Distribution of Benthesicymus tanneri Faxon, 1893 (Dendrobranchiata, Benthesicymidae) off the west coast of Mexico and notes on its morphology

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Abstract
A large series of specimens of Benthesicymus tanneri Faxon, 1893 (Dendrobranchiata; Benthesicymidae) was collected during an extensive survey of deep-water invertebrate fauna off western Mexico. In total, 61 males and 122 females (M:F ratio = 1:2) from 44 sampling stations were examined, considerably increasing the number of known specimens and sampling localities for this species which is widely distributed along the Pacific coast of Mexico. The collection is the largest available for this species to date and presents first records from off the west coast of the Baja California Peninsula and a slight increase of the northernmost record within the Gulf of California. On the whole, females grew larger than males. The petasma of males of different sizes and the female thelycum of B. tanneri are illustrated. The petasma of B. tanneri presents a ventrolateral crescent-shape process otherwise found only in B. tirmiziae Crosnier, 1978 and in B. bartletti S.I. Smith, 1882. A key to the four species of Benthesicymus presently known from the eastern Pacific is presented.

Keywords
Benthesicymus tanneri, eastern Pacific, distribution, key to species
Introduction

Benthicymidae is a relatively large family of shrimps that contains 39 species within five genera. The most species-rich genera are *Gennadas* (16 species) and *Benthesicymus* (15 species) (De Grave and Fransen 2011). The genus *Benthesicymus* was first reviewed by Burkenroad (1936) when the group comprised 19 species. However, since then several of those species have been considered junior synonyms or assigned to different genera, and three new species have been described (see De Grave and Fransen 2011). Burkenroad (1936) separated the 19 species known at that time into two groups (Groups I and II) taking into consideration a long series of characters, including the shape of the exopod of the first maxilliped, the merus of the second maxilliped and the dactyl of the third maxilliped, the relative size of the exopodite of the pereiopods, the position of the pterygostomial spine, and the shape of the pterygostomial carina. In addition, he also considered the structure of the petasma and thelycum. According to Burkenroad (1936), the type species of *Benthesicymus*, *B. crenatus* Spence Bate, 1881, is part of Group I. The two groups (I and II) are essentially the same as those referred to by Kikuchi and Nemoto (1991) and Dall (2001), but these authors used a reduced series of characters and an updated list of species. Kikuchi and Nemoto (1991), however, ommitted *B. cereus* Burkenroad, 1936, from their list and key, and included *B. longipes* Bouvier, 1906 (now synonymized with *B. iridescentes* Spence Bate, 1881) and *B. brevirostris* Kikuchi & Nemoto, 1991 (now transferred to the genus *Altelatipes*). Dall (2001) cited the 15 species from the Indo-West Pacific known to him, including *B. brevirostris* and *B. longipes*, and provided a key to species from that region.

Characters used by Kikuchi and Nemoto (1991) in their definition of Group I and II included the position of the branchiostegal spine, the shape of the second maxilliped and of the dactylus of third maxilliped, and the relative size of pereiopods’ exopod. Their Group II includes five species, two of which have been recorded in deep waters of the Mexican Pacific: *B. altus* Spence Bate, 1881, and *B. tanneri* Faxon, 1893 (see Hendrickx 1996). Although similar in their general shape, *B. altus* and *B. tanneri* are easy to separate based on the structure of the thelycum and petasma. Kikuchi and Nemoto’s (1991) Group I included 10 species, one of them also reported off western Mexico, *B. laciniatus* Rathbun, 1906, which distinctively features small spines on the posterolateral margin of the fifth abdominal somite.

