

Two Hippolytid Shrimps of the Genus *Eualus* (Crustacea: Decapoda: Caridea) from Korea

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This paper provides descriptions and illustrations of two hippolytid shrimps, *Eualus macilentus* (Krøyer, 1841) and *E. leptognathus* (Stimpson, 1860). This is the first record of *E. macilentus* collected in Korean waters; it was found in the East Sea at a depth of 300 m. *Eualus leptognathus* has been collected previously from various locations in southern and eastern Korea, but no detailed description has been reported. This study provides a key to the six species of *Eualus* in Korean waters.

Key words: *Eualus macilentus*, *Eualus leptognathus*, Hippolytidae, Korean fauna, New record

Introduction

The hippolytid genus *Eualus* is characterized by its mandibular palp composed of two segments, its third maxilliped with both an arthrobranch and an exopod, and its lack of supraorbital spine (Holthuis, 1993; Chace, 1997). Shrimps of this genus mainly inhabit the northern hemisphere and are found in littoral to deep water, at depths of approximately 2,000 m (Hayashi, 1993a). This genus contains about 30 species worldwide (Chace, 1997; Komai and Hayashi, 2002), but researchers have only reported five species from Korean waters (Kim and Kim, 1997; Huh and An, 1997; Cha et al., 2001; Kim and Choi, 2006): *E. leptognathus* (Stimpson, 1860), *E. biunguis* (Rathbun, 1902), *E. middendorffi* Brashnikov, 1907, *E. sinensis* (Yu, 1931), and *E. spathulirostris* (Yokoya, 1933).

Two additional species of *Eualus* were collected during a survey of Korean shrimp fauna, *E. macilentus* (Krøyer, 1841) and *E. leptognathus* (Stimpson, 1860). This is the first time that *Eualus macilentus*, which was collected off the Korean coast in the East Sea at a depth of 300 m, has been recorded among Korean hippolytid fauna. This paper describes and illustrates these Korean specimens of *E. macilentus*. Two reports of *E. leptognathus* from Korean waters have been published. Based on specimens collected from Jagyakdo, Incheon, in western Korea, Kim and Park (1972) published the

first photograph of *E. leptognathus* in the lateral view and a short description. However, *E. leptognathus* has been excluded from lists of Korean fauna because of uncertainty in identification (Kim, 1977; Kim and Kim, 1997). Huh and An (1997) listed *E. leptognathus* in their recent ecological study of Gwangyang Bay, southern Korean coast. An additional description of *E. leptognathus* is needed because no detailed taxonomic information is currently available.

Specimens examined in this study have been deposited in the Laboratory of Invertebrate Zoology at Pukyong National University (PUIZ). Postorbital carapace length (cl) was used as a specimen size indicator. The terminology mainly follows the definitions provided by Holthuis (1993).

Systematic accounts

Eualus macilentus (Krøyer, 1841)

(Figs. 1, 2)

New Korean name: Ganeun-mom-kkoma-saewoo
Hippolyte macilenta Krøyer, 1841: 574.

Spirontocaris macilenta: Rathbun, 1899: 557; 1904: 105; 1929: 16, fig. 18; Leim, 1921: 142; Urita, 1942: 26.

Spirontocaris stoneyi Rathbun, 1902: 899; 1904: 103, fig. 46; 1929: 17, fig. 20.

Spirontocarella macilenta: Brashnikov, 1907: 170, fig. 25; Derjugin and Kobjakova, 1935: 142; Kobjakova, 1936: 216 (list); 1937: 130; 1955:

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149, pl. 36-fig. 3; Makarov, 1940: 129.

Eualus macilentus: Holthuis, 1947: 11 (list); Igarashi, 1969: 7, pl. 7-fig. 20, pl. 15-fig. 47; Squire, 1990: 183, figs. 97, 98; Komai et al., 1992: 192 (list); Hayashi, 1993c: 390, figs. 247a, 248a; Komai, 1994: 82 (list); 1995: 248, fig. 183; Chace, 1997: 43 (list).

Eualus macilenta: Vinogradov, 1950: 206, pl. 15-fig. 61.

