

Illustrated catalogue of sphaeromatoid isopods (Crustacea, Malacostraca) in the Canadian Museum of Nature (CMN)

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Abstract

Zoological collections are major treasures representing the history of animal biodiversity on Earth and are an important resource for biodiversity and conservation research. The Canadian Museum of Nature (CMN) has one of the oldest crustacean collections in North America.

Here, we provide an illustrated catalogue of the superfamily Sphaeromatoidea Latreille, 1825, deposited in the Canadian Museum of Nature's Crustacea Collection (CMNC). In this paper, we report 18 species, belonging to 3 families and 14 genera. The majority of species belong to the family Sphaeromatidae with 16 species, followed by the Ancinidae and the Tecticipitidae each with one species. We present a bibliography of the original description, current taxonomic status, the type locality, geographic distribution, and an updated illustration for all species.

Key Words

Canada, CMNC, Isopoda, Sphaeromatoidea, taxonomy

Introduction

The superfamily Sphaeromatoidea Latreille, 1825, comprising the Ancinidae, Sphaeromatidae and Tecticipitidae, with almost 111 genera and 649 known species, is one of the most frequently encountered and diverse isopod taxa (Boyko et al. 2008 onwards). Within the Sphaeromatoidea, the family Sphaeromatidae Latreille, 1825, is the largest family of free-living marine Isopoda, with 622 species belonging to 108 genera occurring in the shallow-water marine environments, and many as yet undescribed species and genera. The two small sphaeromatoid families are the Ancinidae Dana, 1852, with 15 described species distributed across two genera, and the Tecticipitidae Iverson, 1982, with one genus and 12 valid species (Boyko et al. 2008 onwards).

The history of isopod taxonomy in North America dates back to Say (1818), Dana (1853), Oscar Harger (1880) and Verrill et al. (1873), as well as the massive

contributions of, among others, Harriet Richardson, culminating in her 1905 monograph. While many of the species described by these early authors are valid, the brief species descriptions provided at the time have resulted in difficulties in recognizing species and subsequent misidentifications by later authors. Many species in most families remain to be fully described. Furthermore, there is a need to review many of the genera and the placement of species within these. The Canadian Museum of Nature (CMN) holds large collections across all animal groups. Based on the Canadian Museum of Nature database, the museum's Invertebrate Collection contains more than seven million specimens in more than 1.9 million lots. Of these, Amphipoda, Isopoda and Mysidacea are the major groups found in the Crustacean Collection (CMNC). Most of the specimens were collected by Edward L. Bousfield, who joined the CMN in 1950. Bousfield was a world authority on the systematics of Amphipoda; he described more than 300

new species (Conlan et al. 2016). Besides his intensive focus on the Amphipoda, his collections cover all sorts of invertebrates (mostly marine), as well as isopod crustaceans. With more than 3200 isopod records in the CMN database, including about 80 genera and 190 species (about 85% of which are from marine and brackish water habitats), in addition to the many samples yet to be catalogued, this collection is amongst the most important natural history archives for this group in North America. The present catalogue is a comprehensive, up-to-date account of the 18 species of sphaeromatoid isopods represented in the Canadian Museum of Nature, with illustrations of the species. This catalogue is arranged alphabetically by genus and then by species names within families, followed by the original combination, author(s) name and year of publication. For each species, a current nomenclature (valid names or synonymy) is given.

Material and method

Sphaeromatoid isopods for this study are from the Crustacean Collection of the Canadian Museum of Nature (CMNC; located at its Natural Heritage Campus, in Gatineau, Quebec, Canada).

Specimens were examined using Zeiss Stereomicroscope (Stemi 508). Color images of the specimens were taken using a Zeiss AxioCam ERc5s digital camera mounted on a Zeiss (Stemi 508) stereomicroscope. Photographs were merged and edited using Adobe Photoshop CC v.20.0.6.

Results

Systematics

Alphabetical list of taxa

Family Ancinidae Dana, 1852

Genus *Bathycopea* Tattersall, 1905

Bathycopea daltonae (Menzies & Barnard, 1959)

Fig. 1A, B

Ancinus daltonae Menzies & Barnard, 1959: 31, fig. 25; Schultz 1973: 270–272, fig. 1D, G.

Bathycopea daltonae.—Loyola e Silva, 1971: 217–222, figs 5–7; Kussakin 1979: 369, fig. 229; Shimomura 2008: 26.

Type locality. The shelf off San Miguel Island, California.

Material examined. CANADA. 1 ovigerous ♀ (5.2 mm), 2 ♂♂ (up to 5.1 mm); British Columbia, Vancouver Island, Barclay Land District, Cape Beale; 2 Aug. 1975; E.L. Bousfield leg.; CMNC 1985-0633. 4 ♂♂ (up to 5 mm); British Columbia, Barclay Land District, Trevor Ch.; 29 Jul. 1975; E.L. Bousfield leg.; CMNC 1985-

0630. 1 ovigerous ♀ (4 mm); British Columbia, Barclay Land District, Trevor Ch.; 30 May 1977; E.L. Bousfield leg.; CMNC 1985-0634. USA. 2 ovigerous ♀♀ (up to 4.9 mm), 1 ♂ (4.25 mm); Washington, Clallam Co., Makah Bay; 31 July 1966; E.L. Bousfield leg.; CMNC 1991-2557.

Distribution. San Miguel Islands, southern California to Vancouver Island.

Family Sphaeromatidae Latreille, 1825

Genus *Amphoroidea* H. Milne Edwards, 1840

Amphoroidea typa H. Milne Edwards, 1840

Fig. 1C

Amphoroidea typa Milne Edwards, 1840: 22–23; Dana 1853: 783; Hansen 1905: 108–126; Menzies 1962a: 140–141, fig. 47D; Hurley and Jansen 1977: 27 (listed as type species).

Type locality. Chile.

Material examined. CHILE. 30 ♀♀ (up to 19.5 mm), 1 ♂ (16.5 mm); Magallanes-Antarctica Region, Isla Lennox; 5 Feb. 1970; E.L. Bousfield & J.W. Markham leg.; CMNC 1992-0567.

Distribution. Known only from Chile.

Genus *Cassidinidea* Hansen, 1905

Cassidinidea ovalis (Say, 1818)

Fig. 1D

Naesa ovalis Say, 1818: 484–485.

Cassidena lunifrons Richardson, 1900: 222.

Naesa ovalis Richardson, 1900: 224.

Cassidina lunifrons.—Richardson 1901: 533, fig. 14.

Cassidisca lunifrons.—Richardson 1905: 273, figs 283–284.

Cassidisca ovalis.—Richardson, 1905: 274, figs 283, 205.

Cassidinidea ovalis.—Hansen, 1905: 130; Menzies and Frankenberg 1966: 44 fig. 20; Schultz 1969: 115, fig. 158; Kussakin 1979: 336, figs 199–200; Heard 1982: 32, fig. 35; Kensley and Schotte 1989: 208, fig. 92; Bruce 1994: 1151, fig. 45; Camp et al. 1998: 136; Kensley and Schotte 1999: 701–702; Khalaji-Pirbalouty and Bruce 2021: 494–502, figs 2–5.

Type locality. St John's River in Florida.

Material examined. USA. 4 ♂♂ (up to 3 mm), 8 ♀♀ (up to 3.2 mm); South Carolina, Georgetown County; 26 Apr. 1965; E.L. Bousfield leg.; CMNC 1992-0582. 1 ♂ (2.8 mm), 6 ♀♀ (up to 3.2 mm); South Carolina, Charleston County, 25 Apr. 1965; E.L. Bousfield leg.; CMNC 1991-2575. 2 ♀♀ (up to 3 mm); North Carolina, Dare County; 11 Apr. 1975; E.L. Bousfield leg.; CMNC 1985-0643. 1 ♀ (3.1 mm); North Carolina, Tyrrell County, 11 Apr. 1975; E.L. Bousfield leg.; CMNC 1985-0644.

Distribution. Eastern coast of North America from New Jersey to Florida (Khalaji-Pirbalouty and Bruce 2021).

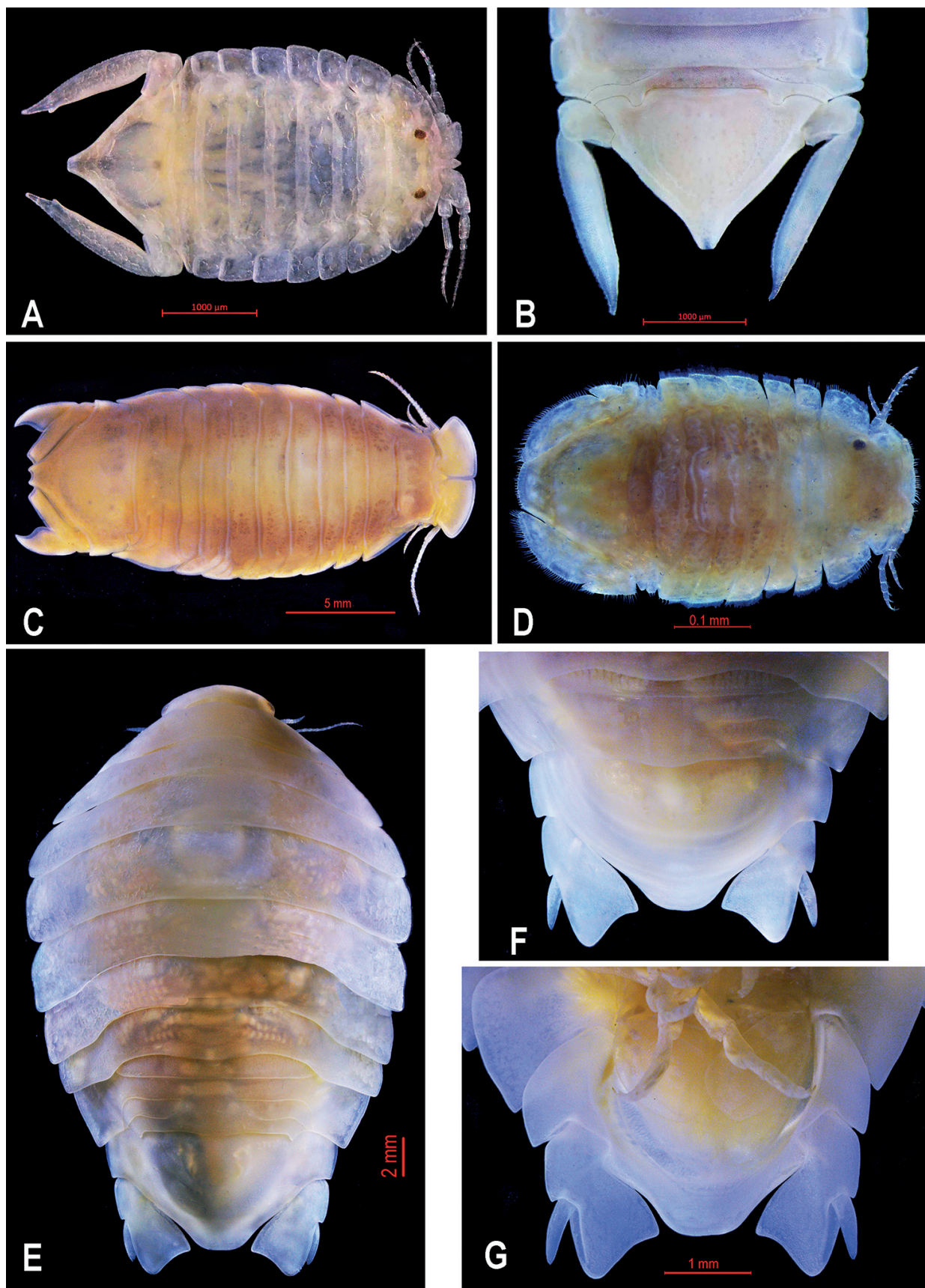


Figure 1. A. *Bathycopea daltonae* (Menzies & Barnard, 1959), male, (CMNC 1985-0633); B. Female, pleotelson; C. *Amphoroidea typa* Milne Edwards, 1840, female, (CMNC 1992-0567); D. *Cassidinidea ovalis* (Say, 1818) male, (CMNC 1992-0582); E. *Cassidinopsis emarginata* (Guérin-Méneville, 1843), male, (CMNC 1985-0636); F. Pleotelson dorsal view; G. Pleotelson ventral view.