To date, four species have been certainly recorded in the eastern Pacific. *Benthesicymus altus* is distributed from California, USA, to the Galapagos Islands, but it also occurs in the Atlantic and Indo-Pacific (Guzmán and Wicksten 2000). *Benthesicymus tanneri* is known from California, USA, and the Gulf of California (north to 27°34’N; 110°53’W), Mexico, to Chile (21°19’S) (Retamal and Soto 1993; Wicksten and Hendrickx 2003). The taxonomic status of *B. laciniatus* Rathbun, 1906, was reviewed by Wicksten (2004) and this species is known from Hawaii, Santa Catalina Island (as *Gennadas pectinatus* Schmitt, 1921, a junior synonym of *B. laciniatus*), California, USA, and off Baja California Peninsula (31°20’N; 120°8’W) (Wicksten 2004). Another species of Group II, *B. investigatoris* Alcock & Anderson, 1899, is widely distributed in
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The material on which this study is based was collected by the R/V “El Puma” of the Universidad Nacional Autónoma de México (UNAM), between 1991 and 2014. Specimens of Benthesicymus tanneri were captured during sampling operations off the west coast of the Baja California Peninsula (TALUD XV, July-August 2012; TALUD...
XVI-B, May-June 2014), in the Gulf of California (a total of nine cruises: TALUD III, September 1991; TALUD IV, August 2000; TALUD V, December 2000; TALUD VI, March 2001; TALUD VII, June 2001; TALUD VIII, April 2005; TALUD IX, November 2005; TALUD X, February 2007), and off the SW coast of Mexico, from Jalisco to Guerrero (TALUD XII, March-April 2009). During these cruises, a total of 228 localities were sampled, from 377 to 2394 m depth. Positional coordinates for each sampling station were obtained using a GPS navigation system. Depth was measured with an EdoWestern analogic recorder (TALUD III-VIII) or a digital recorder (TALUD IX-XVI-B). All the specimens were captured with benthic gear, including an Agassiz dredge (2.5 m width, 1 m high) and a standard benthic sledge (2.35 m width, 0.9 m high), both equipped with a modified shrimp net (ca 5.5 cm stretched mesh size) with a ca 2.0 cm (3/4") internal lining net. The material collected during this survey is deposited in the Regional Collection of Marine Invertebrates (EMU), at UNAM in Mazatlán, Mexico. The size (carapace length, CL) of all the specimens was measured to the nearest 0.1 mm and size distributions of B. tanneri were explored by sex for the entire population sample in the Mexican Pacific. Sexual differences in CL were tested using a Mann-Whitney U test (Mann and Whitney 1947). Abbreviations are: St., sampling station; CL, carapace length; M, male; F, female; AD, Agassiz dredge; BS, benthic sledge.

Results

Benthesicymidae Wood-Mason, 1891

Benthesicymus tanneri Faxon, 1893

Figures 2–6

Material examined. Specimens of B. tanneri were collected in 44 of the 228 stations visited during the survey (Figure 1).

TALUD III. Material reported by Hendrickx (2001). Additional material. St. 14A (24°38'48"N; 108°26'54"W), Aug 19, 1991, 1M (CL 32.5 mm), AD, 1016–1020 m (EMU-4418); St. 14B (24°39'12"N; 108°37'48"W), Aug. 19, 1991, 1F (CL 31.9 mm), AD, 1188–1208 m (EMU-4417); St. 17 (24°33'0"N; 108°50'54"W), Aug 19, 1991, 1M (CL 22.1 mm), AD, 1027–1060 m (EMU-100).

TALUD IV. Material reported by Hendrickx (2001). St. 5 (22°0'57"N; 106°40'0"W), Dec 13, 2000, 1F (CL 36.3 mm), BS, 1515–1620 m (EMU-5540-A); St. 6 (22°N; 106°48'5"W), Dec 13, 2000, 1F (CL 41.1 mm), BS, 1950–2010 m (EMU-5540-B); St. 19 (23°17'30"N; 107°29'51"W), Dec 15, 2000, 1M (CL 31.1 mm), 3F (CL 29.1–36 mm), BS, 1180–1200 m (EMU-5523-A); St. 26 (24°15'18"N; 108°24'6"W), Dec 16, 2000, 2M (CL 29–30.7 mm), 2F (CL 32–34.2 mm), BS, 1280–1310 m (EMU-5523-B).
**Figure 1.** Localities in the Mexican Pacific where *Benthesicymus tanneri* Faxon, 1893 has been collected, including the TALUD project sampling stations and the localities corresponding to the type material collected during the “Albatross” cruises and used by Faxon (1893).

