

This article was downloaded by:[Williams, Jason D.]  
On: 29 October 2007  
Access Details: [subscription number 783597793]  
Publisher: Taylor & Francis  
Informa Ltd Registered in England and Wales Registered Number: 1072954  
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## Journal of Natural History

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713192031>

### Four new records and a new species of **Dactylokepon** Stebbing, 1910 (Epicaridea: Bopyridae: Ioninae) from Chinese waters

Jianmei An <sup>a</sup>, Haiyan Yu <sup>b</sup>, Jason D. Williams <sup>c</sup>

<sup>a</sup> School of Life Science, Shanxi Normal University, Linfen, P. R. China

<sup>b</sup> Institute of Oceanology, Chinese Academy of Sciences, Qingdao, P. R. China

<sup>c</sup> Department of Biology, Hofstra University, Hempstead, New York

Online Publication Date: 01 January 2007

To cite this Article: An, Jianmei, Yu, Haiyan and Williams, Jason D. (2007) 'Four new records and a new species of **Dactylokepon** Stebbing, 1910 (Epicaridea: Bopyridae: Ioninae) from Chinese waters', Journal of Natural History, 41:33, 2063 - 2079

To link to this article: DOI: 10.1080/00222930701554180

URL: <http://dx.doi.org/10.1080/00222930701554180>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article maybe used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

## Four new records and a new species of *Dactylokepon* Stebbing, 1910 (Epicaridea: Bopyridae: Ioninae) from Chinese waters

JIANMEI AN<sup>1</sup>, HAIYAN YU<sup>2</sup> & JASON D. WILLIAMS<sup>3</sup>

<sup>1</sup>School of Life Science, Shanxi Normal University, Linfen, P. R. China, <sup>2</sup>Institute of Oceanology, Chinese Academy of Sciences, Qingdao, P. R. China, and <sup>3</sup>Department of Biology, Hofstra University, Hempstead, New York, USA

(Accepted 4 July 2007)

### Abstract

Five species of the parasitic isopod genus *Dactylokepon* are described from brachyuran crabs and a scyllarid shrimp collected in Chinese waters. Four species are first recorded from this region, *D. richardsonae* Stebbing, 1910 infesting *Portunus argentatus* (White), *D. semipennatus* Bourdon, 1983 infesting *Portunus haanii* (Stimpson) and *Lupocyclus rotundatus* Adams and White, *D. holthuisi* Bourdon, 1967 infesting *Eduarctus martensii* (Pfeffer), and *D. caribaeus* Markham, 1975 infesting *Randallia trituberculata* Sakai. In addition, one species is new to science, *D. barbuladigitus* n. sp. infesting *Liagore rubromaculata* (De Haan). Six brachyuran crabs are reported for the first time as hosts of bopyrids. The new species is distinguished from other species of *Dactylokepon* in having a prominent trifid frontal lamina and a distinct digitate barbula.

**Keywords:** *Epicaridea*, *Bopyridae*, *Chinese waters*, *Dactylokepon*, *Ioninae*, *new species*

### Introduction

Isopod parasites of the subfamily Ioninae are known to infest the brachyurans, Leucosiidae, Majidae, Parthenopidae, Corystidae, Portunidae, Xanthidae, Goneplacidae, Pinnotheridae, and Grapsidae, mostly from tropical waters, and the largest number of species is known in the Indo-West Pacific. Many genera within the Ioninae infest brachyuran hosts in several genera or even different families. An extreme of this phenomenon is the genus *Dactylokepon* Stebbing, 1910, the 10 species of which infest hosts in five families and two infraorders, four belonging to the Brachyura, one belonging to the Palinura (Markham 1986). Examination of three species of portunid crabs, a leucosiid crab, a species of xanthid crab, and a species of scyllarid shrimp collected in Chinese waters, has revealed four newly recorded species and a new species of *Dactylokepon*. Six of the host species are recorded for the first time harbouring isopod parasites.

## Material and methods

Materials for this study originated from the China/Vietnam Comprehensive Oceanographic Survey of Beibu Gulf, Gulf of Tonkin (1959–1960, 1962) and Chinese Academy of Sciences Nansha Islands Multi-disciplinary Investigation (1985, 1987–2000). All materials examined have been deposited in the Institute of Oceanology, Chinese Academy of Sciences, Qingdao, China (IOCAS). Animals were viewed and drawn using a Zeiss Stemi SVzApo. Males for scanning electron microscope study were fixed in 2.5% glutaraldehyde in 0.2 M Millonig's phosphate buffer at pH 7.4 for 1.5 h and postfixed in 1% osmium tetroxide in 0.2 M Millonig's buffer for 1 h. The specimens were then dehydrated through a graded series of ethanol, followed by critical point drying. After sputter coating with colloidal gold, the specimens were examined with a KYKY2800B scanning electron microscope.

## Systematic account

**Subphylum CRUSTACEA** Brunnich, 1772

**Order ISOPODA** Latreille, 1817

**Suborder EPICARIDEA** Latreille, 1831

**Family BOPYRIDAE** Rafinesque-Schmaltz, 1815

**Subfamily IONINAE** H. Milne Edwards, 1840, emend. R. Codreanu, 1967

**Genus *Dactylokepon*** Stebbing, 1910

Type species: *Dactylokepon richardsonae* Stebbing, 1910.

***Dactylokepon richardsonae*** Stebbing, 1910

(Figure 1)

*Dactylokepon richardsonae* Stebbing 1910, p 85, 113, Plate 11C [Type locality: Seychelle Islands; infesting *Trapezicepon cymodoce* (Herbst)]; Nierstrasz and Brender à Brandis 1923, p 83; Shiino 1942, p 444, 447; Markham 1975, p 61, 64, 66, Table 1; 1991, p 289, 291, 292, 294, 296, 297, Figure 2 [Bangkok, Thailand, infesting *Portunus tuberculosus* (A. Milne Edwards)].

*Dactylecepon richardsonae*: Bourdon 1967, p 122; 1980, p 243; 1983, p 855–857, 859, Figure 7 [Marsegu Island, Moluccas; infesting *T. cymodoce*]

### Material examined

Infesting *Portunus argentatus* (White). Nansha, Stn 64, 4°00'N, 112°06'E, 56 m, 1 August 1988, dredge; 2♀, CIEP6401, 2♂, CIEP6402. Nansha, Stn 39, 7°29'N, 114°30'E, 46 m, 13 May 1987, dredge; 3♀, 3♂, CIEP3901 (one female immature).

### Remarks

The first description of *Dactylokepon richardsonae* by Stebbing (1910) was so brief that it became difficult to be certain of the identification of subsequent specimens. However, Bourdon (1983) and Markham (1991) redescribed the species in great detail. The female

