

*Progebiophilus bruscai* n. sp., a new bopyrid isopod parasitic  
on the mud shrimp, *Upogebia dawsoni* Williams  
(Thalassinoidea), from the Gulf of California

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**Abstract :** We describe *Progebiophilus bruscai* n. sp., a bopyrid isopod (Isopoda : Epicaridea) infesting the common mud-shrimp *Upogebia dawsoni* Williams from the southwestern Gulf of California, México. Its closest relatives are *P. upogebiae* (Hay) from the tropical and temperate western Atlantic and *P. sinicus* Markham from the tropical western Pacific. The male differs from such species by having both pleopods and uropods and by the female lacking a transverse row of tubercles on oostegit 5. A key to males of all species in the genus and an appendix with all species recorded from Mexico are also included.

**Résumé :** Nous décrivons *Progebiophilus bruscai* n. sp., un Bopyride (Isopoda : Epicaridea) parasite de Thalassinides, *Upogebia dawsoni* Williams, du Golfe de Californie, Mexique. Les deux espèces les plus proches semblent être *P. upogebiae* (Hay) de l'Atlantique ouest-tropical et tempéré et *P. sinicus* Markham du Pacifique ouest-tropical. Cette nouvelle espèce est différente en ce que le mâle a des uropodes, des pléopodes et que la femelle ne possède pas une rangée longitudinale de tubercules sur les 5<sup>e</sup> oostégites. Une clé pour les mâles des espèces du genre *Progebiophilus* et un appendice avec toutes les espèces d'Epicaridea du Mexique sont également présentés.

#### INTRODUCTION

Bopyrid isopods are common parasites of decapod crustaceans, and are responsible for branchial chamber galls in that group. The adult female generally lives in the host's branchial chamber, although some species are found attached to the host's pleopods. The tiny males are hyperparasites that commonly live on the ventral surface of the female pleon, or inside the brood chamber. In the branchial bopyrids this is restricted to spermatid impregnation (Bourdon 1987 *in litt.*). Common hosts of these isopods include caridean (hence the name Epicaridea) and non-caridean shrimps, brachyurans, anomurans, palinurans, and few species (mainly *Cabirops* spp.) can even be hyperparasites on the brood chamber of other bopyrids.

There are over 20 epicaridean species recorded from México (see Appendix 1). However, in spite that some have been reported from hermit crabs, there is no record of any epicaridean infesting thalassinoid mud-shrimps.

*Upogebia dawsoni* Williams (1986) is the most common mud-shrimp occurring along the southwestern coast of the Gulf of California. Some environmental effects on reproductive mechanisms have been recently noted in two populations from Bahía Concepción, B.C.S., México (Leija-Tristán & Sanchez-Vargas 1988). However, in spite of having examined 280 mud-shrimps from Bahía Concepción, none had parasitic bopyrids.

In this paper we describe a new bopyrid isopod, *Progebiophilus bruscai* n. sp., infesting *U. dawsoni* from the southwestern Gulf of California. Remarks on the host-parasite relationship are reported elsewhere (Leija-Tristán & Salazar-Vallejo 1988).

#### METHODS

Mud-shrimps, *Upogebia dawsoni* Williams, were collected during low tide at three localities in Bahía de La Paz, B.C.S., México : Caimancito (28 November 1986), Enfermería (29 November 1986) and Comitán (1<sup>st</sup> December 1986), and some others were collected in Balandra (25 November 1987) (Fig. 1). We used a shovel to collect and a 0.5 mm sieve to wash the sediment, mud-shrimps were fixed in a 10 % formaline solution in sea water, later washed for 24 h in tap-water, then placed in 70 % ethanol in distilled water.

Bopyridae Rafinesque 1815

Pseudioninae Codreanu 1967

*Progebiophilus* Codreanu & Codreanu 1963

*Progebiophilus bruscai* Salazar-Vallejo & Leija Tristán, n. sp.

Figs. 2, 3.

