

Short Communication

New records of *Probopyrus pandalicola* and *Probopyrinella latreuticola* (Epicaridea: Bopyridae) from the southern Mexican Caribbean

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ABSTRACT. The ecology, distribution, and taxonomy of bopyrid isopod species are often omitted from studies not systematically addressed to crustaceans. From a wider study of zooplankton in coastal and reef waters of the Mexican Caribbean Sea, two bopyrid species were collected, *Probopyrinella latreuticola*, attached to the branchial chamber of *Latreutes fucorum* and *Probopyrus pandalicola* parasitizing the branchial chamber of *Palaemon northropi*. For both parasite-host associations, these records represent a new locality and the southernmost record in the Mexican Caribbean. A map and a list of the bopyrid species belonging to Bopyridae recorded in the Mexican Caribbean are provided.

Keywords: *Probopyrus pandalicola*; *Probopyrinella latreuticola*; marine crustaceans; isopods; bopyrids; ectoparasites; Caribbean Sea

Isopods of the family Bopyridae are obligate ectoparasites that infest the branchial chamber or abdomen of other crustaceans, primarily decapods. Their life cycle involves two crustacean hosts: a copepod used as an intermediate host, and a decapod acts as a definitive host. They exhibit noticeable sexual dimorphism, with males resembling free-living isopods, while females have larger bodies, often distorted to the extent that, in some species, they are hardly recognizable as isopods (Williams & Boyko 2012, Cericola & Williams 2015).

Williams & Boyko (2012) documented 87 species of bopyrids parasitizing a wide variety of hosts along the region between North Carolina, USA, through the Gulf of Mexico to the Caribbean coasts. Currently, 35 bopyrid species are recorded on the Atlantic coast of Mexico (Romero-Rodríguez & Álvarez 2021, 2023), with 19 of them reported in the Mexican Caribbean region, parasitizing 23 host species (Table 1). However,

information on the geographic range and host selection of bopyrids is often limited due to either a constrained sampling effort (Shields et al. 2015) or the overlooking of these parasite species in taxonomic or ecological studies of their hosts (Boyko & Williams 2009).

This study aims to report on shrimps parasitized by bopyrid isopods collected during a broader investigation of zooplankton in coastal and reef waters of the Mexican Caribbean Sea, contributing to our understanding of these host-parasite relationships. Parasitized shrimps were measured, photographed, and deposited in the zooplankton collection of El Colegio de la Frontera Sur (ECO-CH-Z). Carapace length (CL), taken from the rostrum's tip to the carapace's posterior margin, was used to measure the host size. Bopyrids were removed from their hosts, and total length (TL) was recorded. For males, TL was measured from the anteromedial margin of the head to the posterior margin of the pleon.

Table 1. Parasitic isopod species of the family Bopyridae reported on the Mexican Caribbean coasts. 1) Markham (1985), 2) Markham & Donath-Hernández (1990), 3) Markham et al. (1990), 4) Martínez-Mayén (2021), 5) Monroy-Velázquez et al. (2019), 6) Romero-Rodríguez & Álvarez (2020a), 7) Romero-Rodríguez & Álvarez (2020b), 8) Romero-Rodríguez & Alvarez (2021), 9) Romero-Rodríguez & Álvarez, (2023), 10) Romero-Rodríguez & Martínez-Mayén (2017), 11) Romero-Rodríguez & Martínez-Mayén (2018), 12) Romero-Rodríguez & Román-Contreras (2014), 13) this study.

