

## Research Note

# Two new records of Bopyridae (Crustacea: Isopoda) infesting brachyuran crabs from Japan

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### ABSTRACT

Two species of bopyrid isopods infesting brachyuran crabs were first recorded from Japan. *Allokepon hendersoni* (Giard and Bonnier, 1888) of the subfamily Keponinae, infesting *Charybdis bimaculata*, was collected in Tosa Bay, Pacific coast of southern Japan. This species is a branchial parasite of portunid crabs, so far collected in India infesting *C. callianassa* and in China infesting *C. bimaculata*. *Gigantione tau* An, Yu and Markham, 2009 of the subfamily Pseudioninae, infesting *Carcinoplax longimanus*, was collected in Tosa Bay and Wakasa Bay, Sea of Japan. This species was described from the same host crab in China. Adding these species to Japanese fauna, 17 species of bopyrid isopods are known to infest brachyuran crabs in Japan.

Key words: *Allokepon hendersoni*, *Gigantione tau*, Epicaridea, Pacific, Japan Sea

### INTRODUCTION

Members of the family Bopyridae Rafinesque, 1815 are isopods parasitic on a wide variety of decapod crustaceans. Several genera of the subfamily Keponinae and *Gigantione* of the subfamily Pseudioninae include parasites in the branchial chamber of brachyuran crabs. In Japanese waters, 15 species of bopyrid isopods infesting brachyuran crabs have been recorded (Saito et al. 2000, Saito 2002). During a survey of subtidal portunid and goneplacid crabs in 2017 and 2018, *Charybdis bimaculata* and *Carcinoplax longimanus* were found to be parasitized by bopyrid isopods. Examination of the specimens revealed two species of Bopyridae new to Japanese fauna. The present paper reports *Allokepon hendersoni* (Giard and Bonnier, 1888) infesting *C. bimaculata* and *Gigantione tau* An, Yu & Markham, 2009 infesting *C. longimanus* for the first time in Japanese waters.

### MATERIALS AND METHODS

Materials for this study were collected from bycatch in trawl fisheries at Tosa-saga fishing port facing Tosa Bay, Pacific coast of southern Japan. Additional materials were

recovered from Wakasa Bay, Sea of Japan during the research cruise of R. V. *Ryokuyo-maru* of the Field Science Education and Research Center, Kyoto University. Digital photographs were taken with a Canon EOS camera mounted on a stereo microscope (Nikon SMZ800). Stacks of several frames of different focal planes were fused using Affinity Photo (Serif (Europe) Ltd, 2019). Drawings were made using Affinity Designer (Serif (Europe) Ltd, 2019). All measurements are given in millimeters; host size as carapace width (CW) and parasite size as body length from the anterior margin of the head to the posterior margin of the telson excluding uropods (BL). The specimens are deposited with hosts in Osaka Museum of Natural History (OMNH) or the Laboratory of Marine Symbiotic Biology, Kochi University (LMSB KU).

### RESULTS

Family Bopyridae Rafinesque, 1815

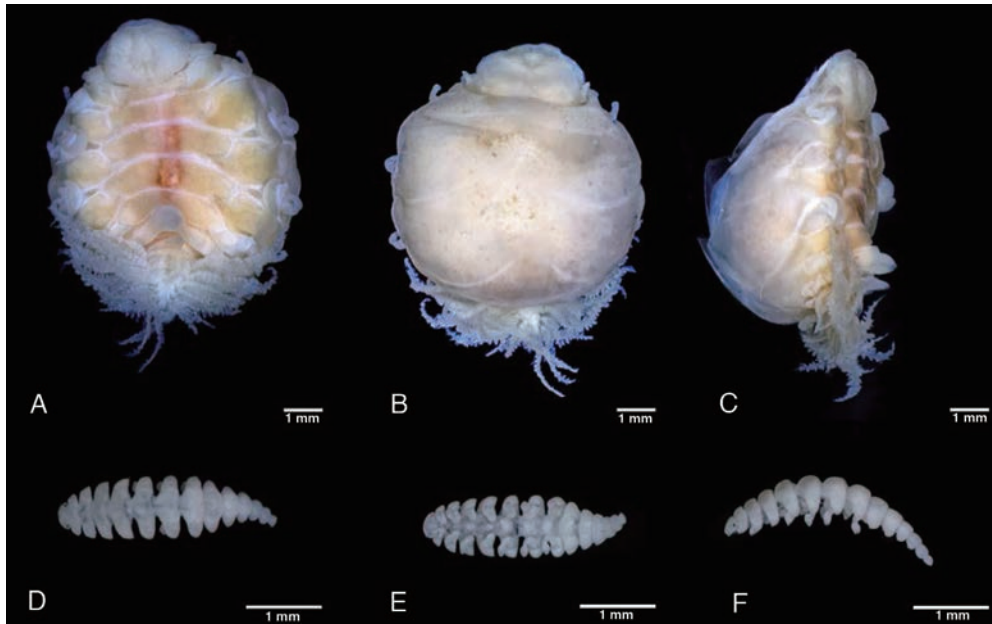
Subfamily Keponinae Boyko, Moss, Williams and Shields, 2013

