

Chapter 6

Isopoda Epicaridea from Deep Water Around North and Central America



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Abstract A total of 39 species of epicarid isopods, four of these unidentified, are recorded from deep water around North and Central America. Most species (27) belong to the Bopyridae with 17 genera, including five species of *Munidion* and at least four species of *Pseudione*. Other families are the Colypuridae (1 sp.), the Cryptoniscidae (1 sp.), the Dajidae (9 spp.), and the Entophilidae (1 sp.). Of the 35 identified species, about half (17) were described in 1930 or earlier, and the rest after 1972.

Keywords Deep water · Epicarids · West Atlantic · East Pacific · Diversity Distribution

6.1 Introduction

Although there is uncertainty about the proper status of the Epicaridea (see Brandt and Poore 2003; Boyko et al. 2013), it is here handled as an infraorder of the suborder Cymothoidea of the order Isopoda, in accordance with the presentation of the online catalog WoRMS. All epicarideans are parasites of other crustaceans, their larvae usually infesting copepods and adults found on cirripedes and malacostracans. By far the most specious and widespread family is the Bopyridae, with just over 600 currently described species worldwide out of a total of about 700 epicaridean species. All bopyrids are ectoparasites, of calanoid copepods as larvae and of decapods as adults. Species in other families parasitize a great diversity of crustaceans, most externally, but several also internally. With very few exceptions, epicarideans are marine, and they are rarely found deeper than 200 m in any part of the oceans. An exception is the dajid genus *Holophryxus*, all of species of which, including two covered herein, are known only from depths greater than 200 m. For reasons not determined, the number of species of bopyrids in the eastern Pacific from Alaska

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to Chile is far smaller than the number of potential host species would suggest (see Markham 1992), with whole subfamilies rare or absent. Nonetheless, two monotypic subfamilies, Phyllodurinae in shallow water (Markham 1977b) and Bathygyginae in deep water (Markham 2016), are known primarily from the eastern Pacific.

In this tabulation of epicaridean species from depths of 200 m or more in the western north Atlantic (including Bermuda and the Gulf of Mexico) and the eastern north Pacific (including Hawaii), the total number of identified species is 36; the totals by family are Bopyridae 24, Colypuridae 1, Cryptoniscidae 1, Dajidae 9, and Entophilidae 1. Half of all species considered, 18, are in the bopyrid subfamily Pseudioninae, whose hosts are primarily anomurans, in this case mostly munidids, but also some carideans found only in deeper waters.

Many of the species listed are known from only their type-specimens and type-localities. This is the case with nine bopyrid species and several of the species described by Harriet Richardson in various cited references. Furthermore, the descriptions H. Richardson presented are far less complete than desired, though all of her type-specimens evidently are still extant in the collections of the Smithsonian Institution, so redescrptions would be possible. For example, Butler (1964) re-described the types of *Holophryxus alaskensis* Richardson, 1905, in fine detail, identified its host for the first time, and entered two other species into its synonymy. For species described in H. Richardson's papers, I have converted the recorded depths from fathoms to meters and, as necessary, supplemented collection data from other sources, such as station-logs of the cruises and ships cited in the descriptions, which are accessible online.

6.2 Material and Methods

Names of the epicaridean species have been updated as needed, with all published synonyms indicated. Names of the host species have also been updated as needed. The authority consulted for the current validity of names of both the epicarideans and their hosts is the online catalog World Register of Marine Species, WoRMS (WoRMS Editorial Board 2019). Genera and species are ordered alphabetically within their respective higher taxa, while families and subfamilies are presented in order from those considered to be closest to the ancestral forms to those considered more derived.

6.3 Results

6.3.1 Systematic Section

Infraorder Epicaridea Latreille, 1825
Superfamily Bopyroidea Rafinesque, 1815

Family Bopyridae Rafinesque, 1815

Subfamily Pseudioninae Codreanu, 1967

1. *Anuropodione carolinensis* Markham, 1974

Type-locality. Off coast of North Carolina, USA, West Atlantic, 35°05'N, 75°11.5'W, 220–260 m. Host: *Munida iris* A. Milne-Edwards, 1880. References: Williams and Brown (1972), Markham (1974a). **Other localities.** Norfolk Canyon, off coast of North Carolina, USA, West Atlantic, 36°56' to 37°09'N, 75°09' to 74°33'W and 36°36' to 37°09'N, 75°06' to 74°33'W, 83–662 m. Host: *Munida iris*. Reference: Wenner and Windsor (1979). **Range outside of region.** Potiguar Basin, Brazil. Host: *Munida iris*. Reference: Alves-Júnior et al. (2019).