Genus *Cassidinopsis* Hansen, 1905***Cassidinopsis emarginata* (Guérin-Méneville, 1843)**

Fig. 1, G

Cassidina emarginata Guérin-Méneville, 1843: 31; Cunningham 1871: 499, pl. 59, fig. 4; Miers 1879: 204; Studer 1883: 19; Pfeffer 1886: 63–69, pl. 2, figs 9–10, pl. 4, figs 23–30, pl. 6, figs 1–10; Dollfus 1891: 67, pl. 8, fig. 10; Stebbing 1900: 562; Ortmann 1911: 650.

Cassidinopsis emarginata – Hansen, 1905: 82, 87, 128; Hodgson 1910: 4; Tattersall, 1921: 223; Monod, 1931: 25–26; Stephensen 1947: 28; Vanhöffen 1914: 514; Menzies 1962a: 144, fig. 49; Carvacho, 1977: 177; Kussakin and Vasina 1980: 356–360; Brandt 1998: 150, figs 9–11.

Cassidinopsis emarginatus. – Giambiagi, 1925: 233; Stebbing 1914: 351.

Type locality. Falkland Island. (Falkland Islands and the West coast of Patagonia).

Material examined. CHILE. 1 ♂ (36 mm); Magallanes y de la Antártica Chilena Region, Isla Navarino, Punta Wulaia; 3 Feb. 1970; E.L. Bousfield leg.; CMNC 1985-0636. 18 ♂♂ and ♀♀ (up to 28 mm); Magallanes-Antarctica Region, Canal Beagle; 19 Feb. 1970; E.L. Bousfield leg.; CMNC 1985-0637. 1 ♀ (18 mm), 2 juveniles; Magallanes-Antarctica Region, Isla Lennox; 6 Feb. 1970; E.L. Bousfield leg.; CMNC 1985-0635.

Distribution. South Georgia Island, Falkland Islands to Southern coasts of Chile; Puerto Deseado, Argentina (Brandt 1998; Gomez Simes 1979).

Genus *Dynamene* Leach, 1814***Dynamene dilatata* Richardson, 1899 (uncertain/*incerta sedis*)**

Fig. 2A, B

Dynamene dilatata Richardson, 1899: 882–883, fig. 8; Richardson 1905: 304, fig. 327; Schultz 1969: 122, fig. 171; Hatch 1947: 214, pl. 7, figs 85–86.

Dynamenella dilatata. – Kussakin, 1971: 450, fig. 298; Brusca et al. 2007: 521, 537, pl. 242.

Note. This species is retained in the genus *Dynamene* (in original combination) and listed as “taxon inquirendum” in WoRMS (Boyko et al. 2008 onwards). Thus, the correct generic status of this species is still in question. Since Richardson (1899; 1905) and subsequent authors provided only a brief description with a figure of the whole body, a morphological revision is required to correctly place this species.

Type locality. Monterey Bay, California.

Material examined. CANADA. 3 ♀♀ (up to 6.5 mm); Oregon, Lincoln Co.; 12 Aug. 1966; E.L. Bousfield leg.; CMNC 1991-2567. 1 ovigerous ♀ (8.5 mm); British Columbia, Long Beach Unit, Long Beach; 5 Aug. 1955; E.L. Bousfield leg.; CMNC 1985-0648. 1 ♂ (5.5 mm); British Columbia, Long Beach Unit, Long Beach; 5 August 1955; E.L. Bousfield leg.; CMNC 1985-0660.

Genus *Dynamenella* Hansen, 1905***Dynamenella sheareri* (Hatch, 1947)**

Fig. 2C

Dynamene sheareri Hatch, 1947: 164, 262, fig. 173; George and Strömberg 1968: 246–248, pl. 2, fig. 9.

Dynamenella sheareri. – Schultz, 1969: 123, fig. 174; Harrison and Holdich 1982: 90.

Note. The true generic status of this species is still undetermined.

Type locality. Coos Bay, Oregon.

Material examined. CANADA. 6 ♀♀ (up to 3 mm), 1 ♂ (3.8 mm); British Columbia, Renfrew Land Distr., Port Renfrew; 1 Aug. 1970; CMNC 1990-0069. 5 ♀♀ (up to 3.5 mm), 2 ♂♂ (4 mm), British Columbia, Vancouver Island, Barclay Land Distr., Bordelais Islets; 9 Aug. 1975; CMNC 1990-0070.

Remarks. *Dynamenella sheareri* cannot be a *Dynamenella* because of the following characters: having a single pleonal suture running to posterior margin (instead of two); penial process more fused, not basally swollen; appendix masculina is evenly slender and long, not “flask shaped.”

Genus *Dynoides* Barnard, 1914***Dynoides canadensis* Khalaji-Pirbalouty & Gagnon, 2021**

Fig. 2D

Dynoides canadensis Khalaji-Pirbalouty & Gagnon, 2021: 12–20, figs 2–5.

Type locality. Canada, British Columbia.

Material examined. CANADA. **Holotype.** ♂ (4.2 mm); British Columbia, Barclay Land District, Cape Beale; 19 July 1970; E.L. Bousfield leg.; 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, Whiffin Spit; 17 August 1955; E.L. Bousfield leg.; CMNC 1990-0064. 3 ♀♀ (up to 5 mm); British Columbia, Rupert Land Distr., Vancouver Island, Cape Scott; 18 July 1959; E.L. Bousfield leg.; CMNC 1990-0066. 20 ♂♂ & ♀♀; British Columbia, Renfrew Land Distr., Vancouver Island, Port Renfrew; 1 August 1970; E.L. Bousfield leg.; CMNC 1990-0068. 1 ♀ (3 mm); British Columbia, Queen Charlotte Islands Land Distr., Graham Island, 27 July 1957; E.L. Bousfield leg.; CMNC 1990-0067. 5 ♂♂ (up to 4.9), 6 ♀♀ (up to 4.2); British Columbia, Barclay Land District, Trevor Channel, Tzartus Island; 21 July 1970; E.L. Bousfield leg.; CMNC 1985-0664. 4 ♂♂ (up to 4.5 mm), 5 ♂♂ (up to 4.2 mm), British Columbia, Metchosin Land Distr., Sooke Basin, Becher Bay; 31 July 1970; E.L. Bousfield leg.; CMNC 1990-0057. 4 ♂♂ (up to 4.5 mm), 2 ♀♀ (3 mm), British

Columbia, Nootka Land Distr., Nootka Island; 20 August 1959; E.L. Bousfield leg.; CMNC 1990-0059. 1 ♂ (4.2 mm), 1 ♂ (3.5 mm), British Columbia, Rupert Land Distr., Hope Island; 22 August 1959; E.L. Bousfield leg.; CMNC 1990-0060. 1 ♂ (5.1 mm), 5 ♂♂ (up to 4 mm), 1 juvenile, British Columbia, Range 2 Coast Land Distr., Goose Island; 6 August 1964; E.L. Bousfield leg.; CMNC 1990-0061. 6 ♀♀ (up to 3 mm), British Columbia, Range 2 Coast Land Distr., Hunter Island; 8 August 1964; E.L. Bousfield leg.; 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; 20 July 1964; E.L. Bousfield leg.; CMNC 1990-0065.

Distribution. Western coasts of British Columbia from Victoria area to Graham Island.

Genus *Exosphaeroma* Stebbing, 1900

Exosphaeroma gigas (Leach, 1818)

Fig. 2E, F

Sphaeroma gigas Leach, 1818: 346–347; Desmarest 1825: 301; Milne-Edwards 1840: 205; White 1847: 102; Dana 1853: 775; Miers 1879: 202–203; Haswell 1882: 287; Studer 1884: 17–18; Dollfus 1891: 62, pl. 8a, fig. 6.

Sphaeroma jurinii.—Krauss, 1843: 65.

Sphaeroma propinqua.—Nicolet, 1849: 277–278.

Sphaeroma chilensis.—Dana, 1853: 195–196.

Sphaeroma obtusa.—Hutton, 1879 (in Chilton 1906).

Exosphaeroma gigas.—Stebbing, 1900: 553–558, pl. 39; Chilton 1906: 271–272; Ortmann 1911: 646–647; Vanhöffen 1914: 510–511; Tattersall 1921: 216; Giambiagi 1925: 235; Stephensen 1927: 362; Nierstrasz 1931: 194; Barnard 1940: 413, fig. 13; Hurley 1961: 269; Hale 1929: 275, fig. 273; Menzies 1962a: 132–134, fig. 43; Kussakin 1967: 235; Hurley and Jansen 1977: 58, fig. 52; Carvacho, 1977: 177–178; Kussakin and Vasina 1980: 355–359; Brandt and Wägele 1989: 209–214, figs 5–9; Bruce 2003: 368.

Type locality. Unknown; The Natural History Museum, syntypes: 1941: 6:27: 5 (presented by Leach) and 1979: 420: 1, Sir Joseph Banks collection (Ellis 1981).

