Euphilomedes biacutidens (Ostracoda, Myodocopida, Philomedidae), a new species from China Sea

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ABSTRACT

Ostracods are one of the major groups of marine benthos, inhabiting virtually all oceanic environments worldwide, and a total of 31 species have been recorded in genus Euphilomedes Kornicker, 1967. In the present study, we describe a new species Euphilomedes biacutidens collected from the Taiwan Strait and South China Sea. E. biacutidens sp. nov. differs from the related species of the genus Euphilomedes in having a unique combination of the characteristics of spines on carapace, the filaments on sensory seta, the arrangement of setae on tip of the first antenna, the numbers of setae on appendages, the claws on fifth limb, the teeth on the comb of the seventh limb and furcal claws. It is particularly obvious that it has a bifurcated and pointed ventral corner of the rostrum, two spines on the posterior margin of right valve, a row of teeth along the inner margin of article 3 of the endopod of the second antenna, and some long claws instead of setae on the fifth limb.

INTRODUCTION

Ostracoda is a class of the phylum Arthropoda (Martin & Davis, 2001). The ostracods are small bivalved aquatic crustaceans and can be benthos or plankton. Ostracods are one of the major groups of marine meiobenthos and also macrobenthos which inhabit virtually all oceanic environments worldwide with various feeding habits and high taxonomic diversity (Karanovic, 2010). Studies on ostracods from China began in the 1950’s on fossil species (Chang, 1955). About thirty years later, we initiated investigations of the taxonomy and ecology of living marine ostracods in China (Chen, 1982; Chen, 1984). So far, 237 species of recent marine ostracods have been recorded from the China Sea (Chen, 2012; Chen et al., 2015a; Chen et al., 2015b; Xiang et al., 2017).

The genus Euphilomedes Poulsen, 1962, belonging to the subfamily Philomedinae Müller, 1908, is the second largest subfamily within family Philomedidae Müller, 1906, which contains 31 species (Brandão et al., 2017). Until now, ten species have been recorded from Chinese waters (Tseng, 1970; Chen & Lin, 1995; Chen & Lin, 2007).
1897; Liu, 2008; Chen, 2012; Chen et al., 2015a; Chen et al., 2015b; Xiang et al., 2017): E. corrugata (Brady, 1897), E. interpuncta (Baird, 1850), E. japonicus (Müller, 1890), E. longiseta (Juday, 1907), E. liuruiyii Xiang et al., 2017, E. multiangular Chen et al., 2015a, E. nodosa Poulsen, 1962, E. pentacanthos Xiang et al., 2017, E. sordida (Müller, 1890), and E. spinulosa Chen et al., 2015b.

In the present study, we describe a further new species of Euphilomedes from the Taiwan Strait and the South China Sea (Fig. 1).
MATERIALS AND METHODS

Samples were obtained from two cruises of the South China Sea and Taiwan Strait in 1984–1985 and 1994–1995, respectively (Fig. 1). There are no specific permissions required for the sampling activities in the research areas.

All samples were collected using a sampling net with a mouth diameter of 80 cm and a mesh aperture of 0.505 mm by vertical dragging from 200 m (or bottom) to surface water. Samples were fixed with 5% buffered formaldehyde for preservation.

Specimens were dissected under a zoom-stereomicroscope (Zeiss Discovery V2.0) and mounted in permanent slides with CMC-9AF mounting medium (Masters Company Inc., Wood Dale, IL, USA). Observations and photomicrographs were obtained with a transmitted-light binocular microscope combined with a differential interference contrast system and AxioVision Image-Pro software (Axio Imager Z2; Carl Zeiss Inc., Oberkochen, Germany). Line drawings were made from photomicrographs and observations of preserved specimens and dissected appendages in slides by Adobe Photoshop CS6 software (Adobe Inc., San Jose, CA, USA).