2. *Aporobopyrina anomala* Markham, 1974

Type-locality. Off coast of Colombia, Caribbean, 12°40'N, 72°00'W, 620–*M. erinaceus* 660 m. Host: *Munida valida* Smith, 1883. Reference: Markham (1974a). **Other localities.** Northwest Gulf of Mexico, 27°38'N, 95°22'N, 490–640 m, and 27°35'N, 95°23'W, 730 m. Host: *M. valida*. South of Marquesas Keys, Florida, USA, Gulf of Mexico, 24°07'N, 82°00'W, 686–715 m. Host: *M. valida*. South of Dry Tortugas, Florida USA, Gulf of Mexico, 24°12'N, 82°50'W, 622 m. Host: *M. valida*. Reference: Markham (1974a). Northern Gulf of Mexico, 27°22' to 29°17'N, 87°47' to 91°16'W, 185–770 m. Host: *M. valida*. Reference: Adkison and Collard (1990). **Range outside of region.** None known.

3. *Bathione magnafolia* Román-Contreras and Boyko, 2007

Type-locality. Southern Gulf of California, Mexico, 24°53'N, 108°59'W, 835–870 m. Host: *Munidopsis depressa* Faxon, 1893. Reference: Román-Contreras and Boyko (2007). **Range outside of region.** None known.

4. *Galathocrypta acaudata* Román-Contreras and Soto, 2002

Type-locality. Southwest Gulf of Mexico, 18°54'N, 94°18'W, 502 m. Host: *Munidopsis erinaceus* (A. Milne-Edwards, 1880). Reference: Román-Contreras and Soto (2002). **Possible other records.** [As “*Pseudione* sp.”] Southern Caribbean. Host: *M. erinaceus*. Reference: Mayo (1974). [As “Bopyrid”]. Southern Gulf of Mexico. Host: *M. erinaceus*. Reference: Vázquez-Bader and Gracia (2016). **Range outside of region.** None known.

5. *Goleathopseudione bilobata* Román-Contreras, 2008

Type-locality. Off coast of California, USA, Pacific, 34°45'N, 123°04'W, 4100 m. Host: *Munidopsis beringanus* Benedict, 1902. Reference: Román-Contreras (2008). **Range outside of region.** None known.

6. *Munidion cubense* Bourdon, 1972

Type-locality. Bahía de Cochinos, Cuba, 22°13'N, 81°10'W, 230–390 m. Host: *Munida stimpsoni* A. Milne-Edwards, 1880. Reference: Bourdon (1972). **Other locality.** Near Península de Paraguaná, Venezuela, Caribbean, 11°40'N, 69°22'W,

134–161 m. Host: *Munida flinti* Benedict, 1902. Reference: Markham (1975). **Range outside of region.** None known. [Described as *Munidion parvum cubensis* Bourdon, 1972].

7. *Munidion irritans* Boone, 1927

Type-locality. North of Glover Reef, Belize, Caribbean, 16°N, 88°W, 670 m. Host: *Munida irrasa* A. Milne Edwards, 1880. Reference: Boone (1927). **Other localities.** Along southeast Florida, USA, Atlantic, 24°12' to 24°48'N, 80°26' to 80°46'W, 90–620 m. Host: *M. irrasa*. Reference: Markham (1975). Hudson Canyon to Norfolk Canyon, off Virginia, USA, Atlantic, 37–40°N, 72–74°W, >200 m. Host: *Munida iris*. Reference: Burse (1978). **Range outside of region.** None known.

8. *Munidion longipedis* Markham, 1975

Type-locality. East coast of Florida, Atlantic, 25°45' to 29°59'N, 79°49' to 80°11'W, 70–330 m. Host: *Agononida longipes* (A. Milne-Edwards, 1880). Reference: Markham (1975). **Other localities.** Isla de Providencia to Dry Tortugas, Florida USA, Southeast Gulf of Mexico, 13°37'N, 81°51'W to 24°18'N, 82°54'W, 330–460 m. Host: *M. longipes*. Reference: Markham (1975). Norfolk Canyon, off Virginia, USA, Atlantic, 37°N, 75°W, ca 200 m. Host: *M. longipes*. Reference: Wenner and Windsor (1979). **Range outside of region.** None known.

