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# The genus *Eudorella* (Crustacea: Cumacea) from the Yellow Sea, with description of a new species

Jae-Sang Hong and Mi-Ra Park

Department of Oceanography, Inha University, Inchon 402–751, Republic of Korea

Two species of the genus *Eudorella* (Crustacea: Cumacea) were collected and examined from the Yellow Sea. A new species and one new record of *Eudorella* are described and illustrated. This new species *Eudorella hwanghaensis* sp. nov. closely resembles *E. intermedia*, but it differs from the latter species in bearing a distinct apical spine of endopod with uropod peduncle. The distribution of the new species is confined to the central portion of the Yellow Sea, and its distributional range coincides well with that of the Yellow Sea Bottom Cold Water Mass. *Eudorella pacifica* is recorded for the first time in Korean waters. It occurred in shallow waters and was distributed widely on both coastal sides of the Yellow Sea.

## INTRODUCTION

The genus *Eudorella* is one of the oldest of all cumacean genera, having been established by Norman in 1867 and contains approximately 28 known species (Watling & McCann, 1997). The cumacean fauna of the Yellow Sea is not well known. Lomakina published three papers (1955, 1958, 1960) based on the materials obtained from the Yellow Sea, describing six species collected in the intertidal zone of the Bohai Sea and Shan-Tung Peninsula, China. Recently, Liu & Liu (1990) and Kang & Lee (1995a,b, 1996) recorded ten and five species respectively so that at present 21 species altogether were found in this region. In the present paper we report two species of *Eudorella* based on the collections made in the Yellow Sea.

## MATERIALS AND METHODS

Most of the specimens were obtained during the cruises of August 1982 and 1983 carried out by Korea Ocean Research and Development Institute in the Yellow Sea. The benthic samples of 1982 were collected by trawling a rectangular dredge (type Charcot, mouth 50×23 cm) of which their sampling volume was limited to 100 l, but duplicate grab samples were obtained at each station with a Smith–McIntyre grab of 0.1 $m^2$ in 1983. Another cruise was organized in September 1992 within the framework of Korea–China Yellow Sea Research Programme between Inha University and the Institute of Oceanology, Academia Sinica, Qingdao, China. During this survey three replicates were made using a van Veen grab of 0.1 $m^2$ at each station. Additional specimens were collected with a van Veen grab again in June 1997 in the Yellow Sea.

The samples were sieved through 1.0-mm mesh screen and fixed in 10% formalin. After examination, specimens were preserved in 70% ethanol.

The measurements for the total length were made from the anterior tip of the carapace to the posterior edge of the last pleonite, but uropods were excluded. The holotype and some other paratypes were deposited in the US National Museum of Natural History, Smithsonian Institution, Washington, DC. Other specimens examined have been deposited in the Benthic Ecology Laboratory, Department of Oceanography, Inha University, Korea.

## SYSTEMATICS

Order CUMACEA Krøyer, 1846
Family LEUCONIDAE Sars, 1878
Genus *Eudorella* Norman, 1867

*Diagnosis (from Watling, 1991)*

Pseudorostral lobes, directed upwards in both male and female; efferent orifice of the branchial cavity placed dorsally; antenna 1 geniculate between peduncle articles 2 and 3; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending nearly to end of pleon; female antenna 2 distal segment not well defined; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopods 2 article 3 lost; uropod endopod 2-articulate; male with two pairs of pleopods.

*Key to females of Korean species of* Eudorella

1. Uropod endopod apical spine fused to distal segment . . . . . 2

— Uropod endopod apical spine articulated with distal segment . . . . . 3

2. Body more or less beset with fine setae. Pseudorostrum with numerous long setae. Pereopod 2 segment 5 about 1.5 times as long as segment 4. . . . . *E. hispida*

— Body more or less free of fine setae. Pseudorostrum without numerous long setae. Pereopod 2 segments 4 and 5 subequal. . . *E. intermedia*

3. Uropod exopod clearly longer than endopod basal segment . . . . . *E. groenlandica*

— Uropod exopod only as long as endopod basal segment ..... 4

4. Upper half of antero–lateral carapace margin smooth ..... 7

— Upper half of antero–lateral carapace margin serrated..... 5

5. Pseudorostrum with many long setae. Antenna 1 accessory flagellum three-quarters length of main flagellum basal segment ..... *E. hirsuta*

— Pseudorostrum with few short setae. Antenna 1 accessory flagellum as long as or longer than half length of main flagellum basal segment 6

6. Carapace with serrations throughout the whole length. On upper surface of carapace about one-third of length from the front margin with a small anteriorly curved tooth *E. monodon*

— Carapace with serrations only on half of lower part and with no tooth on upper surface *Eudorella hwanghaensis* sp. nov.

7. Antenna 1 main flagellum basal segment with plumose setae. Pereopod 2 segment 5 subequal to segment 4..... *E. minor*

— Antenna 1 main flagellum basal segment with naked setae. Pereopod 2 segment 5 about 1.5 times length of segment 4 ..... *E. pacifica*

*Eudorella hwanghaensis* sp. nov.
(Figures 1–4)

*Type material*

Holotype (USNM 260746), adult female, Yellow Sea (35°58′N 124°11′E), 78 m deep, sandy mud, collected 4 June 1997, length 6.2 mm, whitish, with dorsal setae on fifth pleonite, no marsupium.

Paratypes: seven adult females (USNM 260747), Yellow Sea (35°58′N 124°11′E), 78 m deep, sandy mud, collected 4 June 1997, length 5.3–6.2 mm, whitish, no marsupium; two males (USNM 260748), Yellow Sea (36°06′N 124°11′E), 78 m deep, sandy mud, collected 4 June 1997, length 5.3–5.5 mm, all subadults; one adult male (USNM 260749), Yellow Sea (36°06′N 124°29′E), 78 m deep, sandy mud, 4 June 1997, length 5.7 mm, adult.