The type specimens were deposited in the Marine Biological Sample Museum of the Chinese Offshore Investigation and Assessment, the Third Institute of Oceanography, State Oceanic Administration, China (Xiamen, China), under the collection numbers TIO-OMPEu 326–TIO-OMPEu 329 for the new species.

Nomenclatural acts

The electronic version of this article in Portable Document Format (PDF) will represent a published work according to the International Commission on Zoological Nomenclature (ICZN), and hence the new names contained in the electronic version are effectively published under that Code from the electronic edition alone. This published work and the nomenclatural acts it contains have been registered in ZooBank, the online registration system for the ICZN. The ZooBank LSIDs (Life Science Identifiers) can be resolved and the associated information viewed through any standard web browser by appending the LSID to the prefix http://zoobank.org/. The LSID for this publication is: urn:lsid:zoobank.org:act:F773B126-7B58-45EA-8F28-8FCEB23B5868. The online version of this work is archived and available from the following digital repositories: PeerJ, PubMed Central and CLOCKSS.

RESULTS

Systematic account

Order Myodocopida Sars, 1866
Family Philomedidae Müller, 1906
Genus Euphilomedes Poulsen, 1962

Euphilomedes biacutidens Xiang, Ye & Chen sp. nov.
urn:lsid:zoobank.org:act:F773B126-7B58-45EA-8F28-8FCEB23B5868
Figs. 2–5.
Figure 2  Line drawings of *Euphilomedes biacutidens* sp. nov., ♂. (A) Right valve, lateral view. (B) Ros- trum, lateral view. (C) Posterior margin of right valve, lateral view. (D) Frontal organ, lateral view. (E) First antenna, lateral view. (F) Endopod of right second antenna, lateral view. (G) Endopod of left second antenna, lateral view. (H) Exopod of the second antenna, lateral view. (I) Mandible, lateral view. (J) Coxale endite, lateral view. (K) Tip of mandible, lateral view. (L) Exopod of mandible, lateral view. (M) Maxilla, lateral view.
Figure 3  Photomicrographs of Euphilomedes biacutidens sp. nov., ♂. (A) Left valve, lateral view. (B) Right valve, lateral view. (C) Left valve, lateral view. (D) Right valve, lateral view. (E) Rostrum, later view. (F) Posterior margin of right valve, lateral view. (G) Exopod of mandible, lateral view. (H) Coxale endite, lateral view. (I) Tip of mandible, lateral view. (J) Maxilla, lateral view.
Figure 4  Line drawings of *Euphilomodes biacutidens* sp. nov., ♂. (A) Fifth limb, lateral view. (B) Sixth limb, lateral view. (C) Sixth limb, lateral view. (D) Comb of seventh limb, lateral view. (E) Furca, lateral view. (F) Detail of furca, lateral view.
Figure 5  Photomicrographs of *Euphilomedes biacutidens* sp. nov., ♂. (A) Fifth limb, side view. (B) Fifth limb, lateral view. (C) Sixth limb, lateral view. (D) Seventh limb, lateral view. (E) Comb of seventh limb, lateral view. (F) Furca, lateral view. (G) Detail of furca, lateral view.
**Etymology.** *biacutidens*, derived from Latin expression of two spines, indicates that this species has one dorsal spine and one ventral spine on posterior margin of right valve.

**Holotype.** No. TIO-OMPEu 326, adult male, length 1.16 mm, height 0.69 mm, dissected on slides, carapace in alcohol. Type locality: southeastern coastal waters of Hainan Island (18°N, 111°E), depth 102 m, 29 July 1984.

**Paratypes.** No. TIO-OMPEu 327, adult male, length 1.10 mm, height 0.66 mm, deposited in 5% buffered formaldehyde, collected in the same way as the holotype; No. TIO-OMPEu 328, adult male, length 1.19 mm, height 0.71 mm, dissected on slides, collected from the southern Taiwan Strait (22°53’N, 118°33’E), depth 42 m, 29 August, 1994; No. TIO-OMPEu 329, adult male, length 1.14 mm, height 0.69 mm, deposited in 5% buffered formaldehyde, collected in the same way as TIO-OMPEu 328.