TALUD VI, St. 12 (23°18'36"N; 107°26'56"W), Mar 14, 2001, 1M (CL 32.5 mm), 1F (CL 34.8 mm), BS, 1050–1160 m (EMU-5539-A); St. 19 (24°16'24"N; 108°24'18"W), Mar 15, 2001, 1F (CL 50.4 mm), BS, 1160–1200 m (EMU-5539-B); St. 26 (24°56'18"N; 109°6'42"W), Mar 16, 2001, 1M (CL 33.4 mm), 1F (CL 25.2 mm), BS, 1190–1270 m (EMU-5997-A); St. 27 (25°1'12"N; 109°11'36"W), Mar 16, 2001, 1F (CL 32.3 mm), BS, 1580–1600 m (EMU-5539-C); St. 34 (25°43'50"N; 109°53'59"W), Mar 17, 2001, 1M (CL 31.9 mm), 2F (CL 30.5–32.5 mm), BS, 1240–1270 m (EMU-5997-B), and 7M (CL 31.4–34.8 mm), 12F (CL 30.5–42.5 mm), and 3 unsexed specimens (14.5–21.4 mm).

TALUD VII, St. 4 (22°3'18"N; 106°34'42"W), Jun 5, 2001, 1F (CL 37.8 mm), BS, 1190 m (EMU-5541); St. 19 (24°16'12"N; 108°23'42"W), Jun 7, 2001, 1M (CL 11.2 mm) and 1F (CL 34.7 mm), BS, 1160–1180 m (EMU-6004-A); St. 33B (26°6'30"N; 110°6'42"W), Jun 9, 2001, 1F (CL 23.0 mm), BS, 1260–1300 m (EMU-6004-B).

TALUD VIII, St. 10 (24°58'12"N; 110°16'6"W), Apr 17, 2005, 1M (CL 30.4 mm), and 1F (CL 11.2 mm), BS, 1500 m (EMU-8143); St. 3 (24°32'36"N; 109°30'30"W), Apr 16, 2005, 2M (CL 31.9–34.7 mm), 3F (CL 29.2–35.7 mm), BS, 1100 m (EMU-8147).
TALUD IX, St. 20B (25°58′7″N; 110°40′4″W), Nov 14, 2005, 2F (CL 33.7–36.2 mm), BS, 1229–1343 m (EMU-8236).

TALUD X, St. 10 (27°50′5″N; 112°10′7″W), Feb 10, 2007, 1F (CL 32.3 mm), BS, 1399–1422 m (EMU-8030); St. 18 (27°50′6″N; 111°46′54″W), Feb 12, 2007, 1F (CL 31.3 mm), BS, 1526 m (EMU-8118); St. 30 (26°36′50″N; 110°21′10″W), Feb 15, 2007, 1M (CL 29.9 mm), BS, 1203–1213 m (EMU-8203).

TALUD XII, St. 5 (16°58′28″N; 100°55′20″W), Mar 28, 2008, 1F (CL 53.3 mm), BS, 1925–1977 m (EMU-8872); St. 9 (17°10′15″N; 101°37′23″W), Mar 28, 2008, 6F (CL 30.1–35.3 mm), BS, 1392–1420 m (EMU-8874); St. 10 (17°11′18″N; 101°28′30″W), Mar 29, 2008, 3F (CL 21.1–38.7 mm), BS, 1180–1299 m (EMU-10500); St. 13 (17°45′16″N; 102°0′29″W), Mar 30, 2008, 1F (CL 30 mm), BS, 1198 m (EMU-8904); St. 28 (18°50′19″N; 104°34′14″W), Apr 2, 2008, 1F (CL, 38.1 mm), BS, 1101–1106 m (EMU-10499); St. 29 (19°19′37″N; 105°26′20″W), Apr 2, 2008, 1F (CL 44.7 mm), BS, 1609–1643 m (EMU-8873).