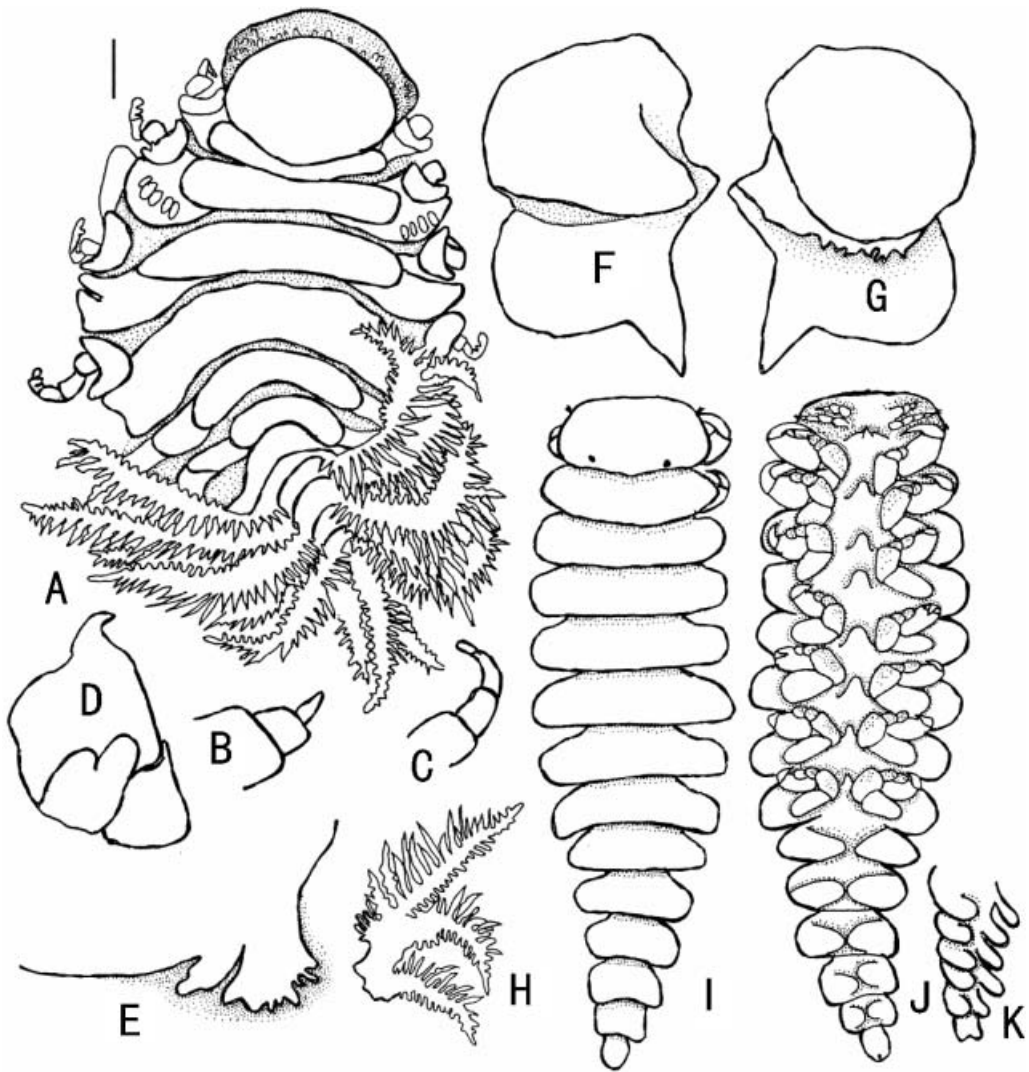


Figure 1. *Dactylokepon richardsonae* Stebbing, 1910. (A–H) Reference female: (A) dorsal view; (B) left antennule; (C) left antenna; (D) right maxilliped, external view; (E) barbula (left side); (F) left oostegite 1, external view; (G) left oostegite 1, internal view; (H) right pleopod 1. (I–K) Reference male: (I) dorsal view; (J) ventral view; (K) ventral view of pleomeres of another male (no. CIEP3901). Scale bar: 1 mm (A); 0.28 mm (B, C); 0.62 mm (D, F, G, H); 0.36 mm (E); 0.33 mm (I, J, K).

specimens (Figure 1A–H) conform well to Markham's description (1991). However, there are some minor differences, such as tubercles on tergal projections of pereomere 2 (Figure 1A); basal segment of antennae 2 not as prominent as in Markham's specimen (1991) (Figure 1C). Four males (Figure 1I, J) are similar to Bourdon's description (1983), the final pleomere round and lacking posterolateral corners. Nevertheless another male (Figure 1K) attached to an immature female is similar to that of Markham (1991), the final pleomere truncate, with distinct posterolateral corners. The host species *Portunus argentatus*

(White) is recorded for the first time bearing parasitic isopods, and this is the first record of *D. richardsonae* from Nansha, China.

#### *Distribution and hosts*

Seychelles, Indian Ocean, on *Trapezia cymodoce* (Herbst); Bangkok, Thailand, on *Portunus tuberculosus* (A. Milne Edwards); Nansha, China on *Portunus argentatus* (White).

### ***Dactylokepon semipennatus* Bourdon, 1983**

(Figure 2)

*Dactylokepon semipennatus* Bourdon 1983, p 857–859, Figure 8 [Type locality: Selem Bay; infesting *Glabropilumnus latimanus* Gordon].

#### *Material examined*

Infesting *Portunus haanii* (Stimpson). Nansha, Stn 2, 11°30'N, 112°52.5'E, 70 m, 4 April 1990, dredge; 1♀, CIEP040401 1♂, CIEP040402. Infesting *Lupocyclos rotundatus* Adams and White. BeiBu Bay, Stn 6236, 20°50'N, 108°00'E, 47.5 m, 18 April 1960, Sun coll., dredge; 1♀ (damaged), CIEP623601.

#### *Redescription of reference female*

Length 12.17 mm (excluding uropod), maximal width 8.62 mm, head length 2.46 mm, head width 3.16 mm, frontal lamina length 0.66 mm. Body distorted ~35° with right side convex (dextrally deflexed) (Figure 2A).

Head bilobate, with prominent frontal lamina, extending beyond both sides of head. Eyes absent (Figure 2A). Antenna of five articles, antennule of three articles (Figure 2B). Maxilliped (Figure 2C) nearly triangular, anterior article broadly rounded, with prominent non-articulating, curved and non-setose palp; plectron short, roundly pointed. Barbula (Figure 2D) with two digitate projections on each side, outer pairs larger than inner pairs.

Pereon broadest across third pereomere. No middorsal projections. Brood pouch almost covered by oostegites. Oostegite 1 (Figure 2E, F) smoothly rounded anteriorly, produced into sharp extended point posterolaterally; posterior edge with sharp projections; internal ridge simply digitate. Pereopods similar structure except increasing in length posteriorly. Pleon of six pleomeres; first five pleomeres with biramous pleopods and lateral plates, all digitate, posterior sides of rami more deeply digitate than anterior sides. First three lateral plates of left side extending anteriorly, due to body curved to the left. Uniramous uropods similar in size and structure to lateral plates of fifth pleomere.

#### *Redescription of reference male*

Length 3.55 mm, maximal width across pereomere 3, 1.13 mm, head length 0.51 mm, pleonal length 1.1 mm. Body gradually tapered posteriorly, all segments distinct (Figure 2G, H).



