



***Bomolochus bramus* n. sp. (Copepoda, Poecilostomatoida, Bomolochidae) from the pomfrets (Bramidae) off Taiwan, with a list of nominal species and key to valid species of *Bomolochus* von Nordmann, 1832**

JU-SHEY HO¹ & CHING-LONG LIN²

¹Department of Biological Sciences, California State University, Long Beach, California, 90840-3702, U.S.A. E-mail: jsho@csulb.edu

²Department of Aquatic Sciences, National Chiayi University, Chiayi 60083, Taiwan. E-mail: cllin@mail.ncyu.edu.tw

Abstract

A new species of copepod, *Bomolochus bramus* n. sp. (Poecilostomatoida: Bomolochidae), is described from the gills of *Brama japonica* Hilgendorf and *Eumegistus illustris* Jordan & Jordan collected off the east coast of Taiwan. This is the first species of bomolochid copepod reported from the pomfrets (Bramidae). The new species is distinguished from its congeners by having a combination of the following characters: (1) a pair of rostral tines; (2) the fourth basal element on the antennule modified as a hook, about as long as its neighboring outer pilose setae; (3) two large patches of spinules on the ventral surface of the anal somite; (4) a large patch of spinules on the ventral surface of the caudal ramus; (5) armature formula of II, I, 5 on the terminal exopodal segment of legs 3 and 4; and (6) leg 4 endopod with a relatively short terminal segment ornamented with long setules along the outer margin and long spinules along the distal margin. In addition to the report of the above new species, a list of the nominal species of *Bomolochus* von Nordmann, 1832, including their current taxonomic status, is provided. A key to the valid species is also included.

Key words: Crustacea, parasitic copepod, marine fish

Introduction

Although the genus *Bomolochus* was established based on the description of a new species, *Bomolochus parvulus*, in the early nineteenth century by von Nordmann (1832), *B. parvulus* has never been accepted as the type-species of the genus. This is simply because von Nordmann's (1832) description of *B. parvulus* was imprecise and illustrations of the species were never published (Damkaer 2002). Indeed, Wilson (1911) designated subsequently *Bomolochus bellones* Burmeister, 1835 as the type-species because it was the second species to be placed in the genus. However, Vervoort (1963) proposed through the plenary powers of The International Commission on Zoological Nomenclature to designate *Bomolochus soleae* Claus, 1864 as the type-species of the genus and cast aside all previous type indications or selections. In 1962, Vervoort considered, by mistake, *B. bellones* as belonging to a genus different from *Bomolochus* and created a new genus *Parabomolochus* Vervoort, 1962 to accommodate it. This mistake was corrected by Vervoort (1969) seven years later. By then, the number of taxa in the genus *Parabomolochus* had expanded to 17 species.

When Vervoort (1962) revised the genera and species of the Bomolochidae, 55 nominal species were listed under the genus *Bomolochus*. In addition to proposing *Parabomolochus*, he also created *Nothobomolochus* Vervoort, 1962 and *Bomolochoides* Vervoort, 1962 to accommodate species that were to be transferred out of *Bomolochus*. In realizing his previous mistake, Vervoort (1969) re-revised the genus *Bomolochus* by discarding *Parabomolochus* and *Bomolochoides*, both of which are currently synonyms of *Bomolochus* since their respective type-species are currently placed within *Bomolochus*, and creating *Holobomolochus* Vervoort, 1969, *Dicrobomolochus* Vervoort, 1969 and *Acantholochus* Vervoort, 1969 to

accommodate species that could not be placed in the redefined *Bomolochus*. Following these various rearrangements of *Bomolochus* taxa plus subsequent additions, the number of nominal species of *Bomolochus* has climbed to 82 species.

In this paper, in addition to describing a new species of *Bomolochus* taken from the pomfrets (Bramidae) off the southeast coast of Taiwan, the nominal species of *Bomolochus* are reviewed and their taxonomic status updated. A key to the valid species is also provided.

Materials and methods

Pomfrets caught and landed at fishing ports on the southeast coast of Taiwan were purchased and then transferred in an icebox to the laboratory at Eastern Marine Biology Research Center located in Tai-Dong. In the laboratory, the gill cavities of each pomfret were examined closely under an Olympus BXFM dissection microscope for attached copepods. Copepod parasites removed from the gills were preserved in 70% ethanol. Two of them were later selected and cleared in 85% lactic acid for 1–2 h before dissection in a drop of lactic acid on a wooden slide (Humes & Gooding 1964). Copepod body parts and appendages were examined under an Olympus BX41 compound microscope at a series of magnifications up to 1500 \times . Drawings were made with the aid of a drawing tube, and measurements of cleared specimens were taken.

Results

Order Poecilostomatoida Thorell, 1859

Family Bomolochidae Sumpf, 1871

Genus *Bomolochus* von Nordmann, 1832

Bomolochus bramus n. sp.

(Figs 1–2)

Material examined. Three ovigerous ♀ on gills of Pacific pomfret, *Brama japonica* Hilgendorf: 2 ♀ on 2 (out of 10) host fish landed at Tai-Dong Fishing Port in Tai-Dong County on 3 October, 2007 and 1 ♀ on 1 (out of 13) host fish landed at the same port on 20 December, 2007; and 1 ovigerous ♀ on 1 (out of 5) brilliant pomfret, *Eumegistus illustris* Jordan & Jordan, landed at the same port on 6 November, 2008. Holotype (USNM 1120935) and intact paratype (USNM 1120936) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, DC; 2 dissected ♀ in the collection of the second author.