*Allokepon* Markham, 1982

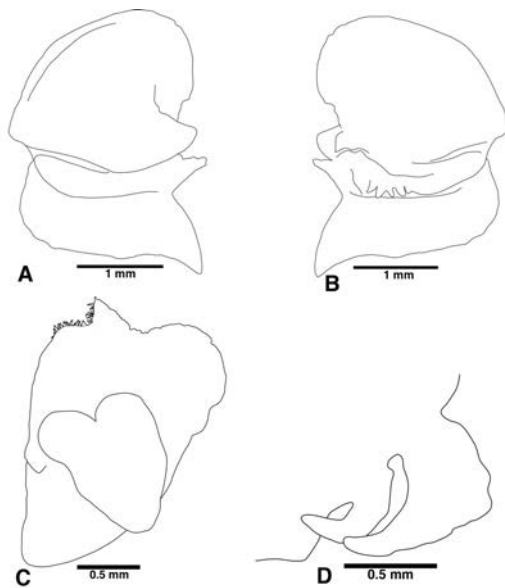
*Allokepon hendersoni* (Giard and Bonnier, 1888) (Figs. 1 and 2)

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**Fig. 1.** *Allokepon hendersoni*. Female (OMNH-Ar 11361, 7.27 mm BL) (A-C). A, dorsal view. B, ventral view. C, left side, lateral view. Male (LMSB KU 2017-07, 3.21 mm BL) (D-F). D, dorsal view. E, ventral view. F, left side, lateral view.



**Fig. 2.** *Allokepon hendersoni*. Female (LMSB KU 2017-07, 8.69 mm BL). A, left first oostegite, external view. B, same, internal view. C, left maxilliped, external view. D, barbula, left side.

*Portunicepon hendersoni* Giard & Bonnier, 1888: 44-47 [original description]; Bonnier, 1900: 274-276, planche XI; Shiino, 1934: 276 [systematic account].

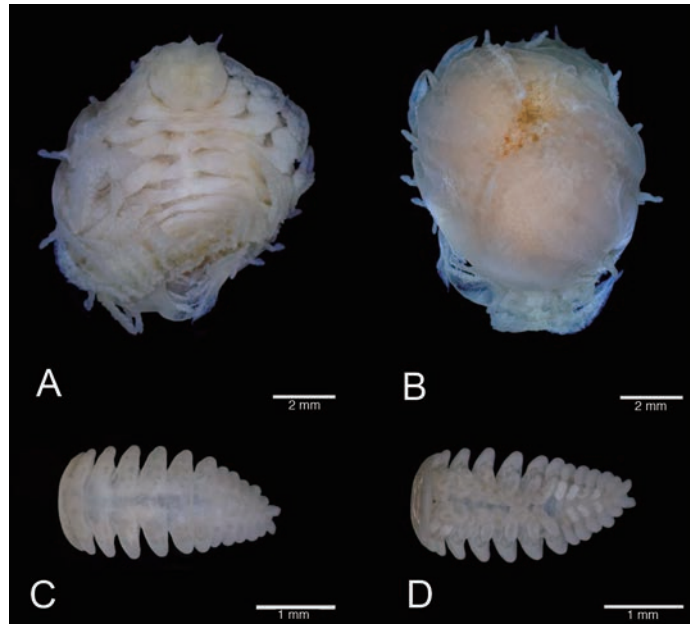
*Allokepon hendersoni* (Markham, 1982): 357 [systematic account]; Duan, An & Yu, 2008: 62-68, fig. 1.