*Additional material examined*

All specimens collected from the Yellow Sea. Four ♀s (36°20′N 125°10′E), 60 m, August 1983; two ♂s (36°20′N 125°00′E), 67 m, August 1983; one ♀ (36°00′N 124°00′E), 76 m, silt, September 1992; one ♀ (36°00′N 123°30′E), 74 m, silt, September 1992; one ♀ (36°00′N 123°00′E), 71 m, silt, September 1992; two ♀s (36°00′N 122°30′E), 59 m, silt, September 1992; two ♂s (35°30′N 124°30′E), 88 m, August 1982; 11 ♀s (35°30′N 124°00′E), 80 m, August 1982; one ♂ (35°00′N 124°50′E), 88 m, August 1983; one ♀ (35°20′N 124°30′E), 93 m, August 1983; three ♀s, one ♂ (35°20′N 124°10′E), 84 m, August 1983; three ♀s (35°20′N 124°00′E), August 1983; two ♀s, five ♂s (35°20′N 123°50′E), August 1983; 13 ♀s, four ♂s (35°00′N 125°00′E), 87 m, sandy silt, August 1982; one ♀ (35°00′N 125°00′E), 87 m, sandy silt, September 1992; one ♀ (35°00′N 124°30′E), 90 m, sandy silt, August 1982; one ♀ (35°00′N 124°00′E), 82 m, silt, August 1982; one ♂ (35°00′N 124°30′E), 90 m, sandy silt, September 1992; two ♀s (35°00′N 124°00′E), 82 m, silt, September 1992; one ♀ (35°00′N 123°30′E), 78 m, silt, August 1982; two ♀s, two ♂s (35°00′N 123°30′E), 78 m, silt, September 1992; three ♀s (35°00′N 123°00′E), 72 m, silt, September 1992; four ♀s, two ♂s (35°00′N 122°30′E), 64 m, silt, September 1992; two ♀s (34°50′N 125°00′E), 90 m, September 1983; one ♀, one ♂ (34°50′N 124°50′E), 93 m, August 1983; one ♀ (34°50′N 124°30′E), 88 m, August 1983; one ♂ (34°50′N 124°20′E), 84 m, August 1983; three ♀s (34°50′N 124°), 98 m, August 1983; seven ♀s, one ♂ (34°50′N 124°00′E), 95 m, August 1983; seven ♀s, two ♂s (34°50′N 123°50′E), 85 m, August 1983; 12 ♀s, four ♂s (34°50′N 123°40′E), 80 m, August 1983; four ♀s, three ♂s (34°30′N 123°30′E), 76 m, August 1982; one ♂ (34°30′N 125°00′E), 80 m, August 1982; two ♀s, one ♂ (34°30′N 124°30′E), 90 m, August 1982; two ♀s (34°30′N 124°00′E), 86 m, August 1982; one ♀ (34°20′N), 97 m, August 1983; two ♀s, one ♂ (34°20′N 124°50′E), 83 m, August 1983; two ♀s (34°20′N 124°10′E), 95 m, August 1983; two ♂s (34°20′N 125°00′E), August 1983; six ♀s (34°00′N 125°00′E), 92 m, sandy silt, August 1982; ten ♀s, one ♂ (34°00′N 124°30′E), 86 m, sandy silt, August 1982; two ♀s, two ♂s (34°00′N 124°30′E), 86 m, sandy silt, September 1992; one ♀, two ♂s (34°00′N 124°00′E), 80 m, silt, August 1982; two ♀s, two ♂s (34°00′N 124°00′E), 80 m, silt, September 1992; six ♀s, one ♂ (34°00′N 123°30′E), 70 m, silt, August 1982; eight ♀s, one ♂ (34°00′N 123°00′E), 66 m, silt, September 1992; two ♀s (33°00′N 125°00′E), 93 m, sandy silt, September 1992.

*Description*

*Adult female.* Body 4.8 mm long, slender, extremely elongated, integument densely hairy, whitish or whitish-brown (Figure 1A). Carapace nearly one-fifth of total length, anterior edge coarsely denticulated on lower half, well-marked below sinus, though sinus rather small. Antero–lateral corner not produced (Figure 1A–C).

Antenna 1 very strongly built. Peduncle segment 1 broad and massive, the last shorter than the second. All three segments with strong plumose setae on both edges. Main flagellum 3-segmented, basal segment with naked setae. Basal segment of main flagellum longer than the accessory, which is about half of the main flagellum, 1-segmented and tipped with three setae (Figure 1D).

Basis of maxilliped 3 rather shorter than remaining segments together and a little curved, with plumose hairs on border and three long plumose hairs on external distal end. Ischium short and merus with one long plumose hair on outer distal end (Figure 2C).

Basis of pereopod one long and rather slender, about two-thirds as long as remaining segments together. Its proximal external border with three spines and one long plumose hair. Dactyl about half of propodus and bearing numerous long hairs (Figure 2D). Basis of pereopod 2 slightly curved, less than half of remaining segments together and exceedingly robust with plumose hairs and strong spines. Merus and carpus bearing spines and propodus slightly half of dactyl, which carries a longer number of spines (Figure 2E). Pereopods 1–3 with developed exopods (Figure 2D–F).



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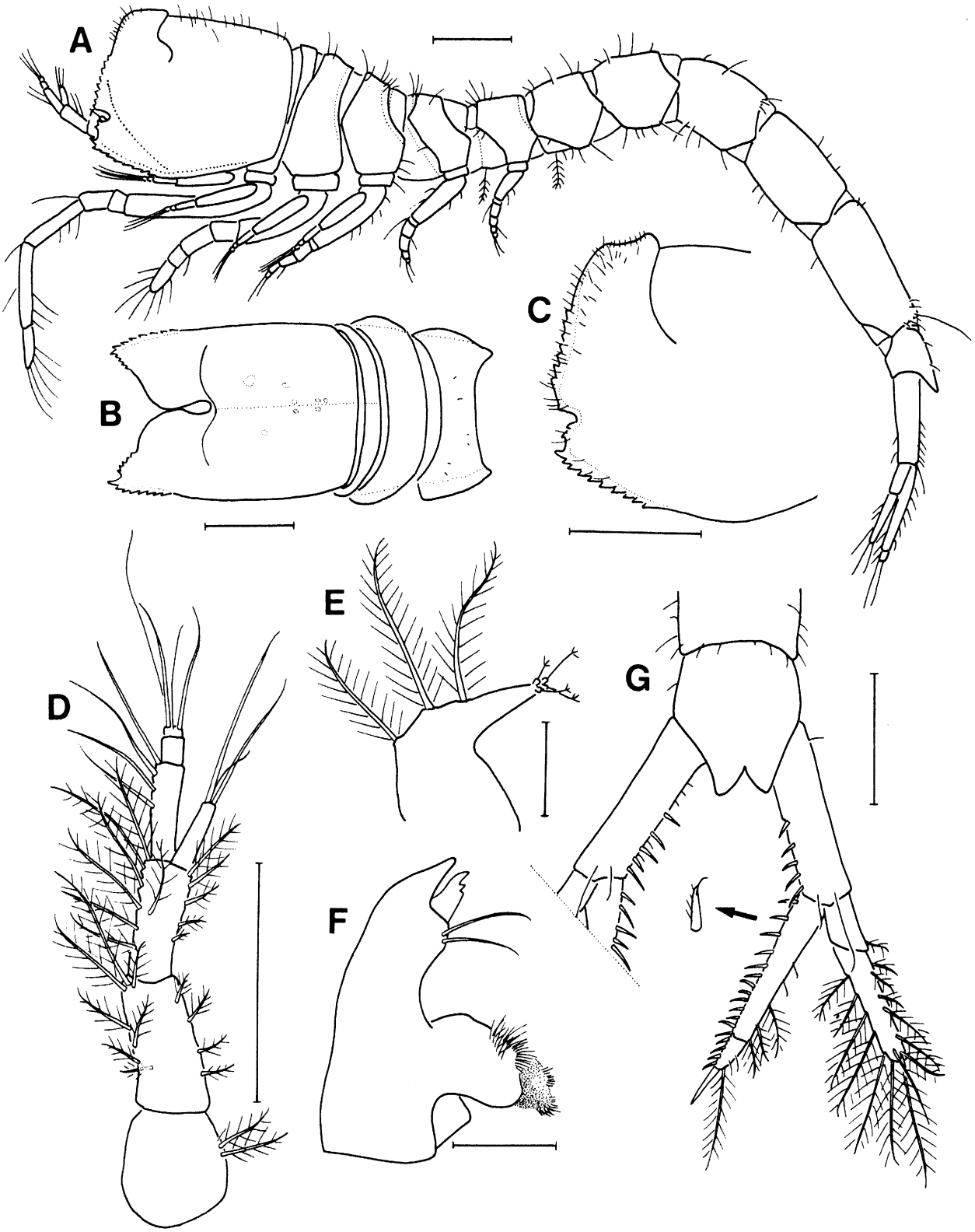


**Figure 1.** *Eudorella hwanghaensis* sp. nov., adult female: (A) lateral view; (B) carapace and pereon dorsal view; (C) carapace; (D & E) antennae 1 and 2; (F) mandible; (G) pleon and uropods. Scale bars: A–D, G, 0.5 mm; E, F, 0.1 mm.