Material examined. CHILE. 22 ♂♂ (up to 24 mm), 50 ♀♀ (up to 18 mm); Magallanes and Chilean Antarctica Region, Picton Island; 7 Feb. 1970; E.L. Bousfield leg.; CMNC 1990-0090. 46 ♂♂ and ♀♀; Magallanes and Chilean Antarctica Region, Navarino Island; 29 Jan. 1970; E.L. Bousfield leg.; CMNC 1990-0092. 300 ♂♂ and ♀♀; Magallanes and Chilean Antarctica Region, Canal Beagle; 19 Feb. 1970; E.L. Bousfield leg.; CMNC 1990-0094. FALKLAND. 1♀ (16 mm); Atlantic Ocean, Falkland Island, East Falkland; 1 Feb. 1969; S.W. Gorham leg.; CMNC 1992-0545. 9 ♂♂ and ♀♀ (up to 18 mm); East Falkland; 25 Jan. 1967; S.W. Gorham leg.; CMNC 1992-0552.

Distribution. Magallanes and Chilean Antarctica Region, Tierra del Fuego, Falkland Islands, Crozet Islands, Kerguelen Islands, Peru, South Africa, South Australia, New Zealand (Chatham Rise, Macquarie Island, Auck-

land Island, Campbell Island), Tasmania (Dana 1853; Vanhöffen 1914; Tattersall 1914; Kussakin 1967; Brandt and Wägele 1989).

Exosphaeroma rhomburum (Richardson, 1899)

Fig. 2G

Sphaeroma rhomburum Richardson, 1899: 835–836, fig. 12; 1900: 222.

Exosphaeroma rhomburum.—Richardson, 1905: 290, fig. 303; Nierstrasz 1931: 195; Schultz 1969: 135, fig. 197; Kussakin 1971: 402, fig. 257; Bruce 2003: 369.

Type locality. Monterey Bay, California.

Material examined. USA. 3 ♂♂ (up to 4.1 mm), 2 ovigerous ♀♀ (up to 4.2 mm); Washington, Clallam Co., Makah Bay; 31 July 1966; E.L. Bousfield leg.; CMNC 1991-2559. CANADA. 4 ♂♂ (up to 4.5 mm), 4 ♀♀ (up to 5 mm); British Columbia, Range 5 Coast; 13 July 1964; E.L. Bousfield leg.; CMNC 1984-1535. 3 ♂♂ (up to 4.1 mm), 4 ♀♀ (up to 4.5 mm); British Columbia, Rupert Land Distr., Hope Island; 22 July 1959; E.L. Bousfield leg.; CMNC 1984-1537. 1 ♀ (4 mm); Alaska, Prince of Wales-Outer Ketchikan Census Area; 31 May 1961; E.L. Bousfield leg.; CMNC 1991-2501.

Distribution. Monterey Bay, California, Washington to British Columbia.

Exosphaeroma russellhansoni Wall, Bruce & Wetzer, 2015

Figs 2H, 3A, B

Exosphaeroma russellhansoni Wall, Bruce & Wetzer, 2015: 28–33, figs 9–12.

Type locality. Washington, Puget Sound, Seattle, Smith Cove.

Material examined. CANADA. 15 ♂♂ (up to 6.2 mm); British Columbia, Esquimalt Land Distr., Esquimalt; 30 July 1970; E.L. Bousfield leg.; CMNC 1984-1465. 2 ♂♂ (5.1, 5.5 mm); British Columbia, Queen Charlotte Islands Land Distr., Yakan Pt.; 25 Aug. 1975; E.L. Bousfield leg.; CMNC 1984-1445. 3 ♂♂ (up to 6 mm); Land Distr., Graham Island; 11 Aug. 1975; E.L. Bousfield leg.; CMNC 1984-1447. 4 ♂♂ (up to 5.8 mm), 2 ♀♀ (up to 4.8 mm); British Columbia, Range 3 Coast Land Distr., Princess Royal Island; 20 July 1964; E.L. Bousfield leg.; CMNC 1984-1448. 5 ♂♂ (up to 6.5 mm), 2 ♀♀ (up to 4.8 mm); British Columbia, Metchosin Land Distr., Witty's Lagoon; 28 July 1964; E.L. Bousfield leg.; CMNC 1984-1449. 16 ♂♂ (up to 6 mm), 3 ♀♀ (up to 5 mm); British Columbia, Range 3 Coast Land Distr., Lady Douglas Island; 9 July 1964; E.L. Bousfield leg.; CMNC 1984-1452. 4 ♂♂ (up to 6.1 mm), 4 ♀♀ (up to 4.1 mm); British Columbia, Range 3 Coast Land Distr., Miles Island; 5 Aug. 1964; E.L. Bousfield leg.; CMNC 1984-1452. 2 ♂♂ (up to 6.5 mm); British Columbia, Range 5 Coast Land Distr., Stephens Island; 12 July 1964; E.L. Bousfield leg.; CMNC 1984-1455. 4 ♂♂ (up to 6.8 mm),

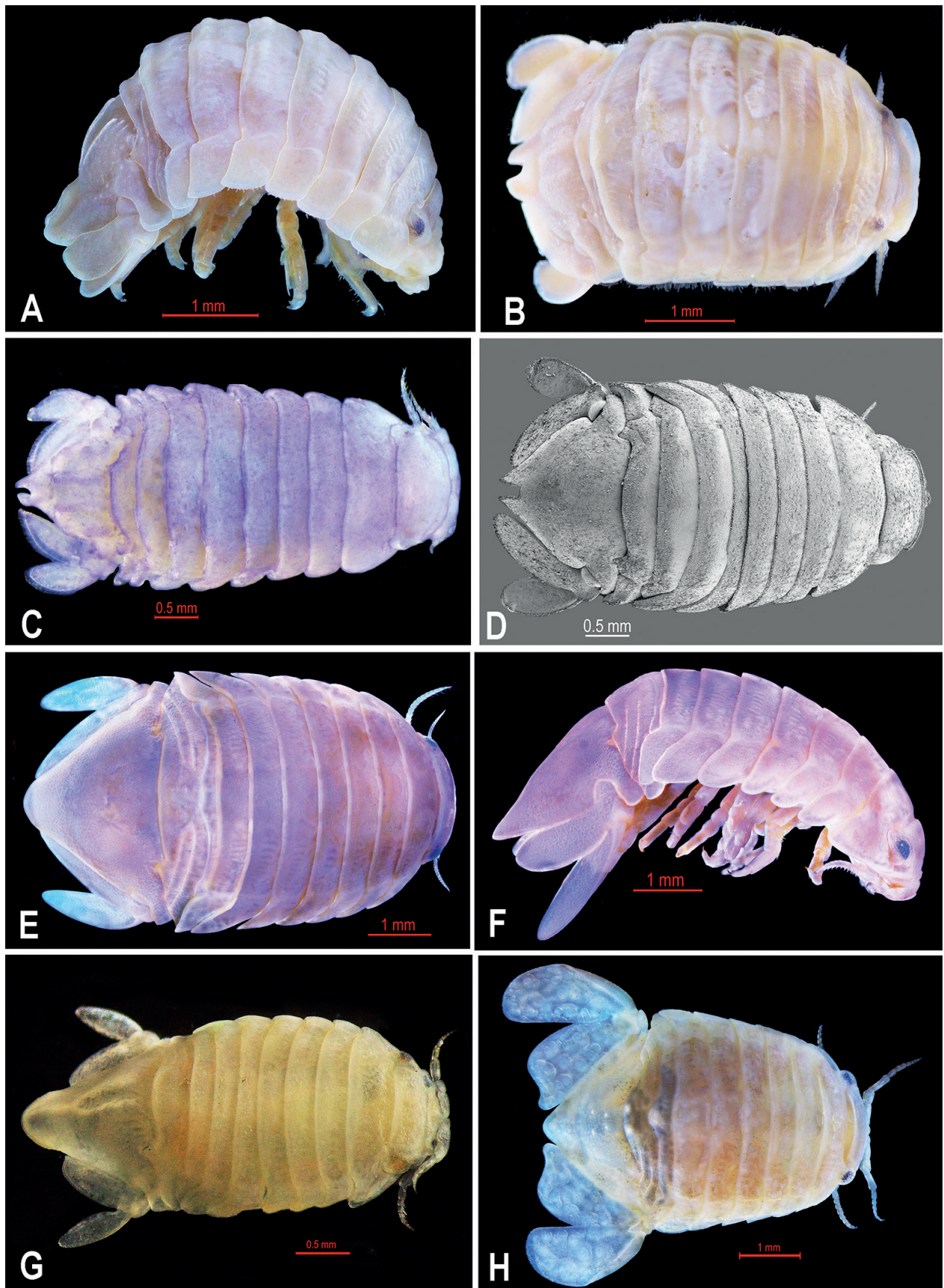


Figure 2. *Dynamene dilatata* Richardson, 1899, female, (CMNC 1991-2567). **A.** Lateral view; **B.** Dorsal view; **C.** *Dynamenella sheareri* (Hatch, 1947), male, (CMNC 1990-0070); **D.** *Dynoides canadensis* Khalaji-Pirbalouty & Gagnon, 2021, (CMNC 1985-0667b). *Exosphaeroma gigas* (Leach, 1818), male, (CMNC 1990-0090); **E.** Dorsal view; **F.** Lateral view. *Exosphaeroma rhomburum* (Richardson, 1899), male, (CMNC 1991-2559); **H.** *Exosphaeroma russellhansonii* Wall, Bruce & Wetzer, 2015, male, (CMNC 1984-1465).

1 ♀ (5.5 mm); British Columbia, Rupert Land Distr.; 7 Aug. 1959; E.L. Bousfield leg.; CMNC 1984-1461. 6 ♂♂ (up to 6.1 mm), 3 ♀♀ (up to 5 mm); British Columbia, Vancouver Island, Barclay Land Distr.; 8 September 1975; E.L. Bousfield leg.; CMNC 1984-1463. USA. 10 ♂♂ (up to 6.5 mm); Washington, Jefferson Co. (WA), Marrowstone Island; 26 July 1966; E.L. Bousfield leg.; CMNC 1984-1456.

Exosphaeroma studeri Vanhöffen, 1914

Fig. 3C, D

Exosphaeroma studeri Vanhöffen, 1914: 510–511, fig. 44; Menzies 1962a: 132–133, fig. 43; Nierstrasz 1931: 195; Bruce 2003: 369.

Sphaeroma calcarea.– Dollfus 1891: 64, pl. 8, fig. 7. [Not *Sphaeroma calcarea* Dana, 1853; misidentification, according to Menzies 1962a].

Type locality. Punta Arenas, Chile.