9. *Munidion parvum* Richardson, 1904

Type-locality. Straits of Juan de Fuca, Washington, USA, Pacific, 48°20'N, 123°30'W, 278 m. Host: *Munida quadrispina* Benedict, 1902. References: Richardson (1904), Markham (1975). **Possible other record.** [As “*Munidon* (sic) *parvum/Pseudione galacanthae*”]. Sechelt Peninsula, British Columbia, Canada, Pacific, 50°N, 124°W, depth unspecified. Host: unidentified munidid. Reference: Lamb and Hanby (2005). **Range outside of region.** None known.

10. *Munidion princeps* Hansen, 1897

Type-locality. Near Malpelo Island, Pacific. 03°58'N, 81°36'W, 205 m. Host: *Munida refulgens* Faxon, 1893. References: Hansen (1897), Markham (1975). **Range outside of region.** None known.

11. *Paragigantione americana* (Markham, 1974)

Type-locality. Off coast of Guyana, Atlantic, 08°40'N, 57°38'W, 1220–1440 m. Host: *Munida microphthalma* A. Milne-Edwards, 1880. Reference: Markham (1974a). **Other locality.** Norfolk Canyon, off Virginia, USA, Atlantic, 36°56' to 37°09'N, 75°06' to 74°33'W, 1408–1698 m. Host: *M. microphthalma*. Reference: Wenner and Windsor (1979). **Range outside of region.** None known. [Described as *Bonnieria americana* Markham, 1974].

12. *Parapleurocryptella elasmonoti* Bourdon, 1972

Type-locality. Martinique, Caribbean, 14°29'N, 61°06'W, 349 m. Host: *Munidopsis squamosus* (A. Milne-Edwards, 1880). Reference: Bourdon (1972). **Range outside of region.** None known.

13. *Pleurocryptella fimbriata* Markham, 1974

Type-locality. Southwest of Jamaica, Caribbean, 17°27'N, 78°10'W, 605–665 m. Host: *Munida constricta* A. Milne Edwards, 1880. Reference: Markham (1974a). **Other localities.** South of Jamaica, Caribbean, 17°16'N, 77°48'W, 720 m; Bahía de Cochinos, Cuba, Caribbean, 22°07'N, 81°08'W, 400–500 m. Host: *M. constricta*. Reference: Markham (1974a). **Range outside of region.** None known.

14. *Pleurocryptella wolffi* Bourdon, 1972

Type locality. Gulf of Panamá, Pacific, 05°44'N, 79°20'W, 2950–3190 m. Host: *Munidopsis antonii* (Filhol, 1884). Reference: Bourdon (1972). **Range outside of region.** None known.

15. *Pontobopyrus abyssorum* Markham, 1979

Type-locality. Northwestern Atlantic, 38°04' to 38°09'N, 70°26' to 70°22'W, 3850 m. Host: *Parapontophilus abyssii* (Smith, 1884). Reference: Markham (1979). **Range outside of region.** None known.

16. *Pseudione ampla* Markham, 1988

Type-locality. Off Florida, USA, Gulf of Mexico, 24°33'N, 83°22'W, 366 m. Host: *Heterocarpus ensifer* A. Milne Edwards, 1881. Reference: Markham (1988). **Range outside of region.** None known.

17. *Pseudione confusa maxillipedis* Bourdon, 1972

Type-locality. Bahía de Cochinos, Cuba, Caribbean, 22°13'N, 81°10'W, 229–393 m. Host: *Munida stimpsoni* A. Milne Edwards, 1880. Reference: Bourdon (1972). **Other locality.** Punta Alegre, Cuba, Caribbean, 22°50'N, 78°55'W, 366 m. Host: *M. stimpsoni*. Reference: Bourdon (1972). St. Croix, US Virgin Islands, Caribbean, ca 17°44'N, 64°50'W, depth uncertain. Host: *Munida* sp. [Reported as *Pseudione minimocrenulata* Nierstrasz and Brender à Brandis (1931) pro parte, separated from that species by Kazmi and Boyko (2005)]. Reference: Nierstrasz and Brender à Brandis (1931). **Range outside of region.** None known.