Uropod peduncle nearly 1.3 times length of last pleonite and with five spines on hairy inner margin. Endopod 2-segmented and a little longer than uropod peduncle, its proximal segment with 14, 15 spines on inner border and plumose hairs on outer border. The distal is very short, one-fourth of the proximal and bearing five spines on the inner border, plumose hairs on the outer border and a stout distinct apical spine. Exopod shorter than endopod, but as long as proximal segment of endopod and with densely plumose hairs on both edges (Figure 1G).

*Adult male.* Body 5.9 mm long (Figure 3A). Carapace about one-fifth of total length, anterior edges coarsely



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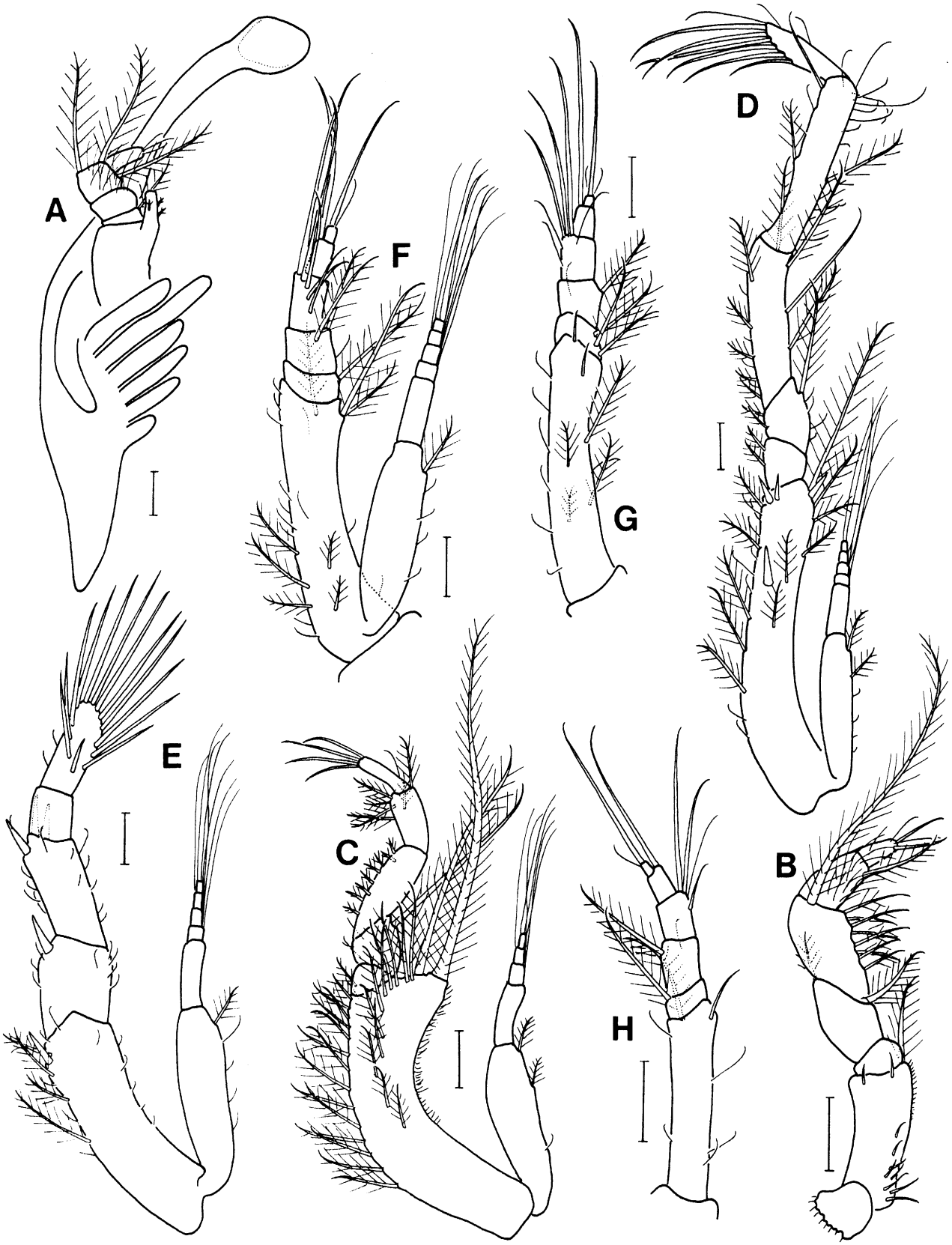


**Figure 2.** *Eudorella hwanghaensis* sp. nov., adult female: (A–C) maxillipeds 1–3; (D–H) pereopods 1–5. Scale bars: 0.1mm.

denticulated only on middle part, no distinct sinus, antero–lateral corners rounded off and armed with two or three serrations (Figure 3A–C).

Antenna 1 very strongly built, basal segment broad and massive, and having last segment shorter than the second, all three segments with plumose setae on both edges. Main flagellum 4-segmented, basal segment as long as or shorter than the accessory, bearing a bundle of long hairs. The accessory is about half the length of the main, and tipped with two setae (Figure 3E).



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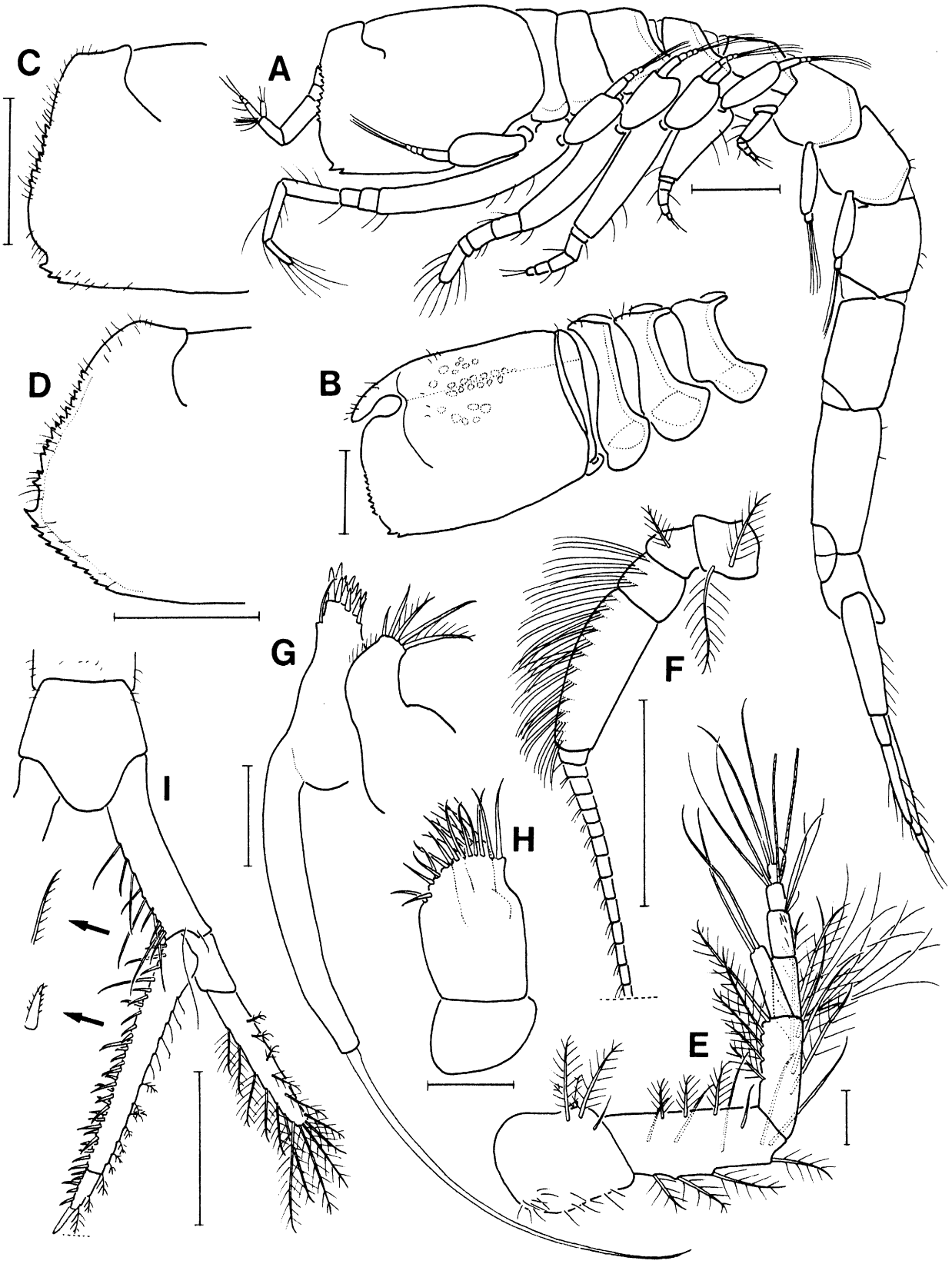