Material examined. CHILE. 1 ♂ (17.1 mm), 1 ovigerous ♀ (14.5 mm); Banco de las Tacas, Isla, Navarino; 5 Feb. 1970; E.L. Bousfield leg.; CMNC 2023-0242. 1 ♂ (18 mm) 5 ♀♀ (up to 12 mm); Canal Beagle; 19 Feb. 1970; E.L. Bousfield leg.; CMNC 2023-0243. 2 ♂♂ (9 mm), 3 ♀♀ (up to 6 mm); Isla Navarino; 5 Feb. 1970; E.L. Bousfield leg.; CMNC 2023-0244. 1 ♂ (9.8 mm); Peninsula Scott; W. Bank LW-HW; 20 Feb. 1970; E.L. Bousfield leg.; CMNC 2023-0245. 1 ♂ (15 mm), 2 subadult ♂♂ (13 mm), 3 ♀♀ (up to 13 mm); Islotes, Mamonés, off Isla Lennox; 6 February 1970; E.L. Bousfield leg.; CMNC 2023-0246. 2 ♀♀ (up to 9.1 mm); Punta Robalo, Isla, Navarino; 29 Jan. 1970; E.L. Bousfield leg.; CMNC 2023-0247.

Distribution. Chile, Straits of Magellan (Menzies, 1962a).

Genus *Gnorimosphaeroma* Menzies, 1954

Gnorimosphaeroma oregonense (Dana, 1853)

Fig. 3E, F

Sphaeroma oregonensis Dana, 1853: 778, pl. 52x; Richardson 1899: 836; 1900: 223.

Sphaeroma olivacea.– Lockington, 1877: 45, pl. 1.

Exosphaeroma oregonensis.– Richardson, 1905: 296, figs 315, 316; Hatch, 1947: 213, Pl. 6, figs. 82, 83.

Neosphaeroma oregonense.– Monod, 1931: 76, fig. 74.

Gnorimosphaeroma oregonensis.– Miller, 1968: 12; Hoestlandt 1969: 325; Schultz 1969: 129, fig. 187; Kussakin 1971: 406–408, fig. 260–262; Hoestlandt 1975: 31; Brusca et al. 2007: 537, pl. 243; Wetzter et al. 2021: 32, figs 1–9 (Neotype designation).

Gnorimosphaeroma oregonensis lutea.– Menzies, 1954: 406, figs 1–4, 6A–P; Riegel 1959: 154–161, fig. 1A.

Gnorimosphaeroma oregonensis oregonensis.– Menzies, 1954: 406, figs 5, 7A–E, 12; Riegel 1959: 154–161, fig. 1B.

Note. Latest synonymies to the species can be found in Wetzter et al. (2021).

Material examined. CANADA. 50 ♂♂ (up to 9.5 mm), 7 ♀♀ (up to 6 mm); British Columbia, Sayward Land Distr., Gowlland Island; 8 Jul. 1983; F. Rafi leg.; CMNC 1985-0715. 16 ♂♂ (up to 9.5 mm), 42 ♀♀ (up to 7 mm); British Columbia, Nootka Land Distr.; 13 June 1976; R.M. O’Clair leg.; CMNC 1987-0201. 75 ♂ & ♀; British Columbia, Sayward Land Distr.; 30 Aug. 1984; F. Rafi leg.; CMNC 1986-0206. 6 ♂♂ (up to 9 mm), 10 ♀♀ (up to 6 mm); British Columbia, Comox Land Distr.; 28 Jul. 1959; E. L. Bousfield leg.; CMNC 1987-0141. 97 ♂ & ♀; Alaska, Juneau Borough; 13 Jun. 1961; E. L. Bousfield leg.; CMNC 1987-0146. USA. 21 ♂ & ♀; Washington, Mason Co. (WA); 17 Jul. 1966; E. L. Bousfield leg.; CMNC 1991-2543.

Distribution. Widely distributed in North America from Alaska, British Columbia, and Vancouver to Washington (Kussakin 1979; Wetzter et al. 2021).

Genus *Ischyromene* Racovitza, 1908

Ischyromene menziesi (Sivertsen & Holthuis, 1980)

Fig. 3G, H

Dynamenella menziesi Sivertsen & Holthuis, 1980: 41–48, figs 6–8, pl. 1. *Ischyromene menziesi*.– Harrison & Holdich, 1982: 86. [New combination]; Bruce 2006: 20; González et al. 2008: 174.

Dynamenella eatoni.– Menzies, 1962a: 135, fig. 44. [Not *Dynamene eatoni* Miers, 1875; misidentification, according to Harrison and Holdich 1982].

Type locality. Tristan da Cunha Island, south Atlantic Ocean.

Material examined. CHILE. 1 ♂ (11 mm); Magallanes-Antarctica Region, Isla Lennox; 6 Feb. 1970; E. L. Bousfield leg.; CMNC 1985-0652. 1 subadult ♂ (9 mm), 1 Ovi. ♀ (9 mm), 2 ♀♀ (10 mm, 19 mm); Magallanes-Antarctica Region, Isla Hoste; 4 Feb. 1970; E. L. Bousfield leg.; CMNC 1985-0653. 2 ♂♂ (10 mm), 2 ♀♀ (9 mm); 5 juveniles; Magallanes-Antarctica Region, Isla Picton; 7 Feb. 1970; E. L. Bousfield leg.; CMNC 1985-0655. 10 Juveniles; Magallanes-Antarctica Region, Canal Beagle; 19 Feb. 1970; E. L. Bousfield leg.; CMNC 1985-0656.

Distribution. Chile, South Atlantic Ocean (Tristan da Cunha, Nightingale, and Stoltenhoff Islands).

Genus *Paracerceis* Hansen, 1905

Paracerceis sculpta (Holmes, 1904)

Fig. 4A, B

Dynamene sculpta Holmes, 1904: 300–302, pl. 34, figs. 1–7.

Cilicæa sculpta.– Richardson, 1905: 318–319, fig. 349.

Paracerceis sculpta.– Richardson, 1905: 9; Menzies 1962b: 340, 341, fig. 2; Miller 1968: 14, fig. 3.; Brusca et al. 2007: 537, pl. 243.

Note. Latest synonymies to the species can be found in Martínez-Laiz et al. (2018).

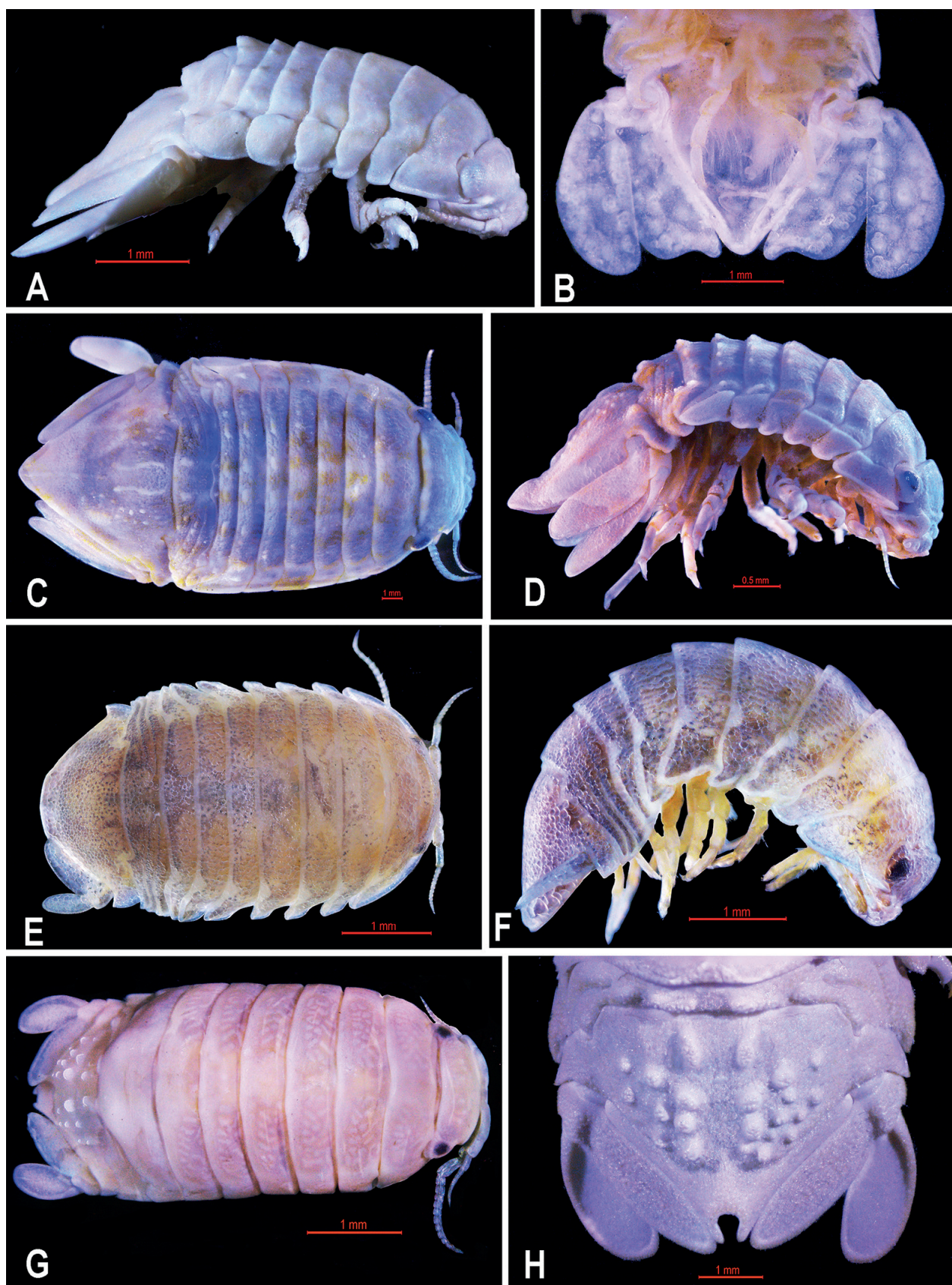


Figure 3. *Exosphaeroma russellhansonii* Wall, Bruce & Wetzer, 2015, male, (CMNC 1984-1465). **A.** Lateral view; **B.** Ventral view. *Exosphaeroma studeri* Vanhöffen, 1914, male, (CMNC 023-0242); **C.** Dorsal view; **D.** Lateral view. *Gnorimosphaeroma oregonense* (Dana, 1853), male, (CMNC 1985-0715); **E.** Dorsal view; **F.** Lateral view. *Ischyromene menziesi* (Sivertsen & Holthuis, 1980), male, (CMNC 1985-0652); **G.** Dorsal view; **H.** Pleotelson, dorsal view.

Type locality. SAN CLEMENTE ISLAND; San Diego, California.

Material examined. 1 ♂ (5.1 mm); Caribbean Sea; 15 Mar. 1968; N.A. Powell; CMNC 1992-0513. 2 ♂♂ (5 mm, 5.2 mm), 8 ♀♀ (up to 4.9 mm); Hawaiian Islands, Coconut Island; 1 Mar. 1962; D.C. Matthews leg.; CMNC 2023-0248. 3 ♀♀ (up to 4.5); Radio Island, North Carolina, 31 Mar. 1975; M.C. Govern leg.; CMNC 2023-0249.