18. *Pseudione galacanthae* Hansen, 1897

Type-locality. Off east side of Baja California, Mexico, Golfo de California, Mexico, 26°48'N, 110°45'W, 1571 m. Host: *Galacantha diomedae* Faxon, 1893. Reference: Hansen (1897). **Other localities.** Nanaimo, British Columbia, Canada, Pacific, ca 49°10'N, 123°57'W, depth unrecorded, and San Juan Islands, Washington, USA, Pacific, ca 48°30'N, 123°W, depth unrecorded. Host: *Munida quadrispina* J. E. Benedict, 1902. Reference: Fraser (1932). [Misidentified as *Pseudione giardi* Calman, 1898]. Strait of Georgia, British Columbia, Canada, Pacific, ca 49°18'N, 123°48'W, 157–448 m. Host: *Munida* sp. Reference: Nierstrasz and Brender à Brandis (1931). **Range outside of region.** Off east coast of Patagonia, Argentina, South Atlantic. Host: *Munida rugosa* (Fabricius, 1793). Reference: Richardson (1904). Falkland Islands, South Atlantic. Host: *Munida gregaria* (Fabricius, 1793). Reference: Rayner (1935). Golfo de Penas and Magallanes, Chile, South Pacific.

Host: *Munida gregaria*. Reference: Stuardo et al. (1986). Off Arica, Chile, South Pacific. Host: *Galacantha diomedea*. Reference: Pardo et al. (2009). Golfo de San Jorge, Argentina, South Atlantic. Host: *Munida gregaria*. Reference: Varisco and Vinuesa (2011).

19. *Pseudione* sp. or spp., western Atlantic

Known localities. South of Jamaica, 17°21'N, 77°35'W, 805–1089 m. Host: *Munidopsis abbreviata* (A. Milne Edwards, 1880). Reference: Mayo (1974). Off Guadeloupe, Caribbean, 16°06'N, 61°22–24'W, 531–733 m. Host: *M. alaminos* Pequegnat and Pequegnat, 1970. Reference: Mayo (1974). Florida Straits, Atlantic, 24°28–51'N, 79°52'–80°16'W, 802–805 m. Host: *M. longimanus* (A. Milne Edwards, 1880). Reference: Mayo (1974). Off Campeche, Campeche, Mexico, Gulf of Mexico, ca 20°N, 71°W, depth unspecified. Host: *M. nitida* (A. Milne Edwards, 1880). Reference: Salazar-Vallejo and Leija-Tristán (1989). Off Caribbean coast of Colombia, and off Guadeloupe, Caribbean, 11°30–34'N, 73°23–26'W, 507–531 m. Host: *M. riveroi* Chace, 1939. Reference: Mayo (1974), Florida Straits, Gulf of Mexico, 24°24'N, 80°52'W, 512 m. Host: *M. robusta* (A. Milne Edwards, 1880). Reference: Mayo (1974). Straits of Florida, 25°17–36'N, 79°40–45'W, 570–824 m; and north coast of Cuba, Gulf of Mexico 23°24'N, 80°11'W, 677–1107 m; and south of Jamaica, Caribbean. Host: *M. serricornis* (Lovén, 1852). Reference: Mayo (1974).

20. Unidentified Pseudioninae, western Atlantic.

Known localities. Norfolk Canyon, off Virginia, USA, Atlantic, 36°56' to 37°09'N, 75°06' to 74°33'W, 1876–2427 m. Host: *Galacantha rostrata* A. Milne-Edwards, 1880. Reference: Wenner and Windsor (1979). Venezuela Basin, Caribbean, 13°34'N, 64°47'W, 3517–3549 m. Hosts: *Munidopsis crassa* Smith, 1885, and *M. geyeri* Pequegnat and Pequegnat (1970). Reference: Gore (1983). Off Cuba, ca 25°N, 80°W, ca 800 m. Host: *M. longimanus*. Reference: Chace (1942). Southern Gulf of Mexico. Hosts: *M. alaminos* and *M. robusta*. Reference: Vázquez-Bader and Gracia (2016).

21. Unidentified Pseudioninae, eastern Pacific

Known locality. Guaymas Basin, Mexico, 27°29'N, 111°24'W, depth uncertain. Host: *Galacantha diomedea*. References: Luke (1977), Wicksten (2012).