TALUD XV, St. 1 (23°18′40″N; 110°19′37″W), Aug 4, 2012, 1F (CL 40.2 mm), BS, 750–850 m (EMU-10435); same station, 5M (CL 17.9–29.1 mm) and 7F (CL 25.3–41.1 mm), BS, 750–850 m (EMU-10434); St. 2 (23°12′2″N; 110°20′50″W), Aug 4, 2012, 4M (CL 32–33.9 mm), 5F (CL 23.2–40.6 mm) and 1Juv. (CL 12.4 mm), BS, 1118–1150 m (EMU-10436); St. 3 (23°9′N; 110°20′W), Aug 4, 2012, 1F (CL 36.4 mm), BS, 1395–1465 m (EMU-10433); St. 5C (23°16′42″N; 110°54′55″W), Aug 5, 2012, 8M (CL 20.5–35.5 mm), BS, 980–1036 m (EMU-10496-A); same station 25F (CL 20.3–40.5 mm), 1M (CL 13.4 mm), BS, 980–1036 m (EMU-10496-B); St. 5F (22°58′15″N; 110°40′17″W), Aug 5, 2012, 1F (CL 39.3 mm), BS, 1035–1108 m (EMU-10432); St. 8 (24°25′48″N; 112°38′6″W), Jul 30, 2012, 1M (CL 29.8 mm), 3F (CL 23.2–41.1 mm), BS, 1212–1235 m (EMU-10431); St. 24 (27°5′42″N; 114°35′30″W), Aug 1, 2012, 2F (CL 25–32.6 mm), BS, 772–786 m (EMU-10430).

TALUD XVI-B, St. 3 (28°42′36″N; 115°50′42″W), May 23, 2014, 2F (CL 30.1–31.0 mm), BS, 1350–1365 m (EMU-10623) St. 6 (29°08′9″N; 115°33′25″W), May 24, 2014, 10M (CL 16.4–29.9 mm) and 9F (CL 16.7–29.5 mm), BS, 1004–1102 m (EMU-10498); St. 8 (29°23′28″N; 115°45′W), May 31, 2014, 1M (CL 35.4 mm), 1F (CL 27 mm), BS, 1416–1480 m (EMU-10438); St. 16 (29°51′N; 116°9′W), May 29, 2014, 4F (CL 23.2–37.2 mm), BS, 1425–1360 m (EMU-10441); St. 23 (30°56′N; 116°40′33″W), May 27, 2014, 1M (CL 33.3 mm), 2F (CL 30.1–32.7 mm), BS, 1296–1340 m (EMU-10439); St. 26 (31°46′3″N; 116°58′12″W), May 26, 2014, 1F (CL 31.4 mm), BS, 982–989 m (EMU-10437); St. 27 (31°42′21″N; 117°13′W), May 27, 2014, BS, 1394–1397 m, 1F (CL 34.7 mm) (EMU-10440) and 1 F (CL 30.5 mm) (EMU-10497).

Size and sex. With 187 specimens available (61 males, CL 11.2–35.5 mm; 122 females, CL 16.7–53.3 mm; 3 unsexed; and 1 juvenile, CL 12.4) (M:F = 1:2), the collection of *B. tanneri* from off western Mexico came from 44 stations and is the largest available to date for this species (Figure 1). The largest specimens measured 103 mm (male; TALUD XV, St. 5C) and 116 mm (female; TALUD XII, St. 5) total length, the latter constituting the largest specimen collected to date. The size of individuals dif-
Benthesicymus tanneri from off west coast of Mexico

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fered across sexes (Mann-Whitney U test, \(U=2058.00, p<0.001\)) with females growing larger than males (Figure 2).