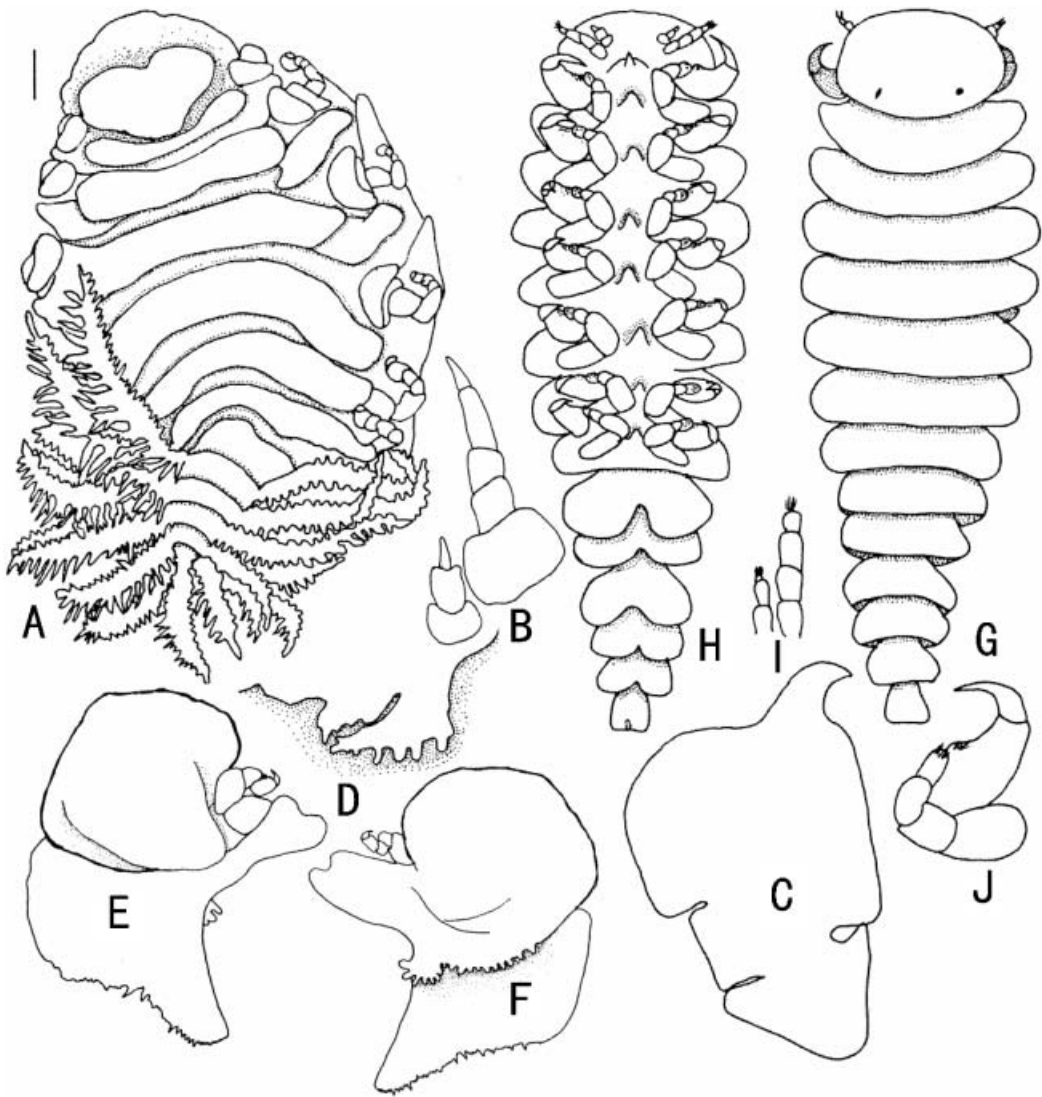


Figure 2. *Dactylokepon semipennatus* Bourdon, 1983. (A–F) Reference female: (A) dorsal view; (B) left antennae; (C) right maxilliped, external view; (D) barbula (left side); (E) left oostegite 1, external view; (F) left oostegite 1, internal view. (G–J) Reference male: (G) dorsal view; (H) ventral view; (I) left antennae; (J) left pereopod 1. Scale bar: 1 mm (A); 0.13 mm (B, I, J); 0.47 mm (C, D); 0.70 mm (E, F); 0.30 mm (G, H).

Head oval, broader than long. Conspicuous dark eyes near posterior edge. Head and first pereomere distinctly separated (Figure 2G). Antenna of four articles, antennule of three articles, distally setose (Figure 2I).

Pereomeres deeply separated. Prominent midventral tubercle on each pereomere (Figure 2H). Pereopods all about same size, but dactyli of first two pairs larger than others (Figure 2J).

Pleon of six segments without midventral tubercles, first five pleomeres with tuberculi-form pleopods (Figure 2H), final pleomere cuneate, with straight posterior margin, uropods lacking.

*Remarks*

This is only the second record of this species, extending its range from Maluku Islands (= Moluccan Islands), Indonesia to Nansha and Beibu Gulf in China. In addition, two portunid hosts are first recorded as hosts for *D. semipennatus*, and for any bopyrid isopods; previously *D. semipennatus* has been found on xanthid hosts. The present material, especially the female, matches the type specimens (Bourdon 1983) very well. However, the inner projections of the barbula are slightly digitate, unlike the smooth projections seen in Bourdon's specimens, and the palp of the maxilliped is slightly more curved than in the holotype. The male reported by Bourdon (1983) differs from the present one in having a straight posterior margin to the head, and bifurcate uropods. The female found on *Lupocyclus rotundatus* Adams and White is damaged and lacks a head, but can be identified based on the morphology of the first oostegite, the pereomeres, and pleomeres. Two species in the genus *Dactylokepon* were previously known to infest portunids. Stebbing (1910) briefly described *D. catoptri*, infesting *Catoptrus nitidus* A. Milne-Edwards from Amirante, but the shapes of its maxilliped palp and barbula are very different from that of the present females. Shiino (1942) described *D. palaoensis*, infesting *Thalamita* spp. at Palao, but, as Bourdon (1983) discussed, *D. palaoensis* and *D. semipennatus* can be differentiated by the greater digitation of the pleopods and the fact that the uropods are of same length as the lateral plates of the fifth pleomere in the latter species.

*Distribution and hosts*

Seleman Bay, Maluku Islands, Indonesia, on *Glabropilumnus latimanus* Gordon; Nansha and BeiBu Bay, China, on *Portunus haanii* (Stimpson) and *Lupocyclus rotundatus* Adams and White.

***Dactylokepon holthuisi* Bourdon, 1967**

(Figures 3, 4)

*Dactylecepon holthuisi* Bourdon 1967, p 167–174, Figures 1–3. [Type locality: Akaba Gulf; infesting *Eduarctus lewini* (Holthuis)].

*Material examined*

Infesting *Eduarctus martensii* (Pfeffer). South Sea, Stn 6059, 21°30'N, 113°45'E, 44.5 m, 10 January 1960, Guangzong Wu coll., 2♀, 2♂, CIEE605901. Stn 6059, 21°30'N, 113°45'E, 45 m, 9 April 1959, Weiquan Zhang coll., dredge; 3♀, 1♂, CIEE605902. Stn 6059, 21°30'N, 113°45'E, 45 m, 9 April 1959, Weiquan Zhang coll., dredge; 3♀, 1♂, CIEE605903. Stn 6059, 21°30'N, 113°45'E, 38 m, 17 March 1959, Weiquan Zhang coll.; 5♀, 3♂, CIEE605904. Stn 6063, 21°30'N, 113°30'E, 39.5 m, 16 February 1960, Shoupeng Shen coll., dredge; 5♀, 2♂, CIEE606301. Stn 6063, 21°30'N, 113°30'E, 39.5 m, 15 July 1959, Xiutong Ma coll., dredge; 3♀, 3♂, CIEE606302. Stn 6046, 21°30'N, 114°30'E, 74.5 m, 8 April 1959, Guangzong Wu coll., dredge; 3♀, 3♂, CIEE604601. Stn 6065, 21°00'N, 113°30'E, 74 m, 17 February 1960, Jingzuo Qu coll., dredge; 5♀, 4♂, CIEE606501. Stn 6065, 21°00'N, 113°30'E, 74 m, 14 July 1959, Xiutong Ma coll., 1♀, CIEE606502. Stn 6065, 21°00'N, 113°30'E, 69 m, 9 April 1960, Zhican Tang coll., 1♀, CIEE606503. Stn 6076, 21°15'N, 113°00'E, 45 m, 7 April 1960, Zhican Tang coll., dredge; 3♀, 2♂, 1♀ immature, CIEE607601. Stn 6076, 21°15'N, 113°00'E, 43 m, 16