Material examined

Off Mukho, East Sea, 37°26.2'N 129°28.4'E, 300 m, 23 June 2004, otter trawl, coll. J.N. Kim, 1 male (cl 11.2 mm), PUIZ 205; same locality, gear and depth, 19 May 2005, coll. J.N. Kim, 1 female (cl 10.6 mm), PUIZ 206.

Description

Rostrum (Fig. 1A-C) short, pointed distally, 0.51-0.58 times as long as carapace, falling short of distal margin of antennular peduncle; lateral margin with developed ridge; dorsal margin convex with 11-14 small teeth, posteriormost tooth located on carapace; ventral margin with 1-2 small teeth distally. Carapace (Fig. 1A-C) with suborbital projection distinct; antennal spine moderately strong; pterygostomial spine weak. Abdomen (Fig. 1D) slender, with dorsal margin smooth; pleura of first three abdominal somites rounded; those of fourth and fifth somites, pointed posteriorly; sixth somite long, 0.71-0.78 times as long as carapace. Telson (Fig. 1E, F) 0.79 times as long as carapace, with 3 pairs of dorsolateral spines; posterior margin with 3 pairs of spines. Antennule (Fig. 1G) with peduncle reaching half of scaphocerite; each of distal two segments with marginal spine on distolateral angle; first segment with small tooth near midlength of ventral margin; stylocerite distolaterally pointed, reaching or slightly falling short of distal margin of first segment; dorsal flagellum 1.34 times as long as carapace in male, 0.70 times in female. Antenna (Fig. 1H) with scaphocerite slender, 0.92-0.94 times as long as carapace, 3.77-3.88 times as long as wide, distolateral spine not reaching distal margin of blade; basicerite with small tooth ventrolaterally. Third maxilliped (Fig. 2A, B) slender, falling short of distal margin of scaphocerite, ultimate segment 2.67 times as long as penultimate segment, antepenultimate segment slightly longer than distal two segments combined; exopod and epipod present. Pereopods (Fig. 2A) slender, with epipod on first to third pereopods; first pereopod (Fig. 2A, C) reaching half of scaphocerite, palm of chela 1.62 times as long as dactylus; second

pereopod (Fig. 2A, D) overreaching distal margin of scaphocerite by chela length, palm of chela 1.66 times as long as dactylus; third to fifth pereopods (Fig. 2A) overreaching distal margin of scaphocerite by dactylus and distal 0.40 of propodus length, dactyli (Fig. 2E) long, inserted by minute corneous process distally, unarmed posteroventrally; meri with 4-7 lateral spines. First pleopod in male (Fig. 2F) with endopod reaching mid-length of exopod, appendix interna terminal; in female endopod reaching distal 0.79 of exopod, elongate subtriangular, lacking appendix interna. Second pleopod in male (Fig. 2G, H) with endopod reaching distal 0.85 of exopod, appendix masculina slightly shorter than appendix interna, with 15 long setae distally.

Distribution

Korean and northern Japanese (Hokkaido) coasts in the East Sea, Okhotsk Sea, and Bering Sea; the North American Atlantic coast; and the Arctic Ocean; depths of 40-1380 m (Rathbun, 1904; Kobjakova, 1937; present study).

Remarks

Eualus macilentus exhibits distinct sexual dimorphism in development of the antennular flagella as reported by Komai and Hayashi (2002). Both flagella are longer in males than in females (Fig. 1A, C).

Eualus macilentus is easily distinguished from other congeners by having a short rostrum with a convex dorsal margin, each of the third maxilliped and first three pereopods with an epipod, slender and long third to fifth pereopods, and posteroventrally unarmed dactyli of third to fifth pereopods.

Eualus leptognathus (Stimpson, 1860)
(Fig. 3)

New Korean name: Jalpi-gaekka-kkoma-saewoo

Hippolyte leptognatha Stimpson, 1860: 103.

Spirontocaris leptognatha: Kemp, 1914: 123; Yokoya, 1933: 26; Yu, 1935: 45, fig. 1.

Spirontocaris japonica Yokoya, 1930: 533, fig. 3; 1939: 271, fig. 6.

Spirontocaris fabricii var. *minuta* Urita, 1942: 25, fig. 6.