**Geographic and bathymetric distributions.** The syntype series, collected by the “Albatross”, contained 56 males and 78 females (134 specimens) from 22 lots captured over a wide latitudinal range (1°3′S to 27°34′N), and included material from 4 stations in Mexico: off Acapulco and Islas Tres Marías, and in the vicinity of Guaymas (Figure 1). We are not aware of further material collected off western Mexico.

According to Wicksten (1989), Retamal and Jara (2002) and Wicksten and Hendrickx (2003), *B. tanneri* is known from San Diego, California, USA, to Chile. The material currently examined slightly increases the distributional range of *B. tanneri* within the Gulf of California to the north, and indicates that *B. tanneri* occurs all along the west coast of the Baja California Peninsula where it had not been reported previously (Figure 1). In the Mexican Pacific it is a widely distributed and frequently captured species.

The material examined herein was collected between 750 and 2010 m depth with bottom sampling gear. One specimen (TALUD III, St. 17) was collected with a mid-water trawl hauled from surface to 770 m depth, in a locality where total depth was 1560 m. All species of *Benthesicymus* occur in deep water and the general depth range for *B. tanneri* is 606–2422 m (Table 1) (Wicksten 1989).

![Figure 2. Carapace length distribution of *Benthesicymus tanneri* Faxon, 1893, by sex. White, juveniles; grey, males; black, females.](image-url)
**Table 1.** Currently known distribution, depth range and maximum size for the species of *Benthesicymus* worldwide. Species list updated according to Fransen and De Grave (2014). MW, midwater trawl; BT, benthic trawl; IK, Isaac Kid midwater trawl; AT, Agassiz (benthic) trawl.

| Species                        | Distribution                  | Depth range                                      | Size            | Source                                                                 |
|-------------------------------|-------------------------------|--------------------------------------------------|-----------------|----------------------------------------------------------------------|
| *Benthesicymus altus*         | Eastern, central and western Pacific; Atlantic and Indian Oceans | 485 m (MW); 916–4089 m; 4130 m (BT)               | CL 23.5 mm; TL 120 mm | Spence Bate 1881; Wicksten 1989; Kikuchi and Nemoto 1991, Guzman and Wicksten 2000; Wicksten and Hendrickx 2003 |
| *Benthesicymus armatus*       | Arabian Sea                   | 2753 m                                           | TL 157 mm       | MacGilchrist 1905                                                    |
| *Benthesicymus bartletti*     | Atlantic, eastern Indian and western Pacific Oceans | 600–5777 m                                      | CL 34.2 mm; TL 115 mm | Crosnier 1978; D’incao 1998; Tiefenbacher 2001                       |
| *Benthesicymus brasiliensis*  | Atlantic, southern Pacific    | 600–4720 m                                      | TL 152 mm       | Spence Bate 1881; Tiefenbacher 2001                                  |
| *Benthesicymus cereus*        | Atlantic                      | 1645–1727 m                                     | CL 25 mm; TL 76 mm | Burkenroad 1936                                                      |
| *Benthesicymus crenatus*      | Northwestern and central Pacific | 3550 m (BT); 3530–6350 m; 5469–9726 m            | TL 200 mm       | Spence Bate 1881; Komai and Komatsu 2009; Jamieson et al. 2009        |
| *Benthesicymus howensis*      | Western Pacific               | 1325 m                                           | CL 24.0 mm       | Dall 2001                                                            |
| *Benthesicymus investigatoris* | Indo-West Pacific; SW Pacific | 0–1300 (IK); 1213 (AT); 580–1690 m               | CL 27.5 mm; TL 89.5 mm | Kensley 1977; Kikuchi and Nemoto 1991; Dall 2001; Retamal and Moyano 2010 |
| *Benthesicymus iridescens*    | Atlantic Ocean                | 3890–6500 m                                     | TL 150 mm; CL 47 mm | Spence Bate 1881; Crosnier 1985; Tiefenbacher 2001                   |
| *Benthesicymus laciniatus*    | Eastern Pacific               | 1471–3393 m                                     | CL 42.6 mm       | Wicksten 2004                                                        |
| *Benthesicymus seymouri*      | Indian Ocean                  | 1789–3716 m                                     | CL 40–59 mm      | Crosnier 1985; Pérez-Farfante and Kensley 1997                       |
| *Benthesicymus strabus*       | Pacific Ocean                 | 3530 m (BT)                                      | CL 39.5 mm       | Kikuchi and Nemoto 1991                                              |
| *Benthesicymus tanneri*       | Eastern Pacific               | 606–2422 m                                      | TL 121 mm        | Wicksten 1989; Wicksten and Hendrickx 2003; Hendrickx 2004           |
| *Benthesicymus tirmiziae*     | Indian Ocean                  | 1920–2249 m                                     | 33 mm CL; 100 mm TL | Crosnier 1978; Peréz-Farfante and Kensley 1997                       |
| *Benthesicymus urinator*      | Indo-Pacific                  | 1789–3716 m; 2500–4200 m; 4120 m (BT)            | CL 25.0 mm       | Crosnier 1985; Kikuchi and Nemoto 1991; Dall 2001                   |
Of the 15 recognized species of *Benthesicymus* (Table 1), currently known distributions indicate that three are widespread (*B. altus*, *B. bartletti*, *B. investigatoris*), one occurs in both the Atlantic and part of the Pacific (*B. brasiliensis*), one is distributed in the Indo-Pacific (*B. urinator*), three are restricted to the Indian Ocean (or part of it) (*B. armatus*, *B. seymouri*, *B. tirmiziae*), five occur in the Pacific Ocean (*B. crenatus*, *B. howensis*, *B. strabus*, *B. laciniatus*, *B. tanneri*; the latter two only known from the eastern Pacific), and two are restricted to the Atlantic Ocean (*B. iridescens*, *B. cereus*).