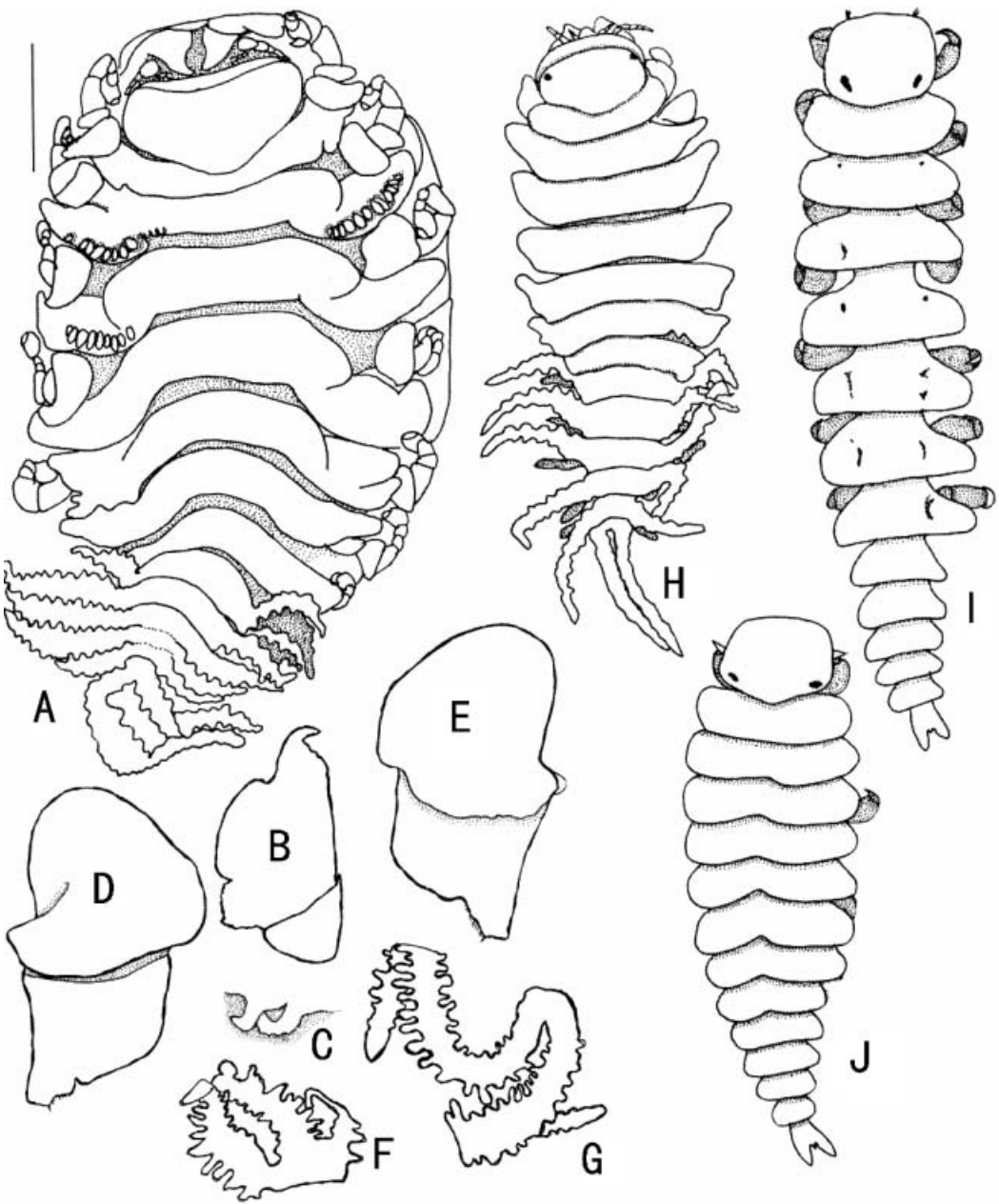


Figure 3. *Dactylokepon holthuisi* Bourdon, 1967. (A–H) Reference female: (A) dorsal view; (B) right maxilliped, external view; (C) barbula (left side); (D) right oostegite 1, external view; (E) right oostegite 1, internal view; (F) left pleopod 1; (G) uropod; (H) immature female (no. CIEE602701). (I, J) Reference male: (I) dorsal view of reference male (no. CIEE605901); (J) dorsal view of another male (no. CIEE605401). Scale bar: 1 mm (A); 0.73 mm (B–G); 0.86 mm (H); 0.40 mm (I); 0.44 mm (J).

February 1959, Guansheng Liang coll.; 1♀, CIEE607602. Stn 6052, 21°30'N, 114°00'E, 48 m, 17 March 1959; 3♀, 1♂, CIEE605201. Stn 6091, 20°30'N, 112°30'E, 99.5 m, 6 April 1960, Zhican Tang coll., 1♀, CIEE609101. Stn 6064, 21°15'N, 113°30'E, 52 m, 18



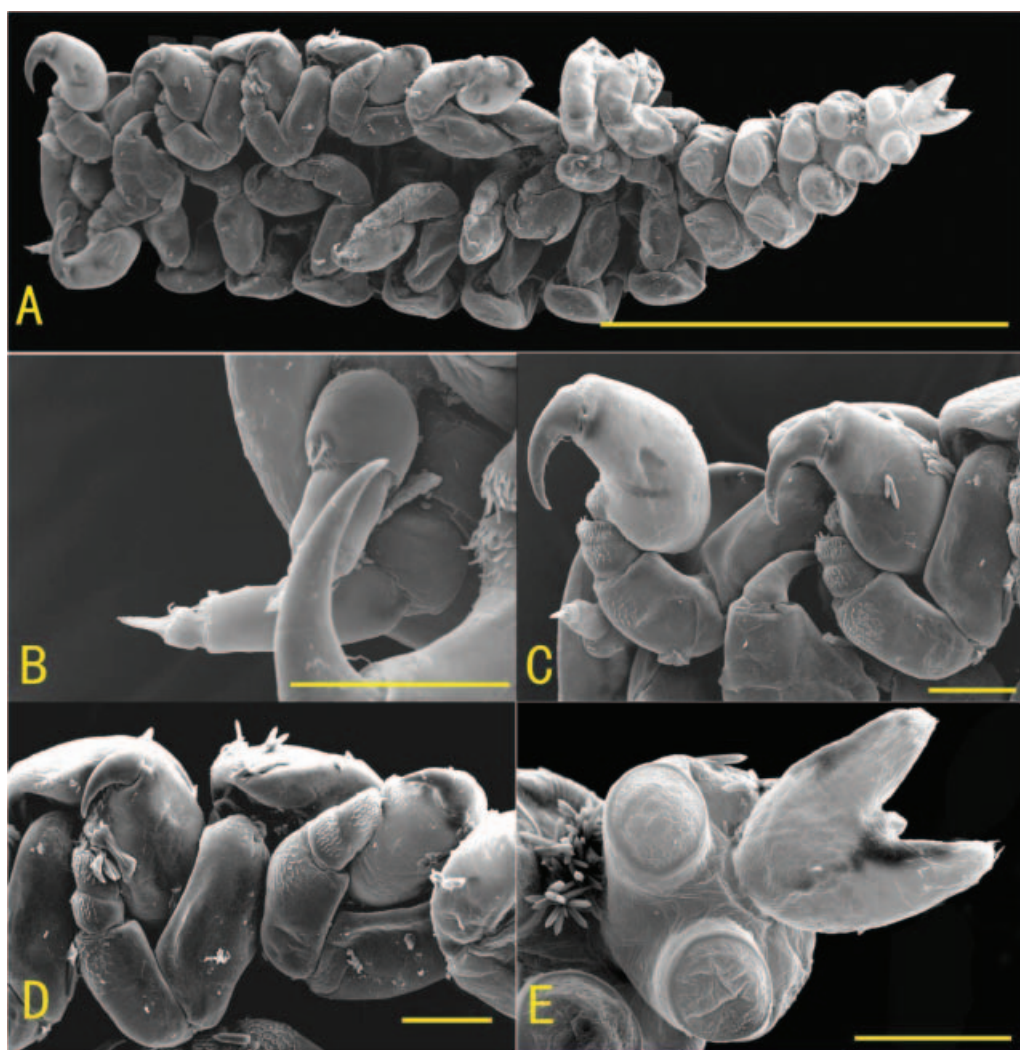


Figure 4. *Dactylokepon holthuisi* Bourdon, 1967, reference male, SEM micrographs. (A) Ventral view; (B) right antennae; (C) pereopods 1–2, left side; (D) pereopods 3–4, left side; (E) ventral view of posterior pleomeres 5–6. Scale bars: 1 mm (A); 100  $\mu$ m (B–E).