**Distribution.** South China Sea and Taiwan Strait (Fig. 1).

**Diagnosis.** Height about 60% of length. Carapace oval, external surface with tiny circular pits and small setae (Figs. 2A–2C, 3A–3F). Rostrum projecting and broad, with rounded dorsal corner, bifurcated and pointed ventral corner, marginal cilia and one row of anterior setae; incisure deep with cilia (Figs. 2B, 3E). Postero-ventral corner projecting, posterior margin of right valve with dorsal and ventral spines (Figs. 2A, 2C, 3A–3D, 3F). Sensory seta of the first antenna with about thirty-two long filaments (Fig. 2E). Endopod of the second antenna with twelve ventral sawteeth on article 3 (Figs. 2F–2G). Mandibular coxale endite spinose with bifurcated tip (Figs. 2I–2J, 3H); mandible with two claws and four setae on tip (Figs. 2K, 31). Seventh limb with eleven cleaning setae (Figs. 4C, 5D); comb with six teeth, side opposite comb with two small pegs (Figs. 4D, 5E). Furcal lamella hirsute; claws 1, 2, 4 and 6 primary, claws 3, 5, 7–12 secondary (Figs. 4E, 5F); main claw 1 with prominent dorsal and ventral sawteeth (Figs. 4F, 5G).

**Description.**

**Carapace:** Valves oval in lateral view, thin and transparent, with tiny circular pits and small setae over surface (Figs. 2A, 3A–3D). Rostrum broad with rounded dorsal corner and pointed bifurcated ventral corner, incisure deep, rostrum with dense marginal cilia and one row of anterior setae, incisure with numerous long cilia (Figs. 2B, 3E). Dorsal to posterior margin evenly rounded, antero-ventral margin distinctly rounded, ventral margin slightly rounded, postero-ventral corner projecting backward. Right valve with one spine on postero-dorsal corner and one spine on postero-ventral corner; left valve without spines (Figs. 2C, 3F). Carapace length 1.10–1.19 mm, height 0.66–0.71 mm, height about 60% of length, greatest height near mid-length.

**Frontal organ:** Frontal organ extremely long and thin with two articles, article 2 longer with a sharp tip (Fig. 2D).

**First antenna:** First antenna uniramous with eight articles (Fig. 2E). Articles 1 and 2 long. Article 2 with one disto-dorsal and one disto-ventral plumose setae. Article 3 short with two spinose setae on disto-dorsal margin. Article 4 with one long and one short plumose setae on disto-dorsal margin, three long setae on mid-ventral margin, and one grand sensory seta with about thirty-two very long soft ventral filaments on disto-ventral margin. Article 5 bare. Article 6 very short with one short and bent plumose seta on disto-dorsal margin. Article 7 and 8 fused, very small with seven setae on tip: a-seta very
short, spinose b- and g-setae very grand and long, c-seta with one mid filament, d-seta long with bifurcated tip, e- and f-setae long and bare.

**Second antenna:** Second antenna biramous. Endopod with three articles (Figs. 2F–2G). Article 1 short with three short ventral dorsal setae and one disto-ventral seta; article 2 long and slightly bent with corpulent ventral part, and two grand setae on ventro-distal margin; article 3 thin and bent, approximately equilong to article 2, with one bent proximo-dorsal seta, two small distal setae, twelve small ventral acute teeth, rugged dorsal margin, uneven inner side, and ten small tines on tip. Exopod with nine articles (Fig. 2H). Articles 1–8 with a line of fine spines on medio-distal margin; articles 2–8 with one disto-ventral long plumose swimming seta, respectively; articles 3–8 with one spine on disto-dorsal edge; article 1 very long, article 2–9 more and more shorter; article 9 very short with four long plumose setae on tip.