**On the presence of the hepatic spine in *B. tanneri***. In their identification key of Group II, Kikuchi and Nemoto (1991) indicated that *B. tanneri* possesses a hepatic spine, a character that separates this species from the other four species of their Group II. Guzmán and Wicksten (2000) emphasize that the presence of a hepatic spine was not mentioned in some of the previous literature referring to *B. tanneri* (i.e., Méndez 1981, Wicksten and Hendrickx 1992, Retamal and Soto 1993). Incidentally, the figure provided by Méndez (1981: fig. 62) does not show the presence of an hepatic spine but its reproduction in Hendrickx (1995) does (p. 437), which is an error due to the illustration process in the editorial office. In his preliminary description of *B. tanneri*, Faxon (1893) indicated that “*B. moratus*, Smith [S.-I. Smith, 1886, now recognized as a junior synonym of *B. brasiliensis* Spence Bate, 1881], another allied species [of *B. tanneri*], differs in having a distinct hepatic spine”, from which it could be concluded that the type material of *B. tanneri* examined by Faxon (1893) lacks this spine. Re-description by Faxon (1895: 205) repeats essentially the same statement as in 1893, and his lateral illustration of the carapace (Plate H 1a) does not indicate the presence of a hepatic spine, although the lower extension of the cervical carina could easily be confused with a strong spine. Besides, this drawing does not include the presence of the pterygostomial spine either, which is definitively present in *B. tanneri* (see Burkenroad 1936: 52). Revision by Dr. Rafael Lemaitre of part of the material used by Faxon (1893, 1895) in his syntypic series and deposited at the National Museum of Natural History, Washington, DC (USNM 21214; syntypes from the Gulf of California, Mexico) confirms the fact that there is no trace of a hepatic spine on the specimens examined. Another revision by Adam Baldinger of one of the syntypes of *B. tanneri* (MCZ-4662) deposited at the Museum of Comparative Zoology at Harvard also clearly indicates the absence of a hepatic spine (Figure 3A). An illustration of a large specimen of *B. tanneri* collected during this survey is also provided for comparison (Figure 3B). References to this spine in earlier literature (Kikuchi and Nemoto 1991, Hendrickx 1995, Dall 2001) are therefore in error. Consequently, the groups definition presented by Kikuchi and Nemoto (1991) have to be altered because all species of Group II as defined by these authors in their key lack the hepatic spine which is otherwise present in seven of the ten species of their Group I. Moreover, the identification key proposed by Dall (2001) should be partly modified.