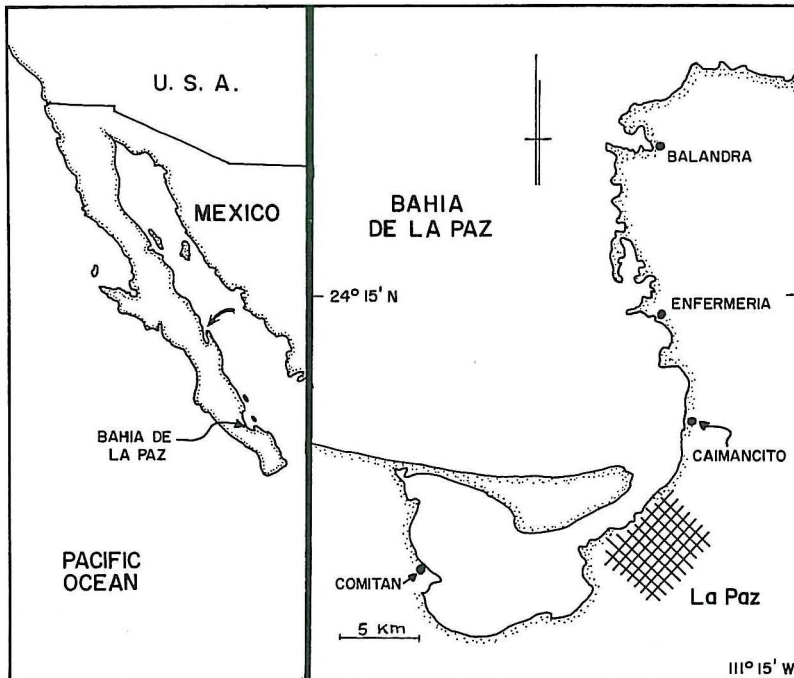


Fig. 1 : Bahía de La Paz, Baja California Sur, México, with localities referred to in text (arrow points to Bahía Concepción, BCS in the insert).

Material examined. Infesting *Upogebia dawsoni* Williams 1986 from Comitán (3 pairs including Holotype and Allotype), Caimancito (39 ♀♀, 25 ♂♂) and Enfermeria (11 ♀♀, 2 ♂♂) in Bahía de La Paz, B.C.S. México. Holotype and Allotype in the Museum national d'histoire naturelle, Paris (MNHN Ep. 554). Some paratypes in the same place (MNHN Ep. 553-556), others in the Instituto de Biología-UNAM, Instituto de Ciencias del Mar y Limnología UNAM, Centro de Investigación Científica y de Educación Superior de Ensenada, Mexico, San Diego Natural History Museum, California, and United States National Museum, Smithsonian Institution.

#### DESCRIPTION

Female. Holotype a large specimen (Fig. 2A, D), length 7 mm, maximal width 4.8 mm, head length 1.4 mm, pleon length 1.8 mm, body axis distortion 15°. Body opaque red naturally, now stained with Congo Red. Outline subelliptical without abrupt changes in width. Ventral integument scaly or tuberculated throughout, with low scattered tubercles each covered with small scales.

Head, slightly broader than long, extending slightly beyond margin of first pereonite as two distinct lateral horns; frontal lamina reduced. Two small, lateral rows of eyespots. Antennae (Fig. 2B) of three and five articles respectively; each antenna distally setose with some setae on the other articles. Maxilliped (Fig. 2C) trapezoidal, produced into a prominent, setose, articulated palp with scaly integument; palp with four distal setae, basal spur with two setae. Posteroventral border of head with two pairs of lamellar digitated process and middle region produced in to similar extensions; each process with small scaly tubercles.

Pereonites well defined, 1-4 with narrow coxal plate, 5-7 with lateral margin expanded, dorsolateral bosses conspicuous on pereonites 1-4, fade out in posterior pereonites. Five pairs of well developed oostegites (Fig. 2D) that completely close the brood pouch. First oostegite (Fig. 2E) developed into two lobes, superior lobe rounded with a basal rib, inferior lobe (enternal ridge) with a large posterodistal lobe supported with a basal rib; internal ridge internally provided with tuberculiform processes that resemble the laminar processes on the posteroventral border of the head; shorter lobes rounded, larger ones slightly branched. Fifth oostegite smooth with many long, simple marginal setae, restricted to the median and posterior margins, without row of tuberculiform processes (Fig. 2D).

