
8. Crab-Infesting Bopyrid Isopods in the Philippines

Jonel M. Corral

The bopyrid isopod is a marine parasite that is known to infect decapods such as crabs and shrimps. This parasite is unique in using crustaceans as both intermediate and definitive hosts. Bopyrid is diverse with 605 species, as reported by Williams and Boyko (2012)¹, but may have increased its number at present. The highest diversity of bopyrids are within the North West Pacific, followed by the East Asian Sea and the Central Indian Oceans. Infestation of bopyrid causes negative effects on the morphology and reproductive capacity of decapod hosts.

Taxonomic research on bopyrid was well conducted in Japan among the Asian countries. Records was published as early as 1933 by carcinologist Prof. Sueo M. Shiino in the *Memoires of the College of Science, Kyoto Imperial University*, titled as *Bopyrids from Tanabe Bay* and produced five volumes from 1933 to 1939, not to mention his many separate taxonomic publications on bopyrid isopod². In 2000, a preliminary check list of isopod crustaceans in Japan was published³, where 85 species of bopyrid species was listed.

Keponinae is a bopyrid subfamily that infest brachyuran crabs^{1, 4}. This parasite is of great interest to the fishing industry because it inhibits the reproduction and body condition of crabs^{5, 6}. In Japan, 14 species were known for this subfamily, but subsequently two species were added to the Japanese fauna^{4, 7}. In the Philippines, bopyrid infesting brachyuran crab was first recorded by Prof. Harriet Richardson during the expedition of the U.S. Fisheries Steamer Albatross in the Philippine waters in 1907-1908⁸. Richardson collected ten species of bopyrid isopods, but only one species from the subfamily Keponinae was described to infest a true crab, the Xanthid crab. The subsequent publications for bopyrid isopod were recorded mostly from hosts Anomuran and shrimps. Until recently, Dela Cruz et al. (2020) recorded a parasitic isopod infecting a portunid crab collected in Manila Bay⁹. This recent publication added to the only record of a bopyrid isopod infecting brachyuran crab more than 100 years ago. A preliminary list of bopyrid isopods in the Philippines is given in Table 1. So far, 31 bopyrid species are known.

The Philippines is endowed with natural resources including the decopod crustaceans. A comprehensive checklist of Philippines decopods was published by Prof. Eulogio P. Estampador of The University of the Philippines in 1937 and updated the list in 1959^{10, 11}. The listing includes 522 species belonging to 207 genera and 58 families. From this, about 307 species of brachyuran crabs were listed. Following this, many other taxonomic reports have been published on brachyuran crabs. Despite this diversity of crabs in the Philippines, studies on parasitic isopods have not received much attention. Considering the rich biodiversity of the country, the Philippines may have an abundant undescribed bopyrid isopod species.

Reference

- 1 Williams, J.D., Boyko, C.B. 2012. The global diversity of parasitic isopods associated with crustacean hosts (Isopoda: Bopyroidea and Cryptoniscoidea). *PLoS ONE*. 7, e35350.
- 2 Ooishi, S. 1979. Sueo M. Shiino (1908-1978). *Crustaceana*. 36, 173-181.
- 3 Saito, N. et al. 2000. A preliminary check list of isopod crustaceans in Japan. *Bulletin of Toyama Science Museum*. 23, 11-107.
- 4 Corral, J.M. et al. 2019. Two new records of Bopyridae (Crustacea: Isopoda) infesting brachyuran crabs from Japan. *Kuroshio Science*. 13, 18-22.
- 5 Corral, J.M. et al. 2019. Parasitic effects of the bopyrid *Megacepon goetici* (Crustacea: Isopoda) on the varunid crab *Gaetice depressus*. *Diseases of Aquatic Organisms*. 135, 71-75.
- 6 Corral, J.M. et al. 2021. Differences in the parasitic effects of a bopyrid isopod and rhizocephalan barnacle on the portunid crab, *Charybdis bimaculata*. *Parasitology International*. 81, 102283.
- 7 Uyeno, D., Boyko, C.B. 2020. A new genus of entoniscid isopod (Crustacea: Peracarida: Bopyroidea) parasitic on common intertidal shore crabs from the Ryukyu Islands, Japan, with a new distributional record of *Kepon grapsi* (Nobili, 1905) (Bopyridae) nov. comb. *Crustacean Research*. 49, 203-219.
- 8 Richardson, H. 1910. Marine isopods collected in the Philippines by the U.S. Fisheries steamer Albatross in 1907-8. *Bureau of Fisheries Document*. 736: 1-44.
- 9 Dela Cruz, M.B. et al. 2020. New record of parasitic isopod (Isopoda: Bopyridae) infecting the branchial chamber of blue swimming crab *Portunus pelagicus* (Linnaeus, 1758) (Decapoda: Portunidae) in the Philippines. *Journal of Fisheries*. 8, 746-751.
- 10 Estampador, E. 1937. A check list of Philippine crustacean decapods. *Philippine Journal of Science*. 62, 465-559.
- 11 Estampador, E. 1959. Revised check list of Philippine crustacean decapods. *Natural and Applied Science Bulletin*. 17, 1-125.

