

Deep-sea shrimps of the genus *Bythocaris* G.O. Sars in the collections of Russian museums, with the description of a new species (Crustacea: Decapoda: Hippolytidae)

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Key words: Crustacea; Decapoda; Caridea; Hippolytidae; *Bythocaris*; new species; Russian museums. The collections of *Bythocaris* in Russian museums and research institutes were studied. Three species, *B. biruli* Kobjakova, 1964, *B. curvirostris* Kobjakova, 1957 and *B. irene* Retovsky, 1946, are redescribed, and a new species, *B. kobjakovae* spec. nov. is described. The intra-specific variation of six species of *Bythocaris* is analysed. A key to the known species of the genus is provided.

Introduction

The genus *Bythocaris* is presently considered to include 15 species (Fransen, 1993): *B. akidopleura* Fransen, 1993; *B. cosmetops* Holthuis, 1951; *B. cryonesus* Bowman & Manning, 1972; *B. curvirostris* Kobjakova, 1957; *B. elegans* Bryazgin, 1982; *B. floridensis* Abele & Martin, 1989; *B. gorei* Abele & Martin, 1989; *B. gracilis* Smith, 1885; *B. grumanti* Burukovsky, 1966; *B. irene* Retowsky, 1946; *B. leucopis* G. O. Sars, 1885; *B. miserabilis* Abele & Martin, 1989; *B. nana* Smith, 1885; *B. payeri* (Heller, 1875); *B. simplicirostris* G. O. Sars, 1869. Two species, *B. biruli* Kobjakova, 1964, and *B. spinipleura* Squires, 1990, were recognised as junior synonyms of, respectively, *B. leucopis* and *B. simplicirostris* by Fransen (1993). These shrimps inhabit mostly deep water, and hence a limited number of specimens is available in museum collections. Despite of this, several authors (Siversten & Holthuis, 1956; Fransen, 1993) demonstrated that such common species as *B. leucopis*, *B. payeri* and *B. simplicirostris* show considerable variation of several important characters.

Five species of *Bythocaris*, *B. biruli*, *B. curvirostris*, *B. elegans*, *B. grumanti* and *B. irene*, were described upon material collected by expeditions carried out by institutions of the former USSR. The descriptions of these species are, in several respects incomplete and sometimes unclear. Hence, three species (*B. biruli*, *B. curvirostris* and *B. irene*) are redescribed here. Besides this, the collections of *Bythocaris* in the Zoological Institute of the Russian Academy of Sciences, St. Petersburg and in the Zoological Museum of the Moscow University include a considerable number of specimens from different areas of the North Atlantic and Arctic region, which enabled the study of intra-specific variation of several species.

The type material of two species, *B. grumanti* and *B. elegans*, was not studied. The material of *B. grumanti* was never deposited in a museum. The author only has a single photo of this shrimp in lateral view. Even though *B. elegans* was reported to be catalogued in the Zoological Institute, St. Petersburg with the number 1/71883 (Bryazgin, 1982), the material was not found there.

Material and methods

The collections of *Bythocaris* in the Zoological Institute Russian Academy of Science, St.-Petersburg (ZISP), in Zoological Museum of Moscow State University, Moscow (ZMMU) and the Shirshov Institute of Oceanology, Russian Academy of Science, Moscow (IORAS), were examined. The ZISP collection includes the material of various expeditions in the Norwegian, the Greenland and north Russian seas collected between the years 1880 and 1995. The most abundant samples were obtained by R/V "Polarstern" of the Russian-German expedition during 1995 year. Most of this material has been studied before. The collections of ZMMU and IORAS were examined for the first time. These collections originate from the Norwegian, Greenland and Barents Seas. Most of the specimens in the ZMMU were collected on board R/V "Sevastopol" in the expeditions organised by the Polar Research Institute of Fisheries and Oceanography, Murmansk (PINRO), and the Department of Hydrobiology of the Moscow State University in the years 1957-1959. The material from the IORAS collection was collected in the north-eastern part of the Norwegian Sea by R/V "Akademik Mstislav Keldysh" between 1991 and 1993. Some specimens are deposited in the Nationaal Natuurhistorisch Museum, Leiden (formerly Rijksmuseum van Natuurlijke Historie (RMNH)).

Measurements were made using an ocular micrometer. Illustrations were made with the aid of an "Olympus SZH-10" stereomicroscope. The abbreviation cl. stands for carapace length excluding the rostrum, measured from the orbital margin to the middorsal posterior margin of the carapace.

The approach of Fransen (1993) with several additions was followed to describe intra-specific variability. Particular attention was paid to the following characters: 1, the form and length/width ratio of the scaphocerite; 2, the pigmentation of the cornea; 3, the form and relative length of the rostrum; 4, the number of middorsal teeth on the carapace; 5, the presence of the antennal spine; 6, the length of the antennular flagellum in relation to the scaphocerite length; 7, the number of the carpal articles of the second pereopod; 8, the presence or absence of the spine on the meri of pereopods 3-5; 9, the form of the pleura of the abdominal segments; 10, the form of the tip of the telson and number of dorsal marginal spines.

Systematic account

Bythocaris simplicirostris G.O. Sars, 1869
(figs 1, 2)

Bythocaris simplicirostris G.O. Sars, 1869: 5-6; G.O. Sars, 1873: 86-87; G.O. Sars, 1882: 46-47; G.O. Sars, 1886: 7-8; Birula, 1897: 427-428, pl. 20, fig. 3; Appellöf, 1906: 126, 161, 167, 168, 188, 189, 210; Birula, 1907: 43, 60; Hansen, 1908: 69-70; G.O. Sars, 1912: 13-17, pl. 2, fig. 1-21; Stephensen, 1912: 567; Stephensen, 1913: 39-40; Sivertsen, 1935: 44; Kobjakova, 1964: 325, 328; Burukovsky, 1966: 536; Bowman & Manning, 189; Fransen, 1993: 582-588.

Hippolyte Panschii Buchholz, 1874: 277, pl. 1 fig. 1.

Hippolyte panchii; Kingsley, 1878: 62.

Bythocaris panschii; Appellöf, 1906: 191, 193, 196, 197.

Bythocaris spinipleura Squires, 1990: 158-162, figs. 82-83.

Material.— 1 non-ovigerous female, cl. 4.5 mm (ZMMU): 61°00'25N-1°36'2W; 140 m depth; 18.vii.1957; R/V "Sevastopol", Cruise 5, st. 1100, det. V.I. Sokolov.— 1 ovigerous female, cl. 7 mm, 1 non-ovigerous female, cl. 7 mm (ZMMU): 66°08'N-30°56'W; 438 m depth; 1.viii.1957; R/V "Sevastopol", Cruise 5, st. 1167, det. V.I. Sokolov.— 1 non-ovigerous female, cl. 6 mm (ZMMU): 63°00'N-07°03'W; 710 m depth; 27.xi.1959; R/V "Sevastopol", Cruise 15, st. 2549, det. V.I. Sokolov.— 1 non-ovigerous female, cl. 5.7 mm (ZISP, 1/3746): 1880; The Murmansk expedition.— 1 ovigerous female, cl. 6 mm (ZISP, 3/36733): Greenland Sea; 0-50 m depth; 26.iii.1899 (8.iv.1899); "Andrei Pervozvannii", st. 388, coll. L. Breitfus, det. Z.I. Kobjakova.— 1 non-ovigerous female, cl. 5.9 mm (ZISP, 4/40607); Greenland Sea; 759 m depth; 11.iii.1958; R/V "Lena", A-153, st. 2, det. Z.I. Kobjakova.— 2 non-ovigerous females, cl. 4.2 and 5.7 mm (ZISP, 5/44427); North Western Atlantic Ocean, 48°55'5-48°59'1N to 50°31'4-50°31'3W; 230-237 m depth; 24.vii.1959; R/V "Sevastopol", Cruise 14, st. 2262, sample 48, 353-1961, coll., det. K.N. Nesis.— 1 juvenile, cl. 3.5 mm (ZISP, 6/45034): North Western Atlantic Ocean, 50°00'1-50°03'7N to 50°19'9-50°28'0W; 420-460 m depth; 3.vii.1960; R/V "Sevastopol", Cruise 17, st. 2895, sample 43, 353-1961, det. K.N. Nesis.— 1 juvenile, cl. 3 mm (ZISP, 7/45034); 53°30'5-52°23'2N to 50°28'5-50°26'5W?; 400-430 m depth; 27.vi.1960; R/V "Sevastopol", Cruise 17, st. 2858, sample 26, 353-1961, det. K.N. Nesis.

Notes on morphology:

1. The scaphocerite is rounded anteriorly in all specimens. The width/length ratio lies between 0.27 and 0.45 (fig. 2). The distolateral tooth of the scaphocerite is clearly visible, never extending beyond the anterior margin of the lamina (fig. 1b).

2. The cornea is dark pigmented.

3. The rostrum has the apex depressed, always overreaching the base of the antennular peduncle (fig. 1b, c). In two specimens (cl. 3 and 3.5 mm) out of 11, rostrum not extending beyond the eyes, in another specimens the rostrum clearly overreaching the eyes.

4. Only in one specimen, one distinct middorsal tooth is present on the carapace, in one specimen a well developed middorsal tooth with a proximal knob is present (fig. 1c), in another specimens two well developed middorsal teeth are present (fig. 1a).

5. In all specimens an antennal spine is present on both sides.

6. The outer and inner antennular flagella are not extending beyond, or slightly overreaching the anterior margin of the scaphocerite.

7. In 5 specimens both left and right carpus of the second pereopod have 10 articles, in 4 specimens 9 articles, and in 2 specimens 11 articles.

8. The meri of pereopods 3-5 are always armed. The number of spines on the merus of the fifth pereopod varies from 1 to 3, on the meri of the third and fourth pereopods from 3 to 5.

9. All pleurae of the abdominal segments have a distinct proximo-ventral tooth (fig. 1d).

10. The posterior margin of the telson is clearly concave (fig. 1e). In all specimens three pairs of dorsal marginal spines are present.

Remarks.— The main diagnostic characters to distinguish *B. simplicirostris* from the other species of *Bythocaris* are: 1, the dark pigmentation of the eye; 2, the anteriorly rounded scaphocerite; 3, the rostrum overreaching the base of the antennular peduncle; 4, the presence of a proximolateral tooth on the pleurae of the first five abdominal segments; 5, the armed meri of the third through fifth pereopods; 6, the presence of at least one middorsal tooth on the carapace. These six characters are always present together.

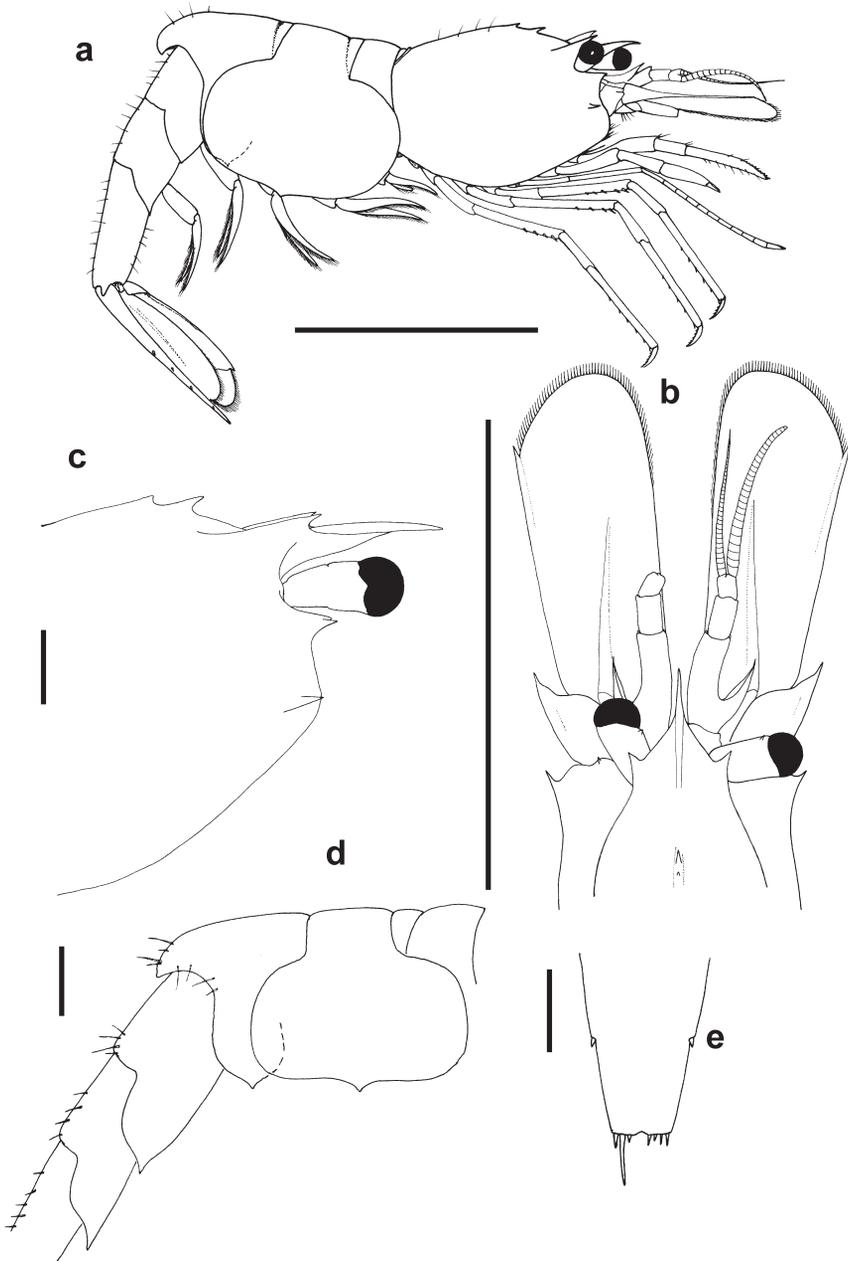


Fig. 1. *Bythocaris simplicirostris* G.O. Sars, 1869. a, lateral view, female, cl. 7 mm (ZMMU, Ma 4126); b, dorsal view of anterior region, female, cl. 7 mm (ZMMU, Ma 4126); c, lateral view of anterior part of carapace, female ("Sevastopol", st. 2549), cl. 6 mm; d, lateral view of abdominal pleura 2-5, female ("Sevastopol", st. 2549), cl. 6 mm; e, tip of telson in dorsal view, ovigerous female (Ma 4126), cl. 7 mm. Scale a, b = 1 cm; c-e = 1 mm.

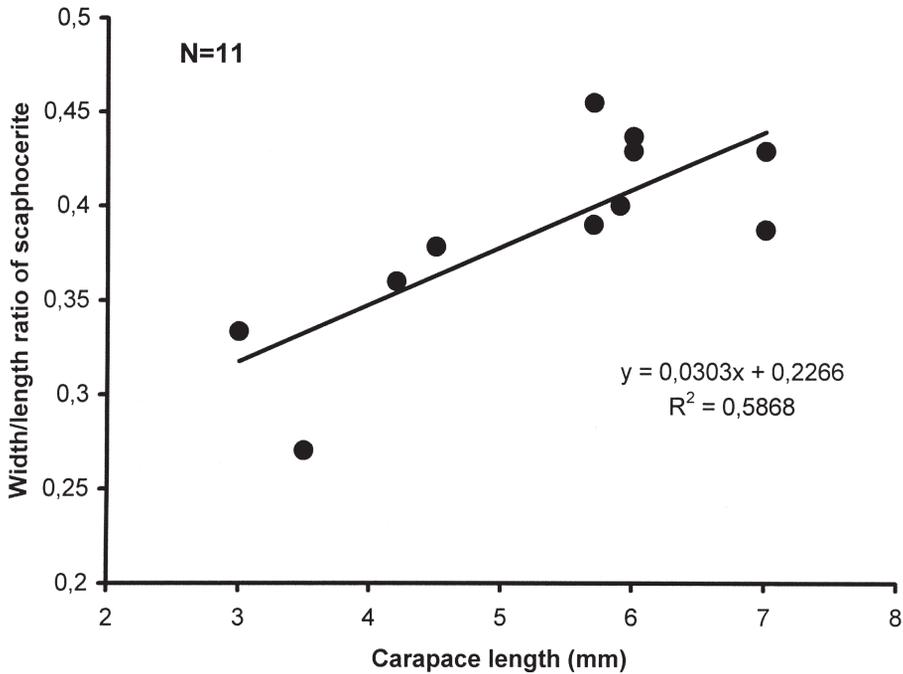


Fig. 2. *Bythocaris simplicirostris* G.O. Sars, 1869. Graph showing width/length ratio of scaphocerite in relation to carapace length.

Fransen (1993) showed that *B. spinipleura* Squires, 1990, is a junior synonym of *B. simplicirostris*. The present material appears to support this conclusion.