**Mandible:** Limb biramous (Fig. 2I). Coxal grand, endite with bifurcated tip and cluster of spines (Figs. 2I, 3H). Basal grand, dorsal margin slightly humped with one mid-dorsal seta and two distal plumose setae; ventral margin with a group of proximal short setae, seven plumose setae and one short medio-ventral seta. Exopod tiny with two equilong plumose setae on tip (Figs. 2I, 3G). Endopod with three articles. Article 1 with a group of five setae on disto-ventral margin (two long plumose and three short). Article 2 longer than one; dorsal margin with a group of two long proximo-dorsal setae (one bare and one plumose), a group of four mid-dorsal long setae; ventral margin with a group of two mid-ventral setae (one short and one long plumose), a group of three bare disto-ventral setae (inner one short, outer two equilong). Terminal article very small with two claws and four setae on tip (Figs. 2K, 3I): disto-dorsal claw biggest with numerous spines on distal half ventral margin, short seta, big claw with numerous spines on distal half ventral margin, longest seta, long seta and shortest disto-ventral seta.

**Maxilla** (Figs. 2M, 3J): Coxal grand with one plumose seta on disto-dorsal edge. Basal grand with two disto-ventral long plumose setae. Exopod small with three long distal plumose setae. Endopod with two articles. Article 1 long with one long and two short dorsal setae, and three disto-ventral setae. Article 2 very short, with one very small seta, two plumose setae, three claws and four plumose setae on tip. Maxilla with three endites. Endite I with seven plumose and one serrated setae. Endite II with two plumose and one serrated setae. Endite III with nine plumose and one serrated setae.

**Fifth limb** (Figs. 4A, 5A–5B): Coxal with three endites. Endite I with four plumose setae. Endite II with two plumose setae and one claw. Endite III with three plumose setae and five claws, inner claw very strong. Exopod with five articles. Article 1 with one plumose and one bare setae on mid-distal margin, main tooth comprising two slices of constituent teeth, medial teeth smooth, lateral teeth jagged. Article 2 with one long bare and one small plumose setae, and two long claws on posterior side. Article 3 with two plumose and one long bare setae on inner lobe and two long slender plumose setae on outer lobe. Articles 4 and five fused, with nine distal plumose setae. All claws of this limb with numerous disto-half ventral spines.
Sixth limb (Figs. 4B, 5C): Epipod with one short and three shorter long plumose setae. Endite I-IV with three, two, five and ten plumose setae, respectively. Terminal article subtriangular with about twenty-two plumose setae (some medial setae very small).

Seventh limb: Limb with about fifty-two articles (Figs. 4C, 5D). All articles very short. Article 40 with one disto-ventral seta with two bells. Article 41 with one disto-dorsal seta with two bells and one disto-ventral seta with three bells. Article 42 with one dorsal seta with three bells. Article 44 with one ventral seta with three bells. Article 45 with one disto-dorsal seta with three bells. Article 52 with two long setae with five and three bells respectively. Terminal article with one long and two short dorsal setae with five, four and three bells, respectively. Comb with six teeth, side opposite comb with two bare bent small pegs. Comb teeth from outside to inside from long to short sequence (Figs. 4D, 5E).

Furca: Furcal lamella hirsute, approximately quadrilateral with slightly inflated base, twelve claws (Figs. 4E, 5F). Claws 1, 2, 4 and 6 primary, long sickle-shaped; main claw 1 with obvious about five dorsal sawteeth, eighteen ventral sawteeth and small ventral spines (Figs. 4F, 5G); other main claws with numerous small ventral spines and bare base, from long to short in turn arrangement. Claws 3, 5, and 7–12 secondary, with several small ventral spines and bare base.