**Reproductive organs**. While studying fine morphology of *B. carinatus* (now included in *Altelatipes*), Tavares (2009) noted the lack of basic information related with the description and development of the reproductive organs of *Benthesicymus* s.l. The male petasma of *B. tanneri* was illustrated by Faxon (1895) and by Hendrickx and
Estrada-Navarrete (1996). Material examined collected in station 6 of the TALUD XVI-B cruise includes small and medium-size males with immature petasma (Figure 4A–D). The smallest male with visible petasma was 11.2 mm CL, in which a small bud without any elaborated structure could be seen. A slightly larger male (CL 16.4 mm) had a similar petasma (Figure 4D). However, another young male from station 19 of TALUD VII cruise with CL 11.2 mm (i.e., smaller than the male of Figure 4D) presented a relatively larger petasma (Figure 4E). The crescent-shape lateral process, which is typical of *B. tanneri*, is not yet developed in males of CL 17.5 mm (Figure 4C). In a male of CL 29.9 mm the two sections (left and right) of the petasma are well developed (Figure 4B) but not yet united medially.
The fully developed petasma (Figure 5A–D) of *B. tanneri* (CL ≥ 35 mm) is clearly distinct from known petasma of mature males of nine species of the genus in the presence of the lateral crescent-shape process. In *B. altus*, *B. brasiliensis*, *B. crenatus* (the type species of the genus), *B. investigatoris* Alcok & Anderson, 1899, *B. iridescens* Spence Bate, 1881, *B. laciniatus*, *B. seymouri* Tirmizi, 1960, *B. strabus* Burkenroad, 1936, and *B. urinator* Burkenroad, 1936, the petasma lacks the lateral crescent-shape process (see A. Milne Edwards and Bouvier 1909, Burkenroad 1936, Crosnier 1978, 1985, Hendrickx 1996, Kikuchi and Nemoto 1991) (see below for the case of *B. bartletti* S.I. Smith, 1882). It should be noted that figure 1, page 28, of Burkenroad (1936) is labeled “*Benthesicymus laciniatus* Rathbun”, which is most certainly an error, and this illustration likely belongs to *B. crenatus*, as indicated earlier in the text by the author. Burkenroad (1936: fig. 35) also provided an illustration of the petasma of *B. cereus* Burkenroad, 1936, probably a juvenile. This figure lacks a lateral crescent-shape process but, as in the case of *B. tanneri* (see Figures 3, 4), this process may appear later during the growth of the species. Of the remaining three species of *Benthesicymus*, a crescent-like process has been described only in *B. tirmiziae* Crosnier, 1978 (but see below). The petasma of *B. howensis* Dall, 2001, remains undescribed as the species (originally described as a new subspecies of *B. urinator*) is known only from the two females of the type material. We were not able to locate an illustration of the petasma of *B. armatus* MacGillchrist, 1905. Another question remains open as far as illustrations of petasma in literature are concerned. Peréz-Farfante and Kensley (1997: fig. 27) provided an illustration of both the petasma and the thelycum of a species which certainly belongs to *Benthesicymus*; however, the figure caption is the same as the one inserted in figure...
25 of the same monograph (i.e. for *Bentheogennema intermedia* (Spence Bate, 1888)) and it was therefore difficult to assess to which species of the genus this figure actually belongs to. A search by Rose Gulledge, Museum specialist at the US National History Museum, Smithsonian Institution crustacean department, Maryland, USA, was successful in finding the original plates prepared by the illustrator of Peréz-Farfante and Kensley (1997). Pencil markings and notes on the plates indicate that the petasma and thelycum of figure 27 belong to *Benthesicymus bartletti*, and that “species in book is wrong [...] must say *Benthesicymus bartletti*”. Consequently, *B. bartletti* represents a third species featuring a crescent-shaped lateral process on the petasma, as *B. tanneri* and *B. tirmiziae* do.

