. Scale bars: 100 μm.

rior frontolateral processes. *Gnathia magdalenensis* and *G. virginalis* differ from *Gnathia bermudensis* sp. nov. in having slightly pointed supraocular lobes, a single pointed mediofrontal process with setae, and a longer cephalosome that is fused with pereonite 1.

Although adult females and zuphea juveniles were collected with the males, they cannot be confidently linked to this species without molecular or ecological data. More collections and rearing of the gnathiid isopods would need to be made in the future for more information and validation of these different life stages, as well as to determine the hosts of the juvenile stages.

Key to members of the genus *Gnathia* known from the Greater Caribbean biogeographic region

This key is based on the morphological characters of the adult male:

1 Pereonite 5 elongate (quadrate); located in deeper waters (≥ 200 m); cephalon frontal border wavy (with 3 bifid frontal lobes or 3 tooth-like projections) **2**

– Pereonite 5 similar in shape and size to pereonites 2–4; located in shallower waters (≤ 200 m); cephalon frontal border with regular frontal processes **3**

2 Frontal border produced with large quadrate projection; deep sea (> 1000 m); total body length measuring approximately 2.8–3.2 mm ..... ***G. brucei***

– Frontal border with deep V-shaped grove; depths below 1000 m (approx. 200 m); total body length measuring approximately 8.8 mm..... ***G. triospathiona***

3 Mediofrontal processes absent..... **4**

– Mediofrontal processes present **10**

4 Anterior margin of cephalon medially concave; robust body; cephalon wider than long and without granules or tubercles..... ***G. gonzalezi***

– Anterior margin of cephalon not medially concave; slender body; cephalon quadrate..... **5**

5 Only superior frontolateral processes present **6**

– Both superior and inferior frontolateral processes present **7**

6 Frontal margin slightly convex or straight; cephalon granular (tubercles) ..... ***G. rathi***

– Frontal margin convex with 4 medial setae; cephalon without tubercles..... ***G. johanna***

7 Pylopod 2-articled; inferior frontolateral processes smaller in size than superior frontolateral processes ..... ***G. micheli***

– Pylopod 3-articled; superior and inferior frontolateral processes similar in size..... **8**

8 Cephalon and body without granules or tubercles; sparsely setose ..... ***G. beethoveni***

– Cephalon with granules or tubercles; few to many slender setae over the body **9**

9 Supraocular lobes not well developed; narrow pleon and pleotelson longer than wide; pereonites 5 and 6 not clearly defined..... ***G. hemingwayi***

– Supraocular lobes well developed; pleon with short setae and wider than long; pereonites 5 and 6 clearly defined ..... ***G. calsi***

10 Mediofrontal process bifid **11**

– Mediofrontal process not bifid **12**

11 Frontal margin medially concave; superior frontolateral processes weak with 3 or 4 simple setae on each process; supraocular lobe not pronounced..... ..... ***G. marleyi***

– Frontal margin produced; superior frontolateral processes strong with 2 simple setae on each process; supraocular lobe pronounced and pointed .... ***G. bermudensis* sp. nov.**

12 Cephalon with few or no granules or tubercles..... **13**

– Cephalon with many small tubercles (finely granular)..... **14**

13 Mediofrontal process with 2–4 simple setae; mandible with inner lobe..... ..... ***G. magdalenensis***

– Mediofrontal process without any setae; mandible without inner lobe..... ..... ***G. samariensis***

14 Cephalon approximately 1.7 times as wide as long; mandibular carina distally notched ..... ***G. vellosa***

– Cephalon approximately 1.2 times as wide as long; mandibular carina distally rounded..... ***G. virginalis***

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