Subfamily Argeiinae Markham, 1977

22. *Argeia atlantica* Markham, 1977

Type-locality. Tongue of the Ocean, Bahamas, Atlantic, 23°54'N, 77°12'W, 1298–1335 m. Host: *Metacrangon jacqueti* (A. Milne-Edwards, 1881). Reference: Markham (1977a). **Other localities.** Southeast of Newfoundland, Canada, Atlantic, 42°59'N, 51°15'W, 1100 m. Host: *M. jacqueti*. References: Sivertsen and Holthuis (1956); Markham (1977a). Middle Atlantic Bight, off Virginia, USA. Atlantic, ca 37°N, 75°W, 452–2679 m. Host: *M. jacqueti*. Reference: Wenner (1978). **Range**

outside of region. Coast of China, West Pacific. Host: *Crangon affinis* de Haan, 1849. Reference: An et al. (2008).

23. *Parargeia ornata* Hansen, 1897

Type-locality. Off Acapulco, Mexico, Pacific, 16°33'N, 99°52'W, 1460–1650 m. Host: *Metacrangon procax* (Faxon, 1893). Reference: Hansen (1897). **Range outside of region.** None known.

Subfamily Bathygyginae Markham, 2016

24. *Bathygyge grandis* Hansen, 1897

Type-locality. Off Acapulco, Mexico, Pacific, 16°33'N, 99°52'W, 1460–1650 m. Host: *Glyphocrangon spinulosa* Faxon, 1896. Reference: Hansen (1897). **Other localities.** Middle Atlantic Bight, off Virginia USA, Atlantic, ca 37°N, 75°W, 452–2679 m. Hosts: *Glyphocrangon sculpta* (Smith, 1882) and *G. longirostris* (Smith, 1882). Reference: Wenner (1978). Magellan Rise, Northeast Pacific, 07°05'N, 176°55'W, 3100 m. Host unspecified. Reference: Kaufmann et al. (1989). San Clemente Basin, off California, USA, Pacific, 32°28'N, 118°08'W, 1782 m. Host: *Glyphocrangon vicaria* Faxon, 1897. Reference: Markham (2016). **Range outside of region.** Off Cape Point, South Africa, South Atlantic Host: *Glyphocrangon sculpta* [possibly actually an undescribed species of *Bathygyge*]. Reference: Stebbing (1906). Off coast of China, western Pacific. Host: *Glyphocrangon* sp. [possibly actually an undescribed species of *Bathygyge*]. Reference: An et al. (2007).

Subfamily Athelginae Codreanu & Codreanu, 1956

25. *Anathelges hyphalus* (Markham, 1974)

Type-locality. Channel Islands, California, Pacific, 33°46' to 33°18'N, 118°22' to 118°33'W, 95319 m. Host: *Parapagurodes laurentae* McLaughlin and Haig, 1973. Reference: Markham (1974b). **Other localities.** Off Carmel, California USA, Pacific, 36°27'N, 122°00'W, 141 m. Host: *P. makarovi* McLaughlin & Haig, 1973. Near Punta de Abrejoja, Baja California Sur, Mexico, Pacific, 26°17'N, 113°41'W, 99 m. Host: *P. laurentae*. Islas de San Benito, Baja California, Mexico, Pacific, 28°13'N, 115°34'W, 115–179 m. Host: *P. makarovi*. Reference: Markham (1974b). **Range outside of region.** None known. [Described as *Stegophryxus hyphalus* Markham, 1974].

26. *Parathelges tumidipes* Markham, 1972

Type-locality. Southwest of Jamaica, Caribbean, 17°09'N, 78°57'W, 26 m. Host: *Dardanus fucosus* Biffar and Provenzano. Reference: Markham (1972). **Other localities.** South of Bermuda, Atlantic, 32°17'N, 64°43'W, ca 200 m. Host: *Allodardanus bredini* Haig and Provenzano, 1965. Reference: Markham (1978). Belize, Caribbean, ca 17°N, 88°W, shallow water. Hosts: *Calcinus tibicen* (Herbst, 1791), *Clibanarius tricolor* Gibbes, 1850, and *C. vittatus* Bosc, 1802. Reference: Boyko and Williams (2016). **Range outside of region.** None known.