Pereopods (Fig. 2F) all similar, slightly increasing in size posteriorly; basis with basal scaly tubercles and a short carina; ischium crenulated with a longitudinal furrow bordered by scales; carpus scaly, setose; propodus with scales and dactylus smooth fitting in a conspicuous distal tubercle on propodus. Pleon completely free from last pereonite, made up of six pleonites, five well defined and last one reduced, each with smooth lateral plates, marginally rounded, though some may appear lobulated. Five pairs of large, lanceolated biramous pleopods (Fig. 2D). Each pleopodal ramus (Fig. 2G) with conspicuous rounded tubercles on sides, arranged regularly into 5 or 6 pairs, basal pair much larger than the others. Uniramous uropods similar to pleopods.

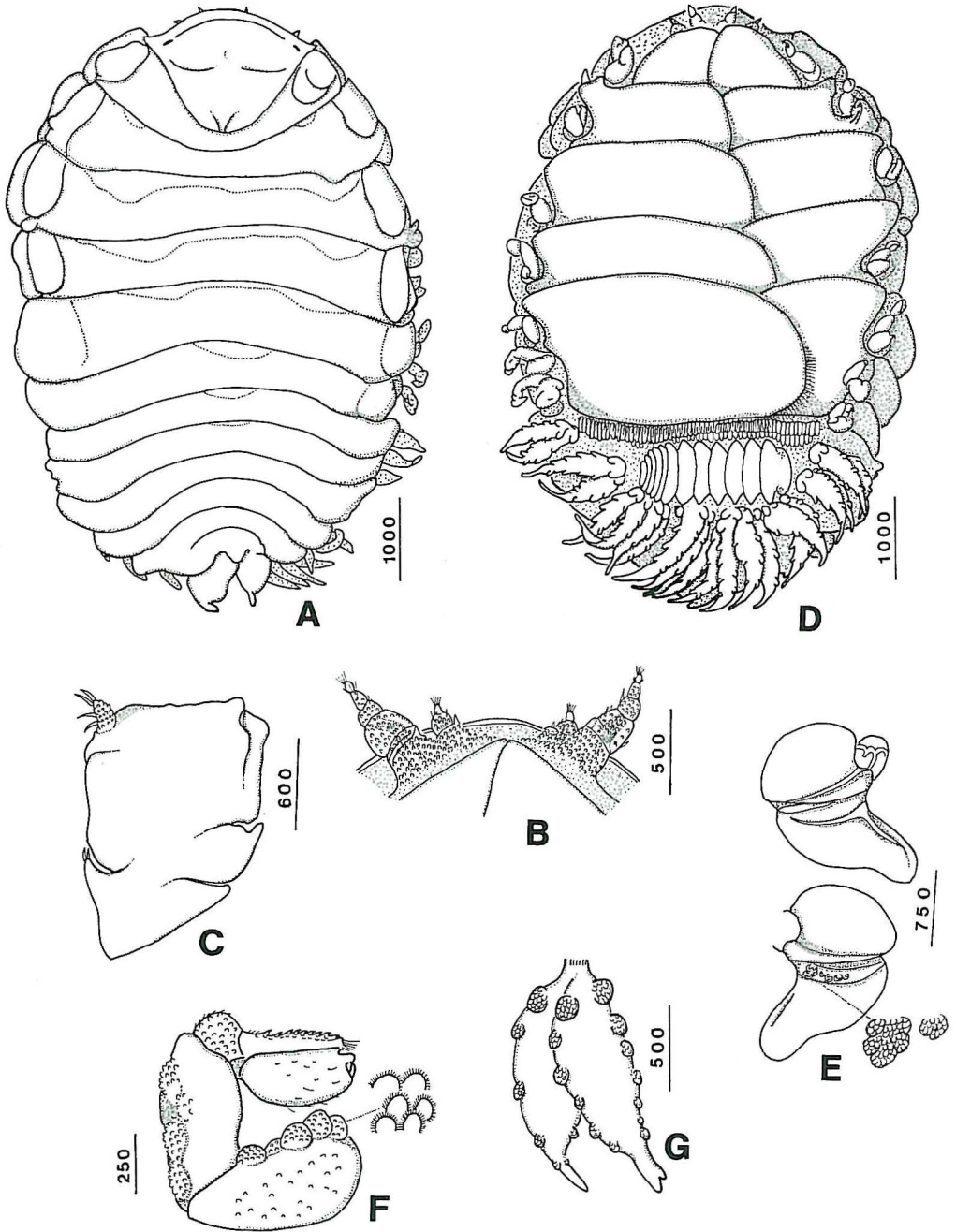


Fig 2 : *Progebiophilus bruscai* n. sp., Female, A. Holotype in dorsal view, B. Antennae from paratype, C. Left maxilliped from paratype in frontal view, D. Holotype in ventral view, E. First left oostegite from paratype in dorsal and ventral views, F. Pereopod from paratype, G. Pleopodal rami from paratype (all scales in  $\mu\text{m}$ ).