Female. Body (Fig. 1A) 2.33 (2.12–2.54) mm long, excluding setae on caudal rami. Cephalothorax wider than long, 0.66 (0.64–0.68) \times 1.09 (1.04–1.16) mm, with broadly rounded rostrum protruding between bases of antennule and distinct central sclerite extending posteriorly from base of rostrum (Fig. 1A). First pediger completely fused to cephalosome; other pedigers on prosome distinctly separated from each other and becoming narrower posteriorly. Urosome distinctly shorter than prosome, measuring 0.82 (0.78–0.84) mm long, about $\frac{1}{3}$ of body length. Genital double-somite distinctly wider than long, 0.23 (0.20–0.26) \times 0.33 (0.32–0.36) mm. Abdomen 3-segmented (Fig. 1C); all somites distinctly wider than long; first two somites with wide band of spinules running across posterior margin of ventral surface; anal somite with 2 patches of spinules on ventral surface.

Caudal ramus (Fig. 1C) longer than wide, 112 (105–120) \times 59 (57–65) μm , with patch of spinules on ventral surface and usual 2 long and 4 short setae. Egg sac (Fig. 1A) large, longer than body (2.64 mm long), containing multiseriate eggs.

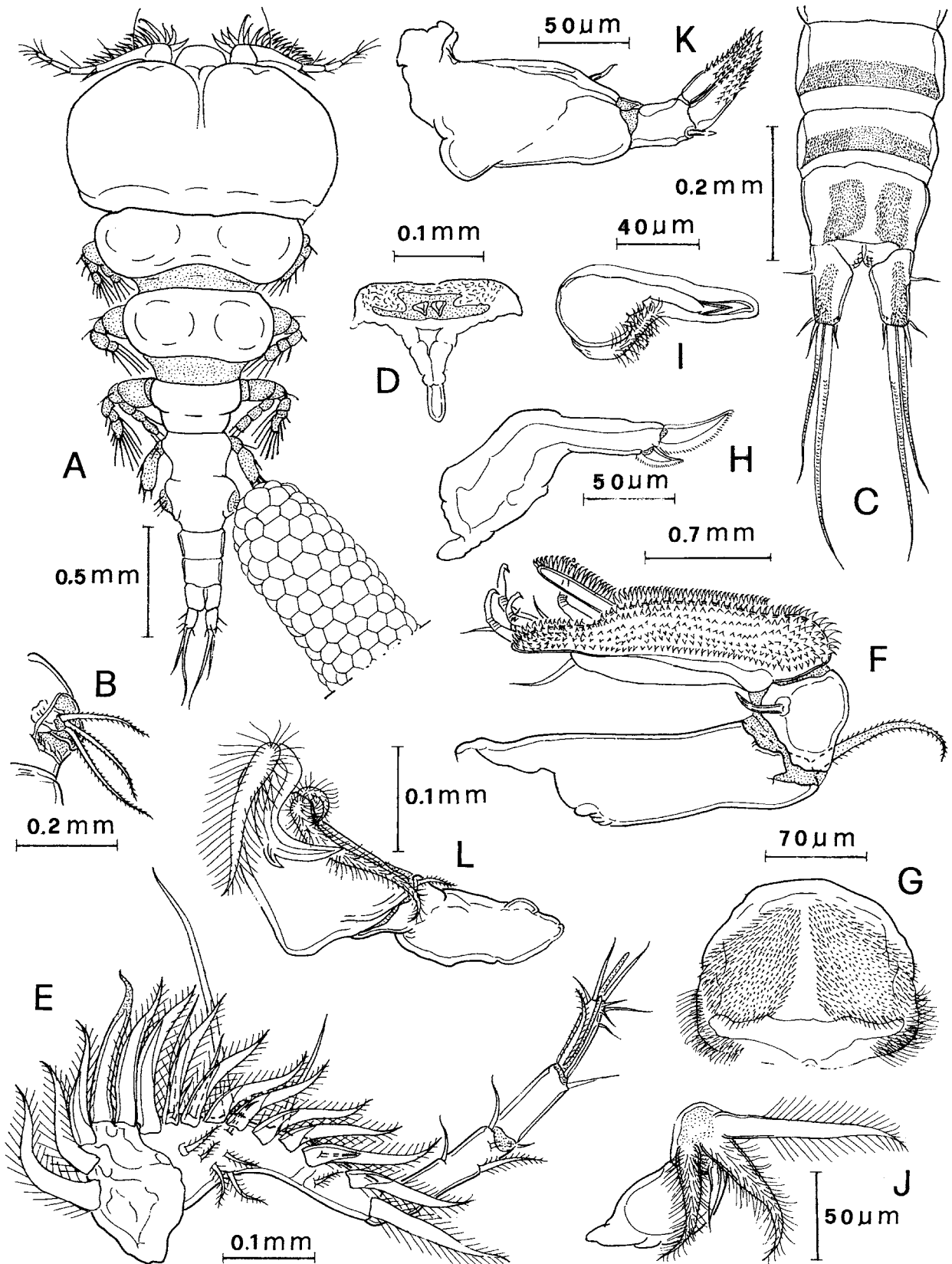


FIGURE 1. *Bomolochus bramus* n. sp., female. (A) habitus, dorsal; (B) egg sac attachment area, dorsal; (C) abdomen and caudal rami, ventral; (D) rostral area, ventral; (E) antennule, ventral; (F) antenna, ventral; (G) labrum, ventral; (H) mandible; (I) paragnath; (J) maxillule; (K) maxilla; (L) maxilliped.