Distribution.— Reported from the Arctic Ocean and the east coasts of Greenland east to the Barents Sea and south to the British Isles and Newfoundland. Recorded from depths between 50 and 760 m.

Bythocaris payeri (Heller, 1875)
(figs 3-6)

Hippolyte Payeri Heller, 1875a: 26-27, Pl. 1, figs. 1-4; Heller, 1875 b: 609.

Bythocaris Payeri; G.O. Sars, 1885: 33-35, pl. 3, fig. 27; G.O. Sars, 1886: 8, Hansen, 1908: 67-68.

Bythocaris payeri; Norman, 1882: 19-20, pl. 1, fig. 8-9; Birula, 1897: 428-429; Appellöf, 1906: 167, 168, 191, 192, 195, 196, 205; Birula, 1907: 43-44, 60, 67; Stephensen, 1913: 38-39; Gorbunov, 1934: 63, 64, 68, 71, 75; Gorbunov, 1946: 44, 100, 104, 126; Sivertsen, 1935: 44; Sivertsen & Holthuis, 1956: 34, figs. 23-24; Kobjakova, 1964: 325, 328; Burukovsky, 1966: 537, fig. 1; Bowman & Manning, 1972: 189; Squires, 1990: 153-157, figs. 79-81; Fransen, 1993: 568-575, figs. 1-13.

Material.— 1 non-ovigerous female, cl 6.6 mm (ZMMU, Ma 3264); 65°13'3N-10°00'W; 730 m depth; 15.x.1958; R/V "Sevastopol", Cruise 10, st. 1765, det. V.I. Sokolov.— 1 non-ovigerous female, cl. 9.1 (ZMMU, Ma 3266); 66°30'N-12°40'W; 920 m depth; 31.iii.1958; R/V "Sevastopol", Cruise 8, st.1383, det. V.I. Sokolov.— 1 non-ovigerous female, cl. 6.4 mm (ZMMU, Ma 3265); 63°00'N-07°30'W; 710 m depth; 27.xi.59; R/V "Sevastopol", Cruise 15, st. 2549, det. V.I. Sokolov.— 1 non-ovigerous female, cl.

6.4 mm; 1 ovigerous female, cl. 12.3 mm; 1 male, cl. 8 mm (ZMMU, Ma 4257); 62°46'N-2°41'W; 890 m depth; 13.x.1958; R/V "Sevastopol", Cruise 10, st. 1758, det. V.I. Sokolov.— 1 non-ovigerous female, cl. 13 mm (ZMMU); 65°45'N-11°00'W; 960 m depth; 22.xi.1959; R/V "Sevastopol", Cruise 15, st. 2530, det. V.I. Sokolov.— 3 non-ovigerous females, cl. 3.7-3.9 mm; 4 males, cl. 3.2-7.9 mm (ZMMU, Ma 3182, RMNH D 48607); Arctic Ocean; 335-355 m depth; 26.iii.1979; CP-22, st. 122, det. N.A. Zarenkov.— 31 non-ovigerous females, cl. 2.6-10.4 mm; 22 males, cl. 3.2-8.5 mm (ZMMU, Ma 2729); Arctic Ocean; 300-330 m depth; 24.ii.1979-25.ii.1979; CP-22, st. 103, det. N.A. Zarenkov.— 3 ovigerous females, cl. 11-13 mm; 6 non-ovigerous females, cl. 2.9-4.7 mm; 9 males, cl. 3-6.6 mm (ZMMU, Ma ?); Arctic Ocean; 100-365 m depth; 13.iii.1979; CP-22, st. 115, det. N.A. Zarenkov.— 1 male, cl. 5.5 mm (ZISP, 2/11169); Arctic Ocean, 78°08'N-73°40'E; 6.ix.1931; st. 12, 495-1933, det. G.P. Gorbunov.— 1 non-ovigerous female, cl. 8 mm (ZISP, 3/38993); Arctic Ocean, 77°39'N-105°41'E; 28.viii.1913-10.ix.1913; st. 326-9142, det. G.P. Gorbunov.— 1 ovigerous female, cl. 12.2 mm; 3 non-ovigerous females, cl. 11.5-12 mm; 6 males, cl. 6.1-9.3 mm (ZISP, 4/40597); Arctic Ocean; 365 m depth; 24.ix.1934; R/V "Sedov", st. 96, rab.744, det. L.O. Retowsky.— 2 ovigerous females, cl. 11.5, 12.5 mm; 1 non-ovigerous female, cl. 6.5 mm; 1 male, cl. 6 mm (ZISP, 5/40598); Kara Sea, 71°26'N-57°34'E; 280 m depth; 13.viii.1931; R/V "Rusanov", st. 18, 265-1934, det. G.P. Gorbunov.— 1 male, cl. 7.8 mm (ZISP, 6/40599); Kara Sea, 70°48'N-65°36'E; 120 m depth; 18.ix.1931; R/V "Rusanov", st. 40, 265-1934, det. G.P. Gorbunov.— 1 ovigerous female, cl. 11.5 mm; 1 non-ovigerous female, cl. 10 mm (ZISP, 7/40600); Arctic Ocean; 510 m depth; 8.ix.1955; R/V "Litke", st. 1, det. Z.I. Kobjakova.— 1 male, cl. 6.3 mm (ZISP, 8/40601); Greenland Sea, 77°51'N-05°59'W; 388 m depth; 25.iii.1958; R/V "Lena", Cruise A-153, st. 28, 504-1958, det. Z.I. Kobjakova.— 2 males, cl. 4.5 and 5.3 mm (ZISP, 9/40602); Arctic Ocean, 76°47'3N-173°17'4E; 425 m depth; 19.vi.1954-20.vi.1954; CP-4, R/V "Ob", st. 2.— 1 non-ovigerous female, cl. 9 mm (ZISP, 10/40603); Greenland Sea; 217 m depth; 23.viii.1956; CP-4, R/V "Ob", st.17, det. Z.I. Kobjakova.— 1 male, cl. 6.5 mm (ZISP, 11/40604); Arctic Ocean; 230 m depth; 28.viii.1956; CP-4, R/V "Ob", st. 31, det. Z.I. Kobjakova.— 1 ovigerous female, cl. 9.5 mm (ZISP, 12/40605); Greenland Sea; 243 m depth; 27.viii.1956; CP-4, R/V "Ob", st. 27, det. Z.I. Kobjakova.— 1 ovigerous female, cl. 9.1 mm; 1 male, cl. 6.5 mm (ZISP, 13/40606); Greenland Sea; 650 m depth; 3.ix.1956; CP-4, R/V "Ob", st. 50, det. Z.I. Kobjakova.— 1 non-ovigerous female, cl. 7.7 mm; 1 male, cl. 6.5 mm (ZISP, 14/44791); Kara Sea, 81°11'4N-66°53'E; 52 m depth; 28.viii.1935; R/V "Sadko", st. 35/71, det. Z.I. Kobjakova.— 1 non-ovigerous female, cl. 8.5 (ZISP, 15/44792); Kara Sea, 76°03'N-68°59'E; 318 m depth; 23.ix.1934; R/V "Sadko", st. 93, det. L.O. Retowsky.— 1 male, cl. 9 mm (ZISP, 16/44793); Kara Sea, 78°43'N-75°05'E; 307 m depth; 29.vii.1934; R/V "Sadko", st. 7, det. L.O. Retowsky.— 1 male, cl. 8.3 mm (ZISP, 17/44794); Kara Sea, 75°04'N-65°08'E; 265 m depth; 24.ix.1934; I/S "G. Sedov", st.95, det. L.O. Retowsky.— 1 non-ovigerous female, cl. 4.7 mm (ZISP, 18/44795); Kara Sea, 79°23'N-70°48E; 525 m depth; 21.viii.1934; I/S "G. Sedov", st. 35, det. L.O. Retowsky.— 1 non-ovigerous female, cl. 8.5 mm (ZISP, 19/44796); Kara Sea 78°06'N-74°21'E; 375 m depth; 29.vii.1934; I/S "G. Sedov", st. 5, det. L.O. Retowsky.— 1 non-ovigerous female, cl. 9 mm (ZISP, 20/44797); Kara Sea, 75°98'N-69°08'E; 279 m depth; 23.viii.1934; I/S "G. Sedov", st. 94,, det. L.O. Retowsky.— 1 ovigerous female, cl. 12 mm; 2 non-ovigerous females, cl. 7.8 and 11.5 mm; 3 males, cl. 6.4-7.8 mm (ZISP); Laptev Sea, 78°31'N-113°03'E; 459 m depth; 1.ix.1948; S-Z., R/V "Litke", st. 145, det. Z.I. Kobjakova.— 3 males, 7.4-7.8 mm (ZISP); East Siberian Sea, 79°49'1N-149°38'1E; 332 m depth; 30.viii.1995; R/V "Polarstern", st. 64a, det. T.V. Menshutkina.— 11 ovigerous females, cl. 9.1-11.1 mm; 76 non-ovigerous females, cl. 5.7-11.6 mm; 35 males, cl. 4.9-7.9 mm (ZISP); East Siberian Sea, 79°49'1N-149°38'1E; 332 m depth; 30.viii.1995; R/V "Polarstern", st. 64a, det. T.V. Menshutkina.— 6 ovigerous females, cl. 10.8-12.8 mm; 19 non-ovigerous females, cl. 7.3-12.2 mm; 8 males, cl. 5.8-9.8 mm (ZISP); 78°21'7N-139°04'5E; 772 m depth; 1.ix.1995; R/V "Polarstern", st. 69a, det. T.V. Menshutkina.— 1 non-ovigerous female, cl.4.5 mm (ZISP); 78°21'7N-139°04'5E; 772 m depth; 1.ix.1995; R/V "Polarstern", st. 69a, det. T.V. Menshutkina.— 2 non-ovigerous females, cl. 6.3 and 10.5 mm; 1 male, cl. 7.8 mm (ZISP); Laptev Sea, 78°42'8N-112°43'4E; 2214 m depth; 6.ix.1995; R/V "Polarstern", st. 80a, det. T.V. Menshutkina.— 1 non-ovigerous female, cl. 8.6 mm; 1 male, cl.7.3 mm (ZISP); Kara Sea 82°03'9N-90°56'3E; 1682 m depth; 10.ix.1995; R/V "Polarstern", st. 91a, det. T.V. Menshutkina.

Notes on morphology:

1. The scaphocerite is rounded anteriorly in all specimens (fig. 4). The width/length ratio lies between 0.28-0.49 (fig. 6); there are no differences between the width/length ratios of males and females. The distolateral tooth of the scaphocerite is clearly visible, never extending beyond the anterior margin of the lamina (fig. 4).

2. The eyes are dark pigmented. In 6 females (cl. 2.8-4.5 mm, CP-22, st. 115 and 122) the pigmentation of the cornea is lighter than that in other specimens. In one male (cl. 5.9 mm, CP-22, st. 115) the pigmentation of the left eye is lighter than that of the right eye.

3. The rostrum usually has a slightly depressed apex, which, as a rule, is not overreaching the base of the cornea (fig. 4b-d). Only in 3 specimens out of 289, the rostrum extends slightly beyond the eyestalks (fig. 4a, 5c). In lateral view the central border of the rostrum is convex (fig. 5).

4. In most specimens (237) the middorsal carina is unarmed (fig. 5a). In 20 specimens a well-developed middorsal tooth is present (fig. 5c), in 2 specimens 2 middorsal teeth are present (fig. 5d). In 18 specimens a well-developed tooth with a proximal knob is present (fig. 5e), in 9 specimens only a knob is present (fig. 5b) and 2 specimens have 2 knobs on the middorsal carina.

5. In 2 specimens the antennal spine is absent, in 5 specimens it is present only on one side, in all other specimens the antennal spine is present on both sides.

6. The outer and inner antennular flagella are not extending beyond the anterior margin of the scaphocerite (Fransen, 1993: fig. 2) or are slightly overreaching it (fig. 4 a, b).

7. In most specimens (175) both left and right carpus of the second pereiopods have 9 articles, in 90 specimens 8 articles, in 14 specimens 10 articles, in 4 specimens 7 articles and in 6 specimens the number of carpal articles on the left and right pereiopods is different.

8. The meri of pereiopods 3-5 are always armed. The number of spines on the merus of the fifth pereiopod varies between 1 and 2, on the meri of the third and fourth pereiopods between 3 and 5.

9. The pleura of the abdominal segments are almost always rounded. In 5 specimens the pleura of the fifth abdominal segment is acute (fig. 3b), in 1 specimen it is produced on the left side and has a proximoventral tooth on the right side. Besides of this, one female (cl. 3.9 mm) has a posterolateral tooth on the pleura of the fourth abdominal segment (fig. 3c) and another female a posterolateral tooth only on the right third pleuron (fig. 3d).

10. The tip of the telson is slightly convex or truncate. The number of dorsal marginal spines varies on each side.

Remarks.— Fransen (1993) presented five most principal diagnostic characters for *B. payeri* which are in agreement with our results.

The main diagnostic characters to distinguish *B. payeri* from the other species of *Bythocaris* are: 1, the dark pigmentation of the eye; 2, the anteriorly rounded scaphocerite; 3, the rostrum, as a rule, not overreaching the base of the cornea of the eye; 4, the pleura of the first five abdominal segment usually being rounded; 5, the ventrally sinuous rostrum; 6, the armed meri of the third through fifth pereiopods. These six characters are always present together.

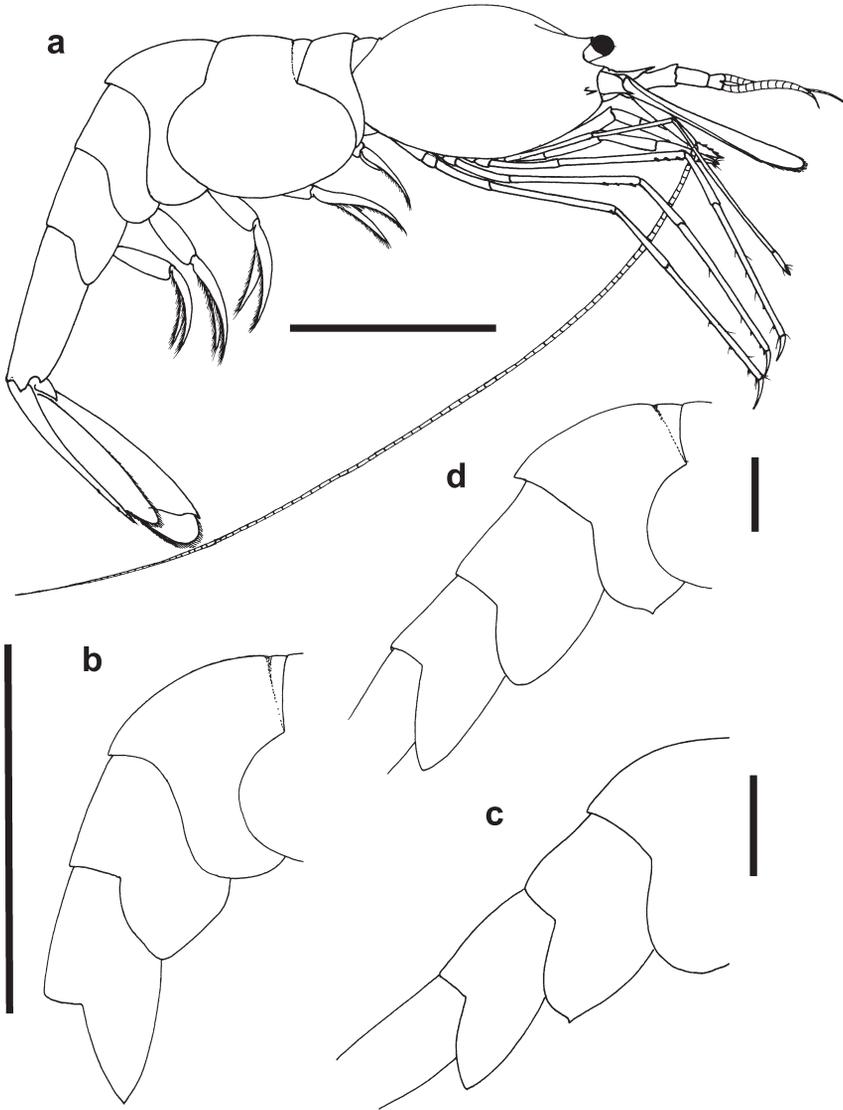


Fig. 3. *Bythocaris payeri* (Heller, 1875). a, lateral view, female (ZMMU, Ma 2729), cl. 10.5 mm; b-d, lateral view of abdominal pleura 2-5 (CP-22, St. 122). b, female, cl. 3.8 mm; c, female, cl. 3.9 mm; d, male, cl. 7.9 mm. Scale a, b = 1 cm; c, d = 1 mm.