DISCUSSION

According to Chen’s key of family Philomedidae Müller, 1906 (Chen & Lin, 1995), the current specimens separated from the other philomedids with the following characteristics defining the genus Euphilomedes: (1) the carapace is elongate oval in lateral view with pits and setae, the posterior margin is evenly rounded; (2) the rostrum is broad anteriorly, and the incisure is shallow (compared with other philomedids); (3) article 4 of the first antenna has one to four ventral setae; (4) the endopodal article 2 of the second antenna has two ventral setae; (5) the anterior triangular protuberance of the main tooth of the fifth limb has denticulate margin, the inner lobe of article 3 has three setae, and the outer lobe has two setae; (6) the seventh limb has six to nineteen cleaning setae, the comb has less than fifteen teeth; (7) the furcal lamella is not fused with the main claws, the secondary claws are alternating with the main claws, the edge between furcal lamella and claws has long cilia. With this new species, the genus Euphilomedes contains 32 recent species thus far (Brandão et al., 2017).

Like E. africanus (Klie, 1940), E. bradyi Poulsen, 1962 and E. walfordi Poulsen, 1962, the new species has a row of teeth along the inner margin of article 3 of the endopod of the second antenna. However, E. biacutidens sp. nov. differs from these three closely related species (Table 1) in having the following combination of characteristics: (1) the carapace is thin and transparent with tiny circular pits and setae over the surface (Figs. 2A, 3A–3D); (2) the rostrum has a pointed bifurcated ventral corner (Figs. 2B, 3E); (3) the posterior margin of the right valve has one postero-dorsal spine and one postero-ventral spine (Figs. 2C, 3F); (4) the new species’ valve is more elongate than E. walfordi and more circular than the other two species; (5) the sensory seta of the first antenna has about thirty-two filaments (Fig. 2E); (6) there are significant differences
Table 1  Comparisons between *Euphilomedes biacutidens* sp. nov. and related species of *Euphilomedes* (♂).

| Characteristics | E. *biacutidens* sp. nov. | E. *africana* Klie, 1940 | E. *bradyi* Poulsen, 1962 | E. *walfordi* Poulsen, 1962 |
|-----------------|---------------------------|--------------------------|--------------------------|---------------------------|
| Ornamentation   | Thin and transparent, tiny circle pits and setae over surface | Dense circle pits and setae over surface | Distinct small polygonal pits and setae over surface | Very hirsute, minute polygonal pits over surface |
| Rostrum         | Broad with rounded dorsal corner and pointed bifurcated ventral corner, incisure deep | Rounded, incisure deep | Slightly protuberant, incisure hardly indicated | Rounded, incisure shallow |
| Posterior part  | Postero-ventral corner protruding, posterior margin of right valve with two spines | Protruding slightly | Rounded | Rounded |
| Aspect ratio    | 60% | 68% | 67% | 55% |
| Frontal organ   | Tip sharp | Base intumescent, Tip rounded | Tip thin and pointed | Tip hairy |
| Article II      | Ventral and distal setae | None distal seta | Ventral, distal and medial setae | Ventral and distal setae |
| Sensory setae   | Thirty-two filaments | Ten filaments, and bifurcated tip | Thirty-five filaments | Less than ten filaments |
| Terminal article| A-seta very short, spinose b- and g-setae very grand and long, c-seta with one mid filament, d-seta long with bifurcated tip, e- and f-setae long and bare | D- and e-setae long, f- and g-setae with several proximal and two terminal filaments | A-seta very short, b-seta with six filaments, c- and f-setae long with fifteen filaments, d- and e- setae long and bare, g-seta with four filaments | A-seta short, c- and f-setae long with thirteen filaments |
| 1st antenna     | | | | |
| Endopod III     | One bent proximo-dorsal seta, twelve small ventral acute teeth, and uneven inner side | None proximo-dorsal seta, six ventral small bulbous teeth | One proximo-dorsal seta, several small ventral blunt teeth, uneven inner side | One proximo-dorsal seta, ten ventral short blunt teeth |
| 2nd antenna I   | None plumose seta | None plumose seta | One plumose seta | None plumose seta |
| Exopod II       | One long plumose seta | One long serrated seta | One small seta | One long serrated seta |
| IX              | Four long plumose setae | Four long and one short setae | Four long plumose setae | Four long and two short setae |