**Figure 3.** *Eudorella hwanghaensis* sp. nov., adult male: (A) lateral view; (B) carapace and pereon dorsal view; (C) carapace of adult; (D) carapace of subadult; (E & F) antennae 1 and 2; (G & H) maxillae 1 and 2; (I), pleon and uropod. Scale bars: A–D, F, I, 0.5 mm; E, G, H, 0.1 mm.

Basis of pereopod 1 a little curved and slightly longer than four-fifths of remaining segments together. Dactyl less than twice the propodus (Figure 4D).

Uropod peduncle nearly 1.5 times length of last pleonite and with spines and long plumose bristles on inner margin. Endopod 2-segmented and 1.6 times length of uropod peduncle, proximal segment with 29 spines on inner dentated border and plumose hairs on outer border. The distal is very short and is one-sixth of the proximal, bearing five spines on inner dentated border, plumose



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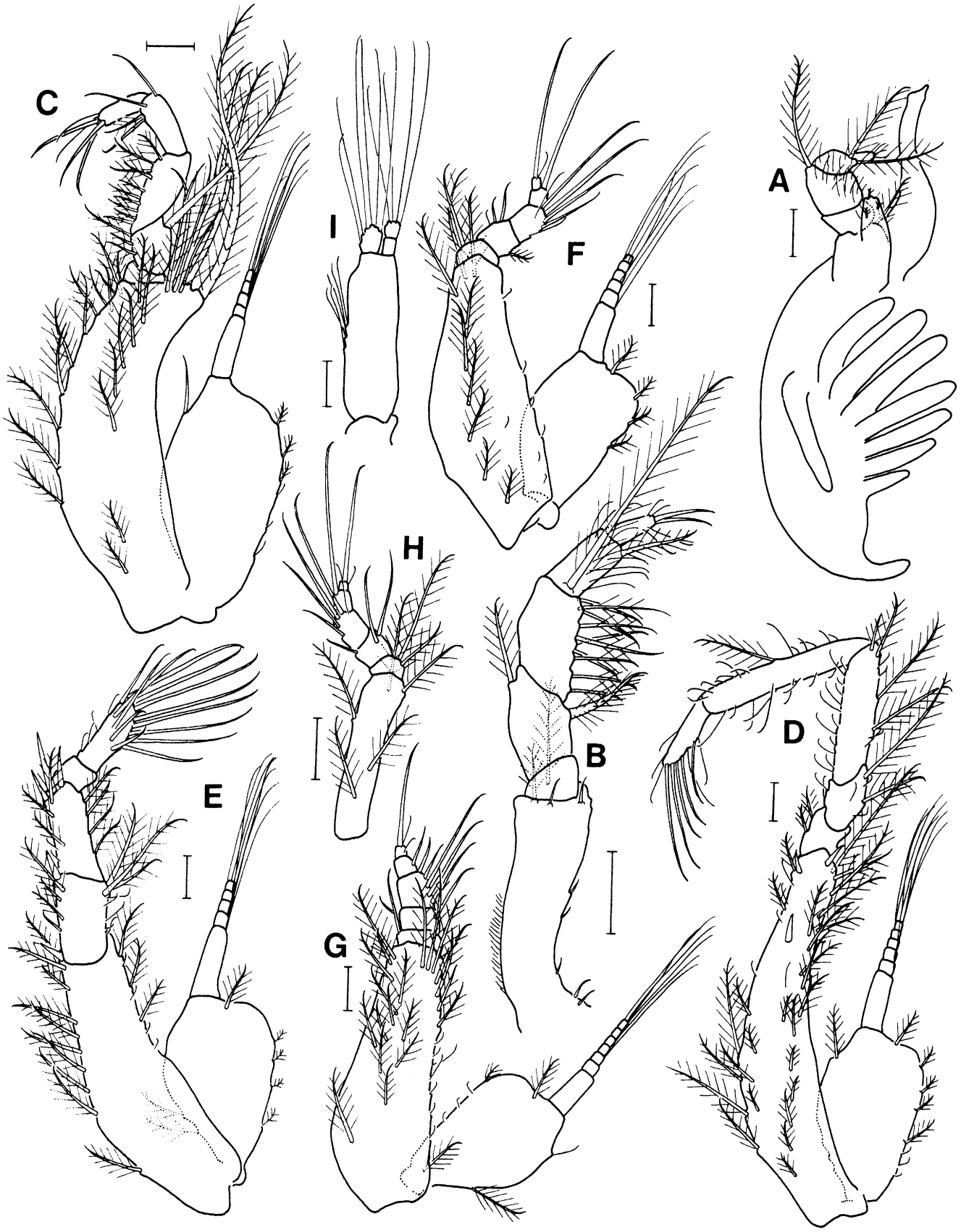


**Figure 4.** *Eudorella hwanghaensis* sp. nov., adult male: (A–C) maxillipeds 1–3; (D–H) pereopods 1–5; (I) pleopod 1. Scale bars: 0.1 mm.



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hairs on outer border and a stout distinct spine at apex. Exopod shorter than endopod, as long as or shorter than basal segment of endopod, and with plumose hairs on both edges (Figure 3I).

*Subadult male.* Body 5.4 mm long, surface sparsely beset with inconspicuous setae. Carapace about one-fifth of total length, inner margin with rather strong serrations for nearly the lower half of its length, and no distinct sinus (Figure 3D).

Antenna 1, 3-segmented. Segment 2 about twice length of the first, and this is subequal to the third segment 1. Main flagellum 3-segmented, basal segment without a bundle of long hairs, longer than the accessory flagellum.

