A review of the genus *Parapenaeon* Richardson, 1904 (Crustacea: isopoda: Bopyridae: Orbioninae), with description of three new species from China

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(Received 5 November 2014; accepted 22 February 2015; first published online 22 April 2015)

Five species of the bopyrid genus *Parapenaeon* are reported from China, of which three are new to science, and one, *Parapenaeon expansa* Bourdon, 1979, is a new record. New species are *Parapenaeon calculosa*, sp. nov., *Parapenaeon diatropa*, sp. nov. and *Parapenaeon sicyoniae*, sp. nov., from the East and South China Seas. The female of each new species has six pleomeres, no lateral plates on the sixth pleomere, and biramous uropods, characters that place them in the genus *Parapenaeon* Richardson, 1904. Each can be distinguished from previously described species of the genus *Parapenaeon* in body shape, by the characters of oostegite 1, the barbula, brood pouch, pleopods and uropods of the females. A table including all of the currently recognized species of *Parapenaeon* with type localities, known geographical distribution and reported hosts, is given. A key to the recorded species of *Parapenaeon* Richardson, 1904 is provided, as is a new diagnosis of the genus.

http://zoobank.org/urn:lsid:zoobank.org:pub:35CD12BB-D1F3-48DF-BABB-2EAA3030395B

Keywords: Isopoda; Bopyridae; *Parapenaeon*; new species; China

Introduction

The genus *Parapenaeon* Richardson, 1904 contains 10 previously described species (Bourdon 1979a, 1981; Boyko et al. 2014) (hosts, type locality, distribution and primary genus of all described species can be seen from Table 1). Richardson (1904) erected the genus with *Parapenaeon consolidata* its type species; the females of this genus are characterized by having six pleomeres, coxal plates on the first two pereomeres of the short side, no lateral plates on the sixth pleomere, uniramous uropods and tuberculate biramous pleopods. Thielemann (1910) described *Epipenaeon japonica*, which Nierstrasz and Brender à Brandis (1923) found again and recorded under the name *Epipenaeon japonicum*; and they also described *Parapenaeon secundum*. Bourdon (1979a) transferred *E. japonicum* to the genus *Parapenaeon* because its female has six pleomeres, not five pleomeres as is characteristic for *Epipenaeon*. Markham (1982) found this species in Hong Kong and discussed the gender of the generic name *Parapenaeon*, concluding that it is feminine and so using the name *P. japonica*. Bourdon (1979a) described another species, *Parapenaeon expansus*, from Madagascar. Markham (1994) again discussed the gender of the

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Table 1. Thirteen species of genus *Parapenaeon* Richardson, 1904.

| Species                  | Type locality | Distribution                                                                                       | Hosts                                                                                     | Preliminary genus                      |
|--------------------------|---------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------|
| *P. brevicoxalis* Bourdon 1981 | Philippines   | Penaeopsis rectacuta (Bate)                                                                       |                                                                                           |                                        |
| *P. coarctata* Bourdon 1981 | Philippines   | Metapenaeopsis andamanensis (Wood-Mason)                                                          |                                                                                           |                                        |
| *P. consolidata* Richardson 1904 | Japan         | *Parapeneaus dalei* Rathbun [Accepted as *Metapenaeopsis dalei* (Rathbun)]                       |                                                                                           |                                        |
| *P. expansa* Bourdon, 1979a | Madagascar    | Melicertus teraoi (Kubo); *M. plebejus* (Hess); *M. longistylus* (Kubo); *M. latistylus* (Kishinouye); *Fenneropenaeus indicus* (H. Milne Edwards); *F. mergiensis* (De Man); *F. penicillatus* (Alcock); *Marsupenaeus japonicus* (Bate) *Penaeus mergiensis* de Man; *P. sp.* *Metapenaeonopsis gaillardia* Crosnier; *M. sinica* Liu and Zhong; *M. faouzi* Ramadan; *M. mogiensis consobrina* (Nobili) |                                                                                           |                                        |
| *P. japonica* (Thielemann 1910) | Okayama, Japan | Japan; India; Mozambique; Pearl River Estuary, Hong Kong; Madagascar; Gulf of Martaban, Burma; Red Sea; Western Indian Ocean; Australia; Thailand; Strait of Makassar; South China Sea; Beibu Gulf; | Metapenaeopsis barbata (de Haan), *M. acclivis* (Rathbun); *M. lamellata* (de Haan); *M. sinica* Liu and Zhong; *M. hilarula* (de Man); *M. toloensis* Hall; *M. stridulans* (Alcock); *M. dura* Kubo; *M. mogiensis* Rathbun; *M. lamellata* (de Haan); *M. novaeguineae* (Haswell); | *Epipenaeon*                             |

(Continued)
| Species | Location | Host | Genus | Family | Species |
|---------|----------|------|-------|--------|---------|
| *P. lobulata* Bourdon 1981 | Philippines | Unknown host | *Metapenaeus* | *Penaeidae* | *Apopenaeon* |
| *P. richardsonae* (Nierstrasz and Breder à Brandis, 1931) | Soerabaja, Indonesia | *Penaeus* | *Penaeus* | *Penaeidae* | *Apopenaeon* |
| *P. secunda* Nierstrasz and Breder à Brandis 1923 | Philippines | *Parapenaeus* | *Parapenaeus* | *Apopenaeon* | *Promegathocopea* |
| *P. tukii* (Shiino 1950) | Japan | *Trachysalambria* | *Trachysalambria* | *Stomachicae* | *Apopenaeon* |
| *P. teritia* Nierstrasz and Breder à Brandis, 1932 | Java, Indonesia, Taiwan | *Trachysalambria* | *Trachysalambria* | *Stomachicae* | *Apopenaeon* |
| *P. calculosa* sp. nov. | East China Sea | | | | |
| *P. diatropa* sp. nov. | East China Sea, South China Sea, Guangdong Province, China | | | | |
| *P. sicyoniae* sp. nov. | | | | | |
genus name and rendered Parapenaeon secundum, Parapenaeon brevicoxale and P. expansus as Parapenaeon secunda, Parapenaeon brevicoxalis and Parapenaeon expansa. Parapenaeon japonica is a very widespread species, has been described and re-described thoroughly (see synonym list).

Examination of 12 species of Penaeidae collected in Chinese waters found five species of Parapenaeon infesting them. Of these, three are new species and one, P. expansa, is recorded for the first time from China. A table including all of the currently recognized species of Parapenaeon with type localities, known geographical distribution and reported hosts, is provided. A key to the 13 species of the genus Parapenaeon Richardson, 1904 now known is presented.