October 1959, Jieshan Xu coll., 1♀, CIEE606401. Stn 6024, 20°30'N, 116°00'E, 45 m, 14 May 1960, Shoupeng Shen coll., 1♀ immature, 1♂, CIEE602401. Stn 6132, 19°45'N, 110°10'E, 70 m, 28 January 1959, Yongliang Wang coll., 2♀, 1♂, CIEE613201. Stn 6132, 19°45'N, 111°15'E, 73 m, 29 October 1959, Zhican Tang coll., 1♀ immature, CIEE613202. Stn 6020, 22°30'N, 116°00'E, 38 m, 5 April 1959, Weiquan Zhang coll., 1♀, CIEE602001. Stn 6020, 22°30'N, 116°00'E, 41 m, 25 January 1959, Weiquan Zhang coll., 1♀, CIEE602002. Stn 6020, 22°30'N, 116°00'E, 37.7 m, 23 December 1959, Weiquan Zhang coll.; 1♀, CIEE602003. Stn 6066, 20°30'N, 113°30'E, 88 m, 17 February 1960, Jingzuo Qu coll., dredge; 1♀, CIEE606601. Stn 6023, 21°45'N, 116°00'E, 98.8 m, 23 April 1960, Jingzuo Qu coll., 1♀, CIEE602301. Stn 6054, 21°00'N, 114°00'E, 79 m, 11 January 1960, Guangzong Wu coll., 1♀, 1♂, CIEE605401. Stn 6154, 19°15'N, 110°45'E,

36 m, 6 May 1960, Jixin Liu coll., 1♀, 1♂, CIEE615401. Stn 6027, 22°15'N, 115°30'E, 49 m, 9 December 1959, Weiquan Zhang coll., 1♀ immature, CIEE602701.

*Redescription of reference female*

Length 4.46 mm (excluding uropods), maximal width 2.36 mm, head length 0.59 mm, head width 1.02 mm. Body distorted ~20° with right side convex (dextrally deflexed) (Figure 3A).

Head slightly bilobate, with narrow frontal lamina. Eyes absent (Figure 3A). Antenna of five articles, antennule of three articles. Maxilliped (Figure 3B) nearly triangular, its anterior article much longer, with prominent non-articulating, curved, and non-setose pointed palp; plectron short, pointed. Barbula (Figure 3C) with two projections on each side, inner pair with smooth margins, outer pair with slightly uneven margins, outer pair larger than inner pair.

Pereon broadest across third or fourth pereomere. No middorsal projections. Brood pouch almost covered by oostegites. First oostegite (Figure 3D, E) smoothly rounded anteriorly, produced into truncate extended point posterolaterally; posterior edge with a notch and setae; internal ridge smooth. Second pereomere 2 and left side of third pereomere with tubercles in a row. Pereopods almost similar, except progressively longer posteriorly.

Pleon of six pleomeres, first five bearing digitate lateral plates and biramous pleopods, terminal pleomere with long uniramous uropods. Lateral plates and biramous pleopods similar and simply digitate (Figure 3F). Uniramous uropods approximately three times longer than lateral plates (Figure 3G).

*Description of juvenile female*

All body segments distinct (Figure 3H). Eyes near anterolateral corners, prominent. Antennae extend beyond anterior edge of head. Pereon with nearly parallel sides, dorsolateral boss and tergal projection absent. First five pleomeres with lateral plates and biramous pleopods similar and slightly digitate. Uniramous uropods about twice longer than lateral plates of pleomere 5.

*Redescription of reference male*

Length 1.91 mm, maximal width across fifth pereomere, 0.48 mm, head length 0.24 mm, pleonal length 0.47 mm. Body gradually tapered posteriorly, all segments distinct (Figures 3I, 4A).

Head quadrate, broader than long, large dark eyes near posterior edge. Head distinctly separated from first pereomere (Figure 3I). Antenna of five articles, antennule of three articles, distally setose (Figure 4B).

Pereomeres deeply separated by anterolateral notches; small irregular pigmented spot on second to seventh pereomeres, or absent (Figure 3I, J). Prominent midventral tubercle on each pereomere. Pereopods all about same size, but first two pairs slightly larger than others (Figure 4C, D). Cutting edges of propodi, carpi, meri, and ischia setose.

Pleon of six segments without midventral tubercles, first five with tuberculiform pleopods, final pleomere bifurcate with setae on posterior margin (Figure 4E).

*Remarks*

This species was originally described under the name *Dactylocepon holthuisi* as a parasite of *Scyllarus lewinsohni* Holthuis by Bourdon (1967). Holthuis (2002) established a new combination for the host name, designating it *Eduarctus lewinsohni* (Holthuis). This is the second record of this species; China is a new locality for *D. holthuisi*, Bourdon, 1967, and the host *Eduarctus martensii* (Pfeffer) is recorded for the first time bearing bopyrid isopods.

*Distribution and hosts*

Gulf of Aqaba, Red Sea, Israel, on *Eduarctus lewinsohni* (Holthuis); South Sea, China, on *Eduarctus martensii* (Pfeffer).

***Dactylokepon caribaeus* Markham, 1975**

(Figure 5)

*Dactylokepon caribaeus* Markham 1975, p 61–66, Figures 4–6 [Type locality: SE coast of Dominican Republic; infesting *Iliacantha subglobosa* Stimpson and *Iliacantha liodactyla* Rathbun]; Adkison 1982, p 702–703, Figure 1.

*Material examined*

Infesting *Randallia trituberculata* Sakai. South Sea, Stn 6094, 19°00'N, 112°30'E, 270 m, 19 April 1959, Fuzeng Sun coll., 1♀, CIEL609401, 1♂, CIEL609402, 1♀ (immature), CIEL609403.

*Remarks*

Three species of the genus *Dactylokepon* are found on members of the Leucosiidae, *D. caribaeus* Markham, 1975 is found on *Iliacantha subglobosa* and *I. liodactyla* in the Caribbean, *D. sulcipes* Adkison, 1982 is found on *Callidactylus asper* Stimpson, 1871 in Mexico, while *D. marchadi* Bourdon, 1967 is found on *Pseudomyra mbizi* Capart, 1951 in Senegal. The present material agrees well with the original description (Markham 1975) except for some minor points. This species was well described and illustrated by Markham (1975); Adkison (1982) then reported this species from the same locality and the same hosts, but provided a redescription with additional notes on its characteristics. In the present reference female (Figure 5A), the tergal projections are not as smooth as in the holotype; the frontal lamina edge is smooth and the barbula is slim and pointed (Figure 5B) rather than stout and blunt. The first oostegite (Figure 5C), all pleopods (Figure 5D), and the uropod (Figure 5E) are similar to those of the holotype. In addition, the immature female (Figure 5F) has small eyes, a short frontal lamina, without tergal projections or posterolateral bosses on all pereomeres. Margins of lateral plates and pleopods are simple. The present reference male (Figure 5G) is similar to the allotype of *D. caribaeus*: head pentagonal, eyes near posterior border, without midventral projections on pereon. This is the first record of a bopyrid infestation on the host *Randallia trituberculata* Sakai. Previously, *D. caribaeus* was known only from the Caribbean.