Male. Paratype (Fig. 3A) length 1.8 mm, maximal width 0.9 mm. Outline elliptical without any abrupt change in contour.

Head anteriorly circular, fused with first pereonite but defined laterally, with two posterolateral groups of eyespots.

Antennae (Fig. 3B) of three and five articles respectively ; both distally setose with some setae on other articles. Triangular maxillipeds, with one distal seta.

Pereonites free from each other, laterally produced into sub-triangular distally rounded lobes. Pereonite 6 with a midventral tubercle (Fig. 3C) and another ill-defined one in pereonite 7. Pereopods (Fig. 3D) slightly decrease in size posteriorly ; basis with a few basal spines ; ischium rounded, smooth ; carpus distally setose and with a median tubercle and two setae ; propodus with a few distal spines ; dactylus smooth fitting into a depression with two coarse spines.

Pleon with six free pleonites. Five pairs of paddle-like pleopods (Fig. 3C). Anus ventroterminal, pleotelson with conspicuous postero-lateral uropods, each distally setose, smaller than the pleotelson.

Type locality. El Comitán, Laguna de La Paz, Bahía de La Paz, Baja California Sur, Mexico. Intertidal in soft bottoms.

Distribution. Presently known only from the intertidal sandy areas of Bahía de La Paz, B.C.S., southwestern Gulf of California, Mexico.

Etymology. The species is named as a modest homage to the striking influence of Dr. Richard C. Brusca for his work on intertidal invertebrates and their ecology, from the Gulf of California, and especially on marine isopods ; a group which he is enthusiastically changing from a difficult status, into a less difficult and more interesting group.

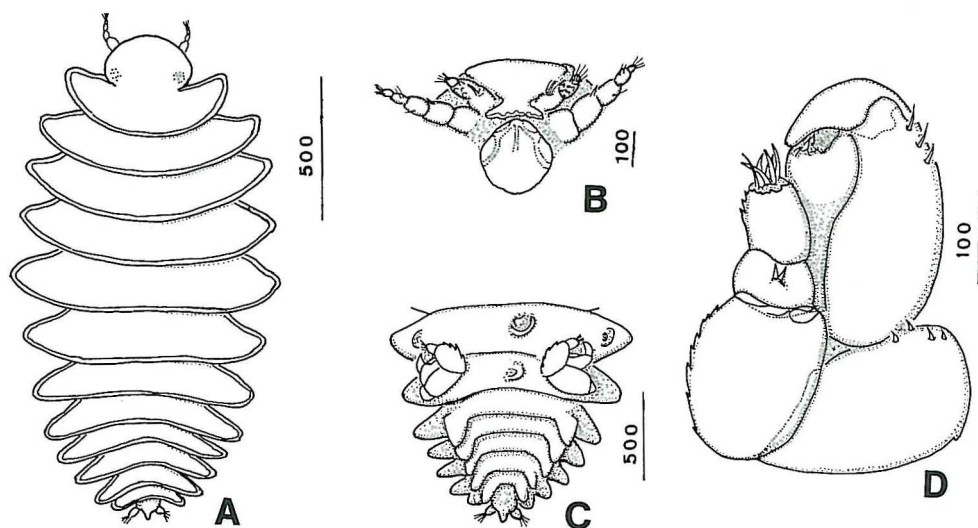


Fig 3 : *Progebiophilus bruscai* n. sp., Male, A. Paratype in dorsal view, B. Antennae from paratype, C. Ventral view of the posterior end of another paratype, D. First Pereopod from another paratype (as seen under a cover slip ; all scales in µm).

Variation. Females : 2.5 - 8.0 mm in length (including juveniles). Young forms rounded, its length and width are subequal, body axis distortion not so marked as in larger females and development of coxal plates conspicuous on both sides. Pleopods of smaller females almost smooth, without any tubercles. Tubercles appear to be size-dependent but some smaller females have larger tubercles than some larger females. Eye development appears to be size-related too. Larger females have two larger lateral eyespots rows made up of two contiguous groups, while in smaller females eyespots are made of up to four groups on each. Male always attached to the same site, between the pleopodal rami, most had the head towards the side with shorter pleopodal rami or larger lateral plates.