Eualus leptognathus: Holthuis, 1947: 11 (list); 1980: 123; Liu, 1955: 41, pl. 14-figs. 5, 6; Miyake and Hayashi, 1967: 257, fig. 5; Hayashi and Miyake, 1968: 128, fig. 3; Kikuchi, 1968: 180 (list); Hayashi, 1976: 16; 1993b: 314, figs. 244f, 245e, 246; Yamashita and Shiota, 1980: 2 (list); Komai et al., 1992: 192; Huh and An, 1997: 535 (table);

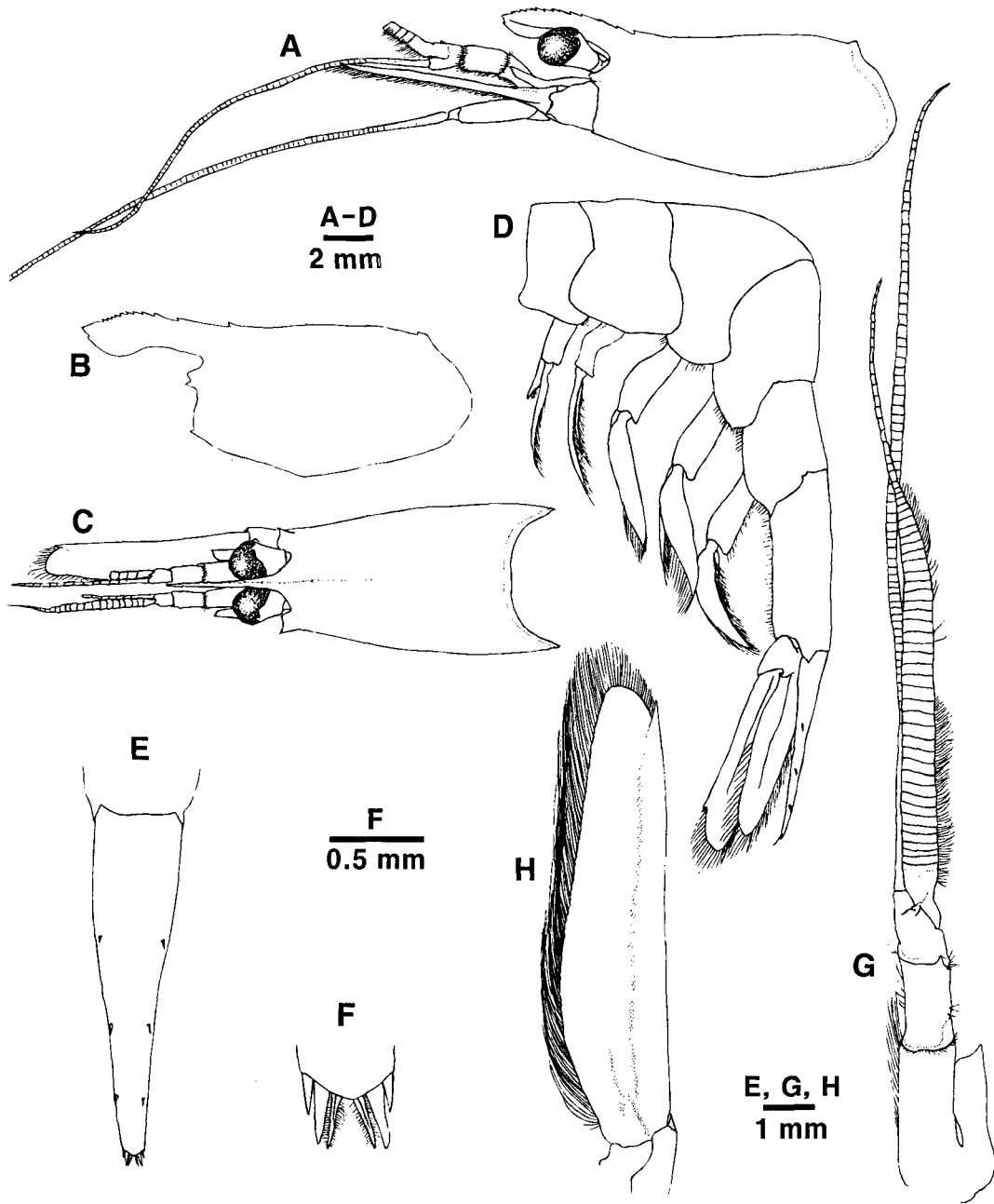


Fig. 1. *Eualus macilentus* Krøyer, 1841. A, D-G, male (cl 11.2 mm); B-C, female (cl 10.6 mm) from off the coast of Mukho, in the East Sea. A, carapace and cephalic appendages, lateral; B, carapace, lateral; C, carapace and cephalic appendages, dorsal; D, abdomen and abdominal appendages, lateral; E, telson, dorsal; F, same, posterior part; G, right antennule, dorsal; H, right antenna, dorsal.

Chace, 1997: 43 (list).

Eualus leptognatha: Vinogradov, 1950: 209, pl. 15-fig. 59.

Eualus japonica: Derjugin and Kobjakova, 1935: 142; Kobjakova, 1936: 211, fig. 31; 1937: 118; 1958: 224; 1967: 235.

Not *Eualus leptognathus*: Kim and Park, 1972: pl. 3-

figs. 6, 7 (figures only). [= *Heptacarpus futihirostris* (Bate, 1888)]

Material examined

Southern coast of Korea. Dongdae Bay, Changsun Island, Namhae, 2-3 m, *Zostera* bed, 3 May 2005, beam trawl, coll. H.W. Kim, 1 male (cl. 2.9 mm), 2