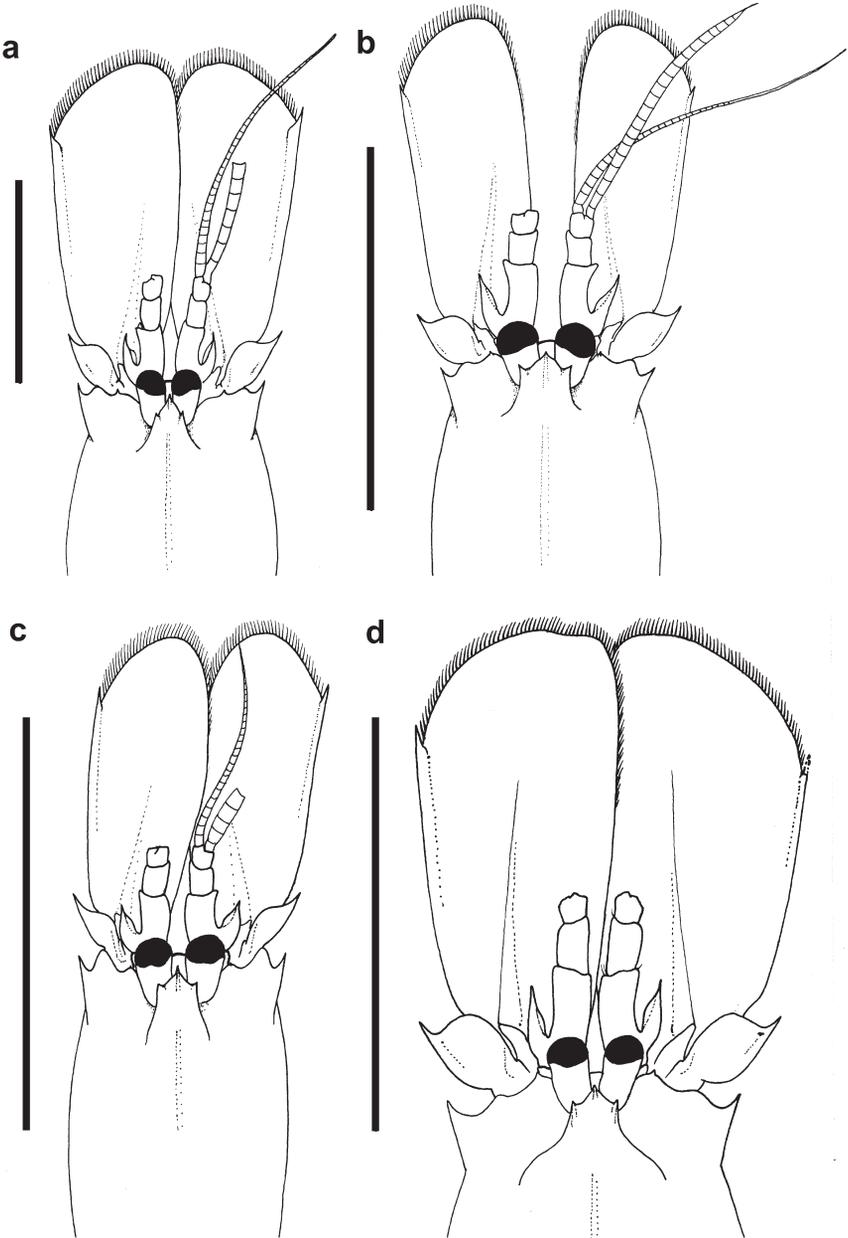


Fig. 4. *Bythocaris payeri* (Heller, 1875), dorsal view of anterior region. a, female (ZMMU, Ma 3265), cl. 11.5 mm; b, male (ZMMU, Ma 3182), cl. 7.2 mm; c, female ("Sevastopol", St. 1765), cl. 7.6 mm; d, female (ZMMU, Ma 3266), cl. 11 mm. Scale 1 cm.

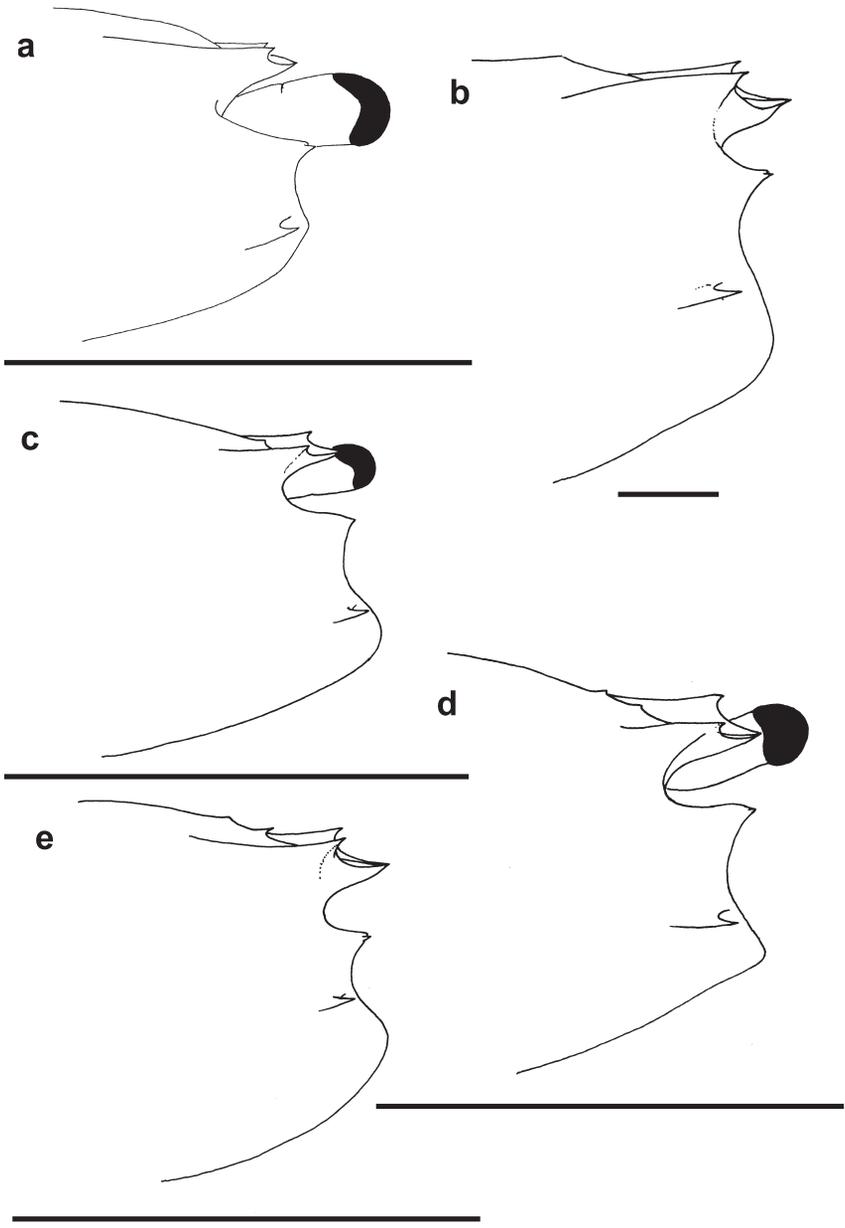


Fig. 5. *Bythocaris payeri* (Heller, 1875), lateral view of anterior part of carapace. a, female ("Sevastopol", St. 1383), cl. 9.1 mm; b, female (ZMMU, Ma 3182), cl. 3.9 mm; c, female ("Sevastopol", 1758), cl. 11 mm; d, ovigerous female (ZMMU, Ma 4257), cl. 12.3 mm; e, female (CP-22, St. 115), cl. 11 mm. Scale a, c-e = 1 cm; b = 1 mm.

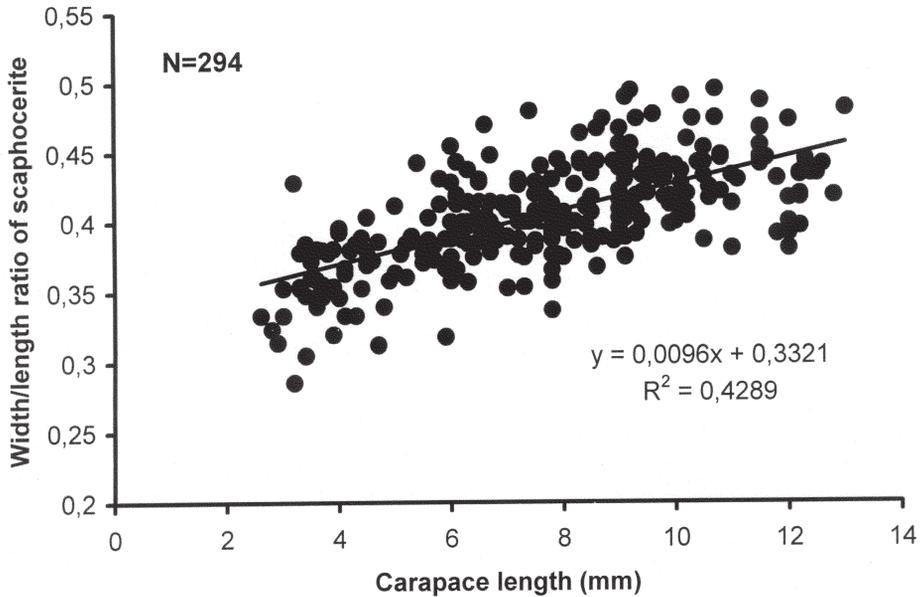


Fig. 6. *Bythocaris payeri* (Heller, 1875). Graph showing width/length ratio of scaphocerite in relation to carapace length.

As shown above, several specimens have acute fifth pleura and in 2 specimens the fourth or the third pleura bear a posterolateral tooth. These may be, however, aberrant specimens, especially the female with the rounded third pleura on the left side and with a posterolateral tooth on the right side. Thus the fourth character could be used for identification.

Sivertsen (1935) suggested that *B. leucopsis* and *B. payeri* are depth-related forms of one species. Fransen (1993) examined material from different depths and doubted this suggestion. In our material numerous specimens of *B. payeri* were collected together with *B. leucopsis* and *B. biruli* and no transitional forms were found.

Distribution.— North Atlantic and Arctic Ocean: Russian Northern Seas (Chukchi Sea, East Siberian Sea, Laptev Sea, Kara Sea), Barents Sea, Greenland Sea, Norwegian Sea, along Newfoundland, Baffin Island, Greenland, the Faroes and Shetlands Isles, northern and western coast of Norway, Jan Mayen, Spitzbergen, Franz Josef Land, Novaya Zemlya. The known depth range is between 180-2000 m (Fransen, 1993). The present records provide some corrections for both minimum (52 m) and maximum depth (2214 m) in the Kara Sea.

Bythocaris leucopsis G.O. Sars, 1885
(figs 7-10)

Bythocaris leucopsis G.O. Sars, 1885: 27-33, pl. 3, figs. 1-26; G.O. Sars, 1886: 8; Appellöf, 1906: 167, 190, 191, 195, 196, 205; Hansen, 1908: 66-67; Birula, 1907: 2, 44-46, 53, 60, 67, fig. 4; Stephensen, 1912: 567; Stephensen, 1913: 39; Gorbunov, 1946: 94, 100, 126; Kobjakova, 1964: 328; Burukovsky, 1966: 538, fig.1; Bowman & Manning, 1973: 189, 192; Fransen, 1993: 575-582, figs. 14-31.

Material.— 9 non-ovigerous females, cl. 10.8-20.5 mm; 3 males, cl. 10.2-14.5 mm (ZMMU); 62°20'N-12°00'W; 1940 m depth; 5.xi.1959; R/V "Sevastopol", Cruise 15, st. 2448, det. V.I. Sokolov.— 1 non-ovigerous female, cl. 19 mm (IORAS); Norwegian Sea; 1725-1770 m depth; 14.viii.1993; R/V "Ak. Keldish", Cruise 31, st. 3153, det. V.I.Sokolov.— 1 ovigerous female, cl. 20.5 mm; 5 non-ovigerous females, cl.18.2-21.2 mm (ZISP); Laptev Sea, 78°16'22N-130°02'48E; 2410 m depth; 4.viii.1995; R/V "Polarstern", st. 23a, det. T.V. Menshutkina.— 5 ovigerous females, cl. 19.6-21 mm; 6 non-ovigerous females, cl. 7.7-22.5 mm; 12 males, cl. 9.2-17.2 mm (ZISP, RMNH D 48608); Laptev Sea, 81°08'9N-138°54'6E; 1790 m depth; 24.viii.1995; R/V "Polarstern", st. 51a, det. T.V. Menshutkina.— 1 male, cl. 17.2 mm (ZISP); Laptev Sea, 81°08'9N-138°54'6E; 1790 m depth; 24.viii.1995; R/V "Polarstern", st. 51a, ZISP, det. T.V. Menshutkina (as *B. biruli*).— 1 ovigerous female, cl. 19.8 mm; 2 non-ovigerous females, cl. 19-22 mm (ZISP); East-Siberian Sea, 81°16'0N-150°17'33E; 1570 m depth; 29.viii.1995; R/V "Polarstern", st. 60b, det. T.V. Menshutkina.— 1 male, cl. 14.9 mm (ZISP); East-Siberian Sea, 81°16'0N-150°17'33E; 1570 m depth; 29.viii.1995; R/V "Polarstern", st. 60b, det. T.V. Menshutkina (as *B. biruli*).— 1 male, cl. 10.5 mm (ZISP, 4/40610); Arctic Ocean; 1540 m depth; 9.ix.1955; I/S "F. Litke", st. 2, Z.I. Kobjakova (as *B. biruli*).

Notes on morphology:

1. The scaphocerite is usually truncate anteriorly; the anterior margin of the lamina is slightly extending beyond the distolateral tooth (fig. 7b, 8a, c-d). The width/length ratio is between 0.44-0.63 (fig. 10). As noted by Fransen (1993), there is a positive correlation between the width/length ratio and the carapace length.

2. Pigmentation of the cornea is absent.

3. In all specimens the rostrum has a more or less compressed apex. The rostrum always overreaches the base of the cornea. In 25 specimens out of 47 the rostrum extends beyond the eyes (fig. 7b, 9c, f), in the other specimens the rostrum just falls short of the cornea (fig. 8a, c-d, 9a, d, e). The shape of the rostrum and the supraorbital spines varies (fig. 8 a, c, d, 9); in lateral view the ventral margin of the rostrum is slightly sinuate or slightly concave (fig. 9).

4. In most specimens (40) a well developed middorsal tooth is present on the carapace (fig. 7c, 9a), in 2 specimens 2 equal teeth are present (fig. 9e), in one specimen a well developed tooth with a small tooth anteriorly is present (fig. 9c), and in 3 specimens 3 teeth are present (fig. 9 b, f).

5. Antennal spines are present on both sides in all except 4 specimens; one of those 4 has no spines at all and 3 specimens have a spine on one side only.

6. The inner antennular flagellum is 2.6-3.3 times as long as the outer antennular flagellum.

7. In 37 specimens both left and right carpi of the second pereopods have 9 articles, in 4 specimens 10 articles, in one specimens 8 articles, in 5 specimens the number of the carpal articles on the left and right pereopod is different.

8. The meri of pereopods 3-5 are always unarmed (fig. 7a).

9. The pleura of the first 3 abdominal segments are rounded, the pleura of the fifth abdominal segment usually have a proximal tooth (only in one specimen the fifth pleura are rounded (fig. 8f)). The form of the fourth pleura varies. In 18 specimens the pleura of the fourth abdominal segment have a proximal tooth (fig. 8e); in 19 specimens the tooth is blunt while in 10 specimens the pleura of the fourth abdominal segment are rounded.