Distribution. This species is widely distributed along the North American Pacific coast from southern California in San Diego to Mexico (Menzies 1962b); Pakistan, in the Indian Ocean (Yasmeen and Javed 2001); Hawaii, Hong Kong, Japan, Australia, Argentina, Brazil and the Azores (mid –Atlantic Ocean); in the Mediterranean Sea from Tunisia, Italy, Greece, France, Malta, Cyprus and Turkey. The wide distribution is most likely correct and results from ship-borne translocations. (Ulman et al. 2017; Martínez-Laiz et al. 2018; Rumbold et al. 2018).

Genus *Paradella* Harrison & Holdich, 1982

Paradella diana (Menzies, 1962)

Fig. 4C, D

Dynamenopsis diana Menzies, 1962b: 341, fig. 3.

Dynamenella diana.– Menzies & Glynn, 1968: 63, 113, fig. 3.

Paradella diana.– Harrison & Holdich, 1982: 104, fig. 6.

Paradella quadripunctata.– Van Dolah et al. 1984: 52.

Note. A comprehensive synonymy to the species can be found in Martínez-Laiz et al. (2018: 8–10).

Type locality. The Bay of San Quintin, Baja California.

Material examined. USA. 4 ♂♂ (up to 7.5 mm); 3 ♀♀ (up to 5 mm); Carteret County, North Carolina; 8 Apr. 1975; E. L. Bousfield leg.; CMNC 1990-0073.

Distribution. Baja California (Menzies 1962b), Italy, Egypt, Spain, Cyprus, Turkey, Libya Pakistan (Arabian Sea); Cádiz Bay, Caleta Vélez, Motril, Barbate (Spain), Australia (Menzies 1962b; Ulman et al. 2017; Martínez-Laiz et al. 2018). Its presence in different parts of the world, especially port cities, indicates a transport via shipping.

Genus *Sphaeroma* Bosc, 1802

Sphaeroma quadridentatum (Say, 1818)

Fig. 4E

Sphaeroma quadridentata Say, 1818: 400–401; De Kay 1844: 44; White 1847: 102; Harger 1873 in Verrill, Smith and Harger 1873: 275, pl.5, fig. 21; Kensley and Schotte 1989: 234, fig. 10.

Sphaeroma quadridentatum.– Harger 1880: 368–370, pl. 9, figs. 53, 54; Smith 1964: 103, pl. 15, fig. 27; Miller 1968: 8, fig. 3; Schultz 1969: 128, fig. 183; Kussakin 1971: 394, fig. 248;

Type locality. Saint Catherine's Island, Georgia.

Material examined. USA. 4 ♂♂ (up to 6 mm); 2 ♀♀ (up to 5 mm); Virginia, Gloucester; 17 Apr. 1975; E. L.

Bousfield leg.; CMNC 1992-0583. 4 ♂♂ (up to 6 mm); 8 ♀♀ (up to 5 mm); Pawley's Greek, Carolina; 17 Mar. 1915; E. L. Bousfield leg.; CMNC 2023-0250. 2 ♂♂ (up to 6 mm); 3 ♀♀ (up to 5.5 mm); South Carolina; 16 May 1975; D.R. Calder leg.; CMNC 2023-0251.

Distribution. Georgia, Florida, Long Island Sound, Connecticut, New Haven County, West Haven, Savin Rock. It is common on the southern shore of New England (Harger 1880; Kensley and Schotte 1989).

Sphaeroma terebrans Bate, 1866

Fig. 4F

Sphaeroma terebrans Bate, 1866: 28, pl. 2, fig. 5; Stebbing 1904: 16; Richardson 1905: 282–286, figs. 294–298; Calman 1921: 217–218; Baker 1926: 247–278; Nierstrasz 1931: 192; Van Name 1936: 447–449, fig. 279; Barnard 1940: 405; Pillai 1954: 9; Pillai 1955: 129–131, Pl. 6, figs 1–11; Loyola e Silva 1960: 14–28, figs 1, 2; John 1968: 1–73, pl. 1, figs 1–36; Miller 1968: 11, fig. 3; Harrison and Holdich 1984: 287–292, fig. 4; Kensley and Schotte 1989: 234, fig. 10; Wilkinson 2004: 1; Baratti et al. 2005: 225–234; Li et al. 2016: 307, fig. 2.

Sphaeroma destructor Richardson, 1897: 105–107.

Type locality. India.

Material examined. USA. 3 ♂♂ (up to 9 mm); South Carolina, Charleston Co.; 25 Apr. 1965; E. L. Bousfield leg.; CMNC 1991-2576. NIGERIA. 15 ♂♂ (up to 9 mm); 30 ♀♀ (up to 7 mm); Mayuku Creek; 5 Oct. 1975; C. Powell leg.; CMNC 2023-0252.

Distribution. Virginia to Louisiana; Belize; Cuba; Venezuela to Brazil; Gulf of Mexico; Kenya, Nigeria, Tanzania, Zanzibar, east coast of southern Africa, Pakistan, India, Sri Lanka, Thailand, Indonesia, Philippines, Australia, China (Kensley and Schotte 1989; Wilkinson 2004; Li et al. 2016).

Family Tecticipitidae Iverson, 1982

Genus *Tecticeps* Richardson, 1897

Tecticeps convexus Richardson, 1899

Fig. 4G, H

Tecticeps convexus Richardson, 1899: 837–838, fig. 15; Richardson 1905: 278–280, figs 290–291; Richardson 1906: 4, figs 6–9; Schultz 1969: 116, fig. 161; Kussakin 1971: 347, figs 210, 211; Brusca et al. 2007: 538.

Type locality. Monterey Bay, California.

Material examined. ALASKA. 10 ♂♂ (up to 9 mm); 25 ♀♀ (up to 10.5 mm); Sitka Borough, Chichagof Island; 30 Jul. 1980; G. Peter & G. Ronald leg.; CMNC 1992-0541. CANADA. 15 ♂♂ & ♀♀; British Columbia, Range 4 Coast Land Distr., Banks Island; 18 Jul. 1964; E. L. Bousfield leg.; CMNC 1991-2583. 19 ♂♂ & ♀♀; British Columbia, Range 2 Coast Land Distr., Goose Island; 5 Aug. 1964; E. L. Bousfield leg.; CMNC 1991-2584. 2 ♂♂ & ♀♀;

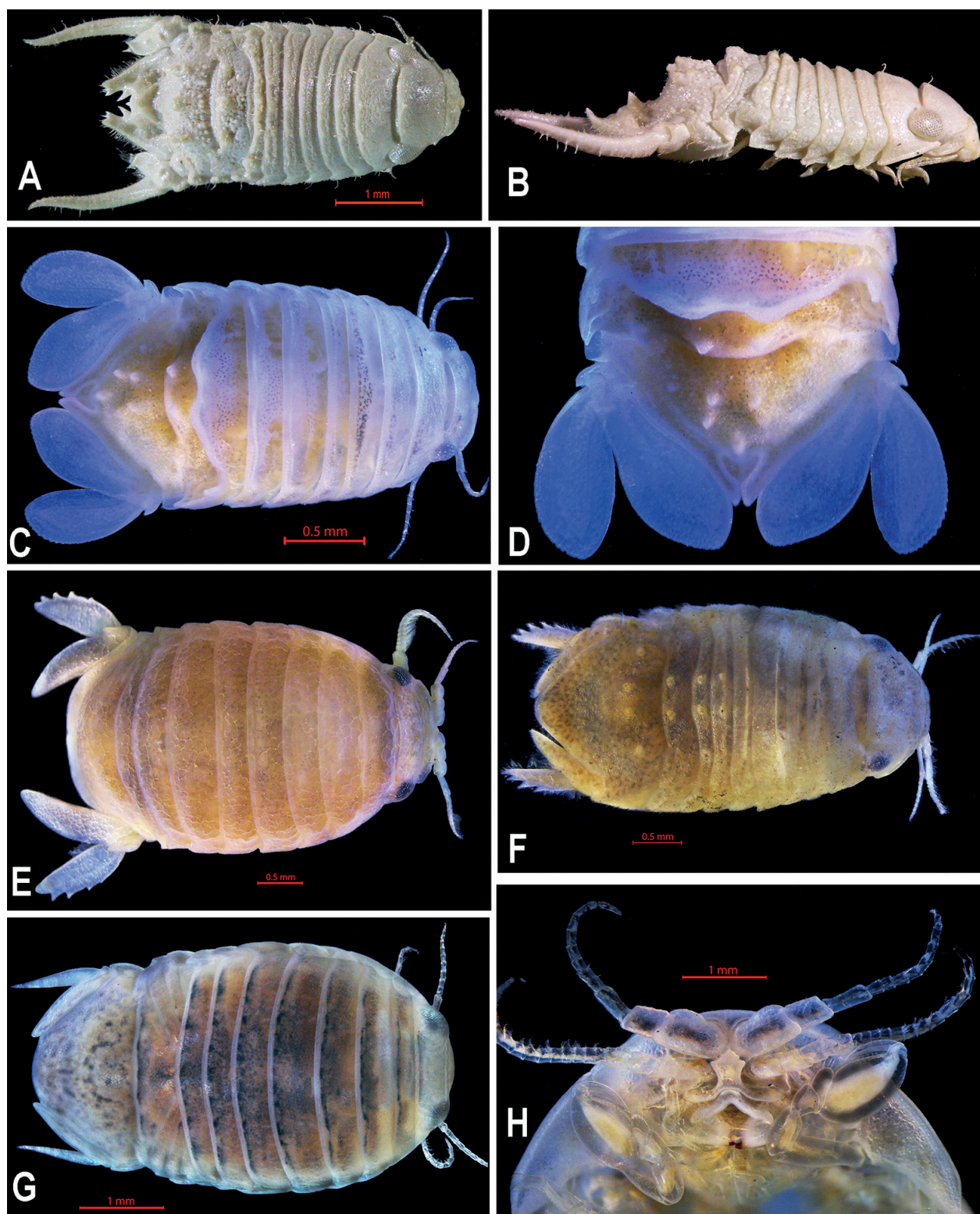


Figure 4. *Paracerceis sculpta* (Holmes, 1904), male, (CMNC 1992-0513). **A.** Dorsal view; **B.** Lateral view. *Paradella diana* (Menzies, 1962), male, (CMNC 1990-0073); **C.** Dorsal view; **D.** Pleotelson, dorsal view; **E.** *Sphaeroma quadridentatum* (Say, 1818); **F.** *Sphaeroma terebrans*, Bate 1866. *Tecticeps convexus* Richardson, 1899, male, (CMNC 1992-0541); **G.** Dorsal view; **H.** Head ventral view.