Uropod peduncle nearly 1.5 times length of last pleonite and with six spines on hairy inner margin. Endopod 2-segmented and longer than the uropod peduncle, and at least as long as the basal segment of the endopod. Its proximal segments have 18 or 19 spines on the inner border and plumose hairs on the outer border. The distal is very short and bears five spines on the inner border, plumose hairs on the outer border and a stout apical spine. Exopod 2-segmented, fringing with plumose hairs on both edges.

*Distribution*

This species is dominant and confined to the middle part of the Yellow Sea at depths from 59 to 93 m. This pattern of distribution corresponds quite well with the characteristic ranges of the Yellow Sea Bottom Cold Waters Mass.

*Etymology*

The specific epithet hwanghaensis originated from the Korean Hwang-Hae, meaning the Yellow Sea. It is named after the region in which it was discovered.

*Remarks*

*Eudorella hwanghaensis* sp. nov. resembles *Eudorella hirsuta* Sars, 1900, *E. monodon* Calman, 1912, and *E. intermedia* Hansen, 1920, in various morphological aspects. On the basis of the well-developed serrations on the anterior margin of the carapace, this species is closely allied to *E. hirsuta* Sars, 1900. However, the new species can be distinguished by the following differences from *E. hirsuta*: (1) the female of *E. hirsuta* is characterized by the carapace with the anterior edges coarsely serrated throughout its whole length. However, the new species has serrations only on the lower half of the anterior edges; (2) the pseudorostrum of *E. hirsuta* is covered with numerous stiff forward curving setae in the upper part, but that is covered with few and short setae in *E. hwanghaensis* sp. nov.; (3) the carpus of pereopod 2 in *E. hirsuta* is four times longer than its propodus, but that of *E. hwanghaensis* sp. nov. is nearly twice as long as the propodus; (4) the exopod of *E. hirsuta* is longer than the basal segment of the endopod, but they are at least subequal in both sexes of the new species; (5) according to Lomakina (1958) and Stebbing (1913), *E. hirsuta* is distributed only on the Norwegian Coast, and is found at depths from 297 to 2524 m. However, our specimens were sampled between 59 and 93 m at depths in the Yellow Sea.

In the shape of the carapace, the new species seems to be quite similar to *E. monodon* Calman, 1912. However, it differs from the latter in the following features: (1) the front of pseudorostrum is covered with relatively long hairs in *E. monodon*, but that of *E. hwanghaensis* sp. nov. is beset with few and short hairs; (2) a small, anteriorly curved tooth is present on the front margin of the carapace in *E. monodon*, but it is not found in the new species; (3) the exopods of *E. monodon* are furnished with naked hairs on the outer edge, but these are covered with plumose hairs in the new species.

This species is also allied to *E. intermedia* in that they share a similarity in the morphology of the carapace on which serrations take place in the lower half. However, Lomakina (1958) illustrated that *E. intermedia* has relatively long and downward setae on the pseudorostrum, and an apical spine fused to the distal segment of the endopod of the uropod, but the new species has a clearly distinct apical spine.

## *Eudorella pacifica* Hart, 1930
(Figures 5–8)

*Eudorella pacifica* Hart, 1930: 27, figures 1G, 2A–C; Lomakina, 1958: 219, figure 135; Barnard & Given, 1961: 159, figures 3–4; Given, 1961: 145; Liu & Liu, 1990: 214, figure 14; Watling & McCann, 1997: 155, figure 2.20.

*Eudorella tridentata* Hart, 1930: 28, figure 2D–G; Lomakina, 1958: 220, figure 136.

*Eudorella* sp. Gamo, 1965: 534, figure 698; Gamo, 1967: 160, figure 1l; Gamo, 1968: 4, figure 3.

*Type locality*

Deep cove, Vancouver Island, west Canada, 120 m deep.

*Material examined*

All specimens collected from the Yellow Sea. Thirteen ♀s (36°50′N 124°30′E), 68 m, August 1983; three ♀s (36°30′N 125°30′E), August 1982; two ♂s (36°30′N 125°00′E), August 1982; 20 ♀s, two ♂s (36°20′N 125°00′E), 67 m, August 1983; two ♀s, one ♂ (36°00′N 125°00′E), 80 m, silty sand, August 1982; three ♀s (36°00′N 125°00′E), 80 m, silty sand, September 1992; four ♀s, two ♂s (35°50′N 125°30′E), 65 m, August 1982; one ♀, four ♂s (35°50′N 125°00′E), 67 m, August 1983; two ♀s, one ♂ (35°50′N 125°00′E), 56 m, August 1982; one ♀ (35°20′N 125°20′E), August 1983; one ♀ (35°20′N 125°10′E), August 1983.

*Description*

*Adult female.* This species is superficially similar to *Eudorella hwanghaensis* sp. nov., especially in general aspects of the body shape. Therefore, the descriptions are done only for the morphological differences between two species.

Body 3.3 mm long (Figure 5A). Carapace nearly one-fifth of total length. Antero–lateral margin of carapace smooth but there are some serrations on the above sinus and three downward pointed serrations on the under sinus, and the antero–lateral corner is not produced (Figure 5A–C).

Antenna 1, 3-segmented. Main flagellum 1.5 times greater than the last segment of peduncle. The accessory is as long as the basal segment of the main flagellum (Figure 5D).



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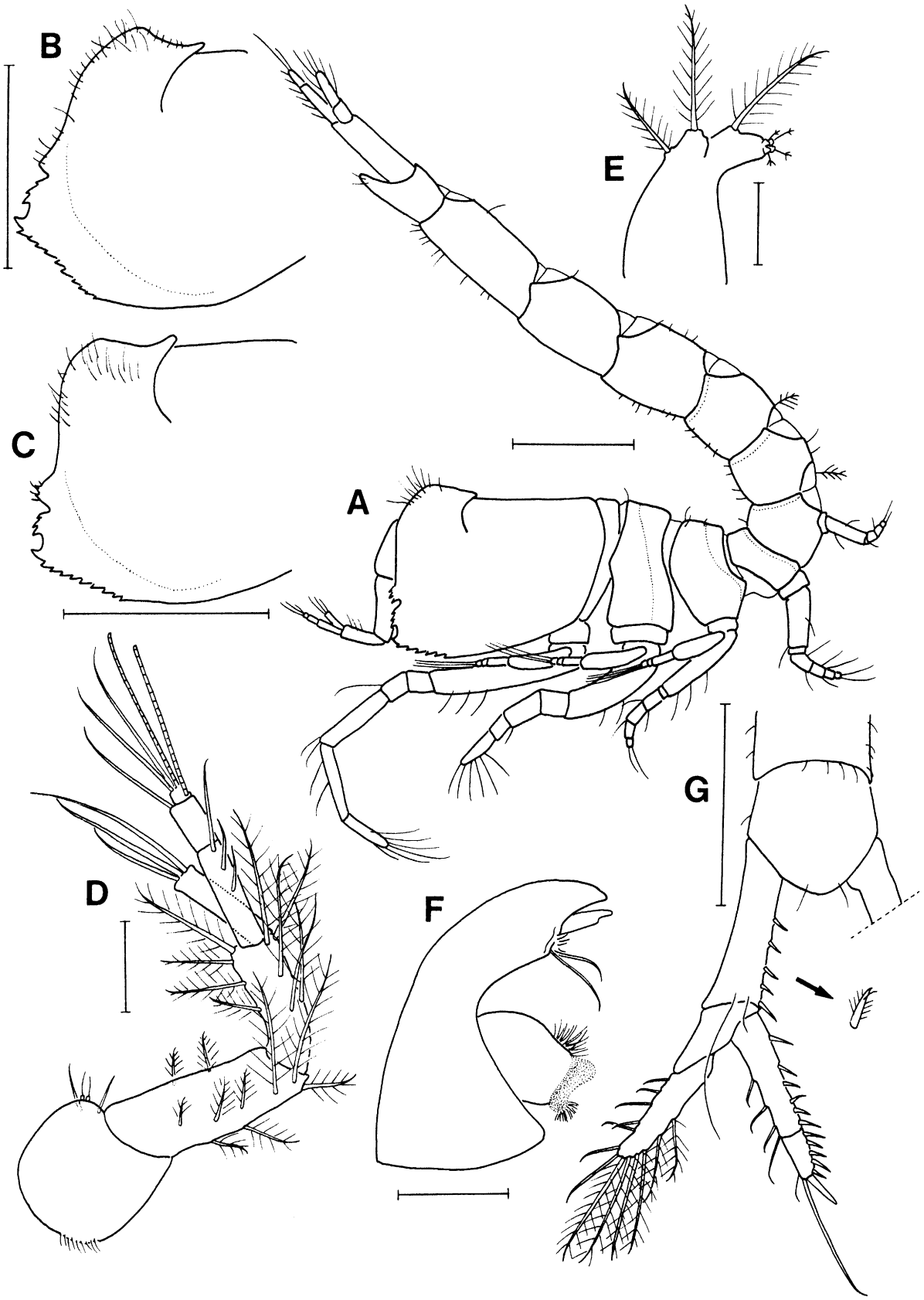