10. In 19 specimens out of 40 the posterior margin of the telson is concave (fig. 7e),

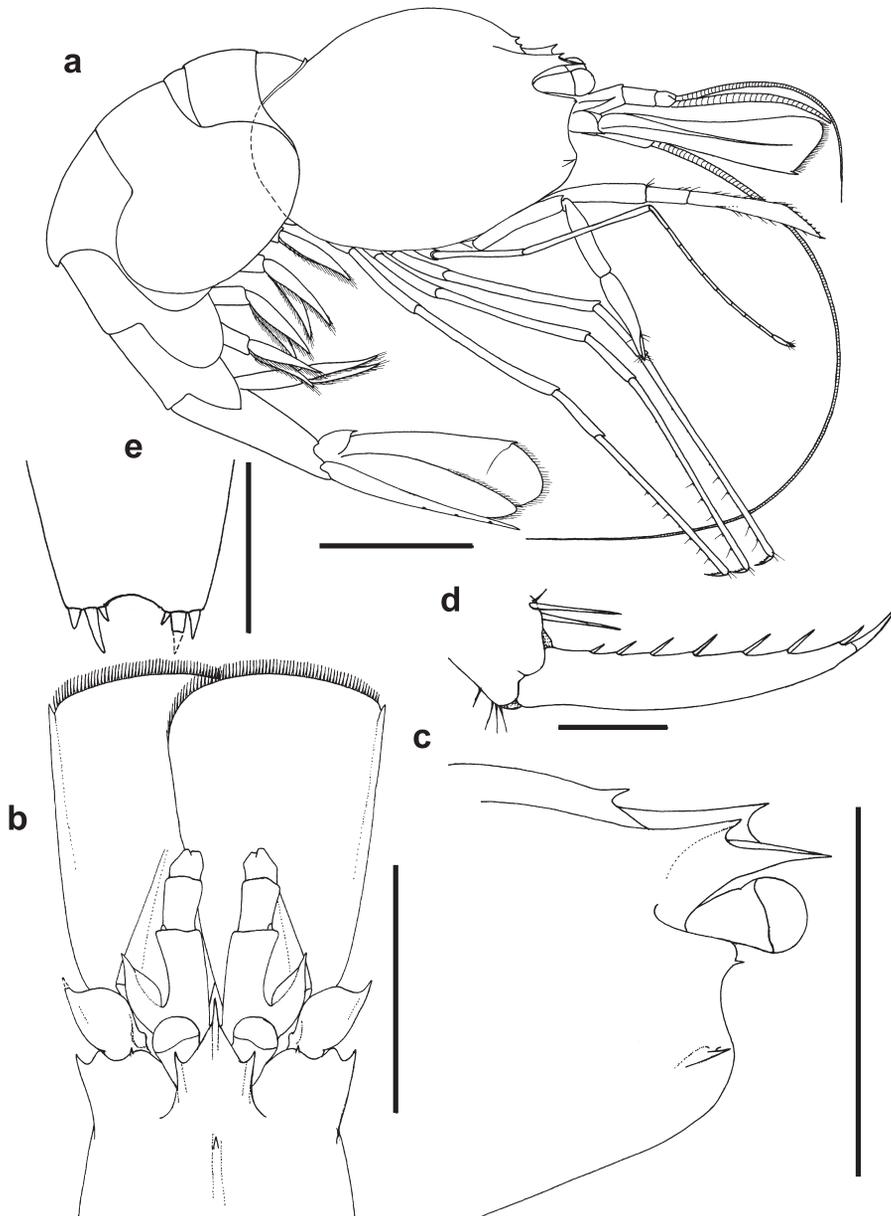


Fig. 7. *Bythocaris leucopsis* G. O. Sars, 1885. a, lateral view, female ("Sevastopol", St. 2448), cl. 17.2 mm; b, dorsal view of anterior region, female ("Polarstern", St. 60b), cl. 19.8 mm; c, lateral view of anterior part of carapace, female ("Polarstern", St. 60b), cl. 19.8 mm; d, dactylus of fifth pereopod, female ("Ak. Keldish", St. 3153), cl. 19 mm; e, tip of telson in dorsal view, female ("Ak. Keldish", St. 3153), cl. 19 mm. Scale a-c = 1 cm; d, e = 1 mm.

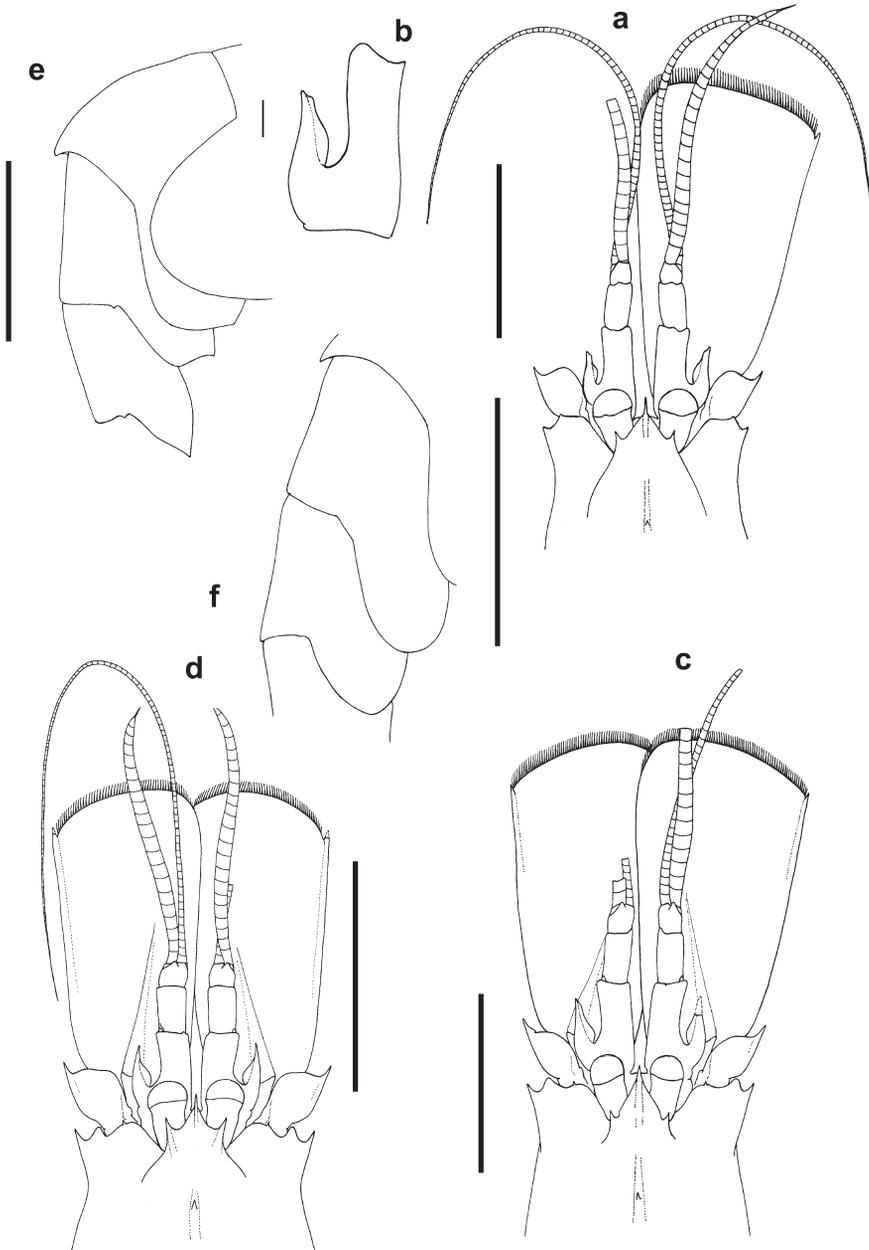


Fig. 8. *Bythocaris leucopsis* G. O. Sars, 1885. a, d, c, dorsal view of anterior region; b, basal segment of antennular peduncle; e, f, lateral view of abdominal pleura 3-5. a-b, ovigerous female ("Polarstern", St. 23a), cl. 20.5 mm; c, male ("Polarstern", St. 60 b), cl. 14.9 mm; d, female ("Polarstern", St. 51a), cl. 19.6 mm; e, ovigerous female ("Polarstern", St. 23a), cl. 20.5 mm; f, female ("Sevastopol", St. 2448), cl. 17.2 mm. Scale a, c-f = 1 cm; b = 1 mm.

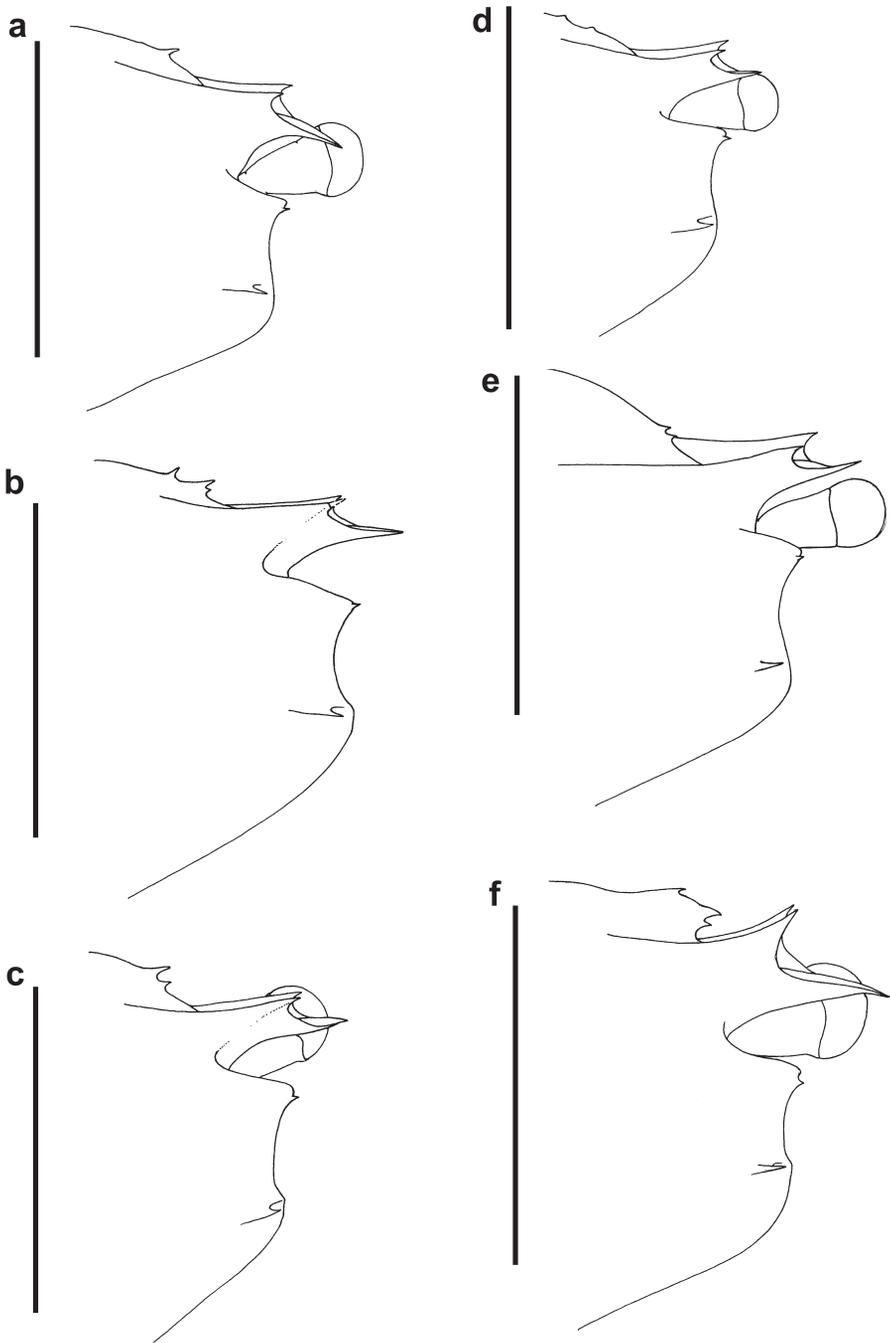


Fig. 9. *Bythocaris leucopis* G. O. Sars, 1885, lateral view of anterior part of carapace. a, female ("Polarstern", St. 51a), cl. 19.6 mm; b, female ("Polarstern", St. 60b), cl. 19 mm; c, female ("Polarstern", St. 23a), cl. 19 mm; d, male ("Polarstern", St. 51a), cl. 17.1 mm; e, female ("Sevastopol", St. 2448), cl. 17.2 mm; f, female ("Polarstern", St. 51a), cl. 19.8 mm. Scale 1 cm.

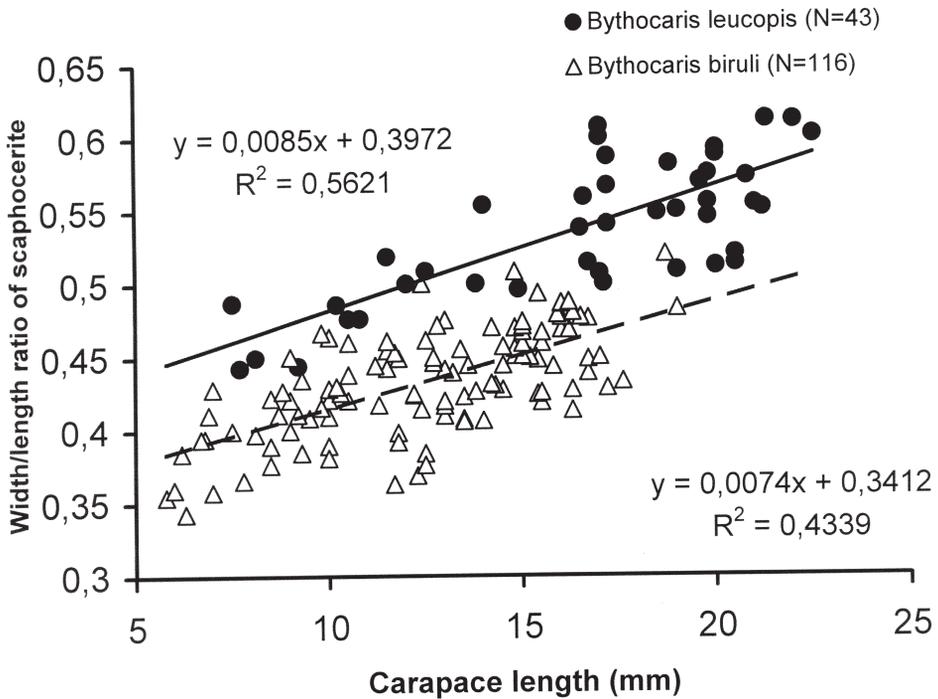


Fig. 10. *Bythocaris leucopis* G. O. Sars, 1885, and *Bythocaris biruli* Kobjakova, 1964. Graph showing width/length ratio of scaphocerite in relation to carapace length.

in 18 specimens it is truncate and in 3 specimens the tip of the telson is slightly rounded. The number of dorsal marginal spines on the telson is a 3 or 4 pair.

Remarks.— The main diagnostic characters to distinguish *B. leucopis* from the other species of *Bythocaris* are: 1, absence of pigmentation of the eyes; 2, the anteriorly truncate scaphocerite; 3, the unarmed meri of pereopods 3-5; 4, the rostrum extending beyond the base of the cornea; 5, the pleuron of the fifth abdominal segment having a proximal tooth; 6, the presence of at least one middorsal tooth on the carapace. These six characters are usually present together. The form of the tip of the telson is a useful character for distinguishing this species too.

Distribution.— North Atlantic and Arctic region. Reported from the Barentz Sea, Norwegian Sea and Greenland Sea, Baffin Bay, along the coasts of Greenland, Jan Mayen, Spitzbergen, Norway, in depths of 650-2850 m (Fransen, 1993). In our material, specimens of *B. leucopis* were present in samples from the Laptev Sea and East Siberian Sea.

Bythocaris biruli Kobjakova, 1964
 (figs 10-14)

Bythocaris leucopis biruli Kobjakova, 1964: 326-327, fig. 1; Burukovsky, 1966: 538, fig.1.

Bythocaris biruli; Bowman & Manning, 1972: 189, 192; Bryazgin, 1982: 603, figs. 8-12.

Bythocaris leucopis; Fransen, 1993: 575-582 (in part). (Not *B. leucopis* Sars, 1885).