**Materials examined:** Ovigerous female (7.36 mm BL) with male (unmeasured), infesting male *Charybdis bimaculata*

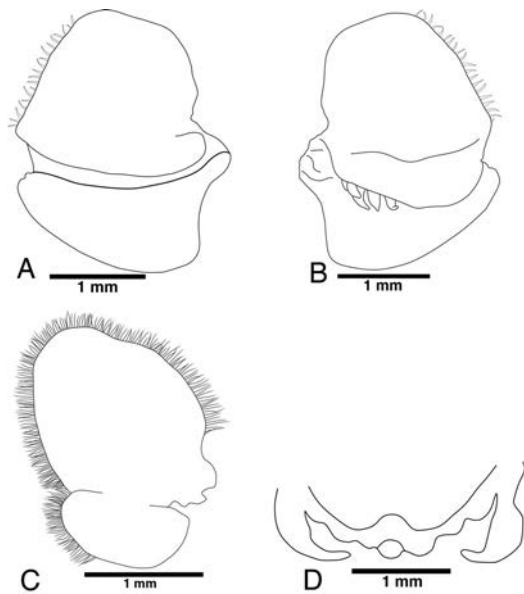
(25.85 mm CW), off Tosa-saga fishing port, Tosa Bay (33° 03'N, 133°08'E), 80-100 m, coll. J. M. Corral, 24 November 2017 (OMNH-Ar 11361). Ovigerous female (8.69 mm BL) with male (3.21 mm BL), infesting male *C. bimaculata* (31.68 mm CW), off Tosa-saga fishing port, Tosa Bay (33°03'N, 133°08'E), 80-100 m, coll. J. M. Corral, 24 November 2017 (LMSB KU 2017-07). Female (6.96 mm BL) with male (unmeasured), infesting male *C. bimaculata* (26.13 mm CW), off Tosa-saga fishing port, Tosa Bay (33°03'N, 133°08'E), 80-100 m, coll. J. M. Corral, 24 November 2017 (LMSB KU 2017-08). Ovigerous female (6.61 mm BL) with male (unmeasured), infesting male *C. bimaculata* (21.33 mm CW), off Tosa-saga fishing port, Tosa Bay (33°03'N, 133°08'E), 80-100m, coll. J. M. Corral, 24 November 2017 (LMSB KU 2017-09). Female (5.24 mm BL) with male (unmeasured), infesting male *C. bimaculata* (22.51 mm CW), off Tosa-saga fishing port, Tosa Bay (33°03'N, 133°08'E), 80-100 m, coll. J. M. Corral, 2 August 2017 (LMSB KU 2017-10).

**Remarks:** *Allokepon* can be differentiated with other related bopyrid genera on having mediadorsal bosses on pereonites VI and VII (Fig. 1A, C) and possessed a shorter first oostegite (Fig. 2A, B) in females (Boyko 2003). The specimens are readily assignable to *A. hendersoni* as described on the Chinese specimens infesting the same host crab species by Duan et al. (2008) in that the females have a bilobate head and uropods as large as lateral plates of pleomere 5.

**New Japanese name:** Futahoshi-ishigani-eramushi



**Fig. 3.** *Gigantione tau*. Female (OMNH-Ar 11362, 6.92 mm BL) (A-B). A, dorsal view. B, ventral view. Male (OMNH-Ar 11362, 3.78 mm BL) (C-D). C, dorsal view. D, ventral view.



**Fig. 4.** *Gigantione tau*. Female (LMSB KU 2017-06, 7.72 mm BL). A, left first oostegite, external view. B, same, internal view. C, left maxilliped, external view. D, barbula.

Subfamily Pseudioninae Codreanu, 1967

*Gigantione* Kossmann, 1881

*Gigantione tau* An, Yu & Markham, 2009

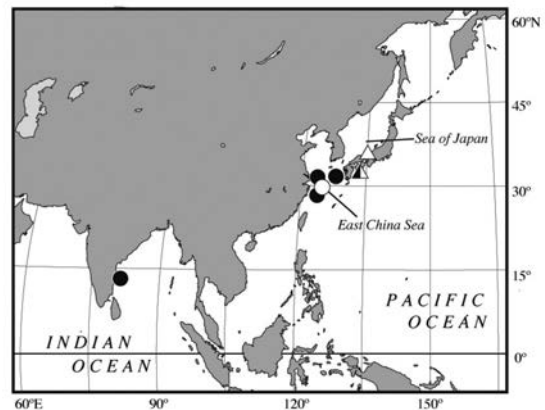
(Figs. 3 and 4)

*Gigantione tau* An, Yu & Markham, 2009: 346-350 fig. 7-8.