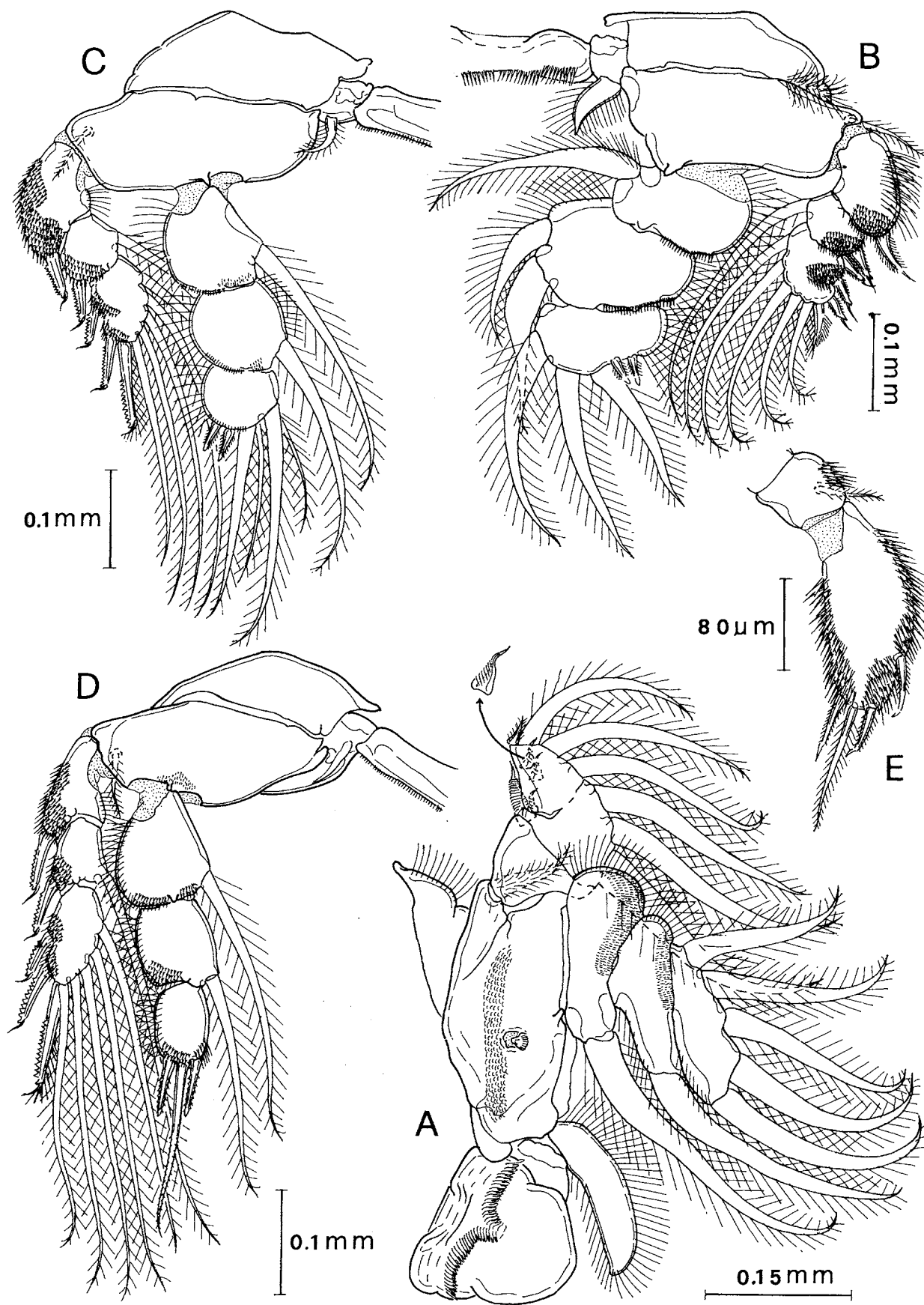


FIGURE 2. *Bomolochus bramus* n. sp., female. (A) leg 1 and intercoxal plate, anterior; (B) leg 2, ventral; (C) leg 3, ventral; (D) leg 4, ventral; (E) leg 5, ventral.

Rostral area (Fig. 1D) with T-shaped sclerite armed with pair of small, sharply pointed tines. Antennule (Fig. 1E) 5-segmented, with indistinctly separated 2nd and 3rd segments. Basal part (expressed segments 1–2) fringed with 14 robust, pilose setae and 1 recurved hook (modified 4th element), in addition to 7 naked, slender setae on dorsal side and 6 small, plumose setae on ventral side. Armature formula of cylindrical distal part: 4, 2 + 1 aesthetasc, and 7 + 1 aesthetasc. Antenna (Fig. 1F) 3-segmented; proximal segment largest, carrying long, plumose outer seta at tip; middle segment smallest, bearing short, naked medial seta; terminal segment carrying rows of fine denticles on ventral surface and protruded distally into large, blunt, cylindrical process with ventral denticles; also armed distally with 4 unequal, curved, long claws, 4 naked setae, and 1 pectinate process. Labrum (Fig. 1G) with 2 large patches of spinules on ventral surface and rows of long setules along posterolateral margin. Mandible (Fig. 1H) tipped with 2 unequal blades serrated along posterior margin. Paragnath (Fig. 1I) an oblong lobe armed with patch of setules on bulbous base. Maxillule (Fig. 1J) with 1 small, naked, 1 large, plumose, and 2 large, pilose setae. Maxilla (Fig. 1K) 2-segmented; proximal segment large, armed with small, subterminal seta on medial margin; distal segment small, armed with 1 tiny, naked seta and 2 large, spinulose, pointed elements. Maxilliped (Fig. 1L) 3-segmented; proximal segment with subterminal seta on medial margin; middle segment with lateral conical projection and 1 robust, pilose and 1 slender, plumose setae on medial margin; terminal segment a sigmoid claw bearing auxiliary hook and large, basal pilose seta.