(continued on next page)
| Characteristics | E. biacutidens sp. nov. | E. africana Klie, 1940 | E. bradyi Poulsen, 1962 | E. walfordi Poulsen, 1962 |
|-----------------|------------------------|------------------------|------------------------|------------------------|
| **Mandible**    |                        |                        |                        |                        |
| Coxale endite   | With bifurcated tip and spines | Stout, with bifurcate tip and spines | Very reduced | Developed, two short and one long spine |
| Basale          | Eight ventral setae     | Eleven ventral setae   | Ten ventral setae      | Thirteen ventral setae |
| Exopod          | Two equilong spinose setae | One long, one short spinose setae | One long, one very short bare setae | Two equilong spinose setae |
| I               | Five ventral setae      | Four ventral setae     | Three ventral setae    | Six ventral setae      |
| II              | Six dorsal, five ventral setae | Nine dorsal, five ventral setae | Five dorsal, one ventral setae | Eleven dorsal, six ventral setae |
| III             | Two claws, four setae   | Two claws, five setae  | One claw, five setae   | Three claws, four setae |
| **Mandible**    |                        |                        |                        |                        |
| Basale          | Two setae               | Three setae            | Three setae            | Two setae              |
| Exopod          | Three long setae        | Three long setae       | One short and two long setae | One short and two long setae |
| I               | Three distal, three disto-ventral setae | One disto-dorsal, three disto-ventral setae | Four setae | Four setae |
| **Maxilla**     |                        |                        |                        |                        |
| Endite II       | Three claws, seven setae | Two claws, nine setae  | About eleven setae     | Three claws, seven setae |
| I               | Eight setae             | Six setae              | Endites low bulged with few short and bare setae | Ten setae |
| **Endite**      |                        |                        |                        |                        |
| II              | Three setae             | Seven setae            |                        | Six setae              |
| III             | Ten setae               | Eight setae            |                        | Eight setae            |
| **Exopod**      |                        |                        |                        |                        |
| II              | Four setae              | Four setae             | Few bare setae         | Five setae             |
| IV + V          | Nine setae              | Five setae             | Five setae             | Six setae              |
| I               | Four setae              | Six setae              | Endites small with few short and bare setae | Five setae |
| **Endite**      |                        |                        |                        |                        |
| II              | Three setae             | Eight setae            |                        | Six setae              |
| III             | Eight setae             | Eleven setae           |                        | Eight setae            |

(continued on next page)
| Characteristics | E. biacutidens sp. nov. | E. africana Klie, 1940 | E. bradyi Poulsen, 1962 | E. walfordi Poulsen, 1962 |
|-----------------|------------------------|-----------------------|-------------------------|----------------------------|
| **6th limb**    |                        |                       |                         |                            |
| Epipod         | Four setae             | Four setae            | One seta                | Three setae                |
| I              | Three setae            | Three setae           | Three setae             | Three setae                |
| II             | Two setae              | Four setae            | Five setae              | Four setae                 |
| III            | Five setae             | Nine setae            | Four setae              | Eight setae                |
| IV             | Ten setae              | Nine setae            | Five setae              | Nine setae                 |
| Terminal article | Twenty-two setae       | Twenty-one setae      | Ten setae               | Eighteen setae             |
| **7th limb**   |                        |                       |                         |                            |
| Cleaning setae | Eleven setae           | Seven setae           | Nine setae              | Nineteen setae             |
| Comb           | Six teeth              | Ten teeth             | Five teeth              | Seven teeth                |
| Side opposite  | Two pegs               | None peg              | One peg                 | Two pegs                   |
| **Furca**      |                        |                       |                         |                            |
| Claws          | Twelve                 | Eleven                | Six                     | Eleven                     |
| Claw I         | Obvious dorsal, ventral sawteeth and numerous ventral spines | Numerous ventral sawteeth | Numerous ventral spines | Numerous ventral sawteeth |
Table 2  Comparisons between *Euphilomedes biaacutidens* sp. nov. and *Euphilomedes sinister* Kornicker, 1974.