Isopod	Host	Locality	Reference
<i>Asymmetrione desultor</i> Markham, 1975	<i>Pagurus simpsoni</i> A. Milne-Edwards & Bouvier, 1893	Cozumel Island	9
<i>Asymmetrione tuxtlaensis</i> Romero-Rodríguez & Álvarez 2023	<i>Clibanarius antillensis</i> Stimpson, 1859	NE coast of Isla Blanca, Cancún	9
<i>Azygopleon schmitti</i> (Pearse, 1932)	<i>Synalpheus longicarpus</i> (Herrick, 1891)	Punta Allen, Ascension Bay	2, 3
<i>Bopyrella harmopleon</i> Bowman, 1956	<i>Synalpheus fritzmulleri</i> Coutière, 1909	Punta Allen, Ascension Bay, Punta Estrella, Puerto Morelos	2, 3
<i>Bopyrinella hadrocoxalis</i> Romero-Rodríguez & Álvarez 2020	<i>Thor manningi</i> Chace, 1972	Mahahual; María Irene and dock of SEPESCA station, Puerto Morelos	6
<i>Bopyrinella thorii</i> (Richardson, 1904)	<i>Thor floridanus</i> Kingsley, 1878	North end of Ascension Bay	2, 3, 12
<i>Bopyrione synalpheii</i> Bourdon & Markham 1980	<i>Synalpheus townsendii</i> Coutière, 1909	Ascension Bay	1, 2, 3
<i>Bopyrissa wolffi</i> Markham, 1978	<i>Clibanarius tricolor</i> (Gibbes, 1850)	Caleta Yalku, Akumal; Cozumel Island and NE coast of Isla Blanca	1, 2, 9
<i>Diplophryxus siankaanensis</i> Markham, 1988	<i>Alpheus formosus</i> Gibbes, 1850	Punta Solimán, Ascension Bay	2, 3
<i>Eophrinx subcaudalis</i> (Hay, 1917)	<i>Synalpheus brooksi</i> Coutière, 1909 <i>Synalpheus bousfieldi</i> Chace, 1972	Old Pier, Mujeres Island and Cozumel	1, 3
<i>Orthione furcata</i> (Richardson, 1904)	<i>Upogebia vasquezi</i> Ngoc-Ho, 1989	Puerto Morelos	8
<i>Parabopyrella lata</i> (Nierstrasz & Brender à Brandis, 1929)	<i>Alpheus normanni</i> Kingsley, 1878 <i>Alpheus packardii</i> Kingsley, 1880	Puerto Morelos and Mahahual reef lagoon	4, 7
<i>Parabopyrella mortenseni</i> (Nierstrasz & Brender à Brandis, 1929)	<i>Alpheus cristulifrons</i> Rathbun, 1900	Mahahual	7
<i>Parabopyrella thomasi</i> (Nierstrasz & Brender à Brandis, 1929)	<i>Tozeuma carolinense</i> Kingsley, 1878	Ascension Bay and Espiritu Santo Bay	11
<i>Parathelges occidentalis</i> Markham, 1972	<i>Clibanarius tricolor</i> (Gibbes, 1850)	Cañeta Yalku, Akumal	3
<i>Probopyrinella latreuticola</i> (Gissler, 1882)	<i>Latreutes fucorum</i> (Fabricius, 1798)	Punta Estrella, Ascension Bay; Puerto Morelos reef, and Xcalak	1, 2, 3, 5, 13
<i>Probopyrus pandalicola</i> (Packard, 1879)	<i>Palaemon northropi</i> (Rankin, 1898)	Near the lighthouse, Punta Nichehabin, Ascension Bay; Chetumal Bay	1, 2, 3 13
<i>Robinione overstreeti</i> (Adkison & Heard, 1995)	<i>Callichirus islagrande</i> (Schmitt, 1935)	Cozumel Island	8
<i>Schizobopyrina urocaridis</i> (Richardson, 1904)	<i>Phycomenes siankaanensis</i> (Martínez-Mayén & Román-Contreras, 2006)	Punta Allen and Punta Hualoxtoc, Ascension Bay; Chal Island, Pobre Island, Punta Norte and San José Island, Espiritu Santo Bay	10
<i>Urobopyrus processae</i> Richardson, 1904	<i>Processa bermudensis</i> (Rankin, 1900)	Bermejo River, Mahahual	8