Armature on rami of legs 1–4 as follows (Roman numerals indicate spines and Arabic numerals represent setae):

	Coxa	Basis	Exopod	Endopod
Leg 1	0–1	1–0	I–0; IV,6	0–1; 0–1; 5
Leg 2	0–1	1–0	I–0; I–1; III,I,5	0–1; 0–2; II,3
Leg 3	0–1	1–0	I–0; I–1; II,I,5	0–1; 0–1; II,2
Leg 4	0–0	1–0	I–0; I–1; II,I,5	0–1; 0–1; I,1,I

Outer margin of coxa and first two endopodal segments of leg 1 (Fig. 2A) ornamented with row of long setules; anterior surface of basis with horizontal rows of small, scale-like sculptures above central platelet; intercoxal plate bearing curved row of sculptures; distal margin of first two endopodal segments with spinules. Outer surface of coxa of leg 2 (Fig. 2B) with rows of long spinules; proximal exopodal segment with rows of long setules in addition to large patch of spinules; same area on other two exopodal segments with spinules only. Exopodal segments on legs 3 (Fig. 2C) and 4 (Fig. 2D) with patch of spinules only. Terminal segment of leg 4 endopod ornamented with long setules along outer margin and long spinules along distal margin.

Leg 5 (Fig. 2E) 2-segmented; proximal segment short, armed with outer plumose seta and cluster of setules on outer distal corner; distal segment about 2 times as long as wide, carrying 1 long and 3 short pinnate, setiform elements and fringed with 3 large patches of long spinules along both margins and on anterior surface close to tip. Leg 6 (Fig. 1B) represented by 3 long, pinnate setae on protuberance located in pit for attachment of egg sac on genital double-somite.

Male. Unknown.

Etymology. The specific name is derived from the family name of the host.

Remarks. This is the first report of a bomolochid copepod from pomfret fishes (Bramidae). *Bomolochus bramus* n. sp. is not a common parasite. In our past five years of sampling, 28 Pacific pomfrets (*Brama japonica*) and 16 brilliant pomfrets (*Eumegistus illustris*) were examined on ten occasions, but only four parasites were found on three occasions from four hosts.

Currently, three species of *Bomolochus* are known from the fishes of Taiwan. They are: *B. megaceros* Heller, 1865; *B. minus* Lin & Ho, 2005; and *B. selaroides* Pillai, 1965 (see Lin & Ho 2005). The new species

TABLE 1. List of nominal species of *Bomolochus* von Nordmann, 1832 and their present allocation. (^a indicates the species was placed originally in *Parabomolochus* Vervoort, 1962, which was synonymized subsequently with *Bomolochus* by Vervoort (1969). ^b indicates the species was placed originally in *Artacolax* Wilson, 1908, which was synonymized subsequently with *Bomolochus* by Vervoort (1962)).

Nominal species	Present allocation	Allocated by
<i>B. achirus</i> Pearse, 1952	Species inquirenda	Present study
<i>B. aculeatus</i> Pillai, 1962	Orbitacolax aculeatus	Pillai (1967c)
<i>B. acuta</i> Gnanamuthu, 1948	Holobomolochus acutus	Vervoort (1969)
<i>B. albidus</i> Wilson, 1932	Hamaticolax albidus	Ho & Lin (2006)
<i>B. anonymus</i> (Vervoort, 1965) ^a	Unicolax anonymus	Cressey & Cressey (1980a)
<i>B. ardeolae</i> Krøyer, 1864	Bomolochus bellones	Cressey (1981)
<i>B. attenuatus</i> Wilson, 1913	Hamaticolax attenuatus	Ho & Lin (2006)
<i>B. bellones</i> Burmeister, 1833	A valid species	Vervoort (1969)
<i>B. bramus</i> n. sp.	A valid species	present study
<i>B. chalguanus</i> Fernandez, 1987	Bomolochus nitidus	Knoff <i>et al.</i> (1994)
<i>B. chatoessi</i> Krøyer, 1964	Species inquirenda	Vervoort (1962)
<i>B. concinnus</i> Wilson, 1911	Bomolochus bellones	Cressey (1983)
<i>B. confusus</i> Stock, 1953	Cresseyus confusus	Ho & Lin (2006)
<i>B. constrictus</i> (Cressey, 1970) ^a	A valid species	Kabata (1979)
<i>B. cornutus</i> Claus, 1864	Nothobomolochus cornutus	Vervoort (1962)
<i>B. cuneatus</i> Fraser, 1920	A valid species	Vervoort (1962)
<i>B. cypseluri</i> Yamaguti, 1953	Nothobomolochus cypseluri	Vervoort (1962)
<i>B. dactylopterusi</i> Carvalho, 1958	Orbitacolax dactylopterusi	Vervoort (1962)
<i>B. decapteri</i> Yamaguti, 1936	A valid species	Vervoort (1969)
<i>B. denticulatus</i> Bassett-Smith, 1898	Nothobomolochus denticulatus	Vervoort (1962)
<i>B. efficatus</i> Leigh-Sharpe, 1934	Species inquirenda	Vervoort (1962)
<i>B. eminens</i> Wilson, 1911	Dicrobomolochus eminens	Vervoort (1969)
<i>B. ensiculus</i> (Cressey, 1970) ^a	A valid species	Kabata (1979)
<i>B. exilipes</i> Wilson, 1911	Acanthocolax exilipes	Present study
<i>B. gazzae</i> Shen, 1957	Nothobomolochus gazzae	Vervoort (1969)
<i>B. gibber</i> Shiino, 1957	Nothobomolochus gibber	Vervoort (1962)
<i>B. globiceps</i> (Vervoort & Ramierez, 1968) ^a	A valid species	Vervoort (1969)
<i>B. glyphisodontis</i> Krøyer, 1864	Holobomolochus glyphisodontis	Cressey (1981)
<i>B. gracilis</i> Heller, 1865	Irodes gracilis	Wilson (1911)
<i>B. hemiramphi</i> Pillai, 1965	Bomolochus bellones	Ho <i>et al.</i> (1983)
<i>B. hirsutus</i> Gnanamuthu, 1949	Species inquirenda	Vervoort (1962)
<i>B. hyporhamphi</i> Yamaguti & Yamasu, 1959	Bomolochus bellones	Ho <i>et al.</i> (1983)
<i>B. indicus</i> Kaliyamurthy, Singh & Singh, 1988	A valid species	Present study
<i>B. jonesi</i> Bennet, 1968	Pumiliopes jonesi	Cressey & Cressey (1980b)
<i>B. kanagurta</i> Pillai, 1965	Nothobomolochus kanagurta	Avdeev (1977)
<i>B. leptoscari</i> Yamaguti, 1953	Orbitacolax leptoscari	Shen (1957)
<i>B. longicaudus</i> Cressey, 1969	Cresseyus longicaudus	Ho & Lin (2006)
<i>B. longisetosus</i> Bere, 1980	Nomen nudum	Present study
<i>B. managatuwo</i> Yamaguti, 1939	Nothobomolochus tricerus	Pillai (1965)