Table 1 List of bopyrid species in the Philippines

Bopyrid species	Host family	Host species	Philippine locality	Ref.
Argeiinae				
<i>Argeiopsis inhacae</i> Kensley, 1974	Stenopodidae	<i>Stenopus hispidus</i>	“Location unknown”	1)
Bopyrinae				
<i>Probopyrus ascendens</i> (Semper, 1880)	Palaemonidae	<i>Palaemon lar</i>	“Location unknown”	2)
<i>Parabopyrella</i> sp.	Lysmatidae	<i>Lysmata amboinensis</i>	“Location unknown”	3)
Keponinae				
<i>Allokepon monodi</i> (Bourdon, 1967)	Portunidae	<i>Portunus pelagicus</i>	Manila Bay	4)
<i>Cancricepon xanthi</i> (Richardson, 1910)	Xanthidae	<i>Phymodius unguulatus</i>	Lubang Island	5)
Orbioninae				
<i>Epipenaeon ingens ingens</i> Nobili, 1906	Penaeidae	<i>Penaeus semisulcatus</i>	Navotas Fishery Port*	6)
<i>Orbione halipori</i> Nierstrasz & Brender a Brandis, 1923	Solenoceridae	<i>Haliporoides sibogae</i>	Luzon Sea	7)
<i>Orbione thielemanni</i> Nierstrasz & Brender a Brandis, 1931	Penaeidae	<i>Penaeus semisulcatus</i>	Palawan	8)
<i>Parapeneon brevocoxalis</i> Bourdon, 1981	Penaeidae	<i>Penaeopsis rectacuta</i>	Cebu	8)
<i>Parapenaeon japonica</i> (Thielemann, 1910)	Penaeidae	<i>Metapenaeopsis velutinus</i>	Panay Island (Sibuyan Sea)	7)
<i>Parapenaeon secunda</i> Nierstrasz & Brender a Brandis, 1923	Penaeidae	<i>Metapenaeopsis palmensis</i>	Luzon Sea	7)
<i>Orbione bonniieri</i> Nobili, 1906	“Host unknown”	“Host unknown”	Tawi-Tawi	5)
<i>Orbione penei</i> Bonnier, 1900	“Host unknown”	“Host unknown”	Panay Island	5)

Pseudioninae

<i>Aporobopyrina lamellata</i> Shiino, 1934	Porcellanidae	<i>Petrolisthes lamarckii</i>	Mindanao	9)
<i>Aporobopyrus galleonus</i> Williams & Madad, 2010	Porcellanidae	<i>Petrolisthes</i> sp	Mindoro (Puerto Galera)	10)
<i>Aporobopyrus retrorsa</i> (Richardson, 1910)	Munididae	<i>Munida andamanica</i>	Tablas Strait (Sibuyan Sea)	5)
		<i>Munida philippinensis</i>	Luzon Sea	11)
		<i>Munida kuboi</i>	Luzon Sea	11)
<i>Asymmetrione asymmetrica</i> (Shiino, 1933)	Calcinidae	<i>Calcinus minutus</i>	Batangas	12)
		<i>Clibanarius virescens</i>	Mindoro (Puerto Galera)	12)
		<i>Dardanus lagopodes</i>	“Location unknown”	12)
<i>Asymmetrione harmoniae</i> Williams, Boyko & Madad, 2019	Calcinidae	<i>Dardanus lagopodes</i>	Batangas; Cebu	12)
		<i>Dardanus megistos</i>	Bohol (Panglao Island)	12)
<i>Bopyrissa marami</i> Williams, Boyko & Madad, 2019	Calcinidae	<i>Calcinus gaimardii</i>	Puerto Galera; Cebu; Batangas	12)
		<i>Calcinus latens</i>	Batangas	12)
		<i>Calcinus minutus</i>	Mindoro (Puerto Galera)	12)
<i>Bopyrissa xiphidiostega</i> Williams, Boyko & Madad, 2019	Calcinidae	<i>Calcinus gaimardii</i>	Puerto Galera	12)
		<i>Calcinus minutus</i>	Batangas	12)
		<i>Dardanus lagopodes</i>	Cebu	12)
<i>Bopyrophryxus branchiabdrominalis</i> Codreanu, 1965	Parapaguridae	<i>Paragiopagurus acutus</i>	Mindoro	13)
<i>Eremitione clibanaricola</i> (Shiino, 1933)	Calcinidae	<i>Calcinus gaimardii</i>	Puerto Galera; Bataan	12)
		<i>Calcinus minutus</i>	Batangas	12)
<i>Munidion laterale</i> Richardson, 1910	“Galatheid”		(Davao Harbor) Dumalag Island	5)
	Munididae	<i>Paramunida scabra</i>	Luzon Sea	11)
<i>Pagurion tuberculata</i> Shiino, 1933	Calcinidae	<i>Dardanus lagopodes</i>	Batangas	12)
<i>Pleurocrypta macrocephala</i> Nierstrasz & Brender a Brandis, 1923	Porcellanidae	<i>Petrolisthes</i> sp	Mindoro (Puerto Galera)	10)
<i>Pleurocryptella laevis</i> (Richardson, 1910)	Munididae	<i>Agonida analoga</i>	Batangas (Malabrigo, Lobo)	11)
<i>Pseudione elongata elongata</i> (Hansen, 1897)	Nematocarcinidae	<i>Nematocarcinus</i> sp	Zamboanga	14)
<i>Pleurocryptella laevis</i> (Richardson, 1920)	“Host unknown”		Corregidor; Malabrigo	5)
<i>Pseudione fibriata</i> Richardson, 1910	“Host unknown”		Antique (Nogas Island, Sulu Sea)	5)
<i>Pseudione incerta</i> Richardson, 1910	“Host unknown”		Mindanao; Tagalo Light	5)
<i>Parione lamellata</i> Richardson, 1910	“Host unknown”		Bohol (Balicasag Island)	5)