Material.— **Holotype**: 1 ovigerous female, cl. 16 mm; **paratype**: 1 male, cl. 6 mm (ZISP, 1/34906); Arctic Ocean, 81°18'N-9°36'E; 1300 m depth; 26.ix.1955; I/S "F. Litke", st. 23, det. Z.I. Kobjakova.— 1 male, cl. 8.5 mm (ZISP, 3/40609); 78°48'N-71°42'E; 475 m depth; 5.ix.1931; R/V "Lomonosov", Cruise 2, st. 8, det. Kobjakova.— 5 non-ovigerous females, cl. 7-14.8 mm; 9 males, cl. 6.2-12.5 mm (ZISP); 79°26'N-107°48'E; 1070 m depth; 30.viii.1948; Exped. S-3, 1948, st. 137, det. Z.I. Kobjakova.— 3 males, cl. 10-13 mm (ZISP, 8/40614); Greenland Sea, 79°56'N-5°17'W; 1135 m depth; 30.viii.1956; D/E "Ob", st. 40, det. Z.I. Kobjakova.— 1 non-ovigerous female, cl. 16.2 mm (ZMMU, Ma 4127); 70°04'N-12°50'W; 1690 m depth; 10.viii.1957; R/V "Sevastopol", cruise 5, st. 1235, det. V.I. Sokolov.— 3 non-ovigerous females, cl. 8.5-13 mm (ZMMU, RMNH D 48606); Norwegian Sea, 66°57'N-4°03'E; 1305 m depth; 26.iii.1958; R/V "Sevastopol", cruise 8, st. 1360, det. V.I. Sokolov.— 4 non-ovigerous females, cl. 9-15 mm (ZMMU, Ma 3270); Norwegian Sea, 67°30'N-09°00'W; 1680 m depth; 12.xi.1959; R/V "Sevastopol", cruise 15, st. 2479, det. V.I. Sokolov.— 1 male, cl. 13 mm (IORAS); Norwegian Sea, 73°42'8N-13°15'74E; 1681-1695 m depth; 1.ix.1991; R/V "Ak. Keldish", cruise 24, st. 2548, det. V.I. Sokolov.— 3 non-ovigerous females, cl.12.5-15.5 mm; 1 male, cl. 12.5 mm (IORAS); Norwegian Sea; 1665-1610 m depth; 18.viii.1993; R/V "Ak. Keldish", cruise 31, st. 3177, det. V.I. Sokolov.— 3 non-ovigerous females, cl. 14.2-17.2 mm; 2 males, cl. 11.2-12.7 mm (ZISP); Laptev Sea, 77°49'7N-130°14'9E; 1349 m depth; 2.ix.1995; R/V "Polarstern", st. 21a, det. T.V. Menshutkina.— 2 non-ovigerous females, cl. 15.4 and 16.7 mm (ZISP); Laptev Sea, 80°50'4N-103°36'9E; 1359 m depth; 10.viii.1995; R/V "Polarstern", st. 30a, det. T.V. Menshutkina (as *B. payeri*).— 1 ovigerous female, cl. 17.6; 3 non-ovigerous females, cl. 11.7-16.3 mm (ZISP); Laptev Sea, 81°08'9N-138°54'6E; 1790 m depth; 24.viii.1995; R/V "Polarstern", st. 51a, det. T.V. Menshutkina.— 3 ovigerous females, cl. 14.8-15.9 mm; 20 non-ovigerous females, cl. 6.8-18.7 mm; 16 males, cl. 6.9-12.7 mm (ZISP); East-Siberian Sea, 80°03'2N-149°46'3E; 961 m depth; 30.viii.1995; R/V "Polarstern", st. 62a, det. T.V. Menshutkina.— 4 ovigerous females, cl. 13.5-15.5 mm; 17 non-ovigerous females, cl. 6.3-16.7 mm; 2 males, cl. 8.5-13 mm (ZISP); Laptev Sea, 78°21'7N-135°04'5E; 772 m depth; 1.ix.1995; R/V "Polarstern", st. 69b, det. T.V. Menshutkina.— 7 non-ovigerous females, cl. 5.8-15.5 mm; 2 males, cl. 12.3 and 12.2 mm (ZISP); Laptev Sea, 78°42'8N-112°43'4E; 2214 m depth; 6.ix.1995; R/V "Polarstern", st. 80a, det. T.V. Menshutkina.

Kobjakova (1964) considered *B. biruli* a new subspecies of *B. leucopis*. That is why she made only a short description of the taxon and provided only two figures. The species is now redescribed.

Description (based on holotype) (figs 11b-f, 12, 13c, 14d).— Carapace smooth. Rostrum unarmed, triangular in dorsal view, apex sharp, slightly depressed, not extending beyond base of cornea. Rostrum flanked by pair of acute supraorbital teeth, slightly above level of rostrum (fig. 14d); distance between these spines about one-fourth carapace width. Distinct dorsal median carina present, from small acute forwardly directed spine extending posteriorly to about middle of carapace. Lower orbital angle rounded. Antennal spine present just below lower orbital angle. Robust hepatic spine present well below antennal spine.

Abdomen smooth. Pleura of first, second, third and fourth somites rounded, pleura of fifth abdominal segment with prominent posterolateral tooth. Telson 1.1 times as long as sixth abdominal segment; dorsal surface with 3 pairs of minute dorsolateral spines situated close to lateral margin (fig. 11e) at 0.88-0.64-0.44 of telson length. Posterior tip of telson truncate and armed with 3 pairs of distolateral spines (fig. 11f).

Eyes small, cornea rounded (fig. 13c), without any dark pigment.

Antennular peduncle with basal segment longer than combined distal segments; penultimate segment about 1.6 times length of distal segment. Basal segment with small spine on inner margin at about one-third distance from distal margin. Stylocerite produced distally, extending to about distal fifth of basal segment. Outer anten-

nular flagellum extending slightly beyond anterior margin of scaphocerite (fig. 13c), composed of 20 articles, inner flagellum about 1.7 time longer than outer flagellum.

Scaphocerite as long as carapace, 2.5 times longer than antennular peduncle and 2.1 times as long as its greatest width; anterior margin truncate, projecting slightly beyond distolateral tooth. Basal segment of antennal peduncle with strong distolateral spine.

Description of the mouthparts is based on the non-ovigerous female (cl. 15 mm, R/V "Polarstern", St. 21).

Mandible (fig. 12a) simple, incisor process and palp absent.

First maxilla (fig. 12b) with broad upper endite with stout median setae. Lower endite turned towards upper one, with few slender, serrate setae. Palp truncate anteriorly, with 5 long, slender, distal setae and 2 distolateral ones.

Second maxilla (fig. 12c) with well-developed bilobated upper endite; distal lobe larger than proximal lobe, both lobes with many setae. Lower endite reduced to single lobe with 6 long setae. Unsegmented palp with 7 long setae. Scaphognathite well developed.

First maxilliped (fig. 12d) with well-developed distal endite, mesial margin straight with many slender short setae. Basal endite rounded with few setae; unsegmented palp long, with few setae. Exopod normally developed, with caridean lobe; epipod rather broad.

Second maxilliped (fig. 12e) of the usual shape; exopod slender, with 4 long, distal setae; no distinct epipod at base.

Third maxilliped reaching distolateral tooth of scaphocerite. Ultimate segment nearly 3 times as long as penultimate segment, armed with 9 strong spines along distoventral border, few transverse rows of setae on mesial surface. Basal segment 3.4 times as long as penultimate segment, slightly curved, with distolateral tooth. Exopod short with few distal setae.

First pereopod short, reaching midlength of ultimate segment of third maxilliped. Chela simple with entire cutting edges; fingers slightly shorter than half length of palm; merus slightly longer than carpus and about twice as long as ischium.

Second pereopod (fig. 11b) long and slender, overreaching scaphocerite with length of chela. Fingers of chela with entire cutting edges, 0.3 times palm length. Carpus slightly longer than merus and ischium together, subdivided into 11 articles; merus 0.53 times as long as carpus; ischium 0.7 times as long as merus.

Third, fourth and fifth pereopods similar; third pereopod (fig. 11c) overreaching scaphocerite with half length of propodus. Dactylus of third pereopod 0.24 times propodus length, with 11 spinules on flexor margin; propodus with 6 ventral and 2 distoventral spines; merus 0.8 times as long as propodus, with 4 distolateral spines. Ischium and carpus subequal, 0.38 times as long as merus. Fourth and fifth pereopods (fig. 11d) with 2 distolateral spines on merus.

Endopod of first pleopod subovate. Appendix interna on pleopod 2-5.

Notes on morphology:

1. In large specimens the scaphocerite is usually anteriorly truncate; the anterior margin of the lamina is slightly extending beyond the distolateral tooth (fig. 13a-c). In small specimens the anterior margin of the scaphocerite is sometimes oblique, over-

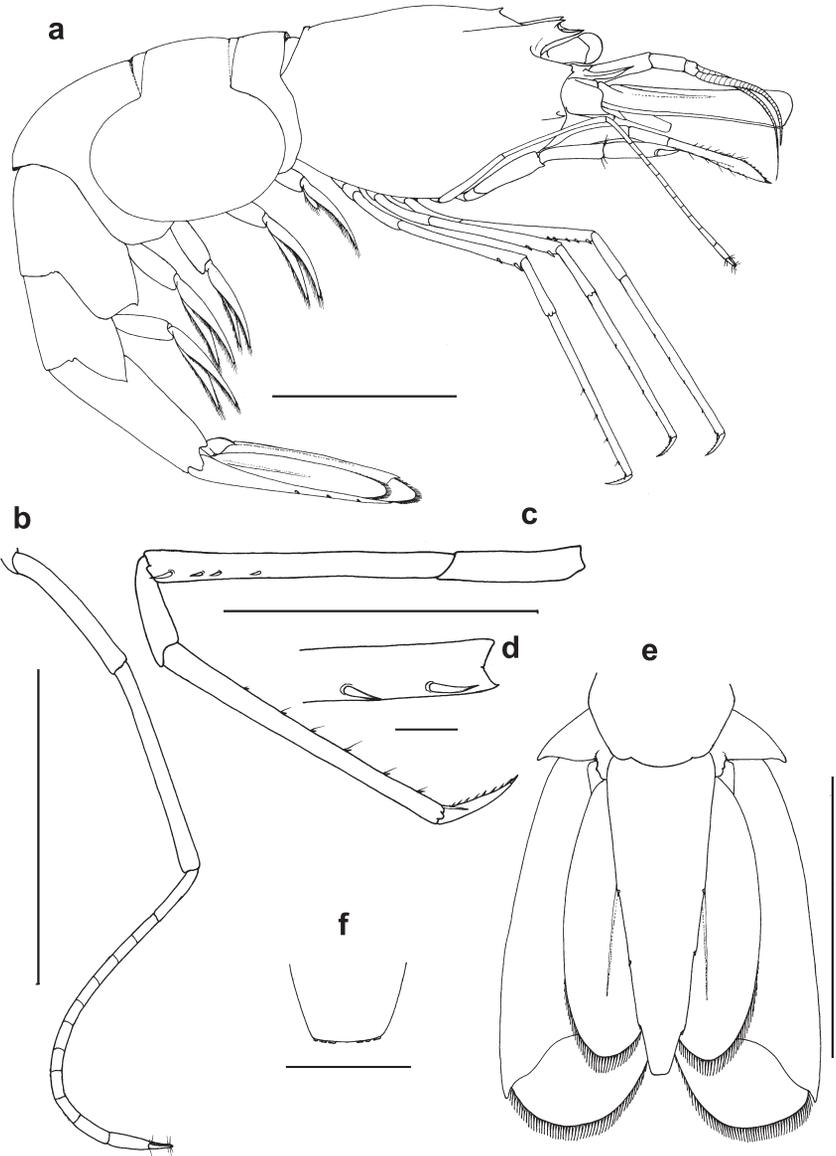


Fig. 11. *Bythocaris biruli* Kobjakova, 1964. a, lateral view, female (ZMMU, Ma 4128), cl. 13 mm. b-f, holotype female (ZISP, 1/34906), cl. 16 mm. b, right second pereiopod; c, left third pereiopod; d, last part of merus of fifth pereiopod; e, telson in dorsal view; f, tip of telson in dorsal view. Scale a-c, e = 1 cm; d, f = 1 mm.

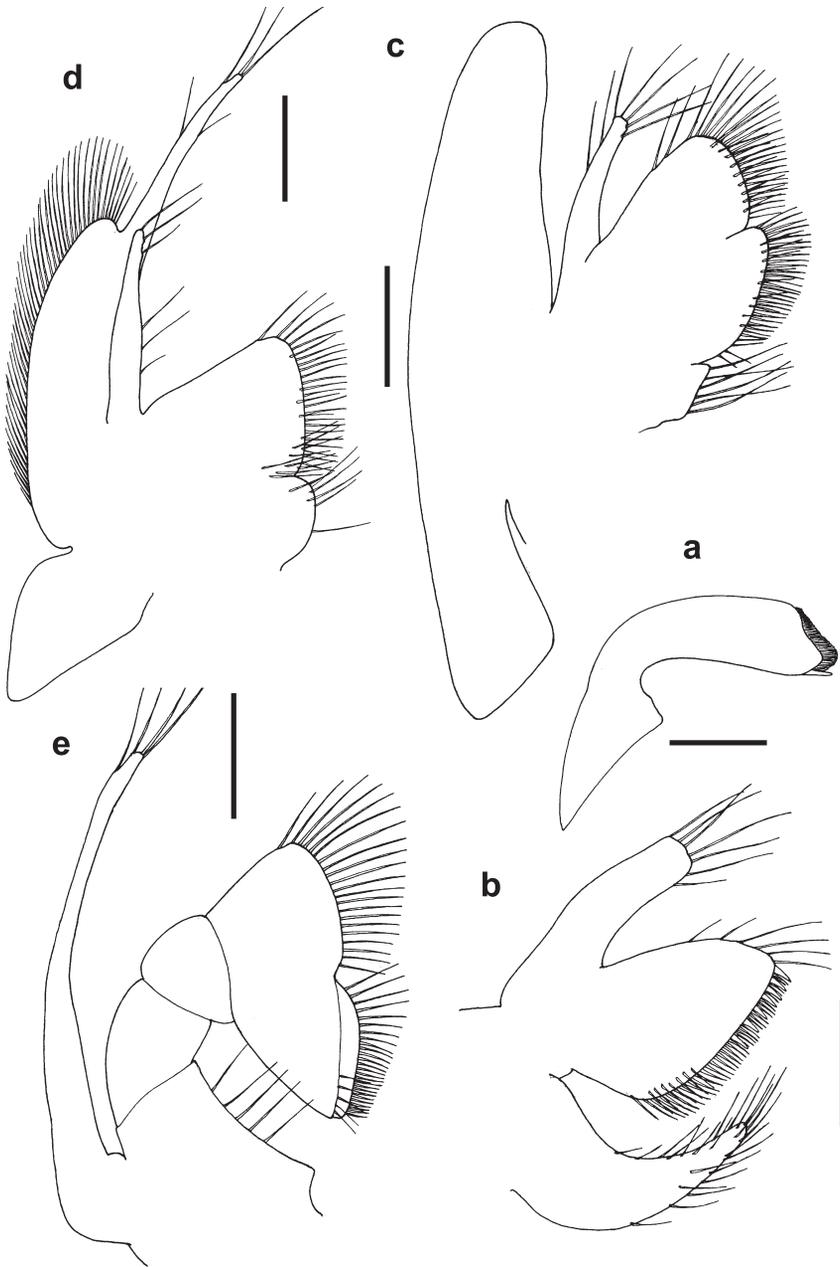


Fig. 12. *Bythocaris biruli* Kobjakova, 1964, holotype, female (ZISP, 1/34906), cl. 16 mm. a, right mandible; b, left first maxilla; c, left second maxilla; d, left first maxilliped; e, left second maxilliped. Scale 1 mm.

reaching the distolateral tooth. The width/length ratio is between 0.34-0.52. There is a positive correlation between the width/length ratio and the carapace length (fig. 10). The distolateral tooth of scaphocerite is always clearly visible.

2. In all but 11 specimens, the pigmentation of the cornea is absent. In 2 non-ovigerous females (R/V "Polarstern", st. 30a, 10.viii.1995, det. by T.V. Menshutkina as *B. payeri*) dark pigment is clearly present in the base of the cornea. In 9 specimens (R/V "Pollarstern", st. 80a, 6.ix.1995, det. T.V. Menshutkina) some dark pigment is present in the base of the cornea.

3. In all specimens the rostrum has a more or less depressed apex (fig. 13a-c). The rostrum never extends beyond the eyes. Only in 29 specimens out of 115, the rostrum extends slightly beyond the base of the cornea (fig. 13a-b, 14f), in other specimens the rostrum does not overreach the eyestalks. The form of the rostrum and supraorbital spines varies; in lateral view the ventral margin of the rostrum is slightly sinuate or slightly concave (fig. 14).

4. In most specimens (113) a middorsal tooth is present on the carapace (fig. 14d, f), in 2 specimens a well developed tooth with proximal knob is present, in 5 specimens a well developed tooth with a proximal small tooth is present (fig. 14b), in 2 specimens two subequal teeth are present (fig. 14 e), in one specimen a well developed tooth with a small tooth anteriorly is present (fig. 14a) and in one specimen 3 middorsal teeth are present (fig. 14c).

5. The antennal spine is absent in 2 specimens. In 3 specimens the antennal spine is present on one side and absent on the another. Other specimens have distinct antennal spines on both sides.

6. The inner flagellum is 2.0-2.7 times as long as the outer flagellum.

7. In 61 specimens both left and right carpus of the second pereopods have 10 articles, in 34 specimens 11 articles, in 8 specimens 9 articles, in 12 specimens the number of the carpal articles on the left and right pereopod is different.

8. The meri of pereopods 3-5 are always armed. The number of spines on the merus of the fifth pereopod varies between 1 and 3, on the merus of the third and fourth pereopods between 3 and 7.