Material and methods

Materials for this study are from the China/Vietnam Comprehensive Oceanographic Survey of Beibu Gulf, Gulf of Tonkin (1959–1960) and East China Sea (2000). All materials examined have been deposited in the Institute of Oceanology, Chinese Academy of Sciences, Qingdao, China (IOCAS). The initials CIEPE as follows: ‘C’ is ‘Crustacea’; ‘I’ is ‘Isopoda’; ‘E’ is ‘Epicaridea’; ‘PE’ is ‘Penaeidae’. Animals were examined and drawn using a Zeiss Stemi SV Apo. Males to be studied by scanning electron microscope were fixed in 2.5% glutaraldehyde in 0.2 M Millonig’s phosphate buffer at pH 7.4 for 1.5 h and post-fixed 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 Brünich, 1772
Order ISOPODA Latreille, 1817
Suborder CYMOTHOIDA Wägele, 1989
Family BOPYRIDAE Rafinesque-Schmaltz, 1815
Subfamily ORBIONINAE R. Codreanu, 1967
Genus Parapenaeon Richardson, 1904

Type species, by monotypy, Parapenaeon consolidata Richardson, 1904

Parapenaeon japonica (Thielemann, 1910)
(Figures 1–3)

Epipenaeon japonica Thielemann, 1910: 7, 79–81, 106–107, 108; text-figs. 86, 87; tab. 8; pl. II, fig. 31 (Okayama, Japan; infesting ‘Penaeus sp.’). Chopra, 1923: 454, 458. Nierstrasz and Brender à Brandis, 1929: 302. Hiraiwa, 1933: 49–69; text-figs. 1–23; pl. I [Hiroshima Bay; infesting Metapenaeopsis barbata (de Haan), Metapenaeopsis acclivis (Rathbun) and Metapenaeopsis lamellata (de Haan)]. Monod, 1933: 222. Hiraiwa, 1934: 45–62, figs. 1–14 (Hiroshima Bay, Japan; infesting M. barbata). Hiraiwa, 1936: 101–137; pls. 1–7. Reverberi, 1942: 60. Reverberi and Pitotti, 1942: 116, 123. Nataraj, 1943: 58 (Travancore, India; infesting unidentified penaeoid).
Figure 1. *Parapenaeon japonica* (Thielemann 1910), reference female (CIEPE730301) (A–L). (A) Dorsal view; (B) ventral view; (C) left antennae; (D) left maxilliped, external view; (E) left side of the barbula; (F) left oostegite 1, internal view; (G) left pleopod 1; (H) left pleopod 2; (I) left pleopod 3; (J) left pleopod 4; (K) left pleopod 5; (L) uropods. Reference male (CIEPE730301) (M–O). (M) Dorsal view; (N) ventral view; (O) left antennae. Scale bars: A, B, 2 mm; C, O, 0.28 mm; D–F, 1.26 mm; G–J, 1.12 mm; L, 1.06 mm; M, N, 0.58 mm.
Morita, 1949: 211. Morris, 1948: 4. Qazi, 1959: 56, 59–60. Dale, 1979: 2, 4. Ivanov, 1982: 197. Wägele, 1989: 215. Cash and Bauer, 1993: 123.

**Epipenaeon japonicum.** Nierstrasz and Breder à Brandis, 1923: 68. Barnard, 1925: 408 (Delagoa Bay, Mozambique; infesting *Penaeopsis monoceros* Fabricius). Barnard, 1925b: 121 (same record). Barnard, 1940: 494. Monod, 1933: 220. Shiino, 1934: 80, fig. 1 (Tuyasaki, Fukuoka Prefecture, Kyûsyû, Japan; infesting *M. acclivis*). Shiino, 1939: 80, fig. 1 (Tanabe Bay, Japan; infesting *M. barbata*). Shiino, 1950: 157. Bourdon, 1968: 133, 134, 386. Beck, 1979: 444. Beck, 1980: 148, 150, 152. Trilles, 1999: 332.

**Apopenaeon japonicum.** Shiino, 1934: 260–263, fig. 2 (Tanabe Bay, Japan; infesting *M. barbata*). Shiino, 1939: 80, fig. 1 (Tuyasaki, Fukuoka Prefecture, Kyûsyû, Japan; infesting *M. acclivis*). Shiino, 1950: 157. Bourdon, 1968: 133, 134, 386. Beck, 1979: 444. Beck, 1980: 148, 150, 152. Trilles, 1999: 332.

**Epipenaeon japonicus.** Hiraiwa and Sato, 1939: 105–115, 121–122 (Hiroshima, Japan; infesting *M. barbata*). Shiino, 1958: 51–53; fig. 13, tab. I; pl. III, fig. 7 {several localities in Japan; infesting *M. acclivis*; Momotori and Owase Bay, Japan; infesting *Penaeopsis akayebi* (Rathbun) [Parapenaeus akayebi (Rathbun) = *Metapenaeopsis bartata* (de Haan)].} Strömberg, 1971: 6, 7, 29, 31, 33, 34, 39, 42.

**Epipenaeon quadrii** Qazi, 1959: 57–60; figs. 1–6 [Korangi, Pakistan; infesting *Parapenaeopsis stylifera* (H. Milne Edwards)]. Bourdon, 1968: 331. Ahmed, 1978: 318–320 (Karachi, Pakistan; infesting *P. stylifera*). Bourdon, 1981: 242 footnote. Ahmed and Hakeem, 1982: 316–317; tab. I (coast of Pakistan; infesting *P. stylifera*). Owens, 1986: 14; tab. 2.4.1. Janssen and Brandt, 1994: 22. Kazmi and Tirmizi, 1994: 171, 173, 174; fig. 2 (Karachi, Pakistan; infesting *Parapenaeopsis sculptilis* (Heller) [=Mierspenaeopsis sculptilis (Heller)] and *P. hardwickii* (Miers) [=Mierspenaeopsis hardwickii (Miers)].} Kazmi and Bourdon, 1997: 59 (considered synonym of *Parapenaeon japonica*). Kensley, 2001: 223. Fatima, 2001: 171–172. Hussain, 2001: 66.

**Epipenaeon quadrii** [sic]. Qazi, 1959: 62-A. ‘Bopyrid parasites’ [in part]. Cheung, 1963: 428 (Hong Kong; infesting many species of five penaeid genera).