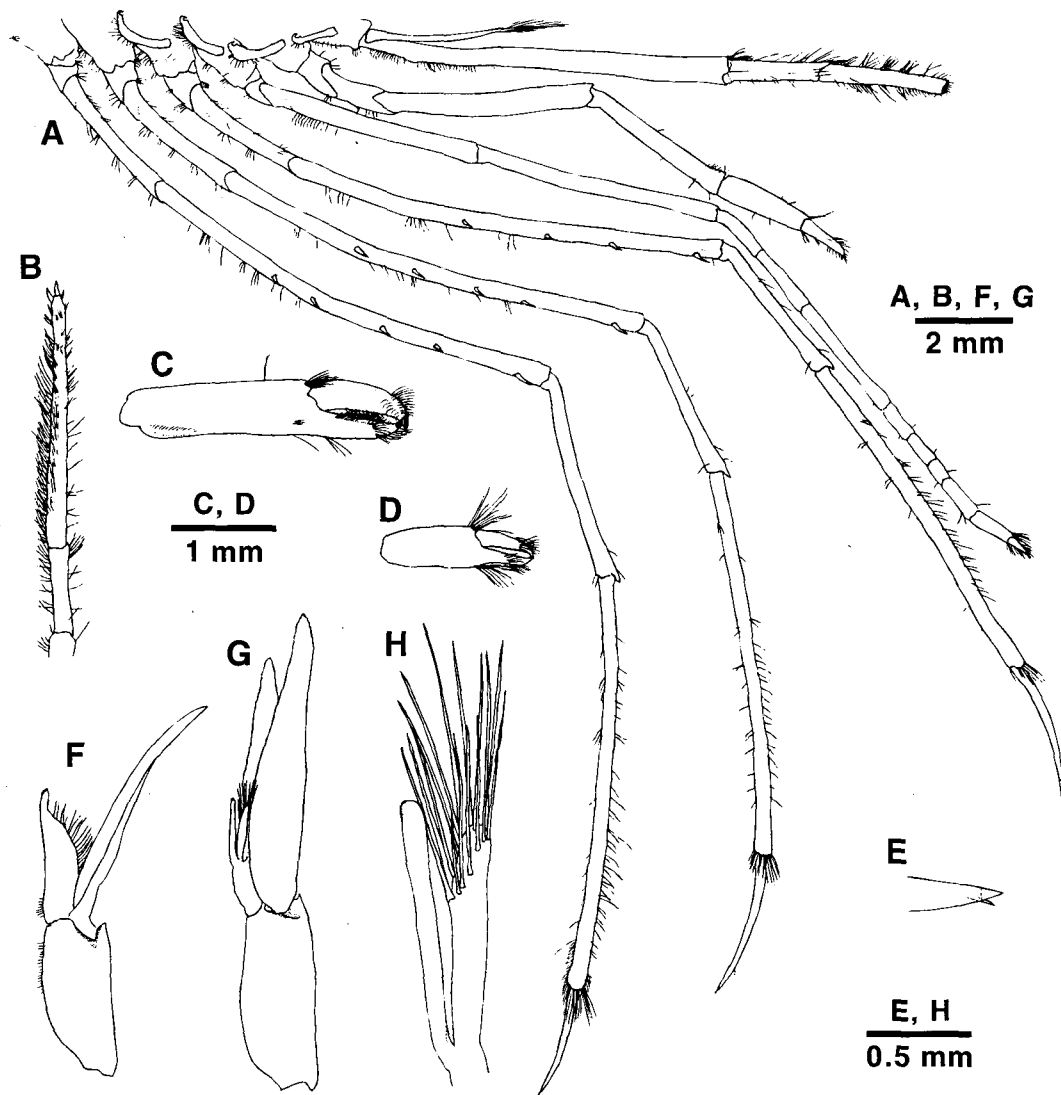


Fig. 2. *Eualus macilentus* Krøyer, 1841. Male (cl 11.2 mm) from off the coast of Mukho, in the East Sea. A, right third maxilliped and first to fifth pereopods, lateral; B, ultimate and penultimate segments of left third maxilliped, ventral; C, chela of right first pereopod, ventral; D, chela of right second pereopod, ventral; E, distal part of dactylus of third pereopod; ventral; F, right first pleopod, dorsal; G, right second pleopod, dorsal; H, same, appendix interna and appendix masculina.

females (cl. 4.7, 5.2 mm), 3 ovigerous females (cl. 5.0-5.6 mm), PUIZ 207; Daedo, Gwangyang Bay, 2-4 m, *Zostera* bed, 17 February 1994, beam trawl, coll. Y.R. An, 26 ovigerous females (cl 4.0-5.6 mm), PUIZ 208.