British Columbia, Vancouver Island, Barclay Land Distr., Pachena Bay; 22 Jul. 1975; E. L. Bousfield leg.; CMNC 1991-2590. USA. 33 ♂ & ♀; Washington, Clallam Co., Crescent Bay; 27 Jul. 1966; E. L. Bousfield leg.; CMNC 1991-2550. 7 ♂ & ♀; Washington, Clallam Co., Shipwreck

Pt.; 1 Aug. 1966; E. L. Bousfield leg.; CMNC 1991-2562. 2 ♀♀; Oregon, Tillamook Co., Cape Kiwanda; 16 Aug. 1966; E. L. Bousfield leg.; CMNC 1991-2574.

Distribution. Eastern Pacific, British Columbia, Oregon to California (Espinosa-Pérez and Hendrickx 2006).

Discussion

The first contribution to the knowledge of isopod taxonomy of North America was Say (1818), who described *Naesa depressus* and *N. ovalis* from the east Coast of North America; these species were later placed in the genus *Ancinus* and *Cassidinidea* by H. Milne Edwards (1840) and Hansen (1905), respectively. A third sphaeromatid isopod, *Sphaeroma quadridentatum*, was described by Say (1818) from Georgia and East Florida. Dana (1853) described *Spheroma oregonensis* from the Pacific Coast of North America; this species being transferred to the combination *Gnorimosphaeroma oregonense* (Dana, 1853) by Wetzer et al. (2021). Harger (1873) reported *Sphaeroma quadridentatum* (Say, 1818) to occur from Massachusetts to Florida. Historically, the major period of isopod documentation in North America was from Richardson's first major (1899) contribution to Kensley and Schotte's (1989) field guide. Prior to 1899, 75 isopod species had been recorded for North America. When Richardson (1899) worked on the North American Pacific Coast, she added 22 new species to the isopod fauna, including seven new sphaeromatids.

At the turn of the 20th century, in 1905, Harriet Richardson published her significant monograph on the isopod fauna of North America in the Bulletin of the U.S. National Museum. This contribution included all terrestrial, freshwater, and marine isopods and Tanaidacea. Out of about 240 marine isopod species, 31 species ($\approx 13\%$) were from the family Sphaeromatidae. The next comprehensive account was given by Hatch (1947), who gave a systematic account of the Pacific Northwest crustacean isopods, reporting 70 species, most of them (51 species) being marine isopods, of which seven species ($\approx 14\%$) were sphaeromatids. Schultz (1969), in "*How to know the marine isopod crustaceans*", listed 444 marine species known from the waters off the coasts of North America, of which 45 ($\approx 10\%$) are sphaeromatid isopods. Finally, Kensley and Schotte (1989) reported about 280 shallow-water species from the Caribbean, of which 30 species ($\approx 11\%$) were sphaeromatid isopods.

There are now 110 accepted genera and close to 650 named species of the sphaeromatoid isopods worldwide (Boyko et al. 2008 onwards). Given that there are approximately 6250 species of marine and estuarine isopods (Poore and Bruce 2012), sphaeromatoid isopods account for approximately 10% of the marine species. The ratio of North American sphaeromatids to the other marine isopods appears to be around 10% as well.

In recent decades, a few taxonomic studies of the North American marine isopod fauna have described or reported new species. For instance, *Paradella tiffany* Bruce & Wetzer, 2004, and *P. garsonorum* Wetzer & Bruce, 2007, are both described from Baja California, Mexico. Later, Bruce and Wetzer (2008) reported a *Pseudosphaeroma* Chilton, 1909 species from the Pacific coast of North America.

Wall et al. (2015) added three new north-eastern Pacific species, *Exosphaeroma paydenae*, *E. russellhansonii*,

and *E. pentche*. Recently, Wetzer et al. (2021) revised *Gnorimosphaeroma oregonense* (Dana, 1852) from the north-eastern Pacific. Furthermore, Khalaji-Pirbalouty and Gagnon (2021) described *Dynoides canadensis* from the south-western coast of British Columbia, and *Cassidinidea ovalis*, a common species along the Atlantic Coast of North America, was redescribed by Khalaji-Pirbalouty and Bruce (2021). At last count, 70 species of sphaeromatid isopods have been reported from North America (Wall et al. 2015; Khalaji-Pirbalouty and Gagnon 2021; Wetzer et al. 2021). This accounts for roughly 10% of all reported sphaeromatid isopods worldwide. In comparison, Australia, with the length of its coastline approximately 15% of that of North America, has a rich sphaeromatid fauna with 203 recorded species, which are nearly 30% of all sphaeromatid species known worldwide (Poore et al. 2002; Bruce 2003, 2009; Poore 2005). Yet, it is estimated that the species number for this family in Australia is still about 50% of the expected total (Poore et al. 2002; Bruce 2003).

The relatively low number of North American sphaeromatid species may be, in part, related to the lower-diversity trends observed for most taxa in higher-latitude regions, particularly in the Northern Hemisphere. The number of known sphaeromatid species reported from Australia is about three times that of North America; it appears that temperate regions are more favorable for sphaeromatid isopods, as previously mentioned by Poore and Bruce (2012). There are clearly other major factors at play, such as the age of the crust around Australia, and also that the family may have primarily evolved and radiated largely in the Southern Hemisphere (unpublished results).

Taxonomic diversity at the family level and above, as reported here, would greatly benefit from the addition of new, fresh material from the field (particularly from under-collected regions and using finer scale methods that capture small crustaceans) which, beyond morphological examination, would provide the additional opportunity to run genetic analyses. There is, however, still lots of material to be examined in collections such as that of the CMN. Work by isopod taxonomists in these collections will likely result in the description of many new species (for instance, see Khalaji-Pirbalouty and Gagnon 2021), especially where there are lots of unexamined samples with unidentified species, or where previous identifications have not been reviewed by experts.

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References

- Baker WH (1926) Species of the isopod family Sphaeromidae from the eastern, southern and western coasts of Australia. Transactions and Proceedings of the Royal Society of South Australia 50: 247–279.
- Baratti M, Goti E, Messina G (2005) High level of genetic differentiation in the marine isopod *Sphaeroma terebrans* (Crustacea Isopoda Sphaeromatidae) as inferred by mitochondrial DNA analysis. Journal of Experimental Marine Biology and Ecology 315(2): 225–234. <https://doi.org/10.1016/j.jembe.2004.09.020>
- Barnard KH (1940) Contributions to the crustacean fauna of South Africa. XII. Further additions to the Tanaidacea, Isopoda and Amphipoda, together with keys for the identification of the hitherto recorded marine and freshwater species. Annals of the South African Museum 32: 381–543.
- Bate CS (1866) Carcinological gleanings. No. II. Annals and Magazine of Natural History, series 3 17(97): 24–31. <https://doi.org/10.1080/00222936608679472>
- Boyko CB, Bruce NL, Hadfield KA, Merrin KL, Ota Y, Poore GCB, Taiti S [Eds] (2008 [onwards]) World Marine, Freshwater and Terrestrial Isopod Crustaceans database. Sphaeromatoidea Latreille, 1825. World Register of Marine Species. <https://www.marinespecies.org/aphia.php?p=taxdetails&id=292950> [on 2023-03-15]
- Brandt A (1998) Sphaeromatidae (Crustacea, Isopoda) of the Beagle Channel and description of *Cymodopsis beageli* n. sp. Beaufortia 48(7): 137–161.
- Brandt A, Wägele JW (1989) Redescriptions of *Cymodocella tubicauda* Pfeffer, 1887 and *Exosphaeroma gigas* (Leach, 1818) (Crustacea, Isopoda, Sphaeromatidae). Antarctic Science 1(3): 205–214. <https://doi.org/10.1017/S0954102089000325>
- Bruce NL (2003) New genera and species of sphaeromatid isopod crustaceans from Australian marine coastal waters. Memoirs of the Museum of Victoria 60(2): 309–369. <https://doi.org/10.24199/j.mmv.2003.60.28>
- Bruce NL (2006) A new species of *Ischyromene* Racovitza, 1908 (Sphaeromatidae: Isopoda: Crustacea) from intertidal marine habitats in New Zealand. Zootaxa 1220(1): 19–34. <https://doi.org/10.11646/zootaxa.1220.1.2>
- Bruce NL (2009) A new genus and new species of Sphaeromatidae (Crustacea: Isopoda) from the Great Barrier Reef, Australia. Memoirs of the Museum of Victoria 66(1): 35–42. <https://doi.org/10.24199/j.mmv.2009.66.5>
- Bruce NL, Wetzer R (2004) *Paradella tiffany* sp. nov., a distinctive sphaeromatid isopod (Crustacea: Isopoda: Sphaeromatidea) from Baja California, Mexico. Zootaxa 623(1): 1–12. <https://doi.org/10.11646/zootaxa.623.1.1>
- Bruce NL, Wetzer R (2008) New Zealand exports: *Pseudosphaeroma* Chilton, 1909 (Isopoda: Sphaeromatidae), a Southern Hemisphere genus introduced to the Pacific coast of North America. Zootaxa 1908(1): 51–56. <https://doi.org/10.11646/zootaxa.1908.1.4>
- Brusca RC, Coelho VR, Taiti S (2007) Isopoda. In: Carlton JT (Ed.) The Light and Smith Manual: Intertidal Invertebrates from Central California to Oregon (4th edn.). University of California Press, Berkeley, 503–542.
- Calman WT (1921) Notes on marine boring animals: Crustacea. Proceedings of the General Meetings for Scientific Business of the Zoological Society of London 1921(2): 215–220. <https://doi.org/10.1111/j.1096-3642.1921.tb03260.x>
- Carvacho A (1977) Sur une importante collection d'isopodes des îles Kerguelen. Comité National Français des Recherches Antarctiques 42: 173–191.
- Chilton C (1906) List of Crustacea from the Chatham Islands. Transactions of the N.Z. Institute 38: 269–73.
- Conlan KE, Bousfield MA, Hendrycks EDA, Mills EL, Cook FR, Gruchy CG (2016) A tribute to Dr. Edward Lloyd Bousfield, 1926–2016. Canadian Field Naturalist 130(4): 359–372. <https://doi.org/10.22621/cfn.v130i4.1932>
- Cunningham RO (1871) Notes on the reptiles, Amphibia, fishes, Mollusca, and Crustacea obtained during the voyage of H.M.S. Nassau in the years 1866–1869. Transactions of the Linnean Society of London 27(4): 465–502. <https://doi.org/10.1111/j.1096-3642.1871.tb00219.x>
- Dana JD (1853) Crustacea. Part II. In: Wilkes C (Ed.) United States Exploring Expedition. During the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes. U. S. N. C. Sherman. Philadelphia, 689–1618.
- De Kay JE (1844) Crustacea. Zoology of New-York or the New-York Fauna; comprising detailed descriptions of all the animals hitherto observed within the State of New-York, with brief notices of those occasionally found near its borders, and accompanied by appropriate illustrations (Vol. 1, Part 6). Carrol and Cook, Albany, 70 pp.
- Desmarest AG (1825) Considérations générales sur la classe des crustacés, et description des espèces de ces animaux, qui vivent dans la mer, sur les côtes, ou dans les eaux douces de la France, Paris, 446 pp. <https://doi.org/10.5962/bhl.title.6869>
- Dollfus A (1891) Crustacés isopodes, 55–76. Mission Scientifique de Cape Horn 1882–1883, Tome VI, Zoologie 55–76. Gauthier-Villars, Paris.
- Ellis JP (1981) Some type specimens of Isopoda (Flabellifera) in the British Museum (Natural History), and the isopods in the Linnaean Collection. Bulletin of the British Museum (Natural History). Historical Series 40(4): 121–128. <https://doi.org/10.5962/p.271708>
- Espinosa-Pérez MC, Hendrickx ME (2006) A comparative analysis of biodiversity and distribution of shallow-water marine isopods (Crustacea: Isopoda) from polar and temperate water in the East Pacific. Belgian Journal of Zoology 136: 219–247.
- Giambiagi DC (1925) Resultado de la primera expedición a Tierra del Fuego (1921). Enviada por la Facultad de Ciencias Exactas, Físicas y Naturales de la Universidad Nacional de Buenos Aires. Crustáceos, Isópodos. Anales de la Sociedad Científica Argentina 1925: 229–246.
- Gomez Simes E (1979) Algunos isopodos de la Ria Deseado (Santa Cruz, Argentina). Contribuciones Científica Centro de Investigación de Biología Marina. Estación Puerto Deseado, Buenos Aires 166: 5–16.
- González ER, Haye PA, Balanda MJ, Thiel M (2008) Systematic list of species of peracarids from Chile (Crustacea, Eumalacostraca). Gayana (Concepción) 72(2): 157–177. <https://doi.org/10.4067/S0717-65382008000200006>