Subfamily Hemiarthrinae Markham, 1972

27. *Hemiarthrus nematocarcini* Stebbing, 1914

Type-locality (outside of region). Off South Africa, southern Atlantic. Host: *Nematocarcinus longirostris* Bate, 1888. Reference: Stebbing (1914). **Other locality** (within the region). Norfolk Canyon, off Virginia USA, Atlantic, 36°56' to 37°09'N, ca 75°W, 1430–3083 m. Host: *Nematocarcinus ensifer* (S.I. Smith, 1882). Reference: Wenner (1979). **Range outside of region**. Chatham Rise, southeast of New Zealand, southern Pacific. Host: *Campylonotus rathbunae* Schmitt, 1926. Reference: Page (1985).

Family Colypuridae Richardson, 1905

28. *Colypurus agassizi* Richardson, 1905

Type-locality. Off Punta Mariato, Panamá, Pacific, 06°36'N, 81°44'W, 1063 m. Host unknown. Reference: Richardson (1905b). **Range outside of region**. None known.

Superfamily Cryptoniscoidea Kossmann, 1880

Family Cryptoniscidae Kossmann, 1880

29. *Zeuxokoma setosa* (Nierstrasz and Brender à Brandis, 1930)

Type-locality. Central California USA, Pacific, 38°17'N, 123°29'W, 305 m. Host: *Spirontocaris holmesi* Holthuis, 1947. References: Nierstrasz and Brender à Brandis (1930), Boyko (2015). **Range outside of region**. None known. [Described as *Faba setosa* Nierstrasz and Brender à Brandis, 1930].

Family Dajidae Giard and Bonnier, 1887

30. *Arthropryxus beringanus* Richardson, 1908

Type-locality. Coast of British Columbia, Canada, Pacific. 53°53'N, 144°53'W, 4023 m. Host: unknown. Reference: Richardson (1908a). **Range outside of region**. None known.

31. *Colophryxus novangliae* Richardson, 1908

Type-locality. Off Long Island, New York, USA, Atlantic. 39°00'N, 72°04'W, 1293 m. Host: unknown. Reference: Richardson (1908b). **Range outside of region**. None known.

32. *Holophryxus acanthephyrae* Stephensen, 1912

Type-locality. Davis Strait, between Canada and Greenland, North Atlantic, 60°07'N, 48°26'W, depth unrecorded, probably ca 1000 m. Host: *Acanthephyra pelagica* (Risso, 1816). Reference: Stephensen (1912). **Range outside of region**. South of England, northeast Atlantic. Host: *A. pelagica*. Reference: Jones and Smaldon (1986). East of New Zealand, southern Pacific. Host: *Acanthephyra pelagica*. Reference: Wasmer (1988). Rocas Atoll, Brazil, south Atlantic. Host: *A. acanthitelsonis* Spence Bate, 1888. Reference: Alves-Júnior et al. (2018). [As

Isophryxus concavus Schultz, 1977]. Antarctic Ocean. Host: probably *A. pelagica*. Reference: Schultz (1977).

33. *Holophryxus alaskensis* Richardson, 1905

Type-locality. Revillagigedo Island, Alexander Archipelago, Alaska, USA, Pacific, 56°N, 131°W, 274–512 m. Host: *Pasiphaea pacifica* Rathbun, 1902. References: Richardson (1905a), Butler (1964). **Other localities.** Granby Bay, Strait of Georgia and west coast of Vancouver Island, British Columbia, Canada, Pacific, ca 49°24'N to 55°24'N, 123°54'W to 129°49'W, 77–198 m. Host: *P. pacifica*, where known. Reference: Butler (1964). [As *Holophryxus californiensis* Richardson, 1908]. Santa Barbara Channel, California, USA, Pacific, ca 34°15'N, 119°50'W, 512 m. Host: unknown. References: Richardson (1908a); Butler (1964). Near Seattle, Washington, USA, Pacific, ca 47°30'N, 122°20'W, 183–512 m. Host: *P. pacifica*. References: Richardson (1908a), Butler (1964). [As *Hypodajus georgiensis* Nierstrasz and Brender à Brandis, 1931]. Strait of Georgia, British Columbia, Canada, Pacific, ca. 49°N, 124°W, ca 200 m. Host: unidentified pasiphaeid. References: Nierstrasz and Brender à Brandis (1931), Butler (1964). **Range outside of region.** None known.