Nominal species	Present allocation	Allocated by
<i>B. megaceros</i> Heller, 1865	A valid species	Vervoort (1969)
<i>B. minimus</i> Richiardi, 1880	Nomen nudum	Vervoort (1962)
<i>B. minus</i> Lin & Ho, 2005	A valid species	Present study
<i>B. monoceros</i> Pillai, 1965	Bomolochus decapteri	Ho (1983)
<i>B. monodi</i> (Brian, 1924) ^b	Species inquirenda	Vervoort (1962)
<i>B. mugilis</i> Pearse, 1952	Bomolochus nitidus	Vervoort (1969)
<i>B. multicerus</i> Pillai & Natarajan, 1977	A valid species	Present study
<i>B. multispinosa</i> Gnanamuthu, 1949	Nothobomolochus multispinosus	Vervoort (1962)
<i>B. muraenae</i> Richiardi, 1880	Phagus muraenae	Wilson (1911)
<i>B. mycterobius</i> (Vervoort, 1965) ^a	Unicolax mycterobius	Cressey & Cressey (1980a)
<i>B. myctophi</i> Avdeev, 1993	A valid species	Present study
<i>B. nitidus</i> Wilson, 1911	A valid species	Vervoort (1962)
<i>B. nothrus</i> Wilson, 1913	Holobomolochus glyphisodontis	Cressey (1981)
<i>B. oblongus</i> Richiardi, 1880	Nomen nudum	Vervoort (1962)
<i>B. onosi</i> T. Scott, 1902	Anchistrotos onosi	Stock (1953)
<i>B. ostracionis</i> Richiardi, 1870	Taeniacanthus ostracionis	Dojiri & Cressey (1987)
<i>B. palleucus</i> (Wilson, 1913) ^b	Cresseyus palleucus	Ho & Lin (2006)
<i>B. parvulus</i> von Nordmann, 1932	Nomen nudum	Vervoort (1962)
<i>B. paucus</i> Cressey & Dojiri, 1984	A valid species	Present study
<i>B. pectinatus</i> Stock, 1955	Bomolochus cuneatus	Vervoort (1964)
<i>B. peruensis</i> Luque & Bruno, 1990	Acanthocolax peruensis	Present study
<i>B. prolixus</i> Cressey, 1969	Hamaticolax prolixus	Ho & Lin (2006)
<i>B. psettobius</i> (Vervoort, 1962) ^a	A valid species	Vervoort (1969)
<i>B. saetiger</i> (Wilson, 1911) ^b	Nothobomolochus saetiger	Vervoort (1962)
<i>B. sardinellae</i> Bennet, 1964	Pumiliopsis sardinellae	Pillai (1967b)
<i>B. scomberesocis</i> Krøyer, 1864	Nothobomolochus scomberesocis	Vervoort (1962)
<i>B. scutigerulus</i> Wilson, 1936	Hamaticolax scutigerulus	Ho & Lin (2006)
<i>B. selaroides</i> Pillai, 1965	A valid species	Lin & Ho (2005)
<i>B. sinensis</i> (Cressey, 1970) ^a	A valid species	Kabata (1979)
<i>B. soleae</i> Claus, 1864	A valid species	Vervoort (1962)
<i>B. spinulus</i> Cressey, 1969	Hamaticolax spinulus	Ho & Lin (2006)
<i>B. stocki</i> Roubal, 1981	Naricolax stocki	Ho & Lin (2005)
<i>B. teres</i> Wilson, 1911	Nothobomolochus teres	Pillai (1967a)
<i>B. tetradonis</i> Bassett-Smith, 1898	Taeniacanthus tetradonis	Kabata (1979)
<i>B. tricerus</i> Bassett-Smith, 1898	Nothobomolochus tricerus	Vervoort (1962)
<i>B. tumidus</i> Shiino, 1957	Bomolochus bellones	Ho <i>et al.</i> (1983)
<i>B. unicirrus</i> Brian, 1902	A valid species	Ho & Rokicki (1987)
<i>B. uniunguis</i> Shen, 1957	Orbitacolax uniunguis	Vervoort (1962)
<i>B. varians</i> Bere, 1980	Nomen nudum	Present study
<i>B. varunae</i> Bennet, 1968	Pseudorbitacolax varunae	Pillai (1971)
<i>B. xenomelanirisi</i> Carvalho, 1955	A valid species	Boxshall & Montú (1997)
<i>B. zeugopteri</i> T. Scott, 1902	Taeniacanthus zeugopteri	Dojiri & Cressey (1987)