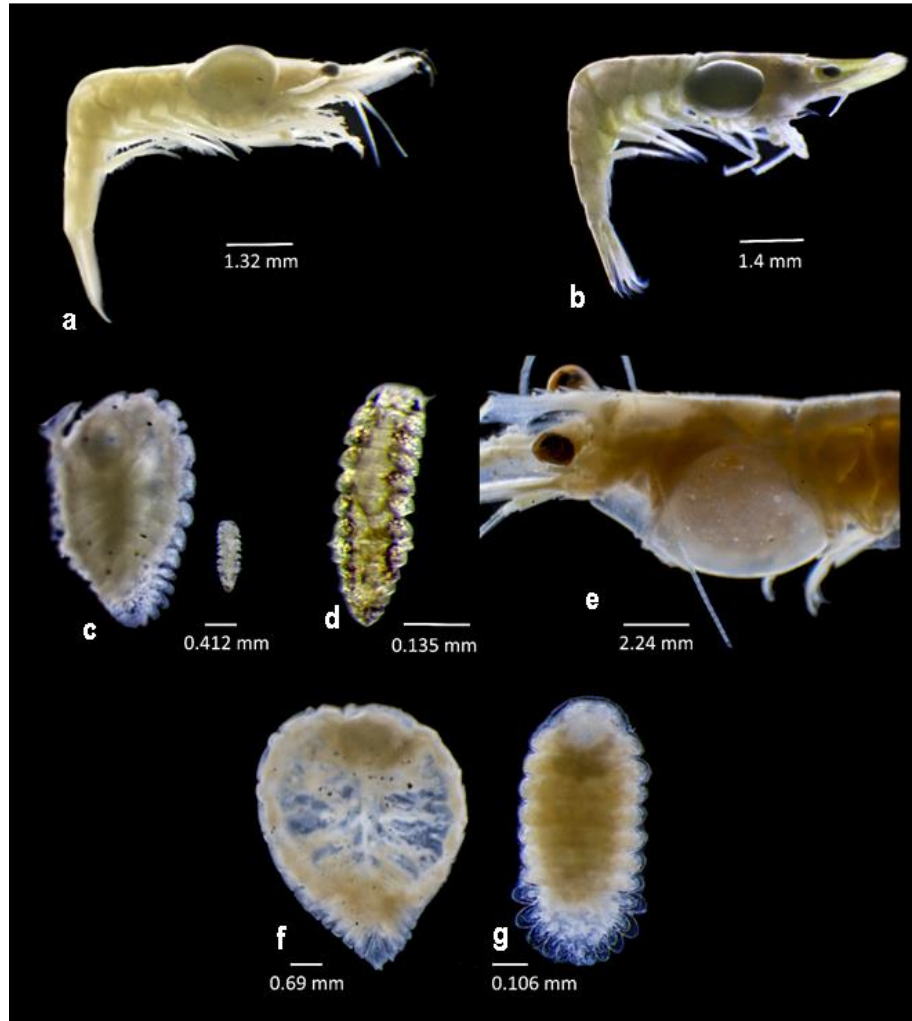


Figure 1. a) *Latreutes fucorum* parasitized by *Probopyrinella latreuticola*, b) *L. fucorum* parasitized by adult female *P. latreuticola*, c) oviparous female and male of *P. latreuticola*, dorsal view, d) male of *P. latreuticola*, dorsal view, e) *Palaemon northropi* parasitized by *Probopyrus pandalicola*, f) oviparous female of *P. pandalicola*, ventral view, g) male of *P. pandalicola*, dorsal view.

In contrast, for females, it was measured from the anterior margin of the first thoracic somite of the longer side to the posterior margin of the pleon. Width (W) was determined across the widest pereomere. Measurements were made to the nearest 0.1 mm using an ocular micrometer attached to a stereomicroscope.

The taxonomic analysis of the isopods and decapods collected revealed two species of isopods belonging to the family Bopyridae and two species of decapod hosts belonging to the families Hippolytidae and Palaemonidae. Two shrimps of *Latreutes fucorum* (Fabricius, 1798) parasitized by *Probopyrinella latreuticola* (Gissler, 1882) were collected during the new moon phase in the reef lagoon off Xcalak, Quintana Roo. On March 8, 2016, (18°16'38.87"N, 87°49'40.87"W), a

single oviparous female of *P. latreuticola* (ECO-CH-Z-11612) of 2.18 mm TL and 1.36 mm W was attached to the right branchial chamber of a shrimp of 14.6 mm CL (ECO-CH-Z-11613) (Fig. 1a). On March 29, 2022, (18°16'16.95"N, 87°49'40.53"W), an oviparous female bopyrid of 2.06 mm TL and 1.33 mm W (Fig. 1c) paired with a male of 0.62 mm TL and 0.21 mm W (Fig. 1d) (ECO-CH-Z-11614) was attached to the right branchial chamber of a host of 13.4 mm CL (ECO-CH-Z-11615) (Fig. 1b).