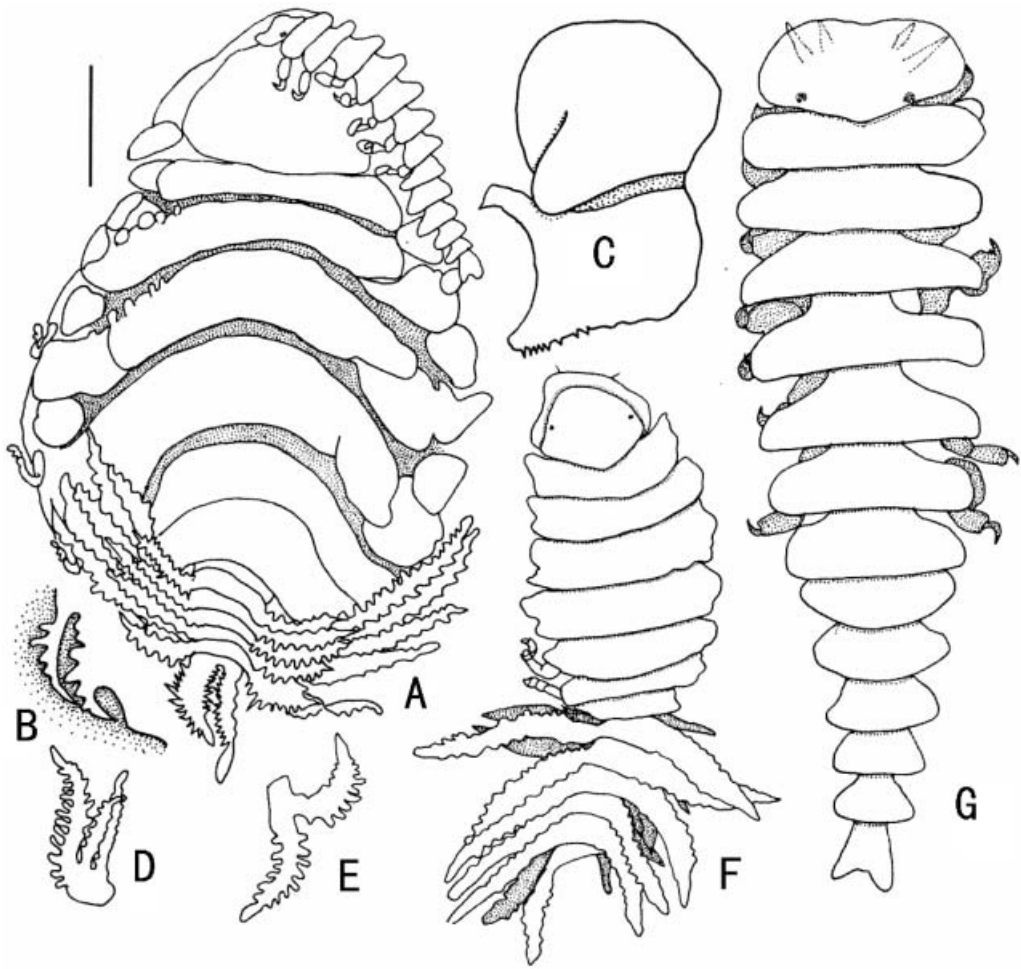


Figure 5. *Dactylokepon caribaeus* Markham, 1975. (A–F) Reference female: (A) dorsal view, with male in situ; (B) barbula (right side); (C) right oostegite 1, external view; (D) right pleopod 5; (E) uropod; (F) immature female (no. CIEL609403). (G) Reference male (no. CIEL609402), dorsal view. Scale bar: 1 mm (A); 0.48 mm (B, C); 0.89 mm (D–F); 0.40 mm (G).

#### *Distribution and hosts*

SE coast of Dominican Republic, on *Iliacantha subglobosai* Stimpson and *Iliacantha liodactyla* Rathbun; South Sea, China, on *Randallia trituberculata* Sakai.

#### ***Dactylokepon barbuladigitus* new species** (Figures 6, 7)

#### *Material examined*

Infesting *Liagore rubromaculata* (De Haan). Holotype: South Sea, Stn 6045, 21°45'N, 114°30'E, 64.5 m, 9 April 1959, Guangzong Wu coll., 1♀, CIEX604501. Allotype: South



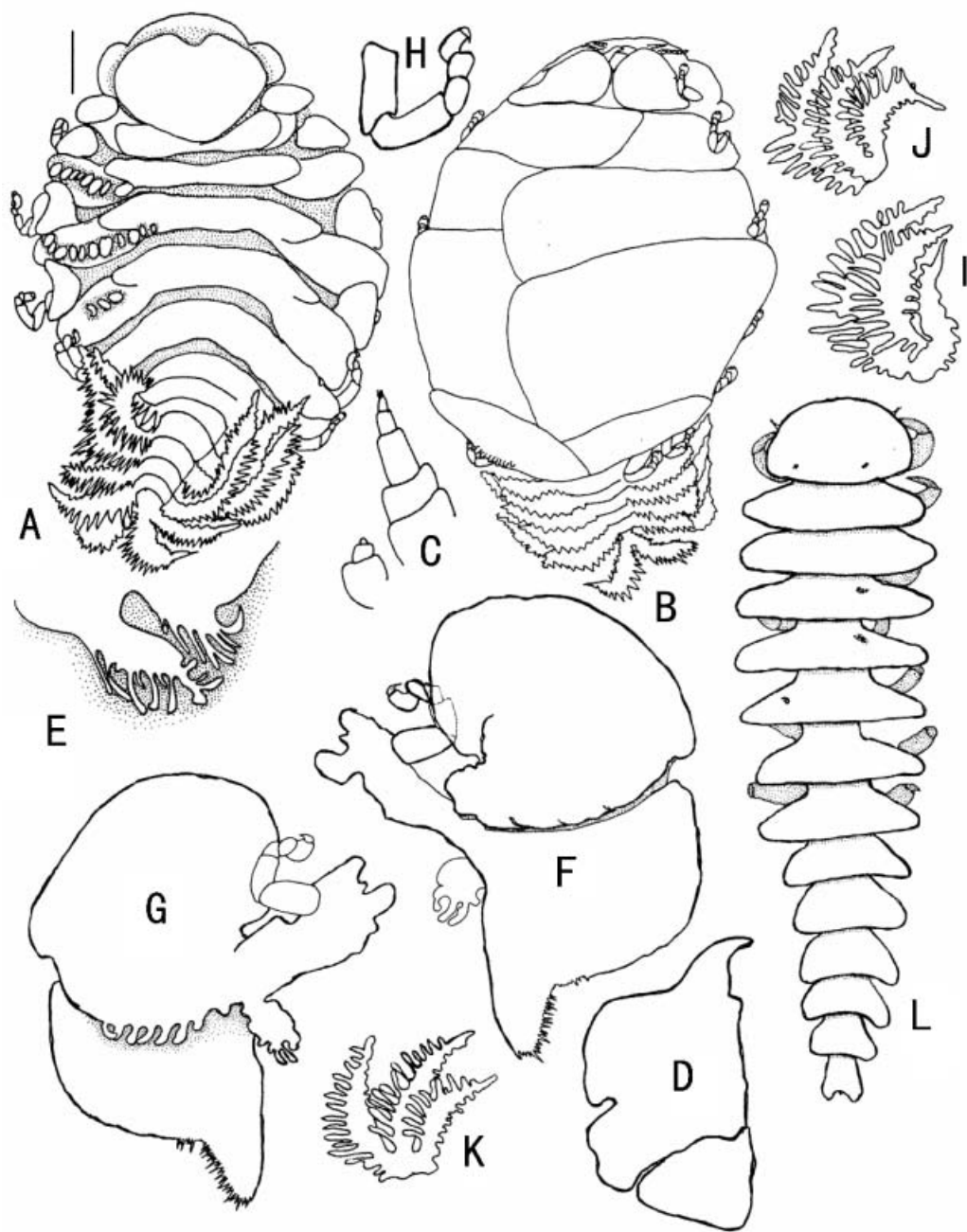


Figure 6. *Dactylokepon barbuladigitus* new species. (A–K) Holotype female: (A) dorsal view; (B) ventral view; (C) left antennae; (D) right maxilliped, external view; (E) barbula (right side); (F) right oostegite 1, external view; (G) right oostegite 1, internal view; (H) left pereopod 2; (I) right pleopod 3; (J) right pleopod 4; (K) right pleopod 5. (L) Allotype male (no. CIEX604502), dorsal view. Scale bar: 1 mm (A, B); 0.18 mm (C); 0.31 mm (D, E); 0.45 mm (F, G); 0.15 mm (H); 0.26 mm (I); 0.69 mm (J–L); 0.39 mm (M).