9. The pleura of the first two abdominal segments are rounded; the pleura of the fifth abdominal segment bear a distolateral tooth. The form of the other pleura varies. In 42 specimens the pleura of the fourth abdominal segment have a proximal sharp tooth (fig. 13d, e). In 29 specimens the tooth is blunt. In 11 specimens the fourth pleura have a concave posterolateral emargination. In 26 specimens the fourth pleura are rounded. The pleura of the third abdominal segment are rounded in all specimens except 10. Two of these have the pleura of the third abdominal segment with a sharp tooth (fig. 13d). In other 8 specimen these pleura have a blunt tooth or a posterolateral emargination.

10. Only in 4 specimens the posterior margin of the telson is truncate (fig. 11f), in all other specimens the posterior margin of the telson is more or less convex (fig. 13f). The number of dorsal marginal spines on the telson is 3-4 pairs.

Remarks.— The main diagnostic characters to distinguish *B. biruli* from the other species of *Bythocaris* are: 1, the armed meri of pereopods 3-5; 2, the rostrum never extending beyond the eyes; 3, the rounded or truncate posterior margin of the telson; 4, the pleura of the fifth abdominal segment having a distolateral tooth; 5, the lack of

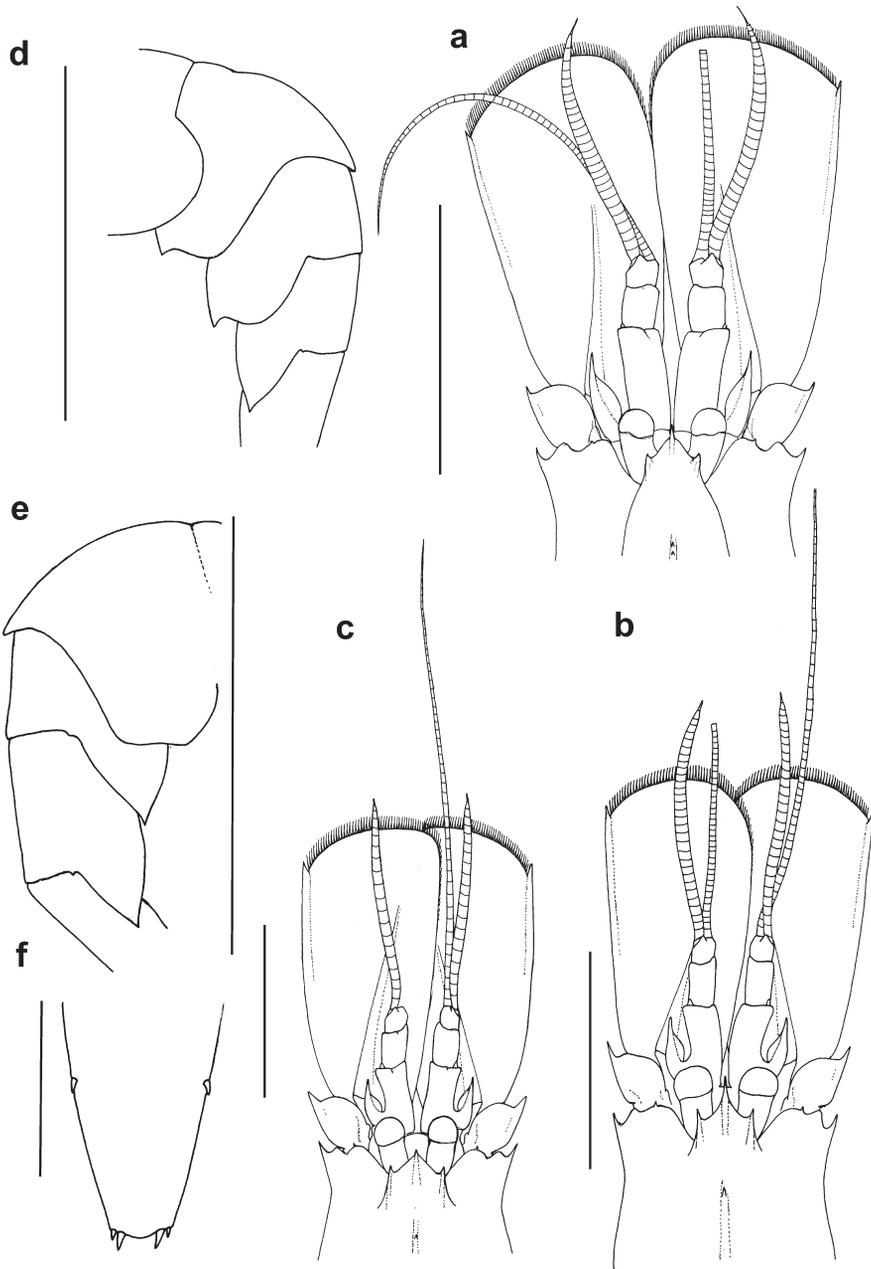


Fig. 13. *Bythocaris biruli* Kobjakova, 1964. a-c, dorsal view of anterior region; d, e, lateral view of abdominal pleura 3-5; f, tip of telson in dorsal view. a, female ("Sevastopol", St. 1360), cl. 13 mm; b, female ("Polarstern", St. 30a), cl. 16.7 mm; c, holotype, female (ZISP, 1/34906), cl. 16 mm; d, female ("Polarstern", St. 62a), cl. 6.9 mm; e, paratype, male (ZISP, 1/34906), cl. 6 mm; f, female (ZMMU, Ma 4128), cl. 12.5 mm. Scale a-e = 1 cm; f = 1 mm.

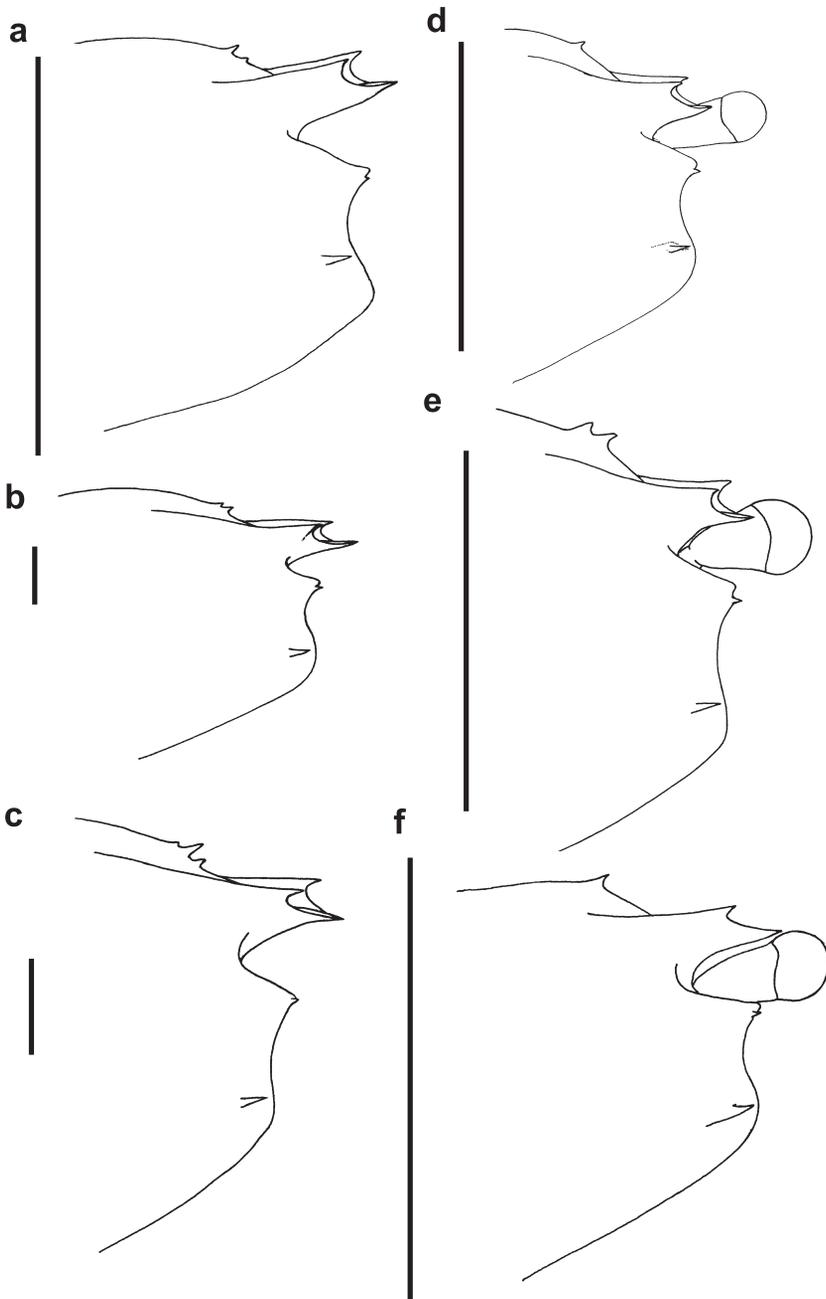


Fig. 14. *Bythocaris biruli* Kobjakova, 1964, lateral view of anterior part of carapace. a. female ("Sevastopol", St. 1360), cl. 13 mm; b. male (ZISP, 3/40609), cl. 8.5 mm; c. female ("Polarstern", St. 62a), cl. 6.9 mm; d. holotype, female (ZISP, 1/34906), cl. 16 mm; e. female ("Polarstern", St. 69b), cl. 16.7 mm; f. female (ZMMU, Ma 4128), cl. 12.5. Scale a, d-f = 1 cm; b,c = 1 mm.

well-developed dark pigmentation of the eye; 6, the presence of at least one middorsal tooth on the carapace. These six characters are always present together. The lack of pigmentation of the eyes is a useful distinguishing character although a little dark pigment in the base of the cornea may be present. Two females with clear dark pigment on the base of the cornea have all other characters of *B. biruli*. It is possible that some specimens of species with depigmented eyes could have a little dark pigment. Other characters as the presence/absence of the antennal spine, the presence/absence of the posterolateral tooth on the third and the fourth pleura, and the number of mid-dorsal teeth on the carapace are variable.

Kobjakova (1964) described the new subspecies based on the following characters: 1, in the new subspecies the rostrum never extends beyond the eyes while in the nominate subspecies the rostrum overreaches the eyes; 2, in *B. leucopis biruli* the width/length ratio of the scaphocerite is 0.5 or less while in the type form it exceeds 0.5; 3, in *B. leucopis biruli* the tip of the telson is rounded while in the typical form the tip of the telson has a median notch; 4, in the new subspecies the number of carpal articles of the second pereopod varies between 9 and 11 while in the typical form it is 9; 5, in *B. leucopis biruli* the fourth pleura have a hardly visible distolateral tooth while in the typical form it is well developed.

The species status of *B. biruli* Kobjakova, 1964 was accepted by Bowman & Manning (1972) without any discussion. Fransen (1993) studied the type series of *B. leucopis* Sars and noted that all three syntype specimens possess characters different from those described for *B. biruli*. However, in the other material of *B. leucopis* at his disposal there were several characters similar to *B. biruli*. Only the syntypes of *B. leucopis* have a long rostrum overreaching the eyes and a median notch on the tip of telson. Moreover Fransen noted that only these specimen have unarmed meri of pereopods 3-5. In other specimens the number of spines varies between 1 and 8 (Fransen, 1993).

I could not find specimen with unarmed meri of pereopods 3-5 or specimen with armed meri on the one side and devoid spine on the other one among *B. irene*, *B. payeri* and *B. simplicirostris*. Besides this, I could not find specimens with spines on the meri of pereopods 3-5 among *B. curvirostris*. That is why the presence/absence of spines on the meri of pereopods 3-5 is here regarded a specific character within *Bythocaris* like pigmentation of the eyes or the shape of the rostrum.

Other difference between *B. leucopis* and *B. biruli* are not so marked: 1, in *B. leucopis* the rostrum always extends beyond the base of the cornea and is often overreaching the eyes, while in *B. biruli* the rostrum never overreaches the eyes and usually does not extend beyond the base of the cornea; 2, in *B. leucopis* the inner flagellum is 2.6-3.3 times as long as the outer flagellum while in *B. biruli* the inner flagellum is only 2.0-2.7 times as long as the outer flagellum; 3, in *B. leucopis* the tip of the telson is concave or truncate while in *B. biruli* it is mostly convex; 4, in *B. leucopis* the width/length ratio of the scaphocerite is 0.44-0.63 while in *B. biruli* it is 0.34-0.52. The latter character is not convenient as there is a positive correlation between the width/length ratio and carapace length. But as is shown in fig. 10, the "cloud" of the points for *B. leucopis* is above the "cloud" for *B. biruli*. Besides this, *B. biruli* is smaller than *B. leucopis* (the maximum carapace length in males of *B. biruli* in the present material is 14.2 mm, in females 19 mm, while in *B. leucopis* the maximum carapace

length in males is 17.2 mm and in females 22.5 mm). I suppose that next to the type material of *B. leucopis*, *B. biruli* is present in the other material studied by Fransen (1993) under *B. leucopis* G. O. Sars.

Bryazgin (1982) described a new species, *B. elegans*, based on a single specimen from the Arctic. Bryazgin compared the specimen with the type-description of *B. biruli* Kobjakova from which it differed in the following respects: 1, in *B. elegans* two equally developed middorsal teeth are present, while in *B. biruli* one middorsal tooth or one large tooth with a proximal small tooth are present on the carapace; 2, in *B. elegans* the distolateral tooth of the scaphocerite and the branchiostegal teeth are larger than in *B. biruli*; 3, in *B. elegans* the scaphocerite is not as rounded as in *B. biruli*; 4, in *B. elegans* the pleuron of the fourth abdominal segment has a larger proximal tooth and the pleuron of the fifth abdominal segment is more pronounced than in *B. biruli*. All the characters of *B. elegans* are within the range of the intra-specific variation observed in the material of *B. biruli* studied. The paratype of *B. biruli* (male, cl. 6 mm) has two equally developed middorsal teeth and a distinct proximal tooth on the pleura of the fourth abdominal segment. Therefore *B. elegans* is here regarded a junior synonym of *B. biruli*. As it was noted above, I was not able to study the holotype of *B. elegans* because of its absence in the ZISP collection.

Distribution.— North Atlantic and Arctic Seas: Greenland Sea, Norwegian Sea, Barents Sea, Laptev Sea, East-Siberian Sea. Depths 250-475 m (Burukovsky, 1966). In our material it is present from 475-2214 m depth.

Bythocaris irene Retowsky, 1946
(figs 15-19)

Bythocaris irene Retowsky, 1946: 298-300; Kobjakova, 1964: 328 (key); Bowman & Manning, 1972: 189,191; Burukovsky, 1966: 538, fig.1; Fransen, 1993: 567, 596.

Material.— **Holotype**: non-ovigerous female, cl. 16 mm (ZISP, 39150); Kara Sea; 520 m depth; 1935; I/S "G. Sedov", st 35/71, det. L.O. Retowsky.— 1 ovigerous female, cl. 16.2 mm; 6 non-ovigerous females, cl. 7.5-17.6 mm; 7 males, cl. 8.8-13.6 mm (ZISP); East Siberian Sea, 80°03'2N-149°46'3E; 961 m depth; 30.viii.1995; R/V "Polarstern", st. 62a, det. T.V. Menshutkina (as *B. biruli*).—1 non-ovigerous female, cl. 17 mm (ZISP); 78°21'1N-135°04'5E; 772 m depth; 1.ix.1995; R/V "Polarstern", st. 69b, det. T.V. Menshutkina (as *B. biruli*).— 4 ovigerous females, cl. 13.5-16 mm; 26 non-ovigerous females, cl. 5.6-17 mm; 14 males, cl. 6.0-13.2 mm; 78°21'1N -135°04'5E; 772 m depth; 1.ix.1995; R/V "Polarstern", st. 69a, det. T.V. Menshutkina.

Retowsky (1946) described this species without mentioning several important characters. It is therefor redescribed here.

Description (based on holotype) (figs 15-17).— Carapace smooth. Rostrum unarmed, broadly triangular in dorsal view, reaching to midlength of eyestalks, not extending to base of cornea; apex bluntly angular (fig. 15b). Rostrum flanked by pair of acute and strong supraorbital teeth, slightly above than level of rostrum (fig. 15b, c); distance between these spines about one-third carapace width. Dorsal median carina present from end of rostrum, extending posteriorly to about posterior third of carapace. Lower orbital angle rounded. Antennal spine present just below lower orbital angle. Robust hepatic spine present below antennal spine.

Abdomen smooth. First four abdominal segments with pleura rounded, pleura of fifth abdominal segment produced, unarmed (fig. 15a, d). Telson slightly longer than sixth abdominal segment; dorsal surface with 3 pairs of minute spines situated close to lateral margin (fig. 17f) at 0.87-0.69-0.47 of telson length. Posterior tip of telson concave (fig. 15e).

Eyes small, 2.5 times as long as wide; eye-stalks with broad basal and narrow distal part; cornea rounded, as wide as distal part of eye-stalk, without any dark pigment.