**Epipenaeon quadrii** [sic]. Bourdon, 1968: 327. Ayub and Ahmed, 2004: 225. Owens, 1987: 118. Ayub, 1998: 219.

**Apopenaeon japonicum hiraiwai.** Strömberg, 1971: 6, 7, 29, 31, 33–34, 39, 42. Shiino, 1950: 155. Palisoc, 1987: 286.

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**Figure 2.** *Parapenaeon japonica* (Thielemann 1910), reference female (CIEPE626201) (A–G). (A) Dorsal view; (B) ventral view; (C) left side of the barbula; (D) left maxilliped, external view; (E) left side of the barbula; (F) left oostegite 1, external view; (G) left oostegite 1, internal view. Reference male (CIEPE626201) (H–J). (H) Dorsal view; (I) ventral view; (J) left antennae. Scale bars: A, B, 2 mm; C, J, 0.40 mm; D, E, 0.98 mm; F, 1.00 mm; H, I, 0.50 mm.
Apopenaeon japonica. Shiino, 1950: 155.

Parapenaeon japonicum. Bourdon, 1979a: 480–486, figs. 6–7 [Madagascar; infesting Metapenaeus monoceros (Fabricius) and Penaeus semisulcatus de Haan]. Bourdon, 1979b: 432 {Gulf of Martaban, Burma; infesting Parapenaeopsis sculp-tilis (Heller) [=Mierspenaeopsis sculptilis (Heller)].} Branford, 1980: 276, tab. 1 {Red Sea; infesting Penaeus latisulcatus Kishinouye [=Melicertus latisulcatus (Kishinouye)].} Ivanov, 1982: 196 (Western Indian Ocean; infesting M. monoceros). Miquel, 1982: 94. Markham, 1986: 159. Anderson, 1990: 290. Courtney, 1991: 615, 617, 620; tab. 2 {Central coast of Queensland, Australia; infesting Penaeus longistylus Kubo [=Melicertus longistylus (Kubo)].}

Parapenaeon japonica Markham, 1982: 366–369, 385, figs. 23–24 [Pearl River Estuary, Hong Kong; infesting Penaeus japonicus (=Marsupenaeus japonicus)]. Markham, 1985: 3, 50–51, 63; tab. 1. (Chonburi, Thailand; infesting Trachypenaeus fulvus Dall [=Trachysalambria fulvus (Dall)]). Owens, 1990: 35, 37; tab. 1. Owens, 1993: 381, 384, 386 [Northeast Australia; infesting P. longistylus (=M. longistylus) and P. latisulcatus (=M. latisulcatus); hyperparasitized by Cabirops orbionei Bourdon]. Markham. 1994: 240–242; figs. 10–11. [Strait of Makassar; infesting Metapenaeopsis sinica Liu and Zhong; Madagascar; infesting M. hilarula (de Man)]. Chu and Leong, 1996: 835. Kazmi and Bourdon, 1997: 59. An, 2006: 82–87; fig. 76 (South China Sea, Beibu Gulf, East China Sea; material examined in present report).

Epipenaeon. Wilson, 1991: 239, fig. 13.4.

Epipenaeum [sic] japonica. Janssen and Brandt, 1994: 9.

non Parapenaeon japonica. Kazmi and Tirmizi, 1994: 171, 172, 174; fig. 1 {Karachi, Pakistan; infesting Penaeus merguiensis de Man [=Fenneropenaeus merguiensis (de Man)]}. (=Parapenaeon expansa Bourdon, 1979a, below.)

‘[S]ome parasitic isopoda.’ Torres-Garcia and Bortolini-Rosales, 2002: 63.

‘[B]opyrids.’ Ayub and Ahmed, 2004: 228.

Material examined

Infesting Metapenaeopsis toloensis Hall, 1962. CIEPE730301, ♀, ♂, Beibu Gulf, Stn. 7303, 20°25’ N, 107°50’ E, 35 m, 25 August 1962, coll. Fuzeng Sun. CIEPE624901, ♀, ♂, Beibu Gulf, Stn. 6249, 20°15’ N, 107°30’ E, 35 m, 14 April 1960, coll. Fuzeng Sun. CIEPE621602, ♀, Beibu Gulf, Stn. 6216, 20°25’ N, 108°50’ E, 61.5 m, 15 April 1960, coll. Fuzeng Sun.

Infesting M. barbata (de Haan, 1844). CIEPE413401, ♀, ♂, East China Sea, Stn. 4134, 29°30’ N, 123°00’ E, 59 m, 10 July 1959, coll. Liren Chen. CIEPE413402, ♀, ♂, East China Sea, Stn. 4134, 29°30’ N, 123°00’ E, 59 m, 10 July 1959, coll. Liren Chen.

Figure 3. Parapenaeon japonica (Thielemann 1910), reference female (CIEPE404201) (A–H). (A) Dorsal view; (B) ventral view; (C) right maxilliped, external view; (D) right side of the barbula; (E) right oostegite 1, external view; (F) right oostegite 1, internal view; (G) right pereopod 1. Reference male (CIEPE404201) (I–N). (I) Dorsal view; (J) ventral view; (K) right antennae; (L) right pereopod 1; (M) right pereopod 7; (N) pereomere 7 and pleon of another male (CIEPE413402). Scale bars: A, B, 2 mm; C, D, 0.94 mm; E, F, I, J, N, 0.74 mm; G, H, 0.40 mm; K–M, 0.42 mm.
CIEPE408001, ♀, ♂, East China Sea, Stn. 4080, 28°00' N, 122°00' E, 52 m, 7 April 1959, coll. Yulin Liao. CIEPE413403, ♀, ♂, East China Sea, Stn. 4134, 29°30' N, 123°00' E, 59 m, 10 July 1959, coll. Liren Chen. CIEPE404602, ♀, ♂, East China Sea, Stn. 4046, 30°30' N, 123°30' E, 63 m, 10 August 1959, coll. Yuhang Cui. CIEPE404901, ♀, the East China Sea, Stn. 4049, 30°15' N, 123°30' E, 57 m, 23 October 1959, coll. Yuhang Cui. CIEPE413404, ♀, ♂, East China Sea, Stn. 4134, 29°30' N, 123°00' E, 61 m, 17 April 1959. CIEPE602601, ♀, ♂, South China Sea, Stn. 6026, 22°30' N, 115°30' E, 29 m, 16 July 1959, coll. Jingsuo, Qu. CIEPE615601, ♀, ♂, South China Sea, Stn. 6156, 18°45' N, 110°45' E, 118.5 m, 16 July 1959, coll. Ruiyu Liu. CIEPE404201, ♀, ♂, East China Sea, Stn. 4042, 31°00' N, 123°30' E, 55 m, 11 August 1959. CIEPE405001, ♀, ♂, East China Sea, Stn. 4050, 30°00' N, 123°30' E, 61 m, 4 February 1959, coll. Liren Chen. CIEPE602101, ♀, ♂, South China Sea, Stn. 6062, 21°45' N, 113°30' E, 35 m, 24 April 1959, coll. Fuzeng Sun. CIEPE413405, ♀, ♂, East China Sea, Stn. 4134, 29°30' N, 123°00' E, 59 m, 10 July 1959, coll. Liren Chen. CIEPE406201, ♀, ♂, East China Sea, Stn. 4062, 29°00' N, 122°30' E, 46 m, 2 April 1959, coll. Yulin Liao. CIEPE605901, ♀, ♂, South China Sea, Stn. 6059, 21°30' N, 113°45' E, 44.5 m, 10 January 1959, coll. Baoliong Wu. CIEPE404601, ♀, ♂, East China Sea, Stn. 4046, 30°30' N, 123°30' E, 57 m, 22 October 1959, coll. Liren Chen. CIEPE622201, ♀, Beibu Gulf, Stn. 6222, 18°45' N, 108°30' E, 23 m, 26 January 1959, coll. Zhengang Fan. CIEPE606401, ♀, ♂, South China Sea, Stn. 6064, 21°15' N, 113°30' E, 52 m, 18 October 1959, coll. Fengshan Xu. CIEPE405501, ♀, ♂, East China Sea, Stn. 4055, 29°30' N, 124°00' E, 74 m, 9 July 1959, coll. Liren Chen. CIEPE609101, ♀, ♂, South China Sea, Stn. 6091, 20°30' N, 112°30' E, 78 m, 5 July 1959, coll. Xiutong Ma. CIEPE607701, ♀, ♂, South China Sea, Stn. 6077, 21°00' N, 113°00' E, 64 m, 7 April 1959, coll. Zhican Tang. CIEPE606202, ♀, ♂, South China Sea, Stn. 6062, 21°45' N, 113°30' E, 32 m, 18 October 1959, coll. Yongliang Wang. CIEPE606501, ♀ (immature), South China Sea, Stn. 6065, 21°00' N, 113°30' E, 74 m, 14 July 1959, coll. Xiutong Ma. CIEPE602301, ♀, ♂, South China Sea, Stn. 6023, 21°45' N, 116°00' E, 103 m, 19 July 1959, coll. Weiquan Zhang. CIEPE751001, ♀, ♂, East China Sea, Stn. V-3, 27°30' N, 122°00' E, 75 m, 11 October 1975, coll. Zhican Tang and Jieshan Xu.