June 1996, a shrimp of *Palaemon northropi* (Rankin, 1898) with a CL of 8.5 mm (ECO-CH-Z-11617) (Fig. 1e) was collected in Bahía de Chetumal, Quintana Roo (18°35'59"N, 88°03'49"W) using a zooplankton trawl. In its left branchial chamber, it

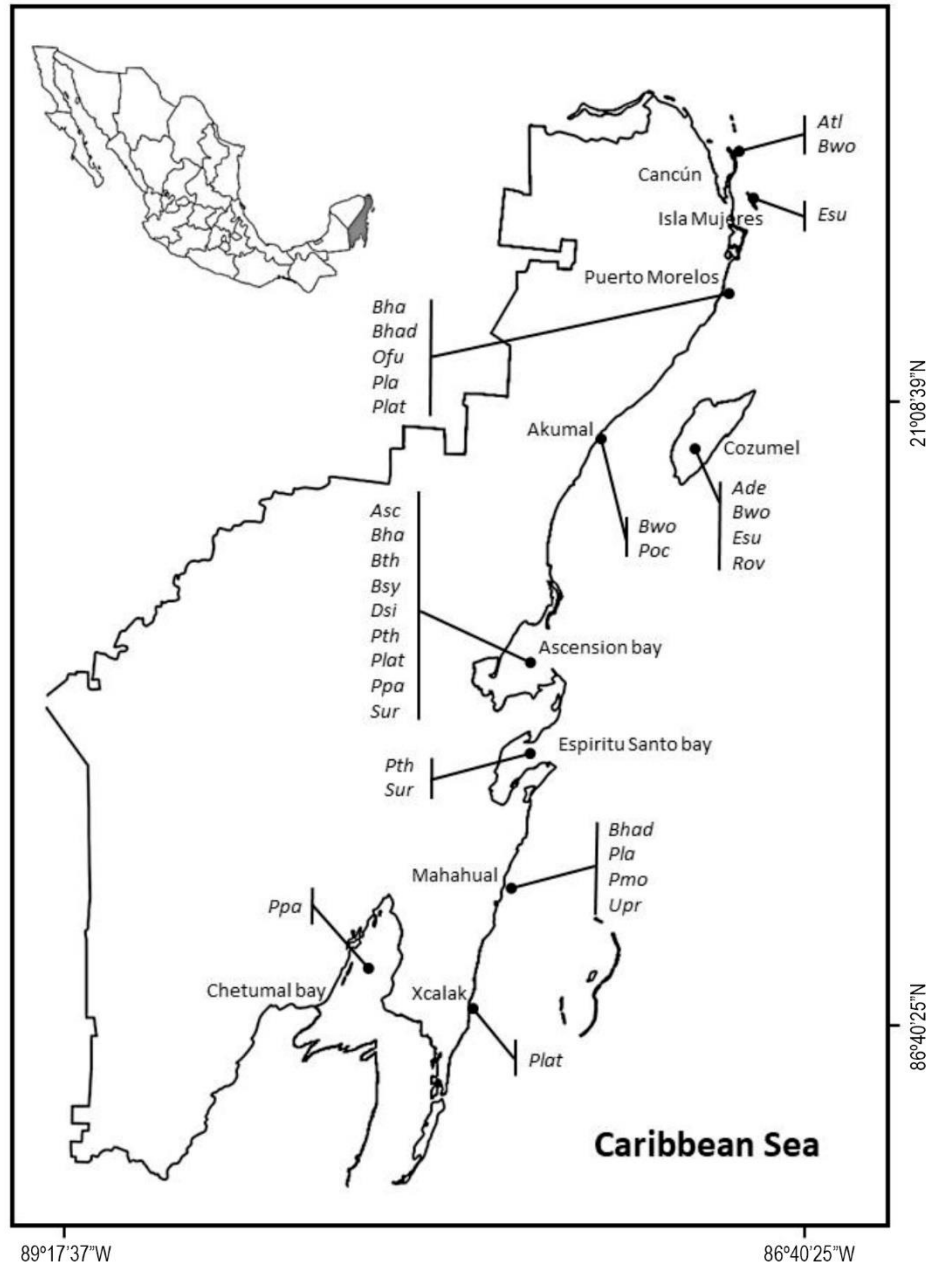


Figure 2. Distribution of parasite isopods of the Family Bopyridae in Quintana Roo. Ade: *Asymmetrione desultor*, Atl: *A. tuxtlaensis*, Azg: *Azygopleon schmitti*, Bha: *Bopyrella harmopleon*, Bhad: *Bopyrinella hadrocoxalis*, Bth: *B. thorii*, Bsy: *Bopyrione synalpei*, Bwo: *Bopyrissa wolffi*, Dsi: *Diplophryxus siankaanensis*, Esu: *Eophryxus subcaudalis*, Ofu: *Orthione furcata*, Pla: *Parabopyrella lata*, Pmo: *P. mortenseni*, Pth: *P. thomasi*, Poc: *Parathelges occidentalis*, Plat: *Probopyrinella latreuticola*, Ppa: *Probopyrus pandalicola*, Rov: *Robinione overstreeti*, Sur: *Schizobopyrina urocaridis*, Upr: *Urobopyrus processae*.

carried one ovigerous female of *Probopyrus pandalicola* (Packard, 1879) measuring 5.5 mm TL and 4.3 mm W (Fig. 1f) paired with a male of 0.85 mm TL and 0.41 mm W (Fig. 1g) (ECO-CH-Z-11616).

To our knowledge, these records represent not only two new localities but also the southernmost distribution in the Mexican Caribbean region reported to date (Fig. 2). *P. latreuticola* is distributed from North Carolina and Florida, USA, through the Sargasso Sea,

Bermuda, Bahamas, Jamaica, Virgin Islands and Haiti (Markham et al. 1990). In Mexico, it had only been reported in Laguna Madre, Tamaulipas (Rodríguez-Almaraz et al. 2000), Puerto Morelos, and Bahía de la Ascensión, Quintana Roo (Markham & Donath-Hernández 1990, Markham et al. 1990, Monroy-Velázquez et al. 2019) (Fig. 2). In all cases, it has been reported that *P. latreuticola* uses *L. fucorum*, as its sole host, consistent with our findings.