- Guérin-Méneville FE (1843) Crustacés. In: Cuvier G (Ed.) *Iconographie du Règne animal de G. Cuvier, ou représentation d'après nature de l'une des espèces les plus remarquable et souvent non encore figurées de chaque genre d'animaux* (Vol. 3). Baillière, Paris.
- Hale HM (1929) The Crustaceans of South Australia. Part 2. Handbooks of the Flora and Fauna of South Australia, issued by the British Science Guild (South Australia Branch). Adelaide: British Science Guild (South Australian Branch), 201–380.
- Hansen HJ (1905) On the propagation, structure and classification of the family Sphaeromidae. *The Quarterly Journal of Microscopical Science* 49: 69–135. <https://doi.org/10.1242/jcs.s2-49.193.69>
- Harger O (1880) Report on the marine Isopoda of New England and adjacent waters. Report of the United States Commission of Fish and Fisheries. For 1878(6): 297–462. <https://doi.org/10.5962/bhl.title.1391>
- Harrison K, Holdich DM (1982) Revision of the genera *Dynamenella*, *Ischyromene*, *Dynamenopsis*, *Cymodocella* (Crustacea: Isopoda), including a new genus and five new species of eubranchiate Sphaeromatids from Queensland waters. *Journal of Crustacean Biology* 2(1): 84–119. <https://doi.org/10.2307/1548115>
- Harrison K, Holdich DM (1984) Hemibranchiate sphaeromatids (Crustacea: Isopoda) from Queensland, Australia, with a world-wide review of the genera discussed. *Zoological Journal of the Linnean Society* 81(4): 275–387. <https://doi.org/10.1111/j.1096-3642.1984.tb01175.x>
- Haswell WA (1882) Catalogue of the Australian stalk- and sessile-eyed Crustacea. Sydney, Australian Museum, 324 pp. <https://doi.org/10.5962/bhl.title.1948>
- Hatch MH (1947) The Chelifera and Isopoda of Washington and adjacent regions. University of Washington Publications in Biology 10(5): 155–274.
- Hodgson TV (1910) Crustacea IX. Isopoda. In: Harmer SF (Ed.) *National Antarctic Expedition 1901–1904. Natural History* (Vol. 5) (Zoology and Botany). British Museum (Natural History), London, 77 pp.
- Hoestlandt H (1969) Sur un sphérome nouveau de la côte pacifique américaine, *Gnorimosphaeroma rayi* n. sp. (isopode flabellifère). *Comptes rendus hebdomadaires des Séances de l'Académie de Sciences, Paris*, 268D: 325–327.
- Hoestlandt H (1975) Occurrences of the Isopoda Flabellifera *Gnorimosphaeroma rayi* Hoestlandt on the coast of Japan, eastern Siberia and Hawaii, with a brief note on its genetic polychromatism. *Publications of the Seto Marine Biological Laboratory* 22(1/4): 31–46. <https://doi.org/10.5134/175891>
- Holmes S (1904) Remarks on the sexes of Sphaeromids, with a description of a new species of *Dynamene*. *Proceedings of the California Academy of Sciences* (3). *Zoology* 3: 295–306.
- Hurley DE (1961) A checklist and key to the Crustacea Isopoda of New Zealand and Subantarctic Islands. *Transactions of the Royal Society of New Zealand (Zoology)* 1: 259–292.
- Hurley DE, Jansen KP (1977) The marine fauna of New Zealand: Family Sphaeromatidae (Crustacea Isopoda Flabellifera). *New Zealand Oceanographic Institute Memoir* 63: 1–80.
- John PA (1968) Habits, structure and development of *Sphaeroma terebrans* (a wood-boring isopod). *University of Kerala Publications* 1: 1–73.
- Kensley B, Schotte M (1989) Guide to the Marine Isopod Crustaceans of the Caribbean. Smithsonian Institution Press, Washington D.C. and London, 114 pp. [204, 232, and 234.] <https://doi.org/10.5962/bhl.title.10375>
- Khalaji-Pirbalouty V, Bruce NL (2021) Redescription of the type species of the genus *Cassinidea* Hansen, 1905 (Crustacea: Isopoda: Sphaeromatidae) with notes on geographic distribution of the New World species. *Marine Biology Research* 17(5–6): 494–502. <https://doi.org/10.1080/17451000.2021.1990958>
- Khalaji-Pirbalouty V, Gagnon JM (2021) A new species of *Dynoides* Barnard, 1914 (Crustacea, Isopoda, Sphaeromatidae) from Canada, with notes on geographic distribution of the north-eastern Pacific Ocean species. *Marine Biology Research* 17(1): 12–20. <https://doi.org/10.1080/17451000.2021.1892766>
- Krauss CFF (1843) Die Südafrikanischen Crustaceen. Eine Zusammenstellung aller bekannten Malacostraca, Bemerkungen über deren Lebensweise und geographische Verbreitung, nebst Beschreibung und Abbildung mehrerer neuen Arten, Stuttgart, 68 pp. <https://doi.org/10.5962/bhl.title.4825>
- Kussakin OG (1967) Isopoda and Tanaidacea from the coastal zones of the Antarctic and subantarctic. In *Biological Results of the Soviet Antarctic Expedition (1955–1958)*, 3. Issledovaniia Fauny Morei 4(12): 220–380. <https://doi.org/10.2307/1442262>
- Kussakin OG (1979) Marine and brackish-water Isopoda of cold and temperate (boreal) waters of the Northern Hemisphere. Part 1. Flabellifera, Valvifera, and Tyloidea). *National Academy of Sciences, USSR, Zoology [Opredeliteli po Faune SSR, Akademiya Nauk, SSSR]* 122: 1–470.
- Kussakin OG, Vasina GS (1980) Additions to the marine Isopoda and Gnathiida of Kerguelen Islands (Southern Indian Ocean). *Tethys* 9(4): 355–369.
- Leach WE (1818) Cymothoadées. In: Cuvier F (Ed.) *Dictionnaire des Sciences Naturelles* 12: 338–354.
- Li X-F, Chong H, Zhong C-R, Xu J-Q, Huang J-R (2016) Identification of *Sphaeroma terebrans* via morphology and the mitochondrial cytochrome c oxidase subunit I (COI) gene. *Zoological Research* 37(5): 307–312. <https://doi.org/10.13918/j.issn.2095-8137.2016.5.307>
- Lockington WN (1877) Remarks on the Crustacea of the Pacific coast, with descriptions of some new species. *Proceedings of the California Academy of Sciences* 7: 28–36. <https://doi.org/10.5962/bhl.part.27534>
- Loyola e Silva J (1960) Sphaeromatidae do litoral Brasileiro (Isopoda-Crustacea). *Boletim da Universidade do Parana. Zoologia* 4: 1–182.
- Loyola e Silva Jde (1971) Sobre os gêneros *Ancinus* Milne Edwards, 1840e *Bathycopea* Tattersall, 1909, da coleção U.S. Nat. Mus. (Isopoda-Crustacea). *Arquivos do Museu Nacional, Rio de Janeiro* 54: 209–223.
- Martínez-Laiz G, Ros M, Guerra-García JM (2018) Marine exotic isopods from the Iberian Peninsula and nearby waters. *PeerJ* 6e4408. <https://doi.org/10.7717/peerj.4408>
- Menzies RJ (1954) A review of the systematics and ecology of the genus “*Exosphaeroma*,” with the description of a new genus, a new species, and new subspecies (Crustacea, Isopoda, Sphaeromatidae). *American Novitates* 1683: 1–24.
- Menzies RJ (1962a) The zoogeography, ecology and systematics of the Chilean marine isopods. *Lunds Universitets Arsskrift A* vd. 2, 57(11): 1–162.
- Menzies RJ (1962b) The marina isopod fauna of Bahia de San Quintin, Baja California, Mexico. *Pacific Naturalist* 3(11): 331–348.
- Menzies RJ, Barnard JL (1959) Marine Isopoda on coastal shelf bottoms of southern California: Systematics and ecology. *Pacific Naturalist* 1(11–12): 1–35.
- Menzies RJ, Glynn PW (1968) The common marine isopod crustacea of Puerto Rico. A handbook for marine biologists. In: Hummelinck W