Infesting Metapenaeopsis stridulans (Alcock, 1905). CIEPE626201, ♀, ♂, Beibu Gulf, Stn. 6262, 19°30' N, 107°00' E, 49.6 m, 7 July 1960, coll. Zhengang Fan. CIEPE720401, ♀, Beibu Gulf, Stn. 7204, 20°30' N, 108°30' E, 49 m, 24 April 1962, coll. Fuzeng Sun. CIEPE625001, ♀, ♂, Beibu Gulf, Stn. 6250, 20°00' N, 107°30' E, 30.5 m, 11 July 1960, coll. Fuzeng Sun. CIEPE627001, ♀, ♂, Beibu Gulf, Stn. 6270, 19°30' N, 108°30' E, 35 m, 8 February 1960, coll. Fuzeng Sun. CIEPE760201, ♀, ♂, Beibu Gulf, Stn. 7602, 19°00' N, 108°00' E, 27 m, 11 April 1962, coll. Fuzeng Sun. CIEPE626301, ♀, ♂, Beibu Gulf, Stn. 6263, 19°00' N, 107°00' E, 55.5 m, 17 May 1960, coll. Zhengang Fan. CIEPE624301, ♀, ♂, Beibu Gulf, Stn. 6243, 18°00' N, 108°00' E, 90.8 m, 12 July 1960, coll. Shoupeng Shen. CIEPE619701, ♀, ♂, Beibu Gulf, Stn. 6197, 21°00' N, 109°00' E, 26 m, 17 July 1960, coll. Fuzeng Sun. CIEPE624001, ♀, ♂, Beibu Gulf, Stn. 6240, 19°30' N, 108°00' E, 58 m, 9 February 1960, coll. Zhengang Fan. CIEPE626601, ♀, Beibu Gulf, Stn. 6266, 17°30' N, 107°00' E, 52 m, 24 October 1960. CIEPE625401, 2♀, ♂, Beibu Gulf, Stn. 6254, 18°30' N, 107°30' E, 72 m, 25 May 1960, coll., Fuzeng Sun.
Infesting *Metapenaeopsis dura* Kubo, 1949. CIEPE730302, ♀, Beibu Gulf, Stn. 6203, 18°15' N, 109°00' E, 35 m, 25 August 1962, coll. Fuzeng Sun. CIEPE730501, ♀, Beibu Gulf, Stn. 7305, 20°00' N, 108°30' E, 20 April 1962.

Infesting *Metapenaeopsis mogiensis* Rathbun, 1902. CIEPE601113, ♀, ♂, South China Sea, Stn. 6011, 22°45' N, 117°00' E, 40.5 m, 5 January 1960. CIEPE601114, ♀, ♂, South China Sea, Stn. 6011, 22°45' N, 117°00' E, 65 m, 28 October 1959, coll. Yongliang Wang. CIEPE601202, ♀, ♂, South China Sea, Stn. 6012, 22°30' N, 117°00' E, 47.6 m, 20 July 1959.

Infesting *Metapenaeopsis lamellata* (de Haan, 1844). CIEPE600501, ♀, ♂, South China Sea, Stn. 6005, 23°15' N, 117°30' E, 40 m, 24 April 1960, coll. Jingzuo Qu.

Infesting *Metapenaeopsis novaeguineae* (Haswell, 1879). CIEPE611901, ♀, ♂, South China Sea, Stn. 6119, 20°15' N, 111°30' E, 71 m, 26 January 1959, coll. Yongliang Wang. CIEPE610601, ♀, ♂, South China Sea, Stn. 6106, 21°00' N, 112°00' E, 65 m, 28 October 1959, coll. Yongliang Wang. CIEPE602201, ♀, ♂, South China Sea, Stn. 6120, 20°00' N, 111°30' E, 81 m, 19 July 1959, coll. Zhican Tang. CIEPE606601, ♀, ♂, the South China Sea, Stn. 6066, 20°30' N, 113°30' E, 89 m, 25 April 1959, coll. Fuzeng Sun.

Infesting unidentified *Metapenaeopsis* species. CIEPE103701, ♀, ♂, Zhejiang Province, Stn. 1037, 20°15' N, 111°30' E, 71 m, 12 August 1960, coll. Guangyu Lin and Baolin Zhang. CIEPE570701, ♀, ♂, Xinying, Hainan Province, 19°53' N, 109°30' E, 10 July 1959, coll. Weiquan Zhang. CIEPE560401, ♀, ♂, Guangdong Province, 22°42' N, 110°35' E, 66 m, 16 July 1959, coll. Zhican Tang. CIEPE570702, 2♀, 2♂, Hainan Province, Xinying, 19°53' N, 109°30' E, 30 July 1957.