References: 1) Calado, R., Bartilotti, C., Goy, J.W., and Dinis, M.T. 2008. Parasitic castration of the stenopodid shrimp *Stenopus hispidus* (Decapoda: Stenopodidae) induced by the bopyrid isopod *Argeiopsis inhacae* (Isopoda: Bopyridae). J. Mar. Biolog. Assoc. U.K. 88(2): 307-309; 2) Chopra, B. 1923. Bopyrid isopods parasitic on Indian Decapoda Macrura. Recs Indian Mus. 25: 411-550; 3) Calado, R., Vitorino, A., and Dinis, M.T. 2006. Bopyrid isopods do not castrate the simultaneously hermaphroditic shrimp *Lysmata ambionensis* (Decapoda: Hippolytidae). Dis Aquat Org 73: 73-76; 4) Dela Cruz, M.B., Quiazon, K.M.A., and Vera Cruz, E.M. 2020. New record of parasitic isopod (Isopoda: Bopyridae) infecting the branchial chamber of blue swimming crab *Portunus pelagicus* (Linnaeus, 1758) (Decapoda: Portunidae) in the Philippines. <http://journal.bdfish.org/index.php/fisheries/article/view/JFish20136>; 5) Richardson, H. 1910. Marine isopods collected in the Philippines by the U.S. Fisheries steamer Albatross in 1907-8. Bureau of Fisheries Document. 736: 1-44; 6) Palisoc, F. 1987. Observations on the host-parasite relationship of *Epipenaeon ingens* Nobili (Epicaridea: Bopyridae) and *Penaeus semisulcatus* De Haan. Philipp J. Sci. 116: 281-293; 7) Markham, J.C., 1994. Crustacea Isopoda: Bopyridae in the Musorstom collections from the tropical Indo-Pacific I. Subfamilies Pseudioninae (in part), Argeiinae, Orbioninae, Athelginae and Entophilinae. Memoires de Museum National d'histoire Naturelle 161, 225-253; 8) Bourdon, R., 1981. Crustacés Isopodes. I. Bopyridae parasites des Pénéides. Résultats des Campagnes MUSORSTOM. I. Philippines (18-28 mars 1976), vol. 1, 10. Mémoires ORSTOM 91, pp. 237-260; 9) Markham, J. C. 1985. Additions to the bopyrid isopod fauna of Thailand. Zoologische Verhandelingen 224: 1-63; 10) Williams, J.D., and Madad, A.Z. 2010. A new species and record of branchial parasitic isopods (Crustacea: Isopoda: Bopyridae: Pseudioninae) of porcellanid crabs from the Philippines. Exp. Parasitol. 125: 23-29; 11) An, J., Boyko, C.B., and Yu, H. 2012. New records and hosts for three species of pseudionine bopyrids (Crustacea: Isopoda: Bopyridae) parasitizing munidid squat lobsters (Crustacea: Anomura: Munididae) in Philippine waters. J. Nat. Hist. 46:45-46; 12) Williams, J.D., Boyko, C.B., and Madad, A.Z. 2019. Branchial parasitic isopods (Crustacea: Isopoda: Bopyridae: Pseudioninae) of hermit crabs (Crustacea: Decapoda: Diogenidae) from the western Pacific, with descriptions of a new genus and three new species. Raffles Bull. Zoo. 67: 83-118; 13) Bourdon, R., and Boyko, C. B. 2005. Redescription of *Bopyrophryxus branchiabdrominalis* Codreanu, 1965 (Crustacea: Isopoda: Bopyridae) with a reappraisal of the subfamily Bopyrophryxinae Codreanu, 1965. Proc. Biol. Soc. Wash. 118(1): 108-116; 14) Kensley, B. 1968. *Pseudione elongata africana*, a new subspecies of bopyrid isopod from the West Coast of the Cape Peninsula, South Africa. Crustaceana 15(2): 188-192; *Collected in the water off Palawan, Cebu, Samar, and Capiz, Manila Bay and Tayabas Bay