can be distinguished from *B. megaceros* and *B. selaroides* in the possession of a short spine (about as long as its neighboring outer pilose setae) on the proximal segment of the antennule. It is also easily distinguished from *B. minus* in the lack of scale-like sculptures on the exopodal segments of legs 2–4.

So far as we are aware, eight species of *Bomolochus* are known from the fishes of the Indo-West Pacific. In addition to the above mentioned three species, there are *B. bellones* Burmeister, 1853, *B. decapteri* Yamaguti, 1936, *B. multiceros* Pillai & Natarajan, 1977, *B. myctophi* Avdeev, 1993, and *B. sinensis* (Cressey, 1970) (see Avdeev 1993; Lin & Ho 2005). The new species is unlike these five species in having large patches of spinules on the ventral side of the anal somite and caudal rami in combination with an armature of II, I, 5 on the distal exopodal segment of leg 4 and a short terminal segment on the endopod of leg 4 (with length/width ratio of 1.55) furnished with long setules along the outer margin and spinules along the terminal edge.

In comparison with its congeners occurring outside the Indo-West Pacific, the new species seems to be closest to *B. nitidus* Wilson, 1911 in its general appearance, the size of the caudal ramus, structure of the terminal endopodal segment of leg 4, and the structure and ornamentation of leg 5. However, the new species can be distinguished from *B. nitidus* by having an armature formula of II, I, 5 on the terminal exopodal segment of legs 3 and 4, the outer surface of the exopod of legs 2–4 densely covered with spinules, and an inner plumose seta on the first two endopodal segments of leg 4.

Nominal species of *Bomolochus* von Nordmann, 1832

So far as we are aware, 71 species of bomolochids have been proposed and placed in the genus *Bomolochus* since its creation in 1832 (Table 1). A further ten species placed originally in two other bomolochid genera have been transferred to *Bomolochus*. A close check of the literature revealed that nine of these 81 nominal species have been relegated to synonyms with other congeners, and 40 species have been removed from *Bomolochus* and placed in a total of 15 different poecilostomatoid genera (ten genera of Bomolochidae and five genera of Taeniacanthidae). Furthermore, in making the detailed morphological comparisons between the above-described new species and the remaining 31 nominal species, we discovered that ten of them were so poorly described that a meaningful comparison was rendered impossible. Consequently in Table 1, those ten species are designated “*nomen nudum*” or “species inquirenda” and the other 20, excluding *Bomolochus exilipes* Wilson, 1911 and *B. peruensis* Luque & Bruno, 1990, are classified as “a valid species”. The latter two taxa are transferred herein to *Acanthocolax* Vervoort, 1969.

Key to valid species of *Bomolochus* females

Including the above described *B. bramus* n. sp., 20 species of bomolochids are now considered valid in the genus *Bomolochus*. However, one of them, *B. xenomelanirisi* Carvalho, 1955, cannot be included in the following key due to the lack of information of its fine structures, which are rather important in the modern classification of the Copepoda. Also, the following key is restricted to females, because many species of bomolochids are known only of the female. The publication containing the best taxonomic description for each species is provided in parentheses following each species name in this key to facilitate a more rapid verification of the species identification.

1	Distal exopodal segment of leg 4 with 7 elements	2
-	Distal exopodal segment of leg 4 with 8 elements	12
2	Leg 4 endopod distinctly longer than exopod.....	3
-	Leg 4 endopod distinctly shorter than exopod	6
-	Leg 4 endopod about as long as exopod	11
3	Fourth (hook-like) element on basal segment of antennule protruding well beyond tip of 5 th element	4
-	Fourth (hook-like) element on basal segment of antennule not protruding as above.....	5