Eastern coast of Korea. Onsan, Ulsan, 3 m, algal bed, 13 January 2006, SCUBA, coll. M.H. Son, 4 males (cl. 2.3-2.5 mm), 4 females (cl. 3.0-4.3 mm), PUIZ 209; Eeumchun, Gyeongju, 4 m, algal bed, 3 December 2002, SCUBA, coll. M.H. Son, 2 females (cl. 2.1, 2.7 mm), PUIZ 210; Gampo, Gyeongju, 1 m, algal bed, 13 January 1994, hand net, coll. J.N. Kim,

3 males (cl. 2.2-2.3 mm), 6 females (cl. 3.5-4.1 mm), PUIZ 211; Yangpo, Pohang, 1 m, algal bed, 14 November 1993, hand net, coll. J.N. Kim, 5 females (cl. 2.8-3.0 mm), PUIZ 212; same locality, gear and depth, 13 January 1994, coll. J.N. Kim, 6 males (cl. 2.0-2.4 mm), 10 females (cl. 3.1-4.1 mm), PUIZ 213; Namae, Yangyang, 1 m, algal bed, 15 January 1994, hand net, coll. J.N. Kim, 3 males (cl. 2.4-2.7 mm), 8 females (cl. 3.7-4.5 mm), PUIZ 214; Hwajinpo, Goseong (Gangwon-do), 1 m, algal bed, 15 January 1994, hand net, coll. J.N. Kim, 3 males (cl. 2.5-2.6 mm), 9 females (cl. 3.2-4.5 mm), PUIZ 215.