**Figure 5.** *Eudorella pacifica* Hart, adult female: (A) lateral view; (B & C) carapace, showing varied serrations; (D & E) antennae 1 and 2; (F) mandible; (G) pleon and uropod. Scale bars: A–C, G, 0.5 mm; D–F, 0.1 mm.



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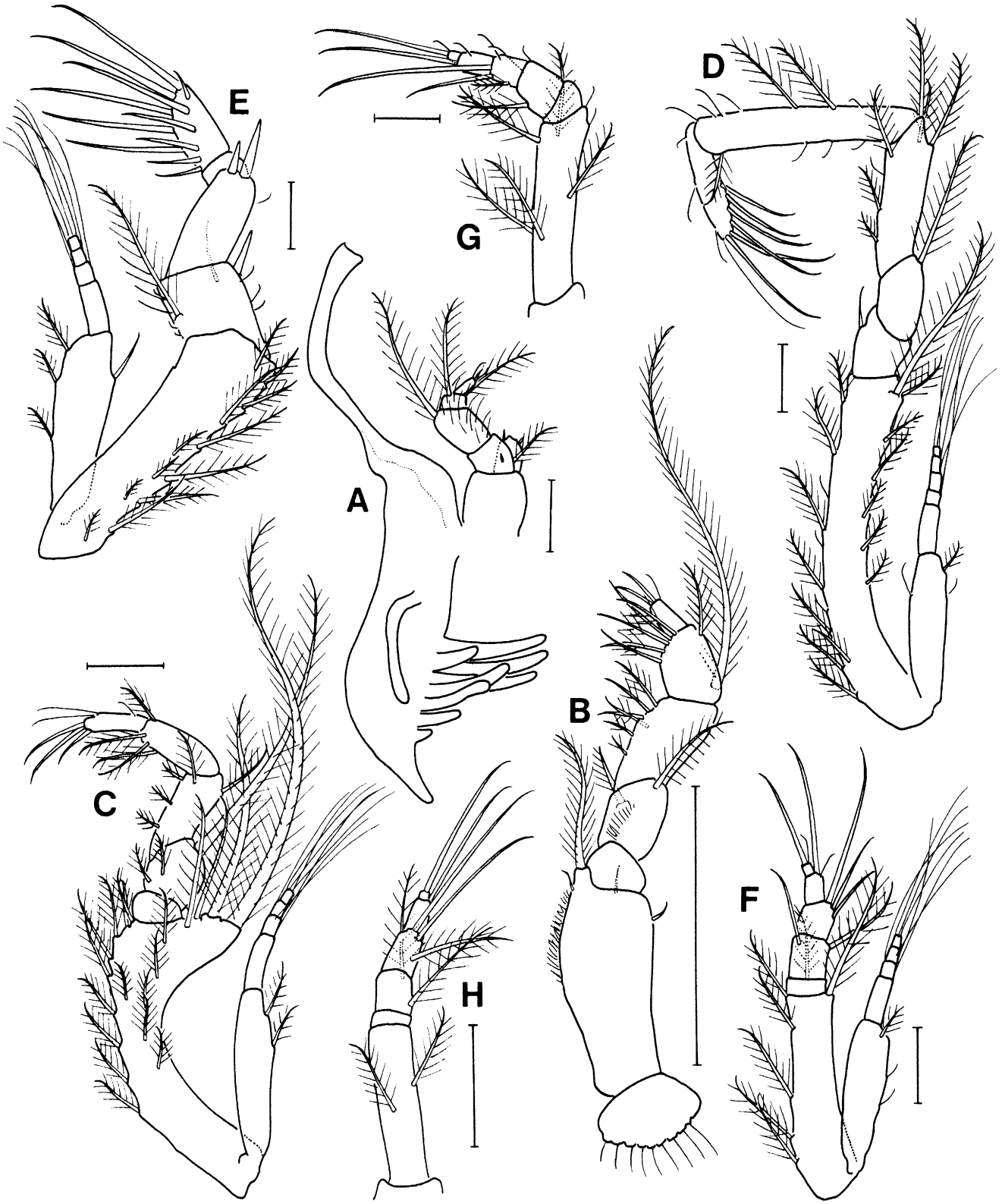


**Figure 6.** *Eudorella pacifica* Hart, adult female: (A–C) maxillipeds 1–3; (D–H), pereopods 1–5. Scale bars: A–G, 0.1 mm; H , 0.05 mm.

Basis of maxilliped 3 rather longer than remaining segments combined and strongly curved, widened distally but slender on basic portion (Figure 6C).

Basis of pereopod 1 about three-fifths of remaining segments together and without spine. Ischium and merus combined about four-fifths as long as carpus. Carpus about three-quarters as long as propodus. Dactyl nearly half of propodus (Figure 6D). Pereopod 2 stout and its basis as long as remaining segments together (Figure 6E). Pereopods 1–3 with developed exopods (Figure 6D–F).