4	Leg 4 distal exopodal segment with armature formula II, 1, 4	<i>B. indicus</i> (Kaliyamurthy <i>et al.</i> 1988: 399–401)
-	Leg 4 distal exopodal segment with armature formula II, I, 4	<i>B. megaceros</i> (Lin & Ho 2005: 118–122)
5	Ventral surface of anal somite and caudal ramus smooth; outer distal spine on leg 5 shorter than inner distal spine ..	<i>B. minus</i> (Lin & Ho 2005: 122–126)
-	Ventral surface of anal somite with two patches of denticles, that of caudal ramus with one patch of denticles; outer distal spine on leg 5 about as long as inner spine	<i>B. decapteri</i> (Ho 1983: 36–42)
6	Third outer spine on distal exopodal segment of leg 4 distinctly longer than segment.....	7
-	Third outer spine on distal exopodal segment of leg 4 as long as or shorter than segment.....	10
7	Leg 5 inner distal spine with apical flagellum.....	8
-	Leg 5 inner distal spine without apical flagellum.....	9
8	Ventral surface of anal somite with two patches of denticles, that of caudal ramus with one patch of denticles	<i>B. constrictus</i> (Cressey & Collette 1970: 370)
-	Ventral surface of anal somite and caudal ramus smooth	<i>B. bellones</i> (Ho <i>et al.</i> 1983: 2–5)
9	Leg 5 outer distal spine shorter than inner distal spine.....	<i>B. sinensis</i> (Cressey & Collette 1970: 370–372)
-	Leg 5 outer distal spine about as long as inner distal spine.....	<i>B. ensiculus</i> (Cressey & Collette 1970: 367–370)
10	Four rows of spinules on ventral surface of terminal segment of antenna; paragnath dagger-shaped	<i>B. psettobius</i> (Vervoort 1962: 49–58)
-	Seven rows of denticles on ventral surface of terminal segment of antenna; paragnath finger-shaped	<i>B. globiceps</i> (Vervoort & Ramirez 1968: 141–154)
11	Medial seta on first two segments of leg 4 endopod short and spiniform	<i>B. nitidus</i> (Cressey 1983: 3–4)
-	Medial seta on first two segments of leg 4 endopod long and plumose	<i>B. cuneatus</i> (Vervoort 1964: 291–302)
12	Fourth (hook-like) element on basal segment of antennule protruding well beyond tip of 5 th element	13
-	Fourth (hook-like) element on basal segment of antennule not protruding as above	14
13	Outer surface of exopodal segments on legs 2–4 bearing spinules; ventral surface of 2 nd abdominal somite smooth...	<i>B. selaroides</i> (Lin & Ho 2005: 114–118)
-	Outer surface of exopodal segments on legs 2–4 bearing coarse denticles; ventral surface of 2 nd abdominal somite with band of denticles	<i>B. uniccirrus</i> (Ho & Rokicki 1987: 1025–1028)
14	Rostral tines present; ventral surface of anal somite with two patches of spinules.....	15
-	Rostral tines absent; ventral surface of anal somite smooth.....	<i>B. multiceros</i> (Pillai & Natarajan 1977: 19–21)
15	Distal segment of leg 5 relatively long, with L/W ratio greater than 2	16
-	Distal segment of leg 5 relatively short, with L/W ratio less than 2.....	<i>B. paucus</i> (Cressey & Dojiri 1984: 221–225)
16	Exopodal segments of legs 2–4 with patch of denticles	<i>B. bramus</i> (present study)
-	Exopodal segments of legs 2–4 without patch of denticles.....	17
17	Endopod of leg 4 distinctly longer than exopod; outer spine on middle exopodal segment of legs 3 and 4 distinctly longer than segment	<i>B. myctophi</i> (Avdeev 1993: 146–149)
-	Endopod of leg 4 about as long as exopod; outer spine on middle exopodal segment of legs 3 and 4 distinctly shorter than segment	<i>B. soleae</i> (Vervoort 1969: 7–20)*

* Cressey & Dojiri (1984: 225) stated that *B. soleae* bears patches of spinules on the ventral surface of all three abdominal somites.

Acknowledgments

We would like to thank Dr. Wei-Chuan Chiang of the Eastern Marine Biology Research Center for helping us to obtain the pomfrets landed at the fishing port of Tai-Dong. We also thank the *Zootaxa* subject editor and two anonymous referees for their critical reading of and comments on the manuscript. The field and laboratory works of this project were made possible through grants (NSC 96-2313-B-415-005; NSC 97-2313-B-415-004-MY3) from the National Science Council of Taiwan to Ching-Long Lin. Completion of this manuscript was aided by a grant from the Paramitas Foundation to Ju-shey Ho.

References

Avdeev, G.V. (1977) New and some known species of copepods of the genus *Nothobomolochus* Vervoort (Cyclopoida,