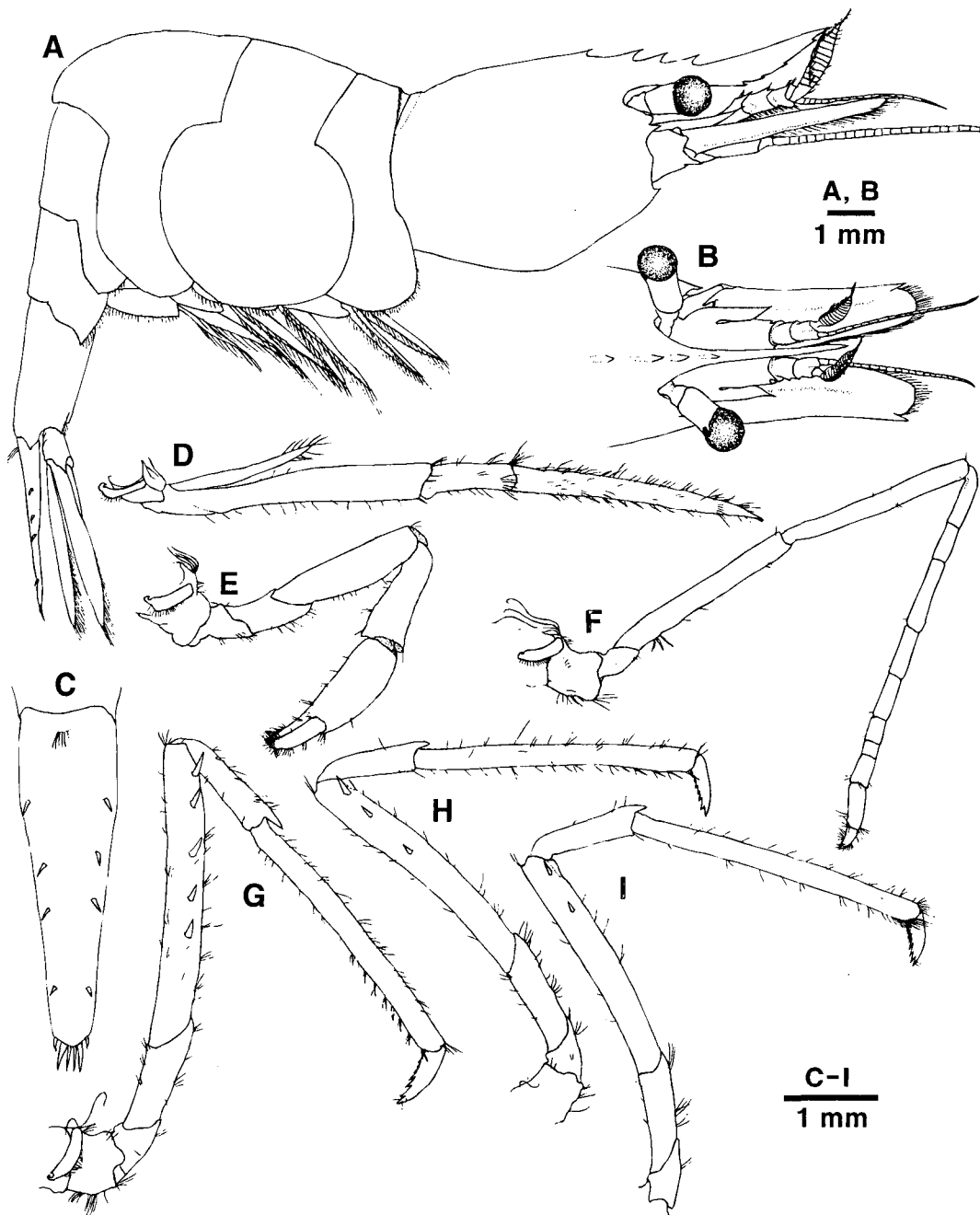


Fig. 3. *Eualus leptognathus* (Stimpson, 1860). Ovigerous female (cl 5.4 mm) from Daedo, Gwangyang Bay. A, entire animal, lateral, third maxilliped and pereopods omitted; B, distal part of carapace and cephalic appendages, dorsal; C, telson, dorsal; D, right third maxilliped, lateral; E, right first pereopod, lateral; F, right second pereopod, lateral; G, right third pereopod, lateral; H, right fourth pereopod, lateral; I, right fifth pereopod, lateral.