The female thelycum of *B. tanneri* was roughly illustrated by Faxon (1895, plate H-1b) and is illustrated herein (Figure 4F). A small tuft of setae is clearly observed arising from each minute pit of the thelycum middle plate (sternite XIII). Of the two groups of species considered by Burkenroad (1936) in his synopsis of *Benthesicymus*, Group I possesses a “thelycum without well-defined receptacles between the twelfth and the thirteenth sternites, the scutes of the twelfth and thirteenth sternites being simple and unexpanded”. Group II possesses “well-defined cavities between the twelfth and the thirteenth sternites, the scutes of the thirteenth sternites being broadly expanded to overlap the sternal surface proper”. Based on these criteria *B. tanneri* belongs to Group II, with the scutes of sternite XIII broadly expanded (Figure 4F).
Color. The color of fresh specimens was described by Faxon (1895: 207) and a color drawing (Plate H-1) was added to his contribution (reproduced here as Figure 6A). All specimens collected during the TALUD survey presented the typical “deep red” color (Figure 6B) described by Faxon (1895). The large patch of bright blue color on the back of the abdominal somites 2–4 mentioned by Faxon (op. cit.) and also observed by Moscoso (2012) actually corresponds to the gonads of mature specimens that extend backward from the thoracic area (pers. observ.).
Fishery resource. Although it reaches a size (i.e., over 115 mm total length) comparable with other species of Dendrobranchiata used as food, *B. tanneri* is not currently subject to any commercial exploitation. It has been considered a potential fisheries resource for the area (see Hendrickx 1995) to a large extent because it occurs together with other species of established potential for deep-water fisheries (e.g., *Heterocarpus affinis* Faxon, 1893, *Haliporoides diomedeae* Faxon, 1893) (Barriga et al. 2009). Since 2004, the Peru fishery program has included *B. tanneri* in a short list of sub-exploited deep-water shrimps subject to “exploratory fishing” in Peruvian waters (Ministerio de la Producción 2004). In the specific case of the western central Pacific, Chan (1998) reported the presence of six species of *Benthesicymus* in this area, but none was considered of importance to fishery, even as a potential resource, probably because this genus has nowhere been reported to be abundant. The 15 species of *Benthesicymus* known to date are from mid-sized (from ca 70–80 mm TL) to large (ca 200 mm TL) (Table 1) but are all from deep-water, thus rending any exploitation attempt very complex.

**Key to the species of *Benthesicymus* from the eastern Pacific**

1a Posterolateral margin of fifth abdominal somite with small spines. .... *B. laciniatus*

1b Posterolateral margin of fifth abdominal somite without spines. .......... 2

2a Petasma ventral margin strongly convex, without lateral crescent-shape process. Thelycum sternite XIII plate smooth, without small pits and setae. ....

............................................................................................... ................................. *B. investigatoris*

2b Petasma ventral margin straight to slightly concave, with or without lateral crescent-shape process. Thelycum sternite XIII plate bearing small pits. .... 3

3a Petasma with strong ventrolateral crescent-shape process. Thelycum sternite XIII plate longer than wide, shallow anterior notch. ................. *B. tanneri*

3b Petasma without ventrolateral crescent-shape process. Thelycum sternite XIII plate wider than long, deep anterior notch. ....................... *B. altus*

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Benthesicymus tanneri from off west coast of Mexico

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