Uropod peduncle about 1.3 times longer than last pleonite and bearing five spines on inner margin. Endopod



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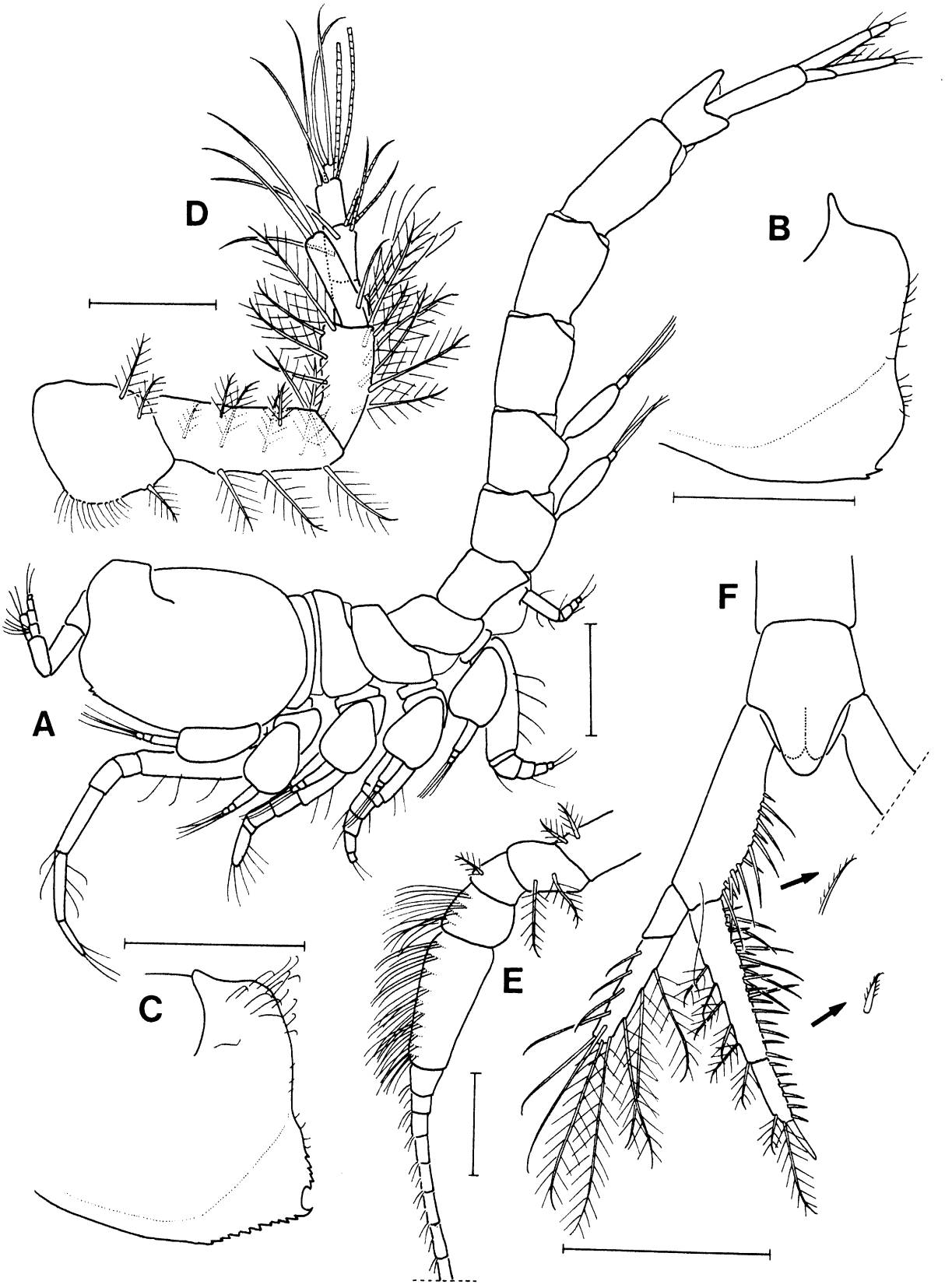


**Figure 7.** *Eudorella pacifica* Hart, adult male: (A) lateral view; (B) carapace of adult; (C) carapace of subadult; (D & E) antennae 1 and 2; (F) pleon and uropod. Scale bars: A–C, F, 0.5 mm; D, E, 0.2 mm.

2-segmented and slightly longer than uropod peduncle. Its proximal segment with six spines on inner border and naked hairs on outer border. The distal is very short, one-third of the proximal and with five normal and one distinct apical spine, which is equal in length to the distal segment and with naked hairs on outer border. Exopod slightly curved, at least as long as the basal segment of endopod and with plumose hairs only on inner border (Figure 5G).



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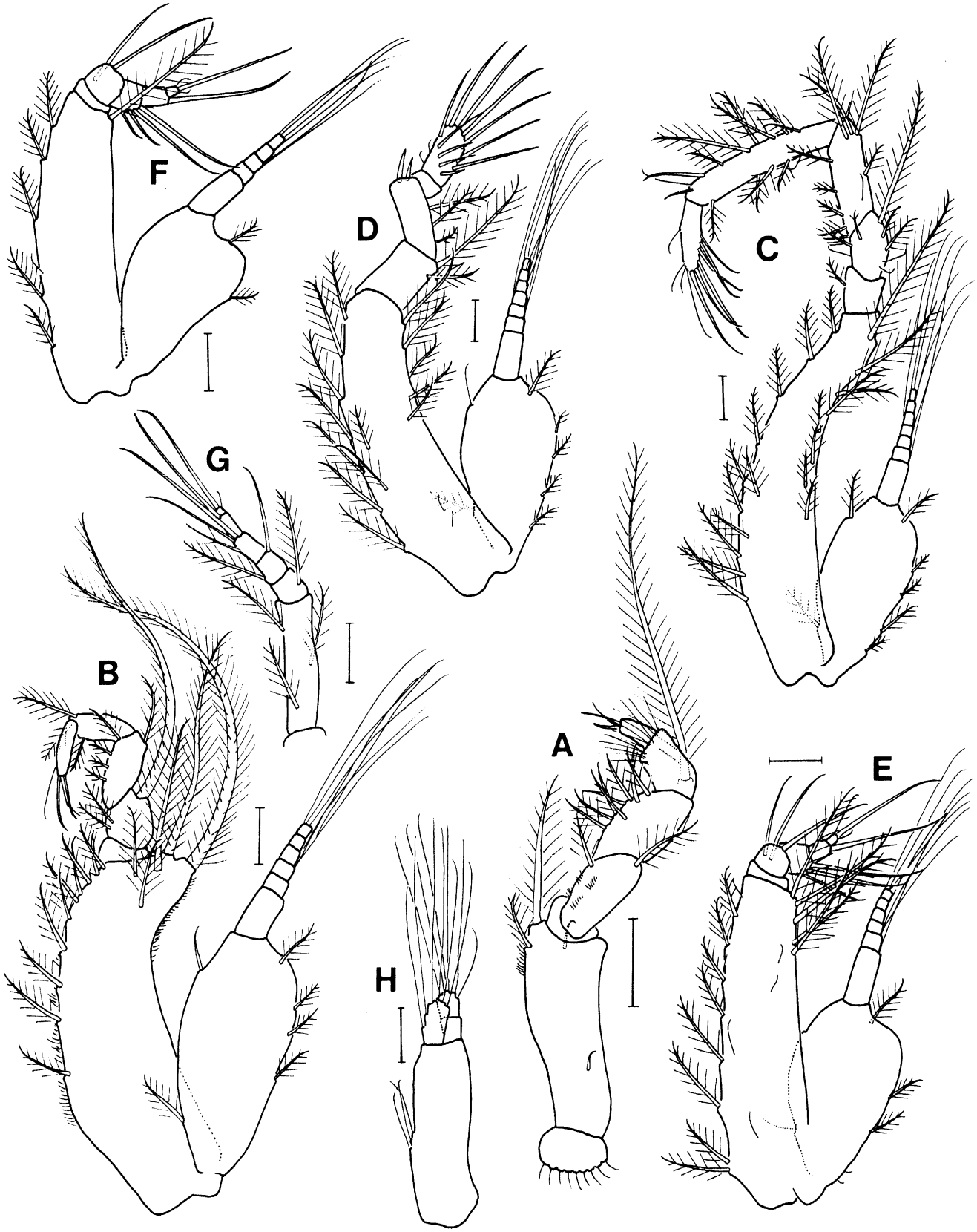


**Figure 8.** *Eudorella pacifica* Hart, adult male: (A & B) maxillipeds 2 and 3; (C–G) pereopods 1–5; (H) pleopod 1. Scale bars: 0.1 mm.