**Remarks**

*Parapenaeon japonica* is a very widespread species, and was reported from the Red Sea through the Indian Ocean past Pakistan and India to Japan, the Philippines and China, including Hong Kong. This species has been thoroughly described and
illustrated, and some aspects of its biology have been studied (Hiraiwa 1933, 1934, 1936). Shiino (1950) transferred it to the genus *Apopenaeon* as *A. japonicum* because its female has six pleomeres. Bourdon (1979a) later transferred this species to *Parapenaeon* as *P. japonicum*. In recording it from Indonesia, the Philippines and near Madagascar, Markham (1994) diagnosed its characters; the most distinctive feature of the female is that its short side bears coxal plates on only the first two pereomeres. Kazmi and Tirmizi (1994) reported *P. japonica* from Pakistan but illustrated the female with coxal plates on both sides of all pereomeres; therefore they actually had *Parapenaeon expansa* (discussed below) instead.

The present specimens display a moderate amount of morphological variation. Although a female (Figure 1) infesting *M. toloensis* Hall conforms well to the description of those from Hong Kong (Markham 1982), its accompanying male (Figure 1M, N) is more similar to that from Madagascar (Bourdon 1979a: fig. 6m). Among parasites (Figure 2) of *M. stridulans*, the posterior margin of the first oostegite (Figure 2F, G) of one female is unusual, and its male (Figure 2H) has black eyes. A female (Figure 3A–H) infesting *M. barbata* (de Haan) has many small differences, internal ridge of oostegite 1 simple and palp stout and straight. At the same time, the pleon of its male has a large midventral tubercle (Figure 3J). In another male (Figure 3N), the pleon is separated into three pleomeres rather than being unsegmented.

The host species *M. toloensis, M. dura, M. mogiensis* and *M. novaeguineae* have never before been reported to bear bopyrid parasites, whereas *M. stridulans* have been reported to bear *Epipenaeon ingens* Nobili, 1906 and *Orbione thielemanni* Nierstrasz and Brender à Brandis, 1931. With the addition of the new host records, *P. japonica* is now known to infest 21 different penaeoid host species, the most for any orbionine bopyrid species. It is also the most widespread geographically of any orbionine species.

*Parapenaeon expansa* Bourdon, 1979a

(Figures 4, 5)

*Parapenaeon expansa* Bourdon, 1979a: 494, 495–498; figs. 15–17, 18b, c {Near Madagascar; infesting *Penaeus teraoi* Kubo [=Melicertus teraoi (Kubo)]}. Nearhos and Lester, 1984: 257, 258 {Moreton Bay, Queensland, Australia; infesting *P. plebejus* Hess [=Melicertus plebejus (Hess)]. Karumbu, Gulf of Carpentaria, Australia; infesting *Penaeus* sp.}. Owens and Glazebrook, 1985a: 105, 108–112; tabs. 2–4 {Northern Australia; infesting *Penaeus indicus* H. Milne Edwards

Figure 4. *Parapenaeon expansa* Bourdon, 1979a, reference female (CIEPE550329) (A–I). (A) Dorsal view; (B) ventral view; (C) right antennae; (D) right maxilliped, external view; (E) right side of the barbula; (F) right oostegite 1, external view; (G) right oostegite 1, internal view; (H) right pereopod 1; (I) right pereopod 5. Reference male (CIEPE550329) (J–N). (J) Dorsal view; (K) ventral view; (L) left antennae; (M) right pereopod 1; (N) right pereopod 4. Scale bars: A, B, 2 mm; C, 0.28 mm; D, 1.13 mm; E, 0.94 mm; F, G, 1.28 mm; H, I, 0.46 mm; J, K, 0.82 mm; L–N, 0.26 mm.
Figure 5. Parapenaeon expansa Bourdon, 1979a, reference female (CIEPE601101) (A–G). (A) Dorsal view; (B) ventral view; (C) right maxilliped, external view; (D) right side of the barbula; (E) right oostegite 1, external view; (F) right oostegite 1, internal view; (G) right pereopod 1. Reference male (CIEPE601101) (H–L). (H) Dorsal view; (I) ventral view; (J) right antennae; (K) right pereopod 1; (L) right pereopod 7. Scale bars: A, B, 2 mm; C, E, F, 1.12 mm; D, 0.46 mm; G, 0.32 mm; H, I, 0.56 mm; J, 0.18 mm; K, L, 0.22 mm.
*latisulcatus* (Kishinouye)]. Humphrey, 1995: tab. 48. Owens and Rothlisberg, 1995: 159 (Gulf of Carpentaria; study of cryptoniscus larvae). Department of Agriculture, 1998: 44; tab. 8. Trilles, 1999: 338. Kensley, 2001: 225. An, 2006: 82, 87–88; fig. 77 (account of material reported herein).

*Parapenaeon monolioncus* An, 2006: 152–153, fig. 78 (invalid name).

*Parapenaeon japonica.* Kazmi and Tirmizi, 1994: 171–172, fig. 1 [Karachi, Pakistan; infesting *P. merguiensis* de Man; non *P. japonica* (Thielemann 1910)]

*Parapenaeon expansa.* Markham, 1994: 225, 226, 242, 244–245; fig. 14 [New Caledonia; infesting *Metapenaeonopsis gaillardia* Crosnier. Strait of Makassar, Indonesia; infesting *Metapenaeonopsis sinica* Liu and Zhong. Seychelles; infesting *Metapenaeonopsis faouzii* Ramadan. Madagascar; infesting *Metapenaeonopsis mogiensis consobrina* (Nobili). Redescription]. Bruce, 2007: 278.

**Material examined**

Infesting *Fenneropenaeus penicillatus* (Alcock, 1905). CIEPE550329, ♀, ♂, Xiamen, Fujian Province, 24°30′ N, 118°05′ E, 29 March 1955. CIEPE560227, ♀, ♂, Zhelang, Guangdong Province, 22°40′ N, 115°35′ E, 27 February 1956. CIEPE560326, ♀, ♂, Guanghai, Guangdong Province, 21°56′ N, 112°45′ E, 26 March 1956, coll. Ruiyu Liu.

Infesting *Penaeus japonicus* (Spence Bate, 1888). CIEPE601101, ♀, ♂, South China Sea, Stn. 6011. 22°45′ N, 117°00′ E, 38 m, 24 April 1960, coll. Mu Chen.

**Remarks**

*Parapenaeon expansa* has been found across the Indian Ocean and on the Pacific side of Australia, but this is the first published record of its occurrence in China. It has previously been found infesting nine species of hosts; those reported here are both new records for any bopyrid parasite.