**Materials examined.** Ovigerous female (6.92 mm BL) with male (3.78 mm BL), infesting female *Carcinoplax longimanus* (24.84 mm CW), off Tosa-saga fishing port, Tosa Bay

(33°03'N, 133°08'E), 80-100 m, coll. J. M. Corral, 14 July 2017 (OMNH-Ar 11362). Female (7.72 mm BL) without male, infesting male *C. longimanus* (24.19 mm CW), off Tosa-saga fishing port, Tosa Bay (33°03'N, 133°08'E), 80-100 m, coll. J. M. Corral, 14 July 2017 (LMSB KU 2017-06). Female (7.94 mm BL) with male (unmeasured), infesting female *C. longimanus* (23.06 mm CW), Wakasa Bay (35°45'N, 135°20'E), 92 m, coll. Y. Henmi, 30 November 2018 (LMSB KU 2018-02). Female (7.20 mm BL) with male (unmeasured), infesting male *C. longimanus* (22.06 mm CW), Wakasa Bay (35°45'N, 135°20'E), 92 m, coll. Y. Henmi, 30 November 2018 (LMSB KU 2018-03).

**Remarks:** The specimens are readily assignable to *G. tau* as described on the Chinese specimens (Fig. 5) infesting the same



**Fig. 5.** Distribution of *Allokepon hendersoni* (closed) and *Gigantione tau* (open). Triangles (this study) and circles indicate the records inside and outside Japan, respectively.

host crab species by An et al. (2009) in that the females have tuberculated lateral plates (Fig. 3A) and its barbula having a pair of ventral projections (Fig. 4D). “T”-shaped pigmentation was observed on the surface of head, but not so conspicuous in Japanese specimens (Fig. 3A).

**New Japanese name:** Enkougani-no-erayadori

## DISCUSSION

*Allokepon hendersoni* (Giard and Bonnier, 1888) was first described as *Portunicepon hendersoni* in Madras, India (Fig. 5), infesting the portunid crab *Charybdis callianassa* (= *Thalamita callianassa*) (Giard and Bonnier 1888). Markham (1982) established the genus *Allokepon* and designated *P. hendersoni* as the type-species. Presently, the genus includes five species; *A. hendersoni*, *A. longicauda*, *A. monodi* (formerly *Portunicepon monodi*), *A. sinensis* (formerly *Grapsicepon sinensis*), and *A. tiariniae* (formerly *Portunicepon tiariniae*) (Boyko 2003). All but *A. tiariniae* are the parasites of portunid crabs.

The genus *Gigantione* Kossmann, 1881 contains 18 previously described species (An et al. 2017). Four species of the genus, *G. notonyxae*, *G. rhombos*, *G. tau*, and *G. tuberculata*, were recorded to infest the goneplacoid crabs Goneplacidae and Euryolacidae (An et al. 2017). Other eleven species are parasites of the crabs of the families Pilumnidae, Xanthidae, Carpiliidae and the other three species are parasitic on the shrimps of the family Axiidae (An et al. 2017).

The bopyrid species infesting portunid and goneplacid crabs were found in Japan for the first time. Adding these

species to Japanese fauna, 17 species of bopyrid isopods are known to infest brachyuran crabs in Japan (Table 1).

## ACKNOWLEDGEMENTS

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**Table 1.** List of bopyrid species infesting brachyuran crabs in Japan.