*Adult male.* Body 4.2 mm long (Figure 7A). Carapace about one-fifth of total length. Antero–lateral margin smooth and rounded except for two denticles on antero–lateral corner (Figure 7A,B).

Antenna 1 very strongly built. Basal segment broad and massive and the last shorter than the second. All three segments with strong plumose setae on both edges. Main flagellum 4-segmented, basal segment bearing a bundle



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of long hairs, much longer than the accessory flagellum (1.7 times) (Figure 7D).

Basis of maxilliped 3 more fairly broad. (Figure 8B).

Basis of pereopod 1 as long as remaining segments together. Ischium and merus combined slightly shorter than carpus and propodus about twice dactyl. All segments except dactyl with abundantly plumose hairs (Figure 8C). Basis of pereopod 2 nearly three-fifths of remaining segments together (Figure 8D). Pereopods 1–4 with well developed exopods (Figure 8C–F).

Uropod peduncle almost 1.3 times last pleonite, which is rather triangular, thin and transparent. Uropod peduncle with spines and long plumose bristles on inner margin. Endopod 2-segmented, a little longer than uropod peduncle. Its proximal segment with 13 spines and plumose bristles on inner border and plumose hairs on outer border. The distal is half of the proximal and has six spines on the inner border, and a stout distinct apical spine. Exopod shorter than endopod, but at least as long as proximal segment of endopod and with plumose hairs on inner border, naked hairs on outer border (Figure 7F).

*Subadult male.* Carapace nearly one-fifth of total length, anterior edges with 2–5 serrations only on lower part and no distinct sinus. Antero–lateral corner rather produced (Figure 7C).

Main flagellum distinctly 3-segmented, basal segment shorter than the accessory and without a bundle of long hairs. The accessory is about half the length of the main flagellum, and is tipped with three setae.

Uropod peduncle as long as exopod, which is longer than proximal segment of endopod. Endopod with spines on inner margin and plumose hairs on outer margin. Exopod with plumose hairs on inner margin and naked hairs on outer margin.

*Distribution*

Southern California, Pacific Ocean in North America; off Manazuru, Japan, sand; Huanghe Estuary located in the inner part of the Yellow Sea (38°48′N 117°44′E), 8 m; (38°29′N 120°14′E), 28 m; (38°35′N 120°02′E), 27 m; Yellow Sea, 56–92 m.

*Remarks*

This species is the most abundant and widespread cumacean in southern California (Barnard & Given, 1961). Lomakina (1958) found this species in all far eastern seas off USSR at depths from 20 to 240 m. Gamo (1967) described *Eudorella* sp. at sandy bottoms in Manazuru Bay, Japan. But, according to the morphology of its carapace, it seems highly probable that this species is conspecific with *E. pacifica*. Liu & Liu (1990) also reported this species in China at the Huanghe Estuary in the Yellow Sea. The present study showed that this species is distributed in more shallow coastal waters of the Yellow Sea compared to *E. hwanghaensis* sp. nov. (Figure 9).

It should be noted that this species shows considerable variation, especially with respect to the teeth in the vicinity of the antero–ventral corner and associated notch in the carapace (Barnard & Given, 1961). They observed more than 25 basic variations. The most common form is two up and one down in southern California. Based on the 55 individuals of our specimens examined from the

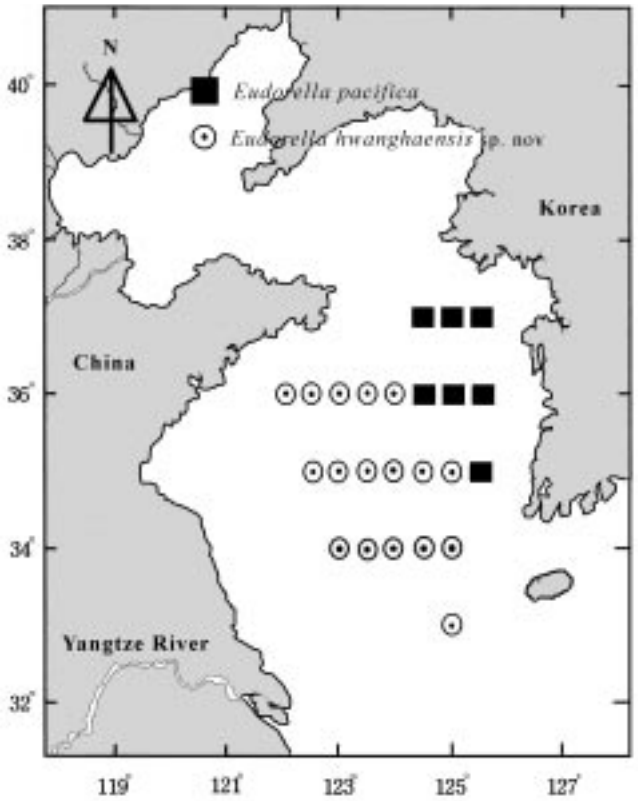


**Figure 9.** Distribution of the genus *Eudorella* in the Yellow Sea.

Yellow Sea, the most abundant form is consistent with the common type. The other forms are two up, one down, or 0 up, two or three down. Lower margin of the carapace is formed by a large horizontal tooth in specimens found in the vicinity of the east Pacific Ocean according to Hart's (1930) and Barnard & Given's (1961) figures, but specimens in the west Pacific Ocean have no such large horizontal tooth (Lomakina 1958; Gamo 1965, 1967; Liu & Liu 1990). Additionally, variation in the length of appendage articles and degree of setation has also been seen, both of which undoubtedly led Hart (1930) to create the new species *E. tridentata* (Watling & McCann, 1997). Following the key of genus *Eudorella* given by Barnard & Given (1961) and Watling (1991), *E. pacifica* is categorized under the endopod apical spine articulated with a distal segment and our specimens clearly belong to this characteristic species group. However, Hart (1930) described in her original diagnosis of *E. pacifica* that it is fused to the distal segment, so this character needs to be checked.

In the morphology of the carapace, uropod and antenna 1, this species is near to *E. groenlandica* Zimmer, 1926. The uropod exopod in *E. groenlandica* is clearly longer than the endopod basal segment only in females, but this character is observed only in 12 specimens out of 23 in the present species. Others have a uropod exopod only as long as the endopod basal segment. *E. groenlandica* is also characterized by the pereopod 2 dactyl with setae on its distal two-thirds, but those setae are found on the whole dactyl in *E. pacifica*. The distribution of *E. groenlandica* is limited to the Arctic Ocean, that is west Greenland, Norway, Denmark and Oslo Fjord, and is found at a depth of 216 m. However, this species was collected in the present



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study from the vicinity of the Yellow Sea at depths from 56 to 92 m.

The present species differs from *E. minor* Lomakina, 1952, in general form and the serrations on the antero–lateral margins of the carapace, which have basal segment of main flagellum of antenna 1 with naked setae and segment 5 about 1.5 times the length of segment 4 of pereopod 2, but *E. minor* may be distinguished by deep-depressed sinus and basal segment of main flagellum of antenna 1 with plumose setae, and segments 5 and 4 of pereopod 2 subequal in length. Watling (1991) mentioned in his key that *E. pacifica* has no setae on the basal article of the antennular main flagellum. However, our specimens do have a couple of naked setae on this article. It will be desirable to check this character in further specimens.

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