Males : 1.0 - 2.0 mm in length. Body outline without any abrupt change. Uropods slightly larger than the pleotelson. Most of the shorter males (1.0 - 1.5 mm) with darkly pigmented areas dorsally but mainly on the pleonal dorsal surface.

#### DISCUSSION

The Epicarid infesting the mud-shrimp *Upogebia dawsoni* Williams corresponds to the diagnosis of the genus *Progebiophilus* Codreanu & Codreanu, 1963, established by Bourdon (1985). But it has now to be modified because of the inclusion of *P. sinicus* Markham, the male of which has neither pleopods nor uropods or posterodistal lobes to the pleotelson.

The *P. bruscai* n. sp. female is related to *P. urogebiae* (Hay, 1917 ; Lemos de Castro, 1965 ; Markham 1988) and to *P. sinicus* Markham, 1985 by the size of the antero-part of the pleon, as large as the seventh pereonit, but is differentiated by features related in Table I, which also shows male characteristics.

TABLE I

Main differential features among three closely related species of *Progebiophilus*.

Sexe	Feature	<i>P. bruscai</i> n. sp	<i>P. urogebiae</i> (Hay) <sup>1</sup>	<i>P. sinicus</i> Markham <sup>2</sup>
♀	Coxal plates 1-4	All more narrow than the adjacent latero-thoracic boss		3-4 from deformed, twice aswide as the boss
♀	Row of tubercles in oostegites 5	Absent	Present	Present
♂	Pleopods	Present	Present	Absent
♂	Uropods	Well developped	Rudimentary	Absent

1 Based on the original description by Hay (1917) and the redescription by Lemos de Castro (1965).

2 Based on the original description by Markham (1980).

Key to males of *Progebiophilus* species  
(Modified from Bourdon 1985)

1	Midventral tubercles absent ; pereonites laterally rounded .....	2
	- Midventral tubercles present .....	5
2 (1)	Pleopods as expanded large plates .....	3
	- Pleopods as rounded short lobes .....	4
3 (2)	Pleonites laterally extended ; pleotelson with elongated uropods .....	<i>P. euxinicus</i> (Popov)
	- Pleonites 5-6 ventrally directed ; uropods absent .....	<i>P. chapini</i> (van Name)
4 (2)	Pereonites laterally acute .....	<i>P. backeri</i> (Hale)
	- Pereonites laterally rounded or truncated .....	<i>P. brevis</i> Bourdon
5 (1)	Pereonites laterally acute .....	6
	-Pereonites laterally rounded .....	8
6 (5)	Pleotelson distally rounded ; uropods reduced, much shorter than pleotelson or absent .....	7
	-Pleotelson distally pointed ; pleopods present ; uropods well- developed, slightly shorter than pleotelson .....	<i>P. bruscai</i> n. sp.
7 (6)	Pleopods present ; uropods as two small lateral projections .....	<i>P. upogebiae</i> (Hay)
	- Pleopods absent ; uropods absent .....	<i>P. sinicus</i> Markham
8 (5)	Pleotelson with well developed uropods .....	<i>P. villosus</i> (Shiino)
	- Pleotelson with tuberculiform uropods .....	<i>P. filicaudatus</i> (Shiino)

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Appendix 1. Alphabetical list of epicarideans and their hosts recorded from México.

*Aporobopyrus muguensis* Shiino, Host : *Pachycheles rudis* Stimpson, many specimens from Ensenada, Baja California (Ramírez 1982 ; Campos-González & Campoy-Farela 1987).

Athelginae, gen. sp. ?, Host : *Tomopagurus cokeri* (Hay), one specimen from Yucatán (Markham 1978).

*Bathygyge grandis* Hansen, Host : *Glyphocrangon spinulosa* Faxon, one specimen Acapulco, Guerrero (Hansen 1897).

Bopyridae, gen. sp.?, Host : *Lysmata californica* (Stimpson) occasionally taken in the Gulf of California (Brusca 1980).

*Bopyrella harmopleon* Bowman, Host : *Synalpheus fritzmuelleri* Coutière, one specimen from Quintana Roo (Markham, 1988).