P. pandalicola is widely distributed along the western Atlantic coast, from the USA to the US Virgin Islands, including Mexico, Costa Rica, Cuba, Colombia, Venezuela, Suriname, and Brazil (Markham 1985). This extensive distribution may be attributed to the fact that *P. pandalicola* parasitizes seven species of *Palaemon* shrimps and five species of *Macrobrachium* prawns throughout its range (Markham 1985). On the Mexican Atlantic coast, *P. pandalicola* has only been reported parasitizing *Palaemon* shrimps: *P. pugio* in Laguna Conchillal, Tamaulipas, and Paraiso, Tabasco (Rodríguez-Almaraz et al. 2000); *P. pugio* (Holthuis, 1949) and *P. mundusnovus* De Grave & Ashelby, 2013 in Laguna de Términos, Campeche (Román-Contreras & Martínez-Mayén 2011); *P. vulgaris* Say, 1818 in Isla Cerro, Yucatán and *P. northropi* in Bahía de la Ascensión (Markham 1985) and Bahía de Chetumal (This study), Quintana Roo. The parasite-host association of *P. pandalicola* and *P. northropi* has also been registered in Venezuela and Brazil (Markham 1985, Ribeiro et al. 2019).

The finding of both parasite-host associations from zooplankton samples show that this group of parasites can be registered from samples not focused solely on the analysis of crustacean issues, and their record can contribute to improving our understanding of the distribution and host selection of this parasite isopod group.

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