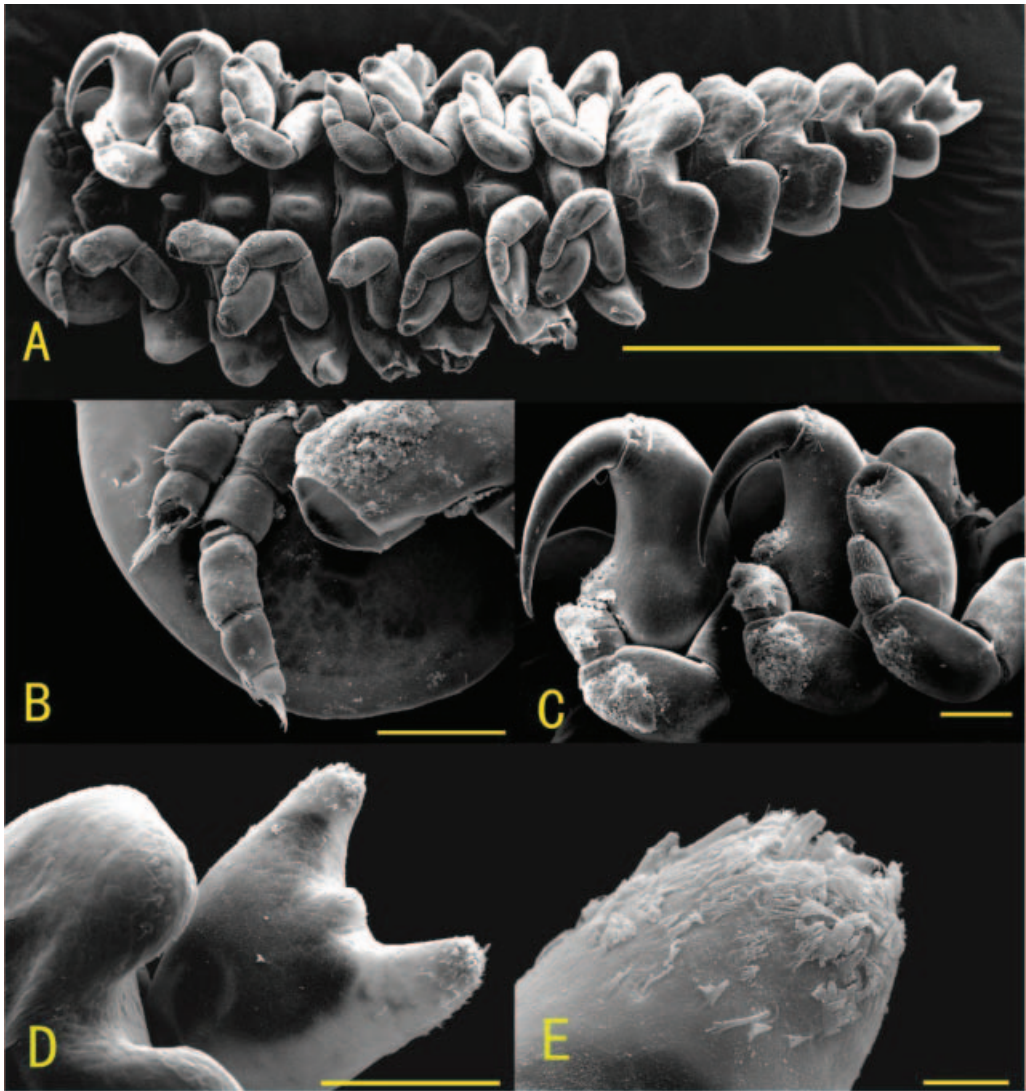


Figure 7. *Dactylokepon barbuladigitus*, new species, allotype, SEM micrographs. (A) Ventral view; (B) right antennae; (C) pereopods 1–3, left side; (D) ventral view of pleomere 6, showing small anal cone extending posteriorly between two lobes; (E) distal margin of lobe of pleomere 6. Scale bars: 1 mm (A); 100  $\mu$ m (B–D); 10  $\mu$ m (E).

Sea, Stn 6045, 21°45'N, 114°30'E, 64.5 m, 9 April 1959, Guangzong Wu coll., 1♂, CIEX604502. Paratypes: East Sea, Stn 4054, 29°30'N, 123°30'E, 69 m, 8 December 1959, Yongliang Wang coll., Zhu, 1♀, CIEX405401, 1♂, CIEX405402. South Sea, Stn 6045, 21°45'N, 114°30'E, 59.6 m, 8 April 1959, Jingzuo Qu coll., 2♀, CIEX604505, 1♂, CIEX604506.

*Other materials.* South Sea, Stn 6045, 21°45'N, 114°30'E, 64.5 m, 9 April 1959, Guangzong Wu coll., 1♀, CIEX604509, 1♂, CIEX604510. South Sea, Stn 6045, 21°45'N, 114°30'E, 59.6 m, 8 April 1960, Jingzuo Qu coll., 1♀, CIEX604511, 1♂, CIEX604512. South Sea, Stn

6090, 21°00'N, 112°30'E, 53 m, 22 October 1959, Yongliang Wang coll., 3♀, CIEX609001, 2♂, CIEX609002. South Sea, Stn 6090, 21°00'N, 112°30'E, 52 m, 6 July 1959, coll., 3♀, CIEX609003, 3♂, CIEX609004. South Sea, Stn 6132, 19°45'N, 111°15'E, 66 m, 12 July 1959, Zhican Tang coll., 2♀, CIEX613201, 2♂, CIEX613202. South Sea, Stn 6131, 20°00'N, 111°15'E, 52 m, 25 April 1959, Xiutong Ma coll., 4♀, CIEX613101, 4♂, CIEX613102. South Sea, Stn 6131, 20°00'N, 111°15'E, 48 m, 12 July 1959, Zhican Tang coll., 1♀, CIEX613105, 1♂, CIEX613106. South Sea, Stn 6131, 20°00'N, 111°15'E, 44 m, 29 October 1959, Mingshou Li coll., 1♀, CIEX613107, 1♂, CIEX613108. South Sea, Stn 6106, 20°30'N, 112°00'E, 65 m, 29 October 1959, Yongliang Wang coll., 1♀, CIEX610603, 1♂, CIEX610604. South Sea, Stn 6119, 20°15'N, 111°30'E, 70 m, 12 April 1959, Xiutong Ma coll., 2♀, CIEX611903, 2♂, CIEX611904. South Sea, Stn 6118, 20°30'N, 111°30'E, 61 m, 16 July 1959, Zhican Tang coll., 3♀, CIEX611801, 2♂, CIEX611802. South Sea, Stn 6035, 22°00'N, 115°00'E, 63 m, 21 March 1959, Weiquan Zhang coll., 1♀, CIEX603501, 1♂, CIEX603502. South Sea, Stn 6105, 21°00'N, 112°00'E, 45 m, 4 April 1960, Zhican Tang coll., 1♀, CIEX610501, 1♂, CIEX610502. South Sea, Stn 6105, 21°00'N, 112°00'E, 45 m, 5 February 1960, Jingzuo Qu coll., 2♀, CIEX610503, 1♂, CIEX610504. South Sea, Stn 6117, 20°45'N, 111°30'E, 49 m, 17 July 1959, Zhican Tang coll., 1♀, CIEX611701, 1♂, CIEX611702. South Sea, Stn 6168, 18°30'N, 110°15'E, 46 m, 4 April 1959, Zhengang Fan coll., 1♀, CIEX616801, 1♂, CIEX616802. South Sea, Stn 6142, 19°00'N, 111°00'E, 96 m, 8 April 1960, Yongliang Wang coll., 1♀, CIEX614201, 1♂, CIEX614202. South Sea, Stn 6075, 21°30'N, 113°00'E, 36 m, 6 July 1959, Xiutong Ma coll., 1♀, CIEX607501, 1♂, CIEX607502. South Sea, Stn 6044, 22°00'N, 114°30'E, 43.6 m, 9 April 1959, Jingzuo Qu coll., 1♀, CIEX604401, 1♂, CIEX604402. East Sea, Stn 105, 26°30'N, 122°00'E, 85 m, 12 June 1978, Zhican Tang and Jieshan Xu coll., 1♀, CIEX10501, 1♂, CIEX10502. South Sea, Stn 6116, 21°00'N, 111°30'E, 41 m, 6 February 1960, Guangzong Wu coll., 1♀, CIEX611601. South Sea, Stn 6119, 20°15'N, 111°30'E, 71.5 m, 18 October 1959, Zhican Tang coll., 1♀, CIEX611901, 1♂, CIEX611902. South Sea, Stn 6047, 21°15'N, 114°30'E, 82 m, 10 July 1959, Jingzuo Qu coll., 1♀, CIEX604701, 1♂, CIEX604702.

#### *Description of holotype (CIEX604501)*

Length (excluding uropods) 7.11 mm, maximal width 5.2 mm, head length 1.87 mm (including frontal lamina), head width 2.34 mm, pleon length 1.21 mm, distortion 32°. All body regions and segments distinct. No pigmentation (Figure 6A).