| Characteristics       | *E. biacutidens* sp. nov.                                      | *E. sinister*                                      |
|-----------------------|----------------------------------------------------------------|--------------------------------------------------|
| **Ornamentation**     | Tiny circle pits                                              | Polygonal reticulations                          |
| **Rostrum**           | Bifurcated ventral corner                                     | Stout ventral corner                              |
| **Posterior part**    | Two spines on posterior margin of right valve                 | Two spines on posterior margin of left valve      |
| **Aspect ratio**      | 60%                                                           | 66%                                              |
| **Sensory seta**      | About thirty-two very long filaments                          | Five short filaments and three long bifurcated filaments |
| **Terminal article**  | A-seta very short, spinose b- and g-setae very grand and long, c-seta with one mid filament, d-seta long with bifurcated tip, e- and f-setae long and bare | A-seta short, spinose b- and c-setae long, bare d- and e-setae long, f- and g-setae long with four short margin and to distal long filaments and bifurcated tip |
| **2nd antenna**       |                                                                |                                                  |
| **Exopod**            |                                                                |                                                  |
| **Basale**            | Four setae in proximo-ventral group                           | Six setae in proximo-ventral group               |
| **Exopod**            | Bare                                                           | Hirsute                                          |
| **I**                 |                                                                | Four ventral setae                               |
| **II**                | One long plumose seta                                         | Seta with short mid-ventral cilia                |
| **III–V**             | One long plumose seta, respectively                           | One bare seta, respectively                      |
| **IX**                | Four long plumose setae                                       | Four long, one medium, one short and one tiny setae |
| **Mandible**          |                                                                |                                                  |
| **Endopod**           |                                                                |                                                  |
| **Basale**            | Two setae                                                      | Three setae                                      |
| **Exopod**            | Three long setae                                               | Three long setae                                 |
| **I**                 |                                                                |                                                  |
| **II**                |                                                                |                                                  |
| **Endite**            |                                                                |                                                  |
| **Maxilla**           |                                                                |                                                  |
| **Endopod**           | Three distal, three disto-ventral setae                       | One disto-dorsal, five disto-ventral setae       |
| **Endite**            | Three claws, seven setae                                       | Twelve setae (some pectinate)                    |
| **I**                 | Eight setae                                                    | Six setae                                        |
| **II**                | Three setae                                                    | Eight setae                                      |
| **5th limb**          | Nine setae                                                     | Six setae                                        |
| **Exopod**            |                                                                |                                                  |
| **Endite**            |                                                                |                                                  |
| **IV + V**            | Six setae                                                      | Six setae                                        |
| **I**                 | Four setae                                                     | Six setae                                        |
| **II**                | Three setae                                                    | Eight setae                                      |
| **III**               | Eight setae                                                    | Eleven setae                                     |
| **6th limb**          |                                                                |                                                  |
| **Epipod**            | Four setae                                                     | Four setae                                       |
| **Endite**            |                                                                | One seta                                         |
| **I**                 | Three setae                                                    |                                              |
| **II**                | Two setae                                                      | Four setae                                       |
| **III**               | Five setae                                                     | Eight setae                                      |
| **IV**                | Ten setae                                                      | Eight setae                                      |
| **Terminal article**  | Twenty-two setae                                               | Twenty setae                                     |
| **7th limb**          |                                                                |                                                  |
| **Cleaning setae**    | Eleven setae                                                   | Seven setae                                      |
| **Comb**              | Six teeth                                                      | Fifteen teeth                                    |
| **Furca**             |                                                                |                                                  |
| **Claw**              |                                                                |                                                  |
| **Claw I**            | Five dorsal, eighteen ventral sawteeth                         | Numerous ventral sawteeth                        |
of setae on the tip of the first antenna between these species (detailed differences are given in Table 1); (7) the endopodal article 3 of the second antenna has about twelve small ventral acute teeth and an uneven inner margin (Figs. 2F–2G); (8) the numbers of setae on the endopod of the mandible, endopod and endites of the maxilla, endopod and endites of the sixth limb have significant differences (detailed numbers are given in Table 1); (9) some setae on the fifth limb have developed into long claws (Figs. 4A, 5B); (10) the comb of the seventh limb has six teeth and the side opposite comb has two bare bend pegs (Figs. 4C–4D, 5D–5E); (11) the furcal lamella has twelve claws, the first claw has dorsal and ventral sawteeth (Figs. 4E–4F, 5F–5G).