*Bopyrinella thorii* (Richardson), Host : *Thor floridanus* Kingsley, one specimen from Yucatán (Markham 1985).

- Bopyrione synalpheii* Bourdon & Markham, Host : *Synalpheus townsendi* (Coutière), one specimen from Yucatán (Markham 1985).
- Cancricepon choprai* (Nierstrasz & Brender à Brandis), Host : *Rithropanopeus harrissi* (Gould), one specimen from Veracruz (Markham 1975a).
- Danalia fraissei* Nierstrasz & Brender à Brandis, Host : *Cancricepon choprai* Nierstrasz & Brender à Brandis from Veracruz (Markham 1975).
- Diplophryxus siankaanensis* Markham, Host : *Alpheus formosus* Gibbes, from Quintana Roo (Markham 1988).
- Eophrinx subcaudalis* (Hay), Host : *Synalpheus brooksi* Coutière, four specimens from Quintana Roo (Markham 1985) ; Host : *Synalpheus bousfieldi* Chace, four specimens from Quintana Roo (Markham 1988).
- Gigantione mortenseni* Adkison, Host : *Dromidia antillensis* Stimpson, one specimen from Yucatán (Adkison 1984).
- Hemiarthrinae, gen. sp.?, Host : *Synalpheus pectiniger* Coutière, from Yucatán (Markham 1985) ; Host : *Salmoneus ortmanni* (Dankin), one specimen from Yucatán (Markham 1985).
- Hemioniscus balani* Buchholz, Host : *Chthamalus pissus* Darwin, many specimens from Baja California (Campos-González & Campoy-Favela 1987).
- Munidion pleuroncodis* Markham, Host : *Pleuroncodes planipes* Stimpson, one specimen from Baja California (Markham 1975 b).
- Parargeia ornata* Hansen, Host : *Sclerocrangon procax* Faxon, one specimen off Acapulco Guerrero (Hansen 1897).
- Phylloporus abdominalis* Stimpson, Host : *Upogebia pugettensis* (Dana) and *U. macginitieorum* Williams, four specimens from Baja California (Campos-González & Campoy-Favela 1987).
- Probopyrus pandalicola* (Packard), Host : *Macrobrachium olfersii* Wiegmann, from Veracruz, Veracruz (as *P. bithynis*, Pearse 1911) ; Host : *Palaemonetes vulgaris* (Say), one specimen from Progreso, Yucatán (as *P. creaseri* Pearse 1936) ; Host : *Macrobrachium cf. acanthurus* (Wiegmann), several specimens from Tuxtepec, Veracruz (as *P. papaloapanensis* Rioja 1949) ; Host : *Macrobrachium acanthurus* (Wiegman), one specimen from Campeche, Campeche (Markham 1985) ; Host ; *Palaemon northropi* (Rankin), one specimen from Quintana Roo (Markham 1985) : Host : *Palaemon ritleri* Holmes many specimens from San Felipe, Baja California (Campos-González & Murillo-Peralta 1987). [These synonyms are after Markham (1985). As stated by Adkison (1988 *in litt.*), some species names might be retained when their life history become clarified (*cf.* Szidat, 1977)].
- Pseudione galacanthae* Hansen, Host : *Galacantha diomedae parvispina* Faxon, five specimens from the Gulf of California (Hansen 1897).
- Pseudione trilobata* Nierstrasz & Brender à Brandis, Host : *Petrolisthes hians* Nobili, six specimens from Zihuatanejo, Guerrero (Bourdon 1976).



- Pseudione* sp., Host : *Munidopsis nitida* (A. Milne-Edwards) from Campeche (Markham 1974) ; Host : *Paguristes anahuacus* Glassell, common in the Gulf of California (Brusca 1973, 1980) ; Host : *Clibanarius dugueti* Bouvier, common in the Gulf of California (Brusca 1980).
- Pseudioninae, gen. sp.?, Host : *Petrolisthes edwardsi* (de Saussure) one specimen from Chamela, Jalisco (Bourdon 1976).
- Synalpheion giardi* Coutière, Host : *Synalpheus longicarpus* Herrick, one specimen from Yucatán (Coutière 1908).
- Thermaloniscus cotylophorus* Bourdon, Host : Unknown, one specimen from hydrothermal vents (12°48' N, 103°56' W ; 2 620 m) in the Pacific coast of México (Bourdon 1983).

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