| Bopyrid species  | Host crab family | Host crab species               | Japanese locality                           | References                     |
|--|------------------|---------------------------------|---|--------------------------------|
| <i>Keponinae</i> Boyko, Moss, Williams & Shields, 2013           |                  |                                 |   |                                |
| 1 <i>Allokepon hendersoni</i> (Giard and Bonnier, 1888)          | Portunidae       | <i>Charybdis bimaculata</i>     | Tosa Bay (Shikoku)                          | this study                     |
| 2 <i>Allokepon tiariniae</i> (Shiino, 1937)                      | Majidae          | <i>Menaethius monoceros</i>     | Shirahama (Honshu)                          | Shiino 1937, 1958              |
|  | Majidae          | <i>Tiarinia cornigera</i>       | Shirahama (Honshu)                          | Shiino 1937, 1958              |
| 3 <i>Apocepon pulcher</i> Nierstrasz & Brender à Brandis, 1930   | Leucosiidae      | <i>Philyra pisum</i>            | various localities (Honshu, Kyushu)         | Shiino 1934, 1936b, 1939, 1958 |
| 4 <i>Cancericepon xanthi</i> (Richardson, 1910)                  | Xanthidae        | <i>Actaea</i> sp.               | Shirahama (Honshu)                          | Shiino 1936a                   |
|  | Xanthidae        | <i>Paraxanthias elegans</i>     | Shirahama (Honshu)                          | Shiino 1936a                   |
|  | Xanthidae        | <i>Pilodius pilumnoides</i>     | Shirahama (Honshu)                          | Shiino 1936a                   |
| 5 <i>Epicepon japonicum</i> Nierstrasz & Brender à Brandis, 1931 | Tymolidae        | <i>Tymolus japonicus</i>        | Izu (Honshu)                                | Shiino 1936b                   |
|  | Tymolidae        | <i>Tymolus</i> sp.              | Misaki (Honshu)                             | Shiino 1936c                   |
| 6 <i>Grapsicepon magnum</i> Shiino, 1936                         | Majidae          | <i>Schizophrys aspera</i>       | Shirahama (Honshu)                          | Shiino 1936a                   |
| 7 <i>Grapsicepon rotundum</i> Shiino, 1936                       | Xanthidae        | <i>Leptodius exaratus</i>       | Shirahama (Honshu)                          | Shiino 1936a                   |
| 8 <i>Heterocephon marginatum</i> Shiino, 1936                    | Pinnotheridae    | <i>Pinnotheres parvulus</i>     | Izu, Misaki (Honshu)                        | Shiino 1936b                   |
|  | Pinnotheridae    | <i>Pinnotheres pholadis</i>     | Ariake Estuary (Kyushu)                     | Morita 1952                    |
| 9 <i>Megacepon choprai</i> George, 1947                          | Sesarmidae       | <i>Chiromantes dehaani</i>      | Okayama (Honshu)                            | Shiino 1958                    |
| 10 <i>Megacepon goetici</i> (Shiino, 1934)                       | Varunidae        | <i>Gaetice depressus</i>        | Mie, Shirahama (Honshu), Amami Is. (Ryukyu) | Shiino 1934, 1939, 1958        |
|  | Macrophthalmidae | <i>Macrophthalmus japonicus</i> | Amakusa (Kyushu)                            | Shiino 1939                    |
| 11 <i>Mesocepon toszimensis</i> Shiino, 1951                     | Leucosiidae      | <i>Arcania undecimspinosa</i>   | Mie (Honshu)                                | Shiino 1951                    |
| 12 <i>Onychocepon resupinum</i> Shiino, 1936                     | Pinnotheridae    | <i>Pinnotheres boninensis</i>   | Shirahama (Honshu)                          | Shiino 1936a                   |
| 13 <i>Scyracepon quadrihamatum</i> Shiino, 1936                  | Majidae          | <i>Maja japonica</i>            | Izu (Honshu)                                | Shiino 1936b                   |
| 14 <i>Tylokepon micippae</i> Shiino, 1950                        | Majidae          | <i>Micippa philyra</i>          | Shirahama (Honshu)                          | Shiino 1950                    |
| <i>Pseudioninae</i> Codreanu, 1967                               |                  |                                 |   |                                |
| 15 <i>Gigantione ishigakiensis</i> Shiino, 1941                  | Carpiliidae      | <i>Carpilius convexus</i>       | Ishigaki Is. (Ryukyu)                       | Shiino 1941                    |
| 16 <i>Gigantione sagamiensis</i> Shiino, 1958                    | Xanthidae        | <i>Actomera boninensis</i>      | Hayama (Honshu)                             | Shiino 1958                    |
| 17 <i>Gigantione tau</i> An, Yu, & Markham, 2009                 | Goneplacidae     | <i>Carcinoplax longimanus</i>   | Tosa Bay (Shikoku), Wakasa Bay (Honshu)     | this study                     |

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