The specimens from Pakistan recorded by Kazmi and Tirmizi (1994) as *P. japonica* we believe were misidentified specimens of *P. expansa* and are cited in our synonymies accordingly above. The present specimens (Figures 4, 5) conform well to the descriptions of Bourdon (1979a) and Kazmi and Tirmizi (1994). Characters of some females that differ from previous records are the inner projection of the barbula (Figure 4E) being much smaller than the outer one, and the maxilliped palp being slightly segmented. In one male specimen (Figure 5H, I) the margin of the pleon is dentate and obscurely segmented in ventral view. An (2006) examined these specimens and recorded two *Parapenaeon* species (*P. expansus* and *P. monolioncus* sp. nov.) in her doctoral dissertation. Now we consider all these materials to represent *P. expansa*, with the name *P. monolioncus* being invalid because of its presentation in an unpublished dissertation (not a published work in the sense of the ICZN); it is introduced here in synonymy.

*Parapenaeon calculosa* sp. nov. (Figure 6)

**Material examined**

Infesting *Trachysalambria curvirostris* (Stimpson). Holotype, CIEPE403901-1, ♀, allotype, CIEPE403901-2, ♂, East China Sea, Stn. 4039, 31°30′ N, 124°00′ E, 44.5 m, 25 October 1959, coll. Liren Chen. Paratype, CIEPE403801, ♀, ♂, East China Sea, Stn. 4039, 31°30′ N, 124°00′ E, 44.5 m, 25 October 1959, coll. Liren Chen.
Figure 6. *Parapenaeon calculosa* sp. nov. Holotype female (CIEPE403901-1) (A–J). (A) Dorsal view; (B) ventral view; (C) right maxilliped, external view; (D) right side of the barbula; (E) right oostegite 1, external view; with pereopod 1 and coxal plates of right pereomere 1; (F) right oostegite 1, internal view; (G) right pereopod 1; (H) right pereopod 7; (I) ventral view of pleopods and uropods; (J) dorsal view of pleomere 6 and uropods. Allotype male (CIEPE403901-2) (K–M). (K) Dorsal view; (L) ventral view; (M) left antennae. Immature female (CIEPE405101) (N, O). (N) Dorsal view; (O) ventral view. Scale bars: A, B, 2 mm; C, K, L, 0.62 mm; D, 0.76 mm; E, F, 1.34 mm; G, H, 0.64 mm; I, 1.00 mm; J, 0.80 mm; M, 0.48 mm.
Description of holotype female (CIEPE403901-1) (Figure 6A–J)
Length 7.72 mm, maximal width 5.69 mm, head length 1.47 mm, head width 1.64 mm (Figure 6A, B).
Head oval, with well-developed frontal lamina. Eyes absent (Figure 6A). First antenna of three articles, second antenna of five articles, both non-setose. Maxilliped triangular, with curved stout palp (Figure 6C). Barbula with one digitate lateral projection on each side and single smooth projection near centre (Figure 6D). Pereon (Figure 6A) broadest across pereomere 3. Pereomeres 2–5 fused medially. Coxal plates well-developed on long side of each pereomere, margins of the first two coxal plates slightly dentate. Coxal plates well developed on short sides of first two pereomeres also, but others rudimentary. Round dorsolateral bosses on first five pereomeres. Brood pouch (Figure 6B) opens medially. First oostegite (Figure 6E, F) with both plates nearly equally long, internal ridge bearing many digitate projections, posterolateral point round, with straight posterior edge. Pereopods (Figure 6G, H) larger posteriorly, carpi and meri smooth, bases of all pereopods produced into lobes. Pleon of six pleomeres, first five bearing lateral plates and biramous pleopods. Surface of first five lateral plates tuberculate. Pleopods and uropods similarly tubercular (Figure 6I). Sixth pleomeres without lateral plates, but with biramous uropods (Figure 6J).

Description of allotype male (CIEPE403901-2) (Figure 6K–O)
Length 2.21 mm, maximal width across pereonite 4, 1.04 mm, head width 0.55 mm, pleonal length 0.45 mm.
Head elliptical with curved posterior edge (Figure 6K). Eyes absent. First antenna of three articles, with setae on distal article; second antenna of five articles, terminal two or three articles setose (Figure 6M).
Pereomeres almost equally wide, lacking midventral projections (Figure 6L). All pereopods of similar size, first three pereopods with much larger dactyli and smaller carpi (Figure 6L).
Pleon fused and oval, without midventral projections, lacking pleopods and uropods (Figure 6K, L).

Variations
Paratype females differ little from the holotype. An immature female (CIEPE405101) has dentate coxal plates on first three pereomeres on long sides, those on short sides being smaller than those on long sides (Figure 6N, O). Slender pleopods extend beyond the lateral plates, and are visible in dorsal view.

Etymology
The specific name, calculosa a Latin adjective meaning ‘pebbly’, refers to the surfaces of the pleopods of the holotype female, which are thickly tuberculated in a pattern reminiscent of small stones or pebbles.

Remarks
The female of P. calculosa, as in other species of the genus Parapenaeon, has six pleomeres, the first five bearing lateral plates. The male has a pleon fused and lacking appendages, as is typical for Parapenaeon. The new species is most similar to P. japonica (Thielemann 1910). The new species differs from P. japonica in the following. (1)
species has a straight posterior edge of the first oostegite, but all specimens of *P. japonica* have curved posterior edge of the first oostegite. (2) Sixth pleomeres of the new species can be seen from dorsal view (Figure 6A, J), but in *P. japonica* only five pleomeres can be seen, sixth pleomere usually hidden under the fifth pleomere (Figures 1A, 2A, 3A). (3) The new species with tubercles on the surface of the lateral plates, and *P. japonica* with smooth lateral plates. (4) The new species barbula with one pairs of digitate projections, and the barbula of *P. japonica* with two pairs of digitate projections. (5) Male of the new species with smooth pleon, without anal cone or other tubercles, and *P. japonica* with distinct anal cone, some specimens with midventral tubercular on the pleon (Figure 3J).