- (Ed.) Studies on the Fauna of Curaçao and other Caribbean Islands (Vol. XXVII). The Hague Martinus Nijhoff, Leiden, 133 pp.
- Miers EJ (1875) Descriptions of new species of Crustacea collected at Kerguelen's Island by the Rev. A. E. Eaton. *Annals and Magazine of Natural History* (ser. 4) 16: 73–76. <https://doi.org/10.1080/00222937508681124>
- Miers EJ (1879) Crustacea. In: Eaton AE (Ed.) *An Account of the Petrological, Botanical, and Zoological Collections Made in Kerguelen's Land and Rodriguez During the Transit of Venus Expeditions in the Years 1874–75*. Philosophical Transactions of the Royal Society of London 168: 200–214.
- Miller MA (1968) Isopoda and Tanaidacea from buoys in coastal waters of the continental United States, Hawaii, and the Bahamas (Crustacea). *Proceedings of the United States National Museum* 125(3652): 1–53. <https://doi.org/10.5479/si.00963801.125-3652.1>
- Milne Edwards H (1834–1840) *Histoire Naturelle des Crustacés, Comprenant l'Anatomie, la Physiologie et la Classification de ces Animaux* (Vol. III). Librairie Encyclopédique de Roret, Paris, 638 pp. <https://doi.org/10.5962/bhl.title.16170>
- Monod T (1931) Tanaidacea et Isopodes Aquatiques de l'Afrique Occidentales et Septentrional 3e Partie. Sphaeromatidae. *Mémoires de la Société des sciences naturelles de Neuchâtel* 29: 1–91.
- Nierstrasz HF (1931) Die Isopoden der Siboga-Expedition III. In: Max Weber (Ed.) *Isopoda Genuina, II. Flabellifera*. Siboga Expédition (Vol. 32c). E. J. Brill, Leiden, 16–227.
- Ortmann AE (1911) Crustacea of Southern Patagonia. Reports of the Princeton University Expeditions to Patagonia, 1896–1899 (Zoology), 635–667. <https://doi.org/10.5962/bhl.title.10517>
- Pfeffer G (1886) Die Krebse von Süd-Georgien nach der Ausbeute der Deutschen Station 1882–83. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten* 4: 43–150. <https://doi.org/10.5962/bhl.title.10084>
- Pillai NK (1954) A preliminary note on the Tanaidacea and Isopoda of Travancore. *Bulletin of the Central Research Institute. University of Travancore, Trivandrum* 3(1): 1–21.
- Pillai NK (1955) Wood boring Crustacea of Travancore. I. Sphaeromatidae. *Bulletin of the Central Research Institute of the University of Travancore, Series C. Nature and Science* 4(1): 127–139.
- Poore GCB (2005) Supplement to the 2002 catalogue of Australian Crustacea: Malacostraca – Syncarida and Peracarida (Vol. 19.2A): 2002–2004. *Museum Victoria Science Reports* 7: 1–15. <https://doi.org/10.24199/j.mvstr.2005.07>
- Poore GCB, Bruce NL (2012) Global Diversity of Marine Isopods (Except Asellota and Crustacean Symbionts). *PLoS ONE* 7(8): e43529. <https://doi.org/10.1371/journal.pone.0043529>
- Poore GCB, Lew Ton HM, Bruce NL (2002) Sphaeromatidae Latreille, 1825. 221–252. In: Houston WWK, Beesley P (Eds) *Crustacea: Malacostraca: Syncarida, Peracarida: Isopoda, Tanaidacea, Mictacea, Thermosbaenacea, Spelaeogriphacea*. Zoological Catalogue of Australia. CSIRO Publishing, Melbourne, 433 pp.
- Richardson H (1897) Description of a new species of *Sphaeroma*. *Proceedings of the Biological Society of Washington* 11: 105–107.
- Richardson H (1899) Key to the isopods of the Pacific Coast of North America, with descriptions of twenty-two new species. *Proceedings of the United States National Museum* 21(1175): 815–869. <https://doi.org/10.5479/si.00963801.21-1175.815>
- Richardson H (1905) A monograph on the isopods of North America. *Bulletin of the United States National Museum* 54, 727 pp. <https://doi.org/10.5479/si.03629236.54.i>
- Richardson H (1906) Descriptions of new isopod crustaceans of the family Sphaeromidae. *Proceedings of the United States National Museum* 31(1479): 1–22. <https://doi.org/10.5479/si.00963801.31-1479.1>
- Riegel JA (1959) A revision in the sphaeromid genus *Gnoriomospheeroma* Menzies (Crustacea: Isopoda) on the basis of morphological, physical, and ecological studies on two of its “subspecies”. *The Biological Bulletin* 117(1): 151–162. <https://doi.org/10.2307/1539047>
- Rumbold C, Meloni M, Doti B, Correa N, Albano M, Sylvester F, Obenat S (2018) Two new nonindigenous isopods in the Southwestern Atlantic: Simultaneous assessment of population status and shipping transport vector. *Journal of Sea Research* 138: 1–7. <https://doi.org/10.1016/j.seares.2018.04.008>
- Say T (1818) An account of the Crustacea of the United States, part 7. *Journal of the Academy of Natural Sciences of Philadelphia* 1: 374–401.
- Schultz GA (1969) *How to Know the Marine Isopod Crustaceans*. W.M. C. Brown Company Publishers, Iowa, 359 pp.
- Schultz GA (1973) *Ancinus* H. Milne Edwards in the new world (Isopoda, Flabellifera). *Crustaceana* 25(3): 267–275. <https://doi.org/10.1163/156854073X00254>
- Shimomura M (2008) *Bathycopea* (Isopoda: Sphaeromatidae: Ancinidae) from Japan, with descriptions of two new species and redescription of *B. parallela* Birstein. *Zootaxa* 1678(1): 25–49. <https://doi.org/10.11646/zootaxa.1678.1.2>
- Sivertsen E, Holthuis LB (1980) The marine Isopod Crustacea of the Tristan da Cunha archipelago. *Gunneria* 35: 1–128.
- Smith RI (1964) Keys to marine invertebrates of the Woods Hole Region. Contribution No. 11, Systematics-Ecology Program, Marine Biological Laboratory, Woods Hole, Massachusetts, 208 pp.
- Stebbing TRR (1900) On some crustaceans from the Falkland Islands, collected by Mr. Rupert Vallentin. *Proceedings of the General Meetings for Scientific Business of the Zoological Society of London* 1900: 517–568. <https://doi.org/10.5962/bhl.title.10309>
- Stebbing TRR (1904) Gregarious Crustacea from Ceylon. *Spolia Zeylanica, Bulletin of the National Museum. Ceylon* 2: 1–29.
- Stebbing TRR (1914) Crustacea from the Falkland Islands collected by Mr Rupert Vallentin, FLS. Part II. *Proceedings of the General Meetings for Scientific Business of the Zoological Society of London* 84(2): 341–378. <https://doi.org/10.1111/j.1469-7998.1914.tb07042.x>
- Stephensen K (1927) Papers from Dr. Th. Mortensen's Pacific expedition 1914–16. XL. Crustacea from the Auckland and Campbell Islands. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kobenhaven* 83: 289–390.
- Stephensen K (1947) Tanaidacea, Isopoda, Amphipoda, and Pycnogonida. In: *Norske videnskaps-akademi i Oslo (Eds) Scientific Results of the Norwegian Antarctic Expedition 1927–1928*. Oslo, 90 pp.
- Studer T (1884) Isopoden, gesammelt während der reise SMS Gazelle um die erde 1874–76. *Kurfürstlich Akademie der Wissenschaften, Berlin*, 27 pp.
- Tattersall WM (1905) The marine fauna of the coast of Ireland. Part V. Isopoda. Reports of the Department of Agriculture and Technical Instruction for Ireland. *Scientific Investigations of the Fisheries Branch* 1904(2): 1–90.
- Tattersall WM (1914) Order Isopoda: Tribe Flabellifera. *Transactions of the Royal Society of Edinburgh* 49: 880–890. <https://doi.org/10.1017/S0080456800017178>
- Tattersall WM (1921) Crustacea. Part VI-Tanaidacea and Isopoda. *Natural History Report. British Antarctic Terra Nova Expedition, 1910*. *Zoology* 3: 191–258. <https://doi.org/10.5962/bhl.title.1679>

- Ulman A, Ferrario J, Occhipinti-Ambrogi A, Arvanitidis C, Bandi A, Bertolino M, Bogi C, Chatzigeorgiou G, Çiçek BA, Deidun A, Ramos-Esplá A, Koçak C, Lorenti M, Martínez-Laiz G, Merlo G, Princisgh E, Scribano G, Marchini A (2017) A massive update of non-indigenous species records in Mediterranean marinas. *PeerJ* 5: e3954. <https://doi.org/10.7717/peerj.3954>
- Van Dolah RF, Knott DM, Calder DR (1984) Ecological effects of rubble weir jetty construction at Murrells Inlet, South Carolina–Vol. I: colonization and community development on new jetties. Technical Report EL-84-4. Prepared by Marine Resources Research Institute, Charleston, SC, for Coastal Engineering Research Center. Vicksburg, U.S. Army Engineer Waterways Experiment Station, 138 pp. <https://doi.org/10.5962/bhl.title.48315>
- Vanhöffen E (1914) Die Isopoden der deutschen Südpolar-Expedition 1901–1903. Deutsche Südpolar-Expedition. *Zoologie* 15: 447–598. <https://doi.org/10.5962/bhl.title.10649>
- Verrill AE, Smith SI, Harger O (1873) Catalogue of the marine invertebrate animals of the southern coast of New England, and adjacent waters. In: Verrill AE, Smith SI (Eds) Report upon the invertebrate animals of Vineyard Sound and adjacent waters, with an account of the physical features of the region. Extracted from: Report of Professor S.F. Baird, Commissioner of Fish and Fisheries, on the condition of the sea-fisheries of the south coast of New England in 1871 and 1872. Government Printing Office, Washington, 243 pp. <https://doi.org/10.5962/bhl.title.31963>
- Wall A, Bruce N, Wetzer R (2015) Status of *Exosphaeroma amplicauda* (Stimpson, 1857), *E. aphrodita* (Boone, 1923) and description of three new species (Crustacea, Isopoda, Sphaeromatidae) from the north-eastern Pacific. *ZooKeys* 504: 11–58. <https://doi.org/10.3897/zookeys.504.8049>
- Wetzer R, Bruce NL (2007) A new species of *Paradella* Harrison & Holdich, 1982 (Crustacea: Isopoda: Sphaeromatidae) from Baja California, Mexico, with a key to East Pacific species. *Zootaxa* 1512(1): 39–49. <https://doi.org/10.11646/zootaxa.1512.1.2>
- Wetzer R, Wall A, Bruce NL (2021) Redescription of *Gnorimosphaeroma oregonense* (Dana, 1853) (Crustacea, Isopoda, Sphaeromatidae), designation of neotype, and 16S-rDNA molecular phylogeny of the north-eastern Pacific species. *ZooKeys* 1037: 23–56. <https://doi.org/10.3897/zookeys.1037.63017>
- White A (1847) List of the Specimens of Crustacea in the Collection of the British Museum. Natural History Museum, London, 143 pp.
- Wilkinson LL (2004) The Biology of *Sphaeroma Terebrans* in Lake Pontchartrain, Louisiana with Emphasis on Burrowing. PhD Dissertation, University of New Orleans, New Orleans, 205 pp. <https://scholarworks.uno.edu/td/205>
- Yasmeen R, Javed W (2001) A new record of *Paracerceis sculpta* (Holmes, 1904) (Sphaeromatidae: Isopoda) from Pakistan, northern Arabian Sea. *Pakistan Journal of Marine Sciences* 10: 43–48. <https://www.pakjmsuok.com/index.php/pjms/article/view/45>