The obvious characteristics of *E. biacutidens* sp. nov. are the postero-dorsal and postero-ventral spines on the right valve; *E. sinister Kornicker, 1974* (including two subspecies: *E. sinister sinister* Kornicker, 1974 and *E. sinister pentathrix* Kornicker & Caraion, 1977) also shows posterior spines, which is known only in the adult female. However, both species can be easily distinguished from each other by the following remarkable differences (Table 2): (1) they have different carapace ornamentation; (2) *E. biacutidens* sp. nov. has the postero-dorsal and postero-ventral spines on the right valve (Fig. 2C, Fig. 3F), but in *E. sinister* the spines are on the left valve; (3) there are about 32 very long filaments on the sensory seta of *E. biacutidens* sp. nov., and only five short filaments and three long bifurcated filaments on the sensory seta of *E. sinister*, and there are significant differences of the setae on the tip of the first antenna between these species (detailed differences are given in Table 2); (4) *E. biacutidens* sp. nov. has two mandibular claws, *E. sinister* has three; (5) they have significant differences in the numbers of setae on the endites of the maxillae and the fifth limbs (except endite III of maxilla, with detailed numbers given in Table 2); (6) *E. biacutidens* sp. nov. has more cleaning setae on the seventh limb, but fewer teeth on the comb (Figs. 4C–4D, 5D–5E).

Additionally, *E. biacutidens* sp. nov. shows some long claws instead of setae on the fifth limb (Figs. 4A, 5B); this is a diagnostic characteristic of the species and is an unusual characteristic in the genus. The rostrum has a pointed bifurcated ventral corner (Figs. 2B, 3E), which is also a distinctive characteristic not previously observed in the genus.

Finally, the distance between the sampling localities of the holotype and paratypes indicates that the new species may be widely distributed southeast off China (Fig. 1).

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**ADDITIONAL INFORMATION AND DECLARATIONS**

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**Competing Interests**
The authors declare there are no competing interests.

**Author Contributions**
- Peng Xiang conceived and designed the experiments, performed the experiments, analyzed the data, contributed reagents/materials/analysis tools, wrote the paper, prepared figures and/or tables, reviewed drafts of the paper, took the photomicrographs, drew the linedrawings.
- Youyin Ye conceived and designed the experiments, performed the experiments, analyzed the data, contributed reagents/materials/analysis tools, wrote the paper, prepared figures and/or tables, took the photomicrographs.
- Xiaoyin Chen analyzed the data, contributed reagents/materials/analysis tools, prepared figures and/or tables.
- Ruixiang Chen conceived and designed the experiments, performed the experiments, analyzed the data, contributed reagents/materials/analysis tools, prepared figures and/or tables.
- Mao Lin conceived and designed the experiments, analyzed the data, contributed reagents/materials/analysis tools, reviewed drafts of the paper.

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