*Parapenaeon diatropa* sp. nov.
(Figures 7, 8)

![Figure 7. Parapenaeon diatropa sp. nov. Holotype female (CIEPE001101-1) (A–I). (A) Dorsal view; (B) ventral view; (C) left antennae; (D) left maxilliped, external view; (E) left side of the barbula; (F) left oostegite 1, external view; (G) left oostegite 1, internal view; (H) right pereopod 1; (I) right pereopod 7. Allotype male (CIEPE001101-2) (J, K). (J) Dorsal view; (K) ventral view. Scale bars: A, B, 1 mm; C, H, I, 0.26 mm; D–G, 0.42 mm; J, K, 0.43 mm.](image-url)
Material examined

Infesting *Metapenaeopsis dalei* (Rathbun), Det. of host, Xinzheng Li. Holotype: CIEPE001101-1, ♀, allotype, CIEPE001101-2, ♂, East China Sea, Stn. H6, 28°10’ N, 122°45’ E, 78 m, 25 November 2000. Paratype: CIEPE601102, 2♀♂, 2♂♂, South China Sea, Stn. 6011, 22°45’ N, 117°00’ E, 38 m, 24 April 1960, coll. Mu Chen. Other materials: CIEPE001102, 2♀♂, 2♂♂, East China Sea, Stn. G4, 29°45’ N, 124°00’ E, 60 m, 23 November 2000, coll. Lusan Liu. CIEPE601103, 2♀♂, 2♂♂, South China Sea, Stn. 6011, 22°45’ N, 117°00’ E, 38 m, 24 April 1960, coll. Mu Chen. CIEPE601104, 2♀♂, 2♂♂, South China Sea, Stn. 6011, 22°45’ N, 117°00’ E, 38 m, 24 April 1960, coll. Mu Chen. CIEPE601105, 2♀♂, 2♂♂, South China Sea, Stn. 6011, 22°45’ N, 117°00’ E, 38 m, 24 April 1960, coll. Mu Chen. CIEPE601106, 2♀♂, 2♂♂, South China Sea, Stn. 6011, 22°45’ N, 117°00’ E, 38 m, 24 April 1960, coll. Mu Chen. CIEPE413406, ♀, ♂, East China Sea, Stn. 4134, 29°30’ N, 123°00’ E, 61 m, 17 April 1959, coll. Leren Chen. CIEPE601107, 2♀♂, 2♂♂, South China Sea, Stn. 6011, 22°45’ N, 117°00’ E, 38 m, 24 April 1960, coll. Mu Chen. CIEPE601108, ♀, ♂, South
China Sea, Stn. 6011, 22°45' N, 117°00' E, 38 m, 24 April 1960, coll. Mu Chen. CIEPE000110, 9♀, 5♂, East China Sea, Stn. G4, 29°45' N, 124°00' E, 60 m, 23 January 2000, coll. Lusan Liu. CIEPE000103, 16♀, 12♂, East China Sea, Stn. H6, 28°10' N, 122°45' E, 78 m, 25 November 2000. CIEPE000112, 9♀, 5♂, East China Sea, Stn. G4, 29°45' N, 124°00' E, 60 m, 23 January 2000, coll. Lusan Liu. CIEPE000102, 16♀, 12♂, East China Sea, Stn. G4, 29°45' N, 124°00' E, 60 m, 23 January 2000, coll. Lusan Liu.

Description of holotype female (CIEPE001101-1) (Figure 7A-I)

Length 5.97 mm, maximal width 4.09 mm, head length 0.94 mm, head width 1.24 mm.

Head oval, with deep bilobate anterior edge and curved posterior edge, well-developed frontal lamina extending beyond sides of the head (Figure 7A). Eyes absent. First and second antennae of three and five articles, respectively, terminal setae not evident (Figure 7C). Maxilliped triangular, with short curved stout palp (Figure 7D). Barbula with two pairs of lateral projections on each side, outer pair with slightly digitate edge, but inner projections smooth. (Figure 7E).

Pereon broadest across fourth pereomere (Figure 7A). Coxal plates well-developed on long side of all pereomeres, margins entire. Coxal plates on short side of first two pereomeres also well-developed, but those on other pereomeres rudimentary. Dorsolateral bosses on first five pereomeres. Brood pouch wide open (Figure 7B). First oostegite (Figure 7F, G) plates of nearly equal length, internal ridge bearing five to eight small tubercules, posterolateral point broadly triangular, pointing posteriorly, and with posterior edge curved. Pereopods larger posterior (Figure 7H, I), surface of the carpi and meri smooth, bases of all pereopods produced into lobes.

Pleon of six pleomeres, first five bearing tubercular biramous pleopods and rudimentary lateral plates. Pleopods are slender and do not extend beyond edges of lateral plates, so they are not visible in dorsal view (Figure 7B). Fifth pleomere widely median separated, and small sixth pleomeres can be seen from dorsal view (Figure 7A). Biramous uropods tuberculate. Exopodites of uropods different endopodites, the former larger, sharp terminal, and slender, but the latter short, cylindrical. Uropods are visible dorsally (Figure 7B).

Description of allotype male (CIEPE001101-2) (Figures 7J, K, 8)

Length 1.99 mm, maximal width across pereonite 5, 0.83 mm, head width 0.50 mm, pleonal length 0.42 mm. All pereomeres distinct, pleon fused (Figures 7J, K, 8).

Head (Figure 7J) trapezoidal, its posterior edge straight. Black eyes near posterolateral corners of head (Figure 7J). First and second antennae (Figure 8A) of three and four articles respectively, setae not evident.
Pereomeres almost equally wide, lacking midventral projections (Figures 7J, 8A). Pereomeres 2 and 4 with pigment on surface (Figure 7J). First three pereopods (Figure 8B) with longer dactyi and smaller carpi than last four pereopods (Figure 8C). All propodi, carpi and meri with setae on their ventral surface (Figure 8B, C).

Pleon fused, median part with pigment. Anal cone visible in dorsal view (Figure 7K).

Variations
Immature females have black eyes, flatter bodies and coxal plates on the short sides of all pereomeres; other characters agree with the holotype.

Etymology
The specific name, the Greek adjective diatropos, refers to uropods of holotype female with remarkable diverse rami.

Remarks
The new species, *P. diatropa*, is most similar to *P. japonica* (Thielemann 1910). The female of *P. diatropa* differs from that of *P. japonica* in longer body shape, uropods with remarkable different rami, cylindrical endopodite and longer and sharp exopodite; pleopods not extending beyond the margin of pleon, cannot be seen from the dorsal view; a simple barbula whose inner projections are almost smooth, oostegite 1 with almost smooth inner ridge bearing only small tubercules, whereas in *P. japonica*, almost round body shape, flake shape uropods with similar endopodite and exopodite; pleopods usually extending beyond the margin of pleon; heavy tubercular digitate projections on each side of the barbula; having long and thick tubercules on the inner ridge of oostegite 1.

*Parapenaeon sicyoniae* sp. nov.
(Figures 9, 10)

Material examined
Infesting *Sicyonia lancifer* (Olivier, 1811) [= *Sicyonia cristata* de Haan, 1844]. Holotype: CIEPE560309, ♀, allotype: CIEPE560310, ♂, Haimen, Guangdong Province, 23°15′ N, 116°40′ E, 14 March 1956, coll. Ruiyu Liu. Paratypes: CIEPE560307, 2♀♀, 2♂♂, Haimen, Guangdong Province, 23°15′ N, 116°40′ E, 14 March 1956, coll. Ruiyu Liu.