Antennular peduncle with basal segment 1.3 times longer than combined distal segments; penultimate segment about 1.7 times length of distal segment. Basal segment with small spine present on inner margin at about one-third distance from distal margin. Stylocerite produced laterally, extending to about distal fourth of basal segment. Outer antennular flagellum extending slightly beyond anterior margin of scaphocerite, composed of 23 articles, inner flagellum about 1.3 times longer than outer flagellum.

Scaphocerite 0.8 times carapace length, twice as long as antennular peduncle and 2.2 times as long as its greatest width; anterior margin slightly rounded, projecting slightly beyond small distolateral tooth. Basal segment of antennal peduncle with strong distolateral spine.

Description of the mouth parts is based on the non-ovigerous female (cl. 15 mm, R/V 'Polarstern', St. 69a).

Mandible (fig. 16a) simple, incisor process and palp absent.

First maxilla (fig. 16b) with broad upper endite with stout median setae; lower endite turned towards upper endite, with many slender, serrate setae; palp broad, with few long, slender distal and lateral setae.

Second maxilla (fig. 16c) with well developed bilobated upper endite; distal lobe subequal to proximal lobe, both lobes with many setae. Lower endite reduced to single lobe with 2 short and 7 long setae. Unsegmented palp with 10 long setae. Scaphognathite well developed.

First maxilliped (fig. 16d) with well developed distal endite; mesial margin straight with many slender short setae. Basal endite rounded with few setae. Unsegmented palp slender, with few setae. Exopod normally developed, with caridean lobe. Epipod rather broad.

Second maxilliped (fig. 16e) of usual shape. Exopod with few setae. No distinct epipod.

Third maxilliped (fig. 17a) extending to distolateral tooth of scaphocerite. Ultimate segment nearly 3 times as long as penultimate segment, armed with 7 spines along distoventral border; few transverse rows of setae on mesial surface. Basal segment 2.3 times as long as penultimate segment, slightly curved, with distolateral tooth. Exopod well developed, reaching to midlength of basal segment, with few distal setae.

First pereopod short, reaching midlength of ultimate segment of third maxilliped. Chela simple with entire cutting edges; fingers about 0.5 times palm length; carpus 1.1 times palm length; merus 1.3 times carpus length and about twice as long as ischium.

Second pereopod (fig. 17b) long and slender, overreaching scaphocerite with length of chela. Fingers of chela with entire cutting edges, 0.5 times palm length. Car-

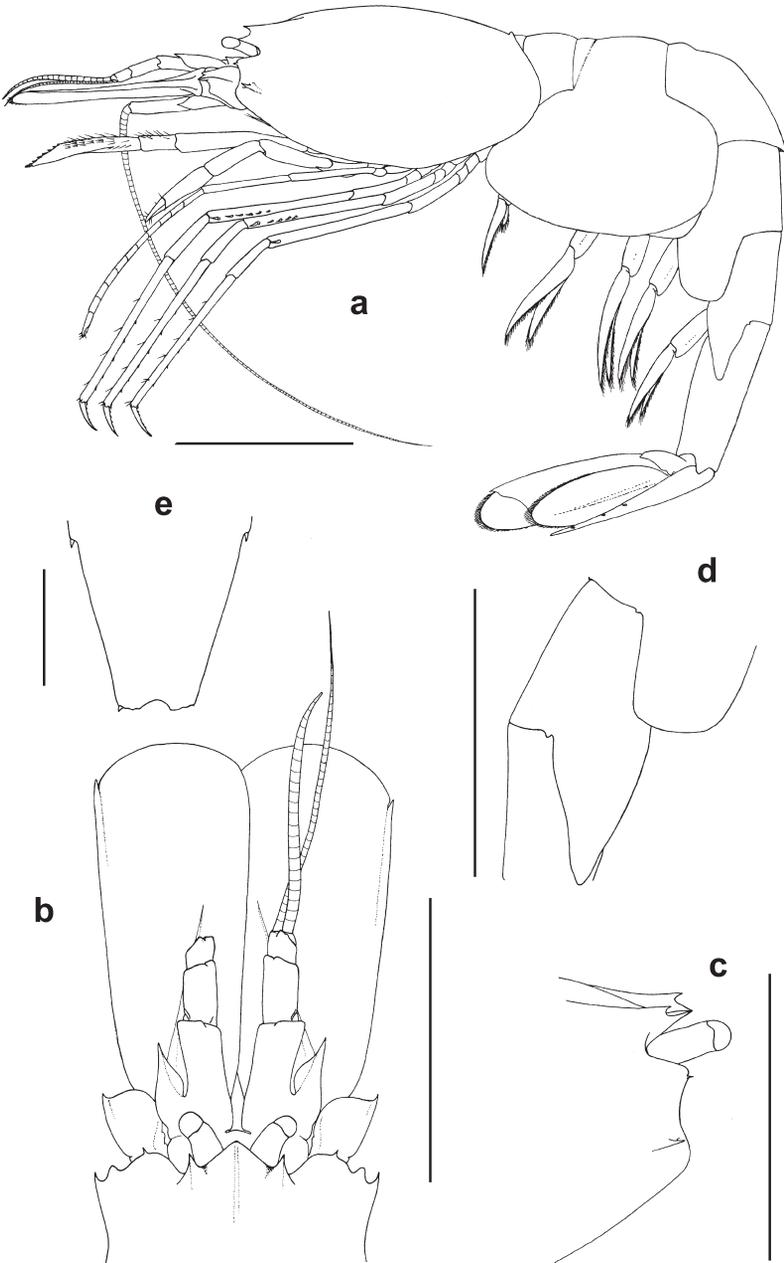


Fig. 15. *Bythocaris irene* Retowsky, 1946, holotype, female (ZISP, 1/39150), cl. 16 mm. a, lateral view; b, dorsal view of anterior region; c, lateral view of anterior part of carapace; d, lateral view of abdominal pleura 4-5; e, tip of telson in dorsal view. Scale a-d = 1 cm; e = 1 mm.

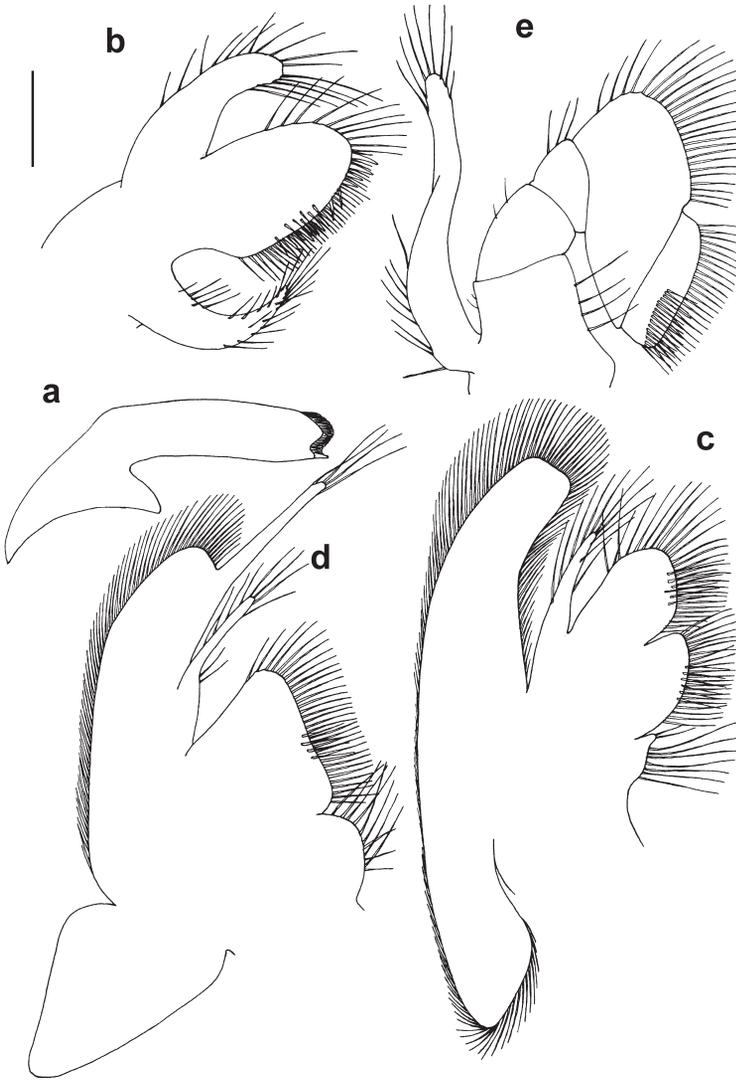


Fig. 16. *Bythocaris irene* Retowsky, 1946, holotype, female (ZISP, 1/39150), cl. 16 mm. a, right mandible; b, left first maxilla; c, left second maxilla; d, left first maxilliped; e, left second maxilliped. Scale 1 mm.

pus slightly longer than merus and ischium together, subdivided into 10 articles; merus and ischium subequal.

Third, fourth and fifth pereopods similar; third pereopod (fig. 17c) overreaching scaphocerite with half-length of propodus. Dactylus of third pereopod 0.22 times propodus length, with 7 spinules on flexor margin; propodus with 6 ventral and 2 distoventral spines; merus 0.8 times as long as propodus, with 6 distolateral spines.

Ischium and carpus subequal, 0.25 times as long as propodus. Fourth pereiopod with 5 distolateral spines (fig. 17d) and fifth pereiopod with one distolateral spine (fig. 17e) on merus.

Endopod of first pleopod subovate. Appendix interna on pleopod 2-5.

Notes on morphology:

1. The scaphocerite is uniformly rounded anteriorly in all specimens and its lateral margins are almost parallel (18c, d). The width/length ratio lies between 0.34-0.44 (fig. 19). The distolateral tooth of the scaphocerite, as a rule, hardly visible, never extending beyond the anterior margin of the lamina.

2. The pigmentation of the cornea is always absent. The eyes have long eye-stalks and a small cornea; in all specimens the cornea is not wider than the distal part of the eye-stalk and distinctly narrower than the basal part (fig. 18c, d).

3. In 14 specimens out of 60, the rostrum has a more or less depressed apex (fig. 18c, d). The rostrum never overreaches the eye-stalks. Only one specimen has the rostrum reaching to the base of the cornea (fig. 18c). The rostrum is always broad triangular in dorsal view; in lateral view the ventral margin of the rostrum is slightly sinuate or slightly concave (fig. 18a, b). The strong supraorbital teeth never overreach the level of the antennal spine.

4. Only in two specimens a distinct middorsal tooth is present (fig. 18a), in one specimen a knob is present (fig. 18b), in other specimens the middorsal carina is unarmed.

5. In 4 specimens the antennal spine is present on one side and absent on the another. Other specimens have distinct antennal spines on both sides.

6. The outer antennular flagellum overreaches the anterior margin of the scaphocerite with one sixth to half its length. The inner flagellum is 1.2-1.5 times as long as the outer flagellum.

7. In 53 specimens both the left and right carpus of the second pereiopods have 9 articles, in 5 specimens 10 articles, and in 2 specimens 9 articles on the left side and 10 on the right.

8. The meri of pereiopods 3-5 are always armed. The number of spines on the merus of the fifth pereiopods varies between 1-2, on the merus of the third and fourth pereiopods from 3 to 6.

9. The pleura of the first to fourth abdominal segments are rounded, the pleura of the fifth abdominal segment are distally produced. The size of the pleura of the second abdominal segment is variable like is other species of *Bythocaris*; ovigerous females have larger second pleura than non-ovigerous females.

10. In 3 specimens the posterior margin of the telson is slightly convex (fig. 18e), in 6 specimens it is truncate (fig. 18f), and in the other specimens it is concave. Most specimens have two pairs of distal spines on the telson.

Remarks.— The main diagnostic characters to distinguish *B. irene* from the other species of *Bythocaris* are: 1, the lack of pigmentation of the eye; 2, the form of the eye (the basal part of eye-stalk is distinctly wider than the distal part, eyes more than twice as long as wide); 3, the rostrum being broadly triangular in dorsal view; 4, the lamina of the scaphocerite having a slightly rounded anterior margin; 5, the produced pleura of the fifth abdominal segment and the rounded pleura of other abdominal

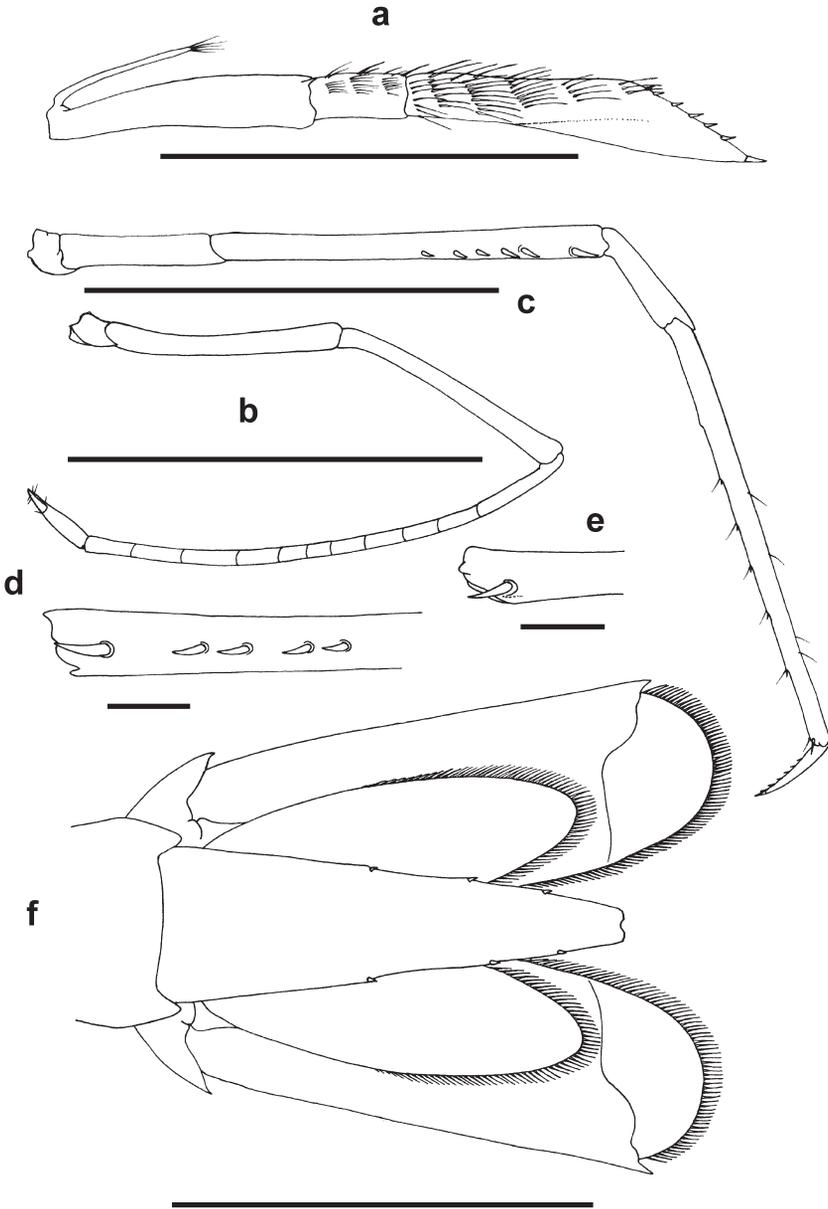


Fig. 17. *Bythocaris irene* Retowsky, 1946, holotype, female ZISP, (1/39150), cl. 16 mm. a, left third maxilliped; b, right second pereopod; c, right third pereopod; d, distal part of merus of left fourth pereopod; e, distal part of merus of left fifth pereopod; f, telson in dorsal view. Scale a-c, f = 1 cm; d, e = 1 mm.