Head widely bilobate, wider than long, posterior margin broadly v-shaped, bearing well-developed, trifid, frontal lamina with wide medial lobe, and two lobes on sides of head. Eyes absent (Figure 6A). Antenna of five articles, antennule of three articles: few setae except for with three terminal setae on antenna (Figure 6C). Maxilliped with large, falcate non-articled, non-setose palp and blunt plectron (Figure 6D). Barbula with two prominent digitate lateral projections on each side, flat middle region, outer projection distinctly longer than inner ones (Figure 6E).

Pereon broadest across third pereomere, gradually tapering on each side posteriorly. Coxal plates absent. No middorsal projections on pereon. Dorsolateral bosses on first four pereomeres, with small tubercles on concave margin of third and fourth pereomeres. Prominent tergal projections on second to fourth pereomeres, with a row of small tubercles on left side of tergal projections (Figure 6A). Oostegites completely enclosing highly vaulted brood pouch (Figure 6B). First oostegite (Figure 6F, G) smoothly rounded anteriorly, with digitate internal ridge and prominent digitate projection, round posterolateral point with

long irregular setae. Second to fourth oostegite with setate posterior margins, anterior margins smooth, third oostegite largest. Pereopods similar, propodi, carpi and meri setate, but first two pereopods (Figure 6H) with stout carinate propodi. Third to fourth pereopods essentially alike except progressively longer posteriorly, basis and propodi slender (Figure 6I).

Pleon of six pleomeres, first five bearing biramous pleopods and lateral plates, all digitate, posterior sides with longer projections than anterior ones. Lateral plates of first three pleomeres slightly longer than respective exopodites, lateral plates of fourth and fifth pleomeres shorter than their exopodites (Figure 6J–L). Endopodite of fourth pleopod longer than its exopodite and the rest slightly shorter than their exopodites (Figure 6K). Uniramous uropods similar to structure of pleopods and lateral plates.

#### *Description of allotype (CIEX604502)*

Length 4.18 mm, maximal width across pleon 4, 1.11 mm, head length 0.46 mm, head width 0.82 mm, pleonal length 1.61 mm.

All body segments distinct, small patches of pigment on dorsal surface of third to fifth pereomeres (Figure 6M). Outline of body smoothly tapering posteriorly from fifth pereomere.

Head semicircular, small eyes in posterolateral regions (Figure 6M). Antenna of five articles, with setae on distal three articles; antennule of three articles, with two or three setae at distal extremity of two basal articles and tuft at tip of terminal article (Figure 7B).

Second to fifth pereomeres almost equally wide, with pointed margins. All pereomeres with prominent midventral projections (Figure 7A). First and second pereopods larger than other five pereopods, dactyli and propodi much larger on first two pereopods than third to fifth pereopods (Figure 7D).

Pleon of six pleomeres, first five with flap-like pleopods, without midventral projections (Figure 7A), sixth pleomere produced into two rounded symmetrically extending posterior lobes (true uropods lacking), each lobe bears setae on distal margin (Figure 7E); small anal cone extending posteriorly between lobes (Figure 7D).

#### *Etymology*

The specific name *barbuladigitus* refers to its distinct digitate barbula of holotype female.

#### *Variation*

Paratype females agree in all respects with the holotype, except that one paratype has a frontal lamina as wide as the head and does not extend beyond the head, as in the holotype, and the first pereomere is bisected by the head dorsally (CIEL626401). Two paratype males differ from the allotype in having asymmetrical projections on the sixth pleomere. Another paratype male has a prominent anal cone which is longer than the lobes of the sixth pleomere.

#### *Remarks*

With the addition of the new species, there are 11 species in the genus *Dactylokepon*. The new species, *D. barbuladigitus*, is distinguished from the other 10 species by the prominent

trifid frontal lamina and distinct digitate barbula. *Dactylokepon barbuladigitus* appears to be most closely related to *D. semipennatus* and *D. richardsonae*, which are known to infest xanthid crabs. The new species differs from *D. semipennatus* in its distinct barbula, trifid frontal lamina, and curved maxilliped palp. Females of *D. semipennatus* have a barbula with slightly digitate projections, smooth round frontal lamina without any indentations, and a short palp on the maxilliped. The new species is distinguished from *D. richardsonae* by the posterolateral point of the first oostegite, shape of the frontal lamina and head, segmentation of antennae, and barbula. In *D. richardsonae*, the first oostegite has a sharp posterolateral point, slightly digitate barbula, a round frontal lamina and oval head, and antenna and antennule of four and two articles, respectively. Males of *D. barbuladigitus* differ from males of *D. richardsonae* in the distinctly separated head and the shape of the final pleomere. Finally, males of *D. barbuladigitus* can also be distinguished from *D. caribaeus*, *D. hunterae* Wells and Wells, 1966 by the distinct midvental projections on the pereomeres.

Many host specimens of *D. barbuladigitus* have both branchial chambers infested, and one chamber hosts *D. barbuladigitus*, while the other chamber hosts *Gigantione* n. sp. (to be described in a later paper). Although many bopyrids infested both branchial chambers of their hosts, it is the first time that two different species were found in the two chambers of one and the same host.

#### *Distribution and hosts*

South Sea, China, on *Liagore rubromaculata* (De Haan).

#### **Acknowledgements**

This study was supported by the National Science Foundation of China (no. 30500055 and 30499341) and Shanxi Province Youth Science Foundation (no. 2007021041). We are grateful to Dr John C. Markham (Arch Cape Marine Laboratory, OR, USA) for his kind offering of bopyrid literature. The authors would like to thank Prof. J. Y. Liu (Ruiyu Liu, IOCAS) and Prof. Xinzhen Li (IOCAS) for their guidance in this study. We are indebted to the collectors of China/Vietnam Comprehensive Oceanographic Survey to Beibu Gulf (1959–1960, 1962).

#### **References**

- Adkison DL. 1982. Description of *Dactylokepon sulcipes* n. sp. (Crustacea: Isopoda: Bopyridae) and notes on *D. caribaeus*. Proceedings of the Biological Society of Washington 95(4):702–708.
- Bourdon R. 1967. Sur deux nouveaux épicarides (Isopoda) parasites de crustacés décapodes. Zoologische Mededelingen 42(17):167–174.
- Bourdon R. 1983. Expédition Rumphius II (1975) Crustacés parasites, commensaux, etc. (Th. Monod éd.). VIII. Crustacés isopodes (3e partie: Épicarides Bopyridae). Bulletin du Muséum National d'Histoire Naturelle, Paris, Série 4 5(A3):845–869.
- Bourdon R. 1980. *Aporobopyrus dollfusi* n. sp. (Crustacea, Epicaridea, Bopyridae) parasite de porcellanes de la mer Rouge. Bulletin du Muséum National de la Histoire naturelle de Paris 2(1):237–244.
- Holthuis LB. 2002. The Indo-Pacific Scyllarine lobsters (Crustacea, Decapoda, Scyllaridae). Zoosystema 24(3):499–683.
- Markham JC. 1975. New records of two species of parasitic isopods of the bopyrid subfamily Ioninae in the western Atlantic. Crustaceana 29(1):55–67.
- Markham JC. 1986. Evolution and zoogeography of the Isopoda Bopyridae, parasites of Crustace Decapoda. Crustacean Issues 4:143–164.

- Markham JC. 1991. Redescriptions and new records of Isopoda Bopyridae (Crustacea) from Thailand. Raffles Bulletin of Zoology 39(2):289–297.
- Nierstrasz HF, Brender a Brandis GA. 1923. Die Isopoden der Siboga Expedition. II. Isopoda Genuinal. Epicaridea. Siboga Expeditie livr. 95 monogr. 32b:57–121.
- Shiino SM. 1942. Bopyrids from the South Sea Islands with description of a hyperparasitic cryptoniscid. Palao Tropical Biological Station Studies 2:437–458.
- Stebbing TRR. 1910. Isopod from the Indian Ocean and British East Africa. Reports of the Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner, M. A. Transactions of the Linnean Society of London, Series 2, Zoology 14(1):83–122.
- Wells MJ, Wells HW. 1966. *Dactylokepon hunterae* and *Bopyrina pontoniae*, two new species of bopyrid isopods from North Carolina. Crustaceana 11:53–60.