- Bomolochidae) parasitizing on marine fishes from the Pacific and Indian Oceans. *Biologiya Morya*, 1977, 12–30.
- Avdeev, G.V. (1993) *Bomolochus myctophi* sp. n. (Copepoda, Bomolochidae) a parasite of lanternfish, *Myctophum spinosum*. *Zoologicheskii Zhurnal*, 72, 146–150.
- Boxshall, G.A. & Montú, M. (1997) Copepods parasitic on Brazilian coastal fishes: A Handbook. *Nauplius, Rio Grande*, 5, 1–225.
- Cressey, R.F. (1981) Parasitic copepods from the Gulf of Mexico and Caribbean Sea, I: *Holobomolochus* and *Neobomolochus*. *Smithsonian Contributions to Zoology*, 339, 1–24.
- Cressey, R.F. (1983) Parasitic copepods from the Gulf of Mexico and Caribbean Sea, II: Bomolochidae. *Smithsonian Contributions to Zoology*, 389, 1–35.
- Cressey, R.F. & Collette, B.B. (1970) Copepods and needlefishes: A study in host-parasite relationships. *Fishery Bulletin*, 68, 347–432.
- Cressey, R.F. & Cressey, H.B. (1980a) Parasitic copepods of mackerel- and tuna-like fishes (Scombridae) of the world. *Smithsonian Contributions to Zoology*, 311, 1–186.
- Cressey, R.F. & Cressey, H.B. (1980b) Bomolochid copepods parasitic on the eyes of Indo-West Pacific clupeid fishes. *Fishery Bulletin*, 78, 715–730.
- Cressey, R.F. & Dojiri, M. (1984) *Bomolochus paucus*, a new species of copepod parasitic on sciaenid fishes from southern California. *Proceedings of the Biological Society of Washington*, 97, 221–225.
- Damkaer, D.M. (2002) *The Copepodologist's Cabinet: A Biographical and Bibliographical History, Volume One, Aristotle to Alexander von Nordmann (330 B.C. to A.D. 1832)*. Memoirs of the American Philosophical Society, Philadelphia, 240, 300 pp.
- Dojiri, M. & Cressey, R.F. (1987) Revision of the Taeniacanthidae (Copepoda: Poecilostomatoida) parasitic on fishes and sea urchins. *Smithsonian Contributions to Zoology*, 447, 1–250.
- Ho, J.S. (1983) Copepod parasites of Japanese surfperches: Their inference on the phylogeny and biogeography of Embiotocidae in the Far East. *Annual Report of the Sado Marine Biological Station*, 13, 31–62.
- Ho, J.S., Do, T.T. & Kasahara, S. (1983) Copepods of the family Bomolochidae parasitic on fishes of Kojima Bay, Okayama Prefecture. *Journal of the Faculty of Applied Biological Sciences, Hiroshima University*, 22, 1–41.
- Ho, J.S. & Lin, C.L. (2005) Three species of *Naricolax* Ho, Do & Kasahara, 1983 (Copepoda, Bomolochidae) parasitic in the nasal cavities of marine fishes of Taiwan. *Crustaceana*, 78, 599–619.
- Ho, J.S. & Lin, C.L. (2006) A new bomolochid copepod parasitic on marine fishes of Taiwan, with reassignment of species of *Holobomolochus* Vervoort, 1969. *Crustaceana*, 78, 1369–1381.
- Ho, J.S. & Rokicki, Y. (1987) Poecilostomatoid copepods parasitic on fishes off the west coast of Africa. *Journal of Natural History*, 21, 1025–1034.
- Humes, A.G. & Gooding, R.U. (1964) A method for studying the external anatomy of copepods. *Crustaceana*, 6, 238–240.
- Kabata, Z. (1979) *Parasitic Copepoda of British Fishes*. Ray Society Publications, London, 152, 468 pp.
- Kaliyamurthy, M., Singh, S.K. & Singh, S.B. (1988) *Bomolochus indicus* sp. nov. (Copepoda) parasitic on the fishes of the Pulicat lake. *Proceedings of the National Academy of Sciences, India, Section B, Biological Sciences*, 58, 399–401.
- Knoff, M., Luque, J.L. & Takemoto, R.M. (1994) Parasitic copepods on *Mugil platanus* Günther (Osteichthyes: Mugilidae) from the coast of the state of Rio de Janeiro, Brazil. *Revista Brasileira de Parasitologia Veterinária*, 3, 45–56.
- Lin, C.L. & Ho, J.S. (2005) Three species of *Bomolochus* Claus, 1864 (Copepoda: Bomolochidae) parasitic on marine fishes of Taiwan. *Journal of the Fisheries Society of Taiwan*, 32, 113–128.
- Nordmann, W. von (1832) *Mikrographische Beiträge zur Naturgeschichte der Wirbellosen Tiere*. G. Reimer, Berlin, Heft 2, 150 pp.
- Pillai, N.K. (1965) Copepods parasitic on South Indian fishes: Family Bomolochidae – 3. *Journal of the Bombay Natural History Society*, 62, 38–55.
- Pillai, N.K. (1967a) Redescription of seven species of bomolochids from the collections of the United States National Museum. *Journal of the Marine Biological Association of India*, 7, 243–276.
- Pillai, N.K. (1967b) Redescription of *Bomolochus sardinellae* Bennet and its transfer to *Pumiliopsis* gen. nov. (Copepoda). *Crustaceana*, 12, 249–256.
- Pillai, N.K. (1967c) Copepods parasitic on Indian marine fishes – A review. *Proceedings of Symposium on Crustacea*, 5, 1556–1680.
- Pillai, N.K. (1971) On the transfer of *Bomolochus varunae* Bennet to *Pseudorbitacolax* gen. nov. (Copepoda: Bomolochidae). *Journal of the Zoological Society of India*, 23, 13–19.
- Pillai, N.K. & Natarajan, P. (1977) Copepods parasitic on fishes of the Kerala coast. *Aquatic Biology*, 2, 19–43.
- Shen, C.J. (1957) Parasitic copepods from fishes of China, Part 1: Cyclopoida (1). *Acta Zoologica Sinica*, 9, 297–327.
- Stock, J.H. (1953) *Bomolochus soleae* Claus, 1864 and *B. confusus* n. sp.: two hitherto confounded parasitic copepods, with remarks on some other *Bomolochus* species. *Beaufortia*, 24, 1–13.

- Vervoort, W. (1962) A review of the genera and species of the Bomolochidae (Crustacea, Copepoda), including the description of some old and new species. *Zoologische Verhandelingen*, 56, 1–111.
- Vervoort, W. (1963) *Bomolochus* Von Nordman, 1832 (Crustacea, Copepoda: Cyclopoida): proposed designation of a type-species under the plenary powers. *Bulletin of Zoological Nomenclature*, 20, 148–149.
- Vervoort, W. (1964) Notes on Bomolochidae (Cyclopoida), I. A redescription of *Parabomolochus cuneatus* (Fraser, 1920) and notes on its synonymy. *Crustaceana*, 6, 291–302.
- Vervoort, W. (1969) Caribbean Bomolochidae (Copepoda: Cyclopoida). *Studies on the Fauna of Curaçao and Other Caribbean Islands*, 28, 1–125.
- Vervoort, W. & Ramirez, F. (1968) *Parabomolochus globiceps* nov. spec. (Copepoda, Cyclopoida) from the gills of *Austroatherina smitti* (Lahille) (Pisces, Atherinidae). *Zoologische Mededelingen*, 43, 141–154.
- Wilson, C.B. (1911) North American parasitic copepods belonging to the family Ergasilidae. *Proceedings of the United States National Museum*, 39, 263–400.