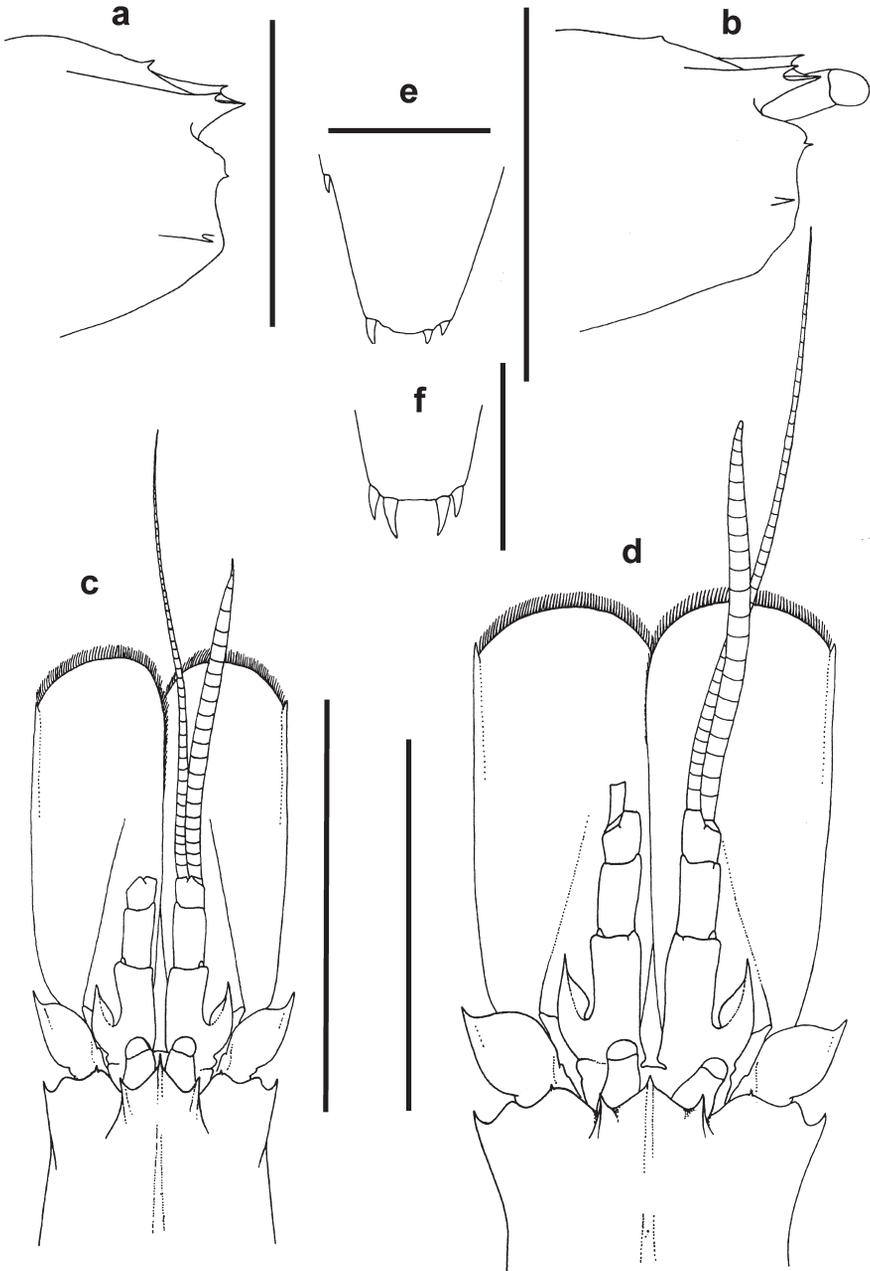


Fig. 18. *Bythocaris irene* Retowsky, 1946. a-b, lateral view of anterior part of carapace; c-d, dorsal view of anterior region; e-f, tip of telson in dorsal view. a, female ("Polarstern", St. 69a), cl. 16.4 mm; b, male ("Polarstern", St. 62a), cl. 13.2 mm; c, male ("Polarstern", St. 62a), cl. 8.8 mm; d, male ("Polarstern", St. 62a), cl. 13.6 mm; e, female ("Polarstern", St. 69a), cl. 16.4 mm; f, female ("Polarstern", St. 62 a), cl. 17.6 mm. Scale a-d = 1 cm; e, f = 1 mm.

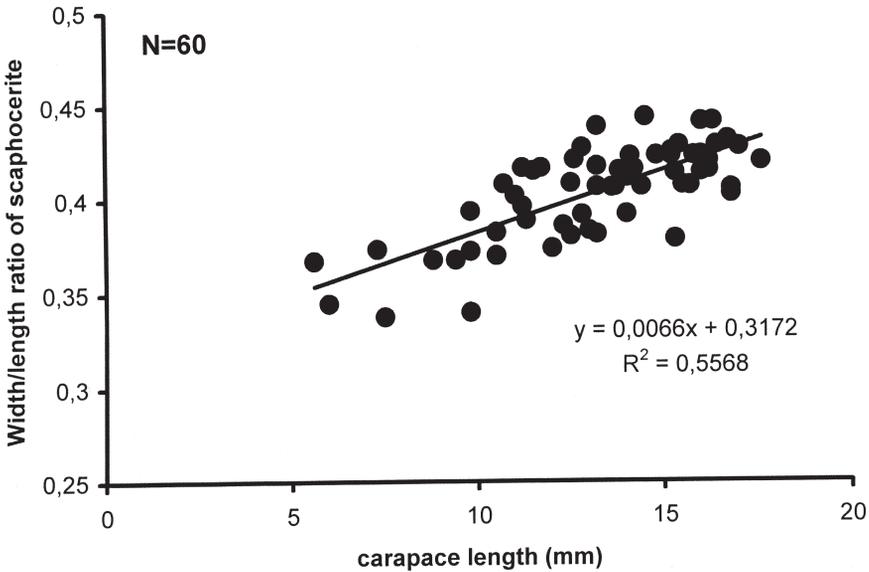


Fig. 19. *Bythocaris irene* Retowsky, 1946. Graph showing width/length ratio of scaphocerite in relation to carapace length.

segment; 6, the armed meri of the third to fifth pereopods. These six characters are always present together. Characters like the form of the tip of the telson, presence or absence of an antennal spine, size of the pleura of the second abdominal segment, and the form of the apex of the rostrum are variable.

The specific status of *B. irene* was doubted by Kobjakova (1964) without any discussion. The presented reliable diagnostic characters confirm the specific status of this species.

Distribution.— Kara Sea and East-Siberian Sea in depths between 520-961 m.

Bythocaris curvirostris Kobjakova, 1957
(figs 20-26)

Bythocaris curvirostris Kobjakova, 1957: 363-364; Kobjakova, 1964: 328; Bowman & Manning, 1972: 189, 191; Zarenkov, 1986: 796-797, fig. 1; Burukovsky, 1966: 538; Fransén, 1993: 567, 596.

Material.— **Holotype**.— 1 male, cl. 18.2 mm (ZISP, 1/36136); Arctic Ocean, 81°06'6N-161°36'W; 3255 m depth; 6.iii.1951; SP-2, st. 12, det. Z.I. Kobjakova.— 4 non-ovigerous females, cl. 16.9-21.8 mm; 1 male, cl. 17.2 mm (ZMMU); Chukchi Sea; 2805 m depth; 13.viii.1977; SP-23, st.?, det. N.A. Zarenkov.— 2 non-ovigerous females, cl. 21.5 and 20.3 mm; 11 males, cl. 6.0-16.5 mm (ZMMU, RMNH D 48609); Norwegian Sea, 67°53'3N-0°00'0E; 3440 m depth; 27.iii.1958; R/V "Sevastopol", cruise 8, st. 1364, det. V.I. Sokolov.— 1 non-ovigerous female, cl. 21 mm (ZMMU, Ma 4125); Norwegian Sea, 65°47'N-1°50'E; 2730 m depth; 10.vii.1957; R/V "Sevastopol", cruise 5, st. 1057, det. V.I. Sokolov.

As several mistakes were encountered in the description of Kobjakova (1957), a redescription is given below.

Description of holotype (figs 20-22).— Carapace smooth. Rostrum unarmed, triangular in dorsal view (fig. 21c), downcurved distally in lateral view (fig. 21a); apex sharp, depressed, extending beyond cornea. Rostrum flanked by pair of acute supra-orbital teeth, slightly above level of rostrum; distance between these spines about one-fifth carapace width. Strong dorsal median carina present from level basis of eyes, extending posteriorly to about middle of carapace. Lower orbital angle rounded. Antennal spine present just below lower orbital angle. Robust branchiostegal spine present below antennal spine. Small spine in front of hepatic spine present on right side (fig. 21b).

Abdomen smooth. Pleurae of the first to fifth abdominal segments rounded. Telson 1.6 times as long as sixth abdominal segment; dorsal surface with 3 pairs of minute spines situated close to lateral margin (fig. 20e) at 0.87-0.75-0.56 of telson length. Posterior tip of telson straight, armed with 3 pairs of distolateral spines (fig. 20f).

Eyestalks short, cornea rounded, without any dark pigment.

Antennular peduncle with basal segment slightly longer than combined distal segments; penultimate segment about 1.5 times length of distal margin. Basal segment with small spine present on inner margin at about one-third distance from distal margin. Stylocerite produced laterally, extending to about distal fourth to distal margin of basal segment. Outer antennular flagellum overreaching scaphocerite with half its length, composed of 42 articles, inner flagellum about twice as long as outer flagellum.

Scaphocerite 0.8 times carapace length, about 2 times longer than antennular peduncle and 1.8 times as long as its greatest width; anterior margin truncate, projecting slightly beyond small distolateral tooth. Basal segment of antennal peduncle with strong distolateral spine.

Mandible (fig. 22a) simple, incisor process and palp absent.

First maxilla (fig. 22b) with broad upper endite with stout median setae; lower endite turned towards upper endite, with many slender, serrate setae; palp short and rather broad, with few long, slender setae.

Second maxilla (fig. 22c) with well-developed bilobated upper endite; distal lobe larger than proximal lobe, both lobes with many setae. Lower endite reduced to single lobe with 8 long setae. Unsegmented palp with 8 long setae. Scaphognathite well developed.

First maxilliped (fig. 22d) with well-developed distal endite; mesial margin straight with many slender short setae. Basal endite rounded with few setae. Unsegmented palp long, with few setae. Exopod normally developed, with caridean lobe. Epipod rather broad.

Second maxilliped (fig. 22e) of the usual shape. Exopod rather slender, with 5 long, distal setae. No distinct epipod at base.

Third maxilliped reaching anterior margin of scaphocerite. Ultimate segment 2.8 times as long as penultimate segment, armed with 7 strong spines along distoventral border; few transverse rows of setae on mesial surface. Basal segment 3.4 times as long as penultimate segment, slightly curved, with distolateral tooth. Exopod short, 0.3 times length of basal segment, with few distal setae.

First pereopod short, reaching to proximal third of ultimate segment of third

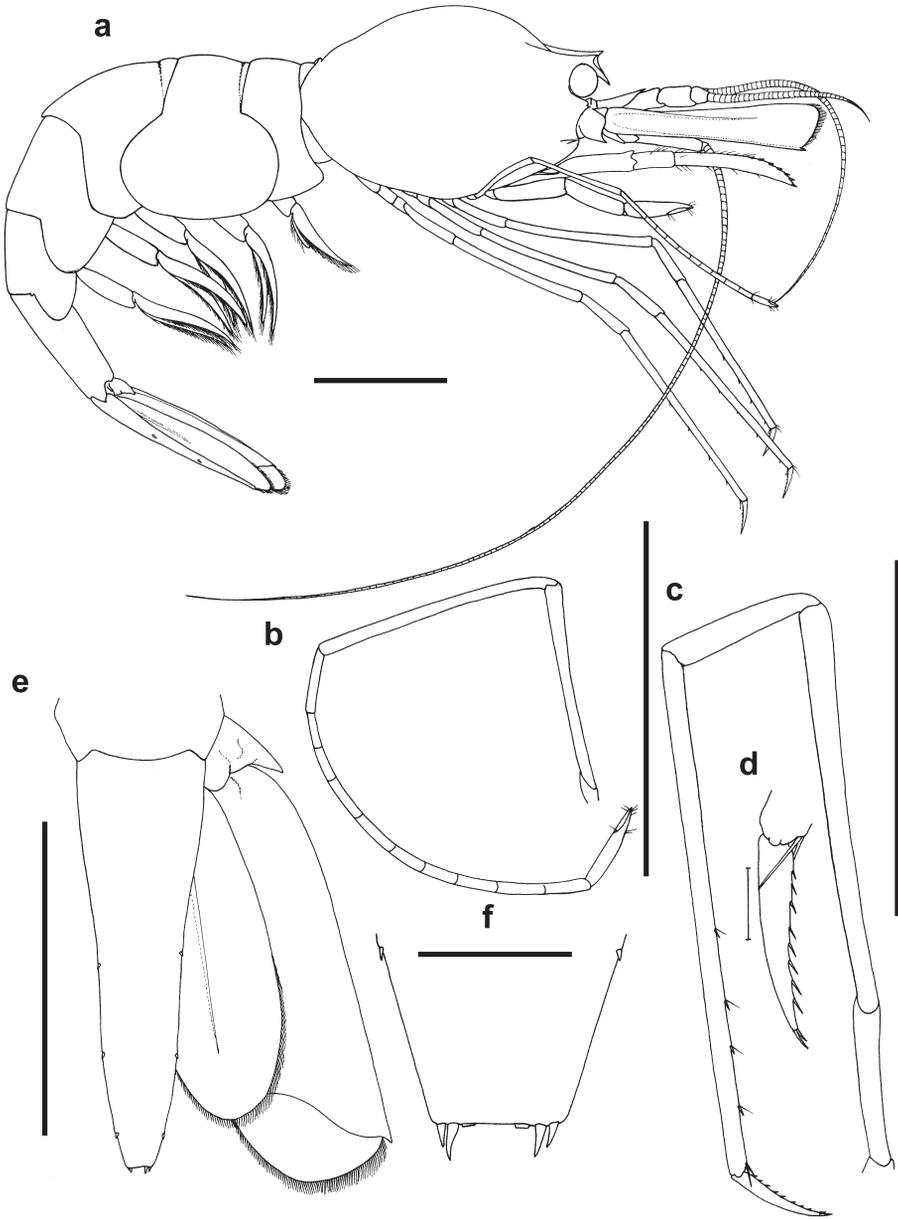


Fig. 20. *Bythocaris curvirostris* Kobjakova, 1957, holotype, male (ZISP, 1/36136), cl. 18.2 mm. a, lateral view; b, left second pereiopod; c, left third pereiopod; d, dactylus of left third pereiopod; e, telson in dorsal view; f, tip of telson in dorsal view. Scale a-c, e = 1cm; d, f = 1 mm.

maxilliped. Chela simple with entire cutting edges; fingers slightly shorter than half length of palm; carpus subequal to propodus; merus slightly longer than carpus and 2.4 times as long as ischium.

Second pereopod (fig. 20b) long and slender, overreaching scaphocerite with ultimate carpal segment. Fingers of chela with entire cutting edges, 0.4 times palm length. Carpus slightly longer than merus and ischium together, subdivided into 10 articles; merus 0.46 times as long as carpus; ischium 0.8 times as long as merus.

Third, fourth and fifth pereopods similar; third pereopod (fig. 20c) overreaching scaphocerite with half length of propodus. Dactylus of third pereopod (fig. 20d) 0.2 times propodus length, with 10 spinules on flexor margin; propodus with 4 ventral and 2 distoventral spines; merus 0.7 times as long as propodus, unarmed. Ischium and carpus subequal, 0.36 times as long as merus. Meri of fourth and fifth pereopods unarmed.

Endopod of first pleopod subovate, with slender internal projection (fig. 21d). Appendix masculina of second pleopod longer than appendix interna, with few long setae (fig. 21e). Appendix interna on pleopod 2-5.

Notes on morphology:

1. The scaphocerite is usually truncate anteriorly; the anterior margin of the lamina is slightly extending beyond the distolateral tooth (fig. 23a-c, e). The width/length ratio is between 0.42-0.57. There is a positive correlation between the width/length ratio and carapace length (fig. 26).

2. The pigmentation of the cornea is absent. The eyestalk is very short. The cornea is relatively large (fig. 23d, f).

3. In all but two specimens the rostrum has a more or less depressed apex (fig. 23a-c, e, f). In these two specimens the rostrum does not overreach the eyes. In other specimens the rostrum extends beyond the eyes (fig. 23-24). The shape of the rostrum and the supraorbital spines is variable. In lateral view the ventral margin of the rostrum is concave or slightly sinuate (fig. 24). Only in two specimens the rostrum is strongly downcurved distally (fig. 21a), in three specimens the rostrum is slightly downcurved distally (fig. 24a), and in the other specimens the rostrum is not downcurved at all. In a non-ovigerous female from the Chukchi sea a small spine between the rostrum and left supraorbital spine is present (fig. 23e, f).

4. The dorsal carina of the carapace lacks a spine or projection in all specimens (fig. 24).

5. The antennal spine is absent in 6 specimens. In 3 specimens the antennal spine is present on one side and absent on the another. The other specimens have distinct antennal spines on the both sides.

6. The inner flagellum is 1.8-2.6 times as long as the outer flagellum.

7. In one specimen out of 20 both left and right carpus of the second pereopods have 9 articles, in one specimens 10 articles on the right and 9 on the left pereopod, in the other specimens both carpi of the second pereopods have 10 articles.

8. The meri of pereopods 3-5 are always unarmed.

9. The pleura of the first three abdominal segments are rounded. The form of the fourth and fifth pleura varies (fig. 25a-d). In 3 specimens the pleura of the fifth abdominal segment are acute, in 8 specimens the pleura of the fifth abdominal seg-