Description of holotype female (*CIEPE560309*) (Figure 9A, O)

Length 5.79 mm, maximal width 4.23 mm, head length 0.96 mm, head width 1.37 mm.

Head oval, with well-developed frontal lamina. Small black eyes on boundary between frontal lamina and head (Figure 9A). First antenna of three articles without evident setae, basal two articles stout, terminal article very narrow; second antenna of four articles, each much narrower than that proximal to it, terminal article with sparse
setae (Figure 9C). Palp of maxilliped broadly triangular, offset slightly from medial margin, non-setose, not articulating with maxilliped (Figure 9D). Barbula with two pairs of digitate lateral projections on each side, more branches on outer projections than inner ones. Small tubercule medial to each inner projection (Figure 9E).

Pereon broadest across third pereomere (Figure 9A). Coxal plates well-developed on long side of all pereomeres. Coxal plates on short side of first two pereomeres also well-developed, but those on third and fourth pereomeres rudimentary, absent from other pereomeres. Round dorsolateral bosses on first four pereomeres. Brood pouch
almost closed (Figure 9B). First oostegite (Figure 9F, G) with slightly sinuate internal ridge. Roundly triangular posterolateral point extending posterolaterally. Pereopods larger posteriorly (Figure 9H, I), all bases produced into lobes.

Pleon of six pleomeres, first five bearing smooth lateral plates (Figure 9J) and biramous digitate pleopods (Figure 9K–O). Sixth pleomeres visible in dorsal view, with digitate biramous uropods (Figure 9J). Exopodites of uropods round, endopodites as slender triangles.

Description of allotype male (CIEPE560310) (Figures 9P, Q, 10)

Length 2.36 mm, maximal width across pereonite 4, 1.03 mm, head width 0.52 mm, pleonal length 0.49 mm. Pereon segments distinct, pleon fused (Figures 9P, Q, Figure 10A–D).

Head fan-shaped (Figure 9P). Eyes absent. First antenna of three articles, terminal one setose. Second antenna of four articles, terminal one setose (Figure 10B).
Pereomeres almost equally wide, lacking midventral projections (Figures 9Q, 10A). All pereopods of similar size and structure, propodi, carpi and meri with clusters of setae near distal margins (Figure 10B–D); those projections on propodi in two lines along sides of grooves receiving tip of dactyli (Figure 10D).

Pleon subtriangular, fused, its anterior region indicating remnant of former first pleomeres much broader than rest of pleon. No pleopods or uropods (Figure 9Q).

Variations
Other males and females do not differ significantly from the type specimen.

Etymology
The specific name, *sicyoniae* is the genitive form of the genus name of the host of the new species.

Remarks
The female of *P. sicyoniae* shows the reduced and surrounded sixth pleomere characteristic of the genus *Parapenaeon*. *Parapenaeon sicyoniae* is most similar to *P. diatropa*, but the former can be distinguished from the latter as follows: (1) the new species with round body, and *P. diatropa* with much long body; (2) pleopods of new species foliate and can be seen from the dorsal view, but *P. diatropa* with slender pleopods and cannot be seen from dorsal view; (3) brood pouch of the new species nearly closed, but *P. diatropa* with open brood pouch; (4) the male of the new species without eyes, but the allotype male of *P. diatropa* with dark eyes.

An (2006) regarded these specimens as one species of the genus *Minicopenaeon* in her doctoral dissertation, but because they have coxal plates on the short side of pereomere 2, they belong to the genus *Parapenaeon*. A key to the species of genus *Parapenaeon* Richardson, 1904 is presented below.

The 12 host species identified to species recorded in this report include eight species in the genus *Metapenaeopsis* and one species of each of the genera *Fenneropenaeus*, *Marsupenaeus*, *Sicyonia* and *Trachypalambria*. Of these 12 species, five have not previously been reported as hosts of bopyrid parasites and are therefore new records here. They are *Metapenaeopsis toloensis*, *M. dura*, *M. lamellata*, *M. novaeguineae* and *Sicyonia cristata*.

Key to 13 species of the genus *Parapenaeon* Richardson, 1904 based on mature females

1. Pleon with well-developed lateral plates .......................................................... 5
   Pleon with rudimentary lateral plates ........................................................... 2

2. Sixth pleomere visible in dorsal view ............................................................ 3
   Sixth pleomere not visible in dorsal view .................................................... 4

3. Pleopods and uropods with smooth surfaces ........................................... *P. richardsonae*
   Pleopod and uropods with tuberculate surfaces ......................................... *P. consolidata*

4. Frontal lamina large; no tubercules on the lateral plates of pleon ....... *P. lobulata*
   Frontal lamina small; tubercules on lateral plates of the pleon .... *P. brevicoxalis*

5. Only first two pereomeres with large coxal plates on short side ............ 10
   At least first four pereomeres with large coxal plates on short side .......... 6
6. Uropods biramous ................................................................. ................................. P. takii
   Uropods uniramous ............................................................................. 7

7. Coxal plates equally well developed on both sides of first four pereomeres ....
   ................................................................................................. P. expansa
   Coxal plates not equally developed on both sides with first four pereomeres ... 8

8. Lateral plates of first pleomeres different from others ......................... P. coarctata
   Lateral plates of first pleomeres similar to others ................................. 9

9. Sixth pleomere and uropods visible in dorsal view ......................... P. tertia
   Sixth pleomere and uropods covered by lateral plates of fifth pleomeres....
   ................................................................................................. P. secunda

10. Surface of pleonal lateral plates tubercular ................................. P. calculosa sp. nov.
    Surface of pleonal lateral plates smooth .............................................. 11

11. Internal ridge of oostegite 1 and barbula slightly digitate ...................... 12
    Internal ridge of oostegite 1 and barbula strongly digitate ................. P. japonica

12. Body oval, pleopods foliate and visible in dorsal view ........ P. sicyoniae sp. nov.
    Body long, pleopods slender and not visible in dorsal view except uropods ....
    ................................................................................................. P. diatropa sp. nov.

Acknowledgements
The first author would like to thank Dr Haiyan Yu for her guidance in this study. We are
indebted to collectors of the China/Vietnam Comprehensive Oceanographic Survey to Beibu
Gulf.

Disclosure statement
No potential conflict of interest was reported by the authors.

Funding
This work was supported by the National Natural Science Youth Foundation of China [grant
number 31101614]; and the National Natural Science Foundation of China [grant number
31471970].

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