Description

Rostrum (Fig. 3A, B) long, reaching beyond distal margin of antennular peduncle, 0.92-1.23 times as long as carapace, distally acute and upward; dorsal margin distally unarmed, proximally with 3-5 teeth, posterior 2 teeth located on carapace; ventral margin

with 2-4 teeth. Carapace (Fig. 3A, B) smooth with suborbital projection distinct; antennal spine moderately large; pterygostomian spine small. Abdomen (Fig. 3A) smooth dorsally; pleura of first to third somite rounded, that of fourth somite pointed or rounded posteroventrally, that of fifth somite always

acute posteroventrally. Telson (Fig. 3C) with 4-5 pairs of dorsolateral spines, posterior margin with 3 pairs of spines. Antennule (Fig. 3A, B) with peduncle slightly overreaching midlength of scaphocerite; each of three segments with small tooth on dorsodistal margin; stylocerite reaching distal margin of first segment of antennular peduncle. Antenna (Fig. 3A, B) with scaphocerite rather stout, 0.84-1.13 times as long as carapace, 3.08-3.84 times as long as wide; distolateral spine slightly falling short of blade. Third maxilliped (Fig. 3D) falling short of scaphocerite, with exopod and epipod. Each of first three pereopods (Fig. 3E-G) with epipod. Third to fifth pereopods (Fig. 3G-I) rather stout; dactyli with 5-7 small teeth posteroventrally; meri with 2-7 lateral spines.

Distribution

Korea (southern and eastern coasts), northern China, Japan, and Russian Far East; 1-16 m (Vinogradov, 1950; present study).

Ecology

This species inhabits algal or eelgrass beds (Miyake and Hayashi, 1967; Huh and An, 1997). In the eelgrass bed of Gwangyang Bay in Korea, *E. leptognathus* can be found during every month except June and July; it is abundant from January to May, and its breeding season is February to May (Huh and An, 1997).

In the *Zostera* bed of Tomioka Bay in Kyushu, Japan, many juvenile specimens of this species have been collected from April to September, and are abundant from June to August (Miyake and Hayashi, 1967). Using data from the *Zostera* bed off Miyajima Island in Hiroshima, Japan, Yamashita and Shoita (1980) reported its estimated life span to be 1 year and its breeding season to be from winter to spring.

Remarks

Eualus leptognathus reported by Kim and Park (1972: pl. 3-figs. 6, 7) has been referred to as *Heptacarpus futilirostris* (Bate, 1888) because the published figures represented secondary sexual differences that have frequently been observed in the third maxilliped and the first pereopod in males (Hayashi and Miyake, 1968; Kim, 1977).

The data from the present study are identical to *E. leptognathus* reported by Huh and An (1997).

Eualus leptognathus differs from other Korean species of *Eualus* in the following combination of characters: (1) its long rostrum reaches beyond the distal margin of the antennular peduncle, (2) the

dorsal margin of its rostrum is unarmed in the distal half, and (3) each of its third maxilliped and first three pereopods bears an epipod.

A key to the Korean species of *Eualus*

1. Third maxilliped without epipod; [each of third to fifth abdominal somites with small median tooth on posterior margin] *Eualus middendorffi* Brashnikov, 1907
1. Third maxilliped with one epipod 2
2. Pereopods without epipod; [dactyli of third to fifth pereopods with minute chelalike appearance distally] *Eualus biunguis* (Rathbun, 1902)
2. First and second pereopods, at least, with epipod 3
3. Third pereopod without epipod; [carapace usually with pterygostomian spine] *Eualus sinensis* (Yu, 1931)
3. Third pereopod with epipod 4
4. Postrostral median carina highly crested, serrate; [rostrum lacking dorsal tooth in distal half; dactyli of third to fifth pereopods without accessory tooth] *Eualus spathulirostris* (Yokoya, 1933)
4. Postrostral median carina low, not crested 5
5. Rostrum overreaching distal margin of antennular peduncle; rostrum lacking dorsal tooth in distal half; dactyli of third to fifth pereopods with 5-7 small accessory teeth *Eualus leptognathus* (Stimpson, 1850)
5. Rostrum falling short of distal margin of antennular peduncle; rostrum with dorsal teeth distributed over entire length; dactyli of third to fifth pereopods without accessory tooth *Eualus macilentus* (Krøyer, 1841)

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