34. *Oculophryxus bicaulis* Shields and Gómez-Gutiérrez, 1996

Type-locality. Off Baja California, Mexico, Pacific, 20°13' to 28°52'N, 112°23' to 117°48'W, to 210 m. Host: *Stylocheiron affine* Hansen, 1910. Reference: Shields and Gómez-Gutiérrez (1996). **Range outside of region.** South China Sea, western Pacific. Host: *S. affine*. Reference: Gómez-Gutiérrez and Shields (1998).

35. *Prophryxus alascensis* Richardson, 1909

Type-locality. Goletus Channel, British Columbia, Canada, Pacific, 53°05'N, 138°31'W, 3658 m. Host unknown. Reference: Richardson (1909). **Range outside of region.** None known.

36. *Zonophryxus retrodens* Richardson, 1903

Type-locality. South of Oahu, Hawaii, Pacific, ca 21°20'N, 158°W, ca 300 m. Host unknown. Reference: Richardson (1903). **Range outside of region.** None known.

37. *Zonophryxus similis* Richardson, 1914

Type-locality. Off Punta Mariato, Panamá, Pacific, 06°36'N, 81°44'W, 1063 m. Host unknown. Reference: Richardson (1914). **Range outside of region.** None known.

38. *Zonophryxus* sp.

Known localities. California Bight, off California, USA, Pacific, 32°35'N, 117°55'W to 33°59'N, 118°43'W, 98–305 m. Hosts: *Pantomus affinis* Chace, 1973, and *Plesionika trispinus* Squires and Barragán, 1976. Reference: Montagne and Cadien (2001). **Range outside of region.** None known.

Family Entophilidae Richardson, 1903

39. *Entophilus omnitectus* Richardson, 1903

Type-locality. Between Maui and Molokai, Hawaii, Pacific, 20°57'N, 156°41'W, ca 300 m. Host: *Agononida normani* (Henderson, 1885). Reference: Richardson (1903). **Other localities.** Palolo Channel, Hawaii, Pacific, 21°04'N, 156°42'W, to 258 m. Host: *A. normani*. Reference: Richardson (1903). Northern Gulf of Mexico, 27°22' to 29°17'N, 85°52' to 93°31'W, 185–850 m. Hosts: *Munida valida* S. I. Smith, 1883, and *M. microphthalma*. Reference: Adkison and Collard (1990). **Range outside of region.** Madagascar, Indian Ocean. Host: *Agononida incerta* (Henderson, 1888). Reference: Bourdon (1976). Chesterfield Islands, southwestern Pacific. Host: *A. "incerta"*. Reference: Markham (1994).

6.4 Conclusions

A thorough review of previous records of epicarid isopods from deep water around North and Central America allows for the listing of 39 species, 4 of these unidentified. Most species (27) belong to the Bopyridae with 17 genera, including five species of *Munidion* and at least four species of *Pseudione*. Other families are the Colypuridae (1 sp.), the Cryptoniscidae (1 sp.), the Dajidae (9 spp.), and the Entophilidae (1 sp.).

Markham (1986) reported on the evolution and zoogeography of Bopyridae stating that 469 species had been described worldwide at that time. In a more recent review, Williams and Boyko (2012) estimated the number of epicarideans isopods (Bopyroidea and Cryptoniscoidea) at 794 species: 605 Bopyridae and 99 Cryptoniscoidea. Bopyrids were more diverse in the NW Pacific, while cryptoniscoids were more diverse in the NE Atlantic (Williams and Boyko 2012).

Of the 35 identified species, about half (17) were described in 1930 or earlier and the rest after 1972. Epicarid isopods of the area infest a wide variety of hosts, including euphausiids of the genus *Stylocheiron*; caridean shrimps of the genera *Acantheephyra*, *Campylonotus*, *Crangon*, *Glyphocrangon*, *Heterocarpus*, *Parapontophilus*, *Pasiphaea*, *Metacrangon*, *Nematocarcinus*, and *Spirontocaris*; hermit crabs of the genera *Clibanarius*, *Dardanus*, and *Parapagurodes*; and squat lobsters of the genera *Agononida*, *Munida*, *Munidopsis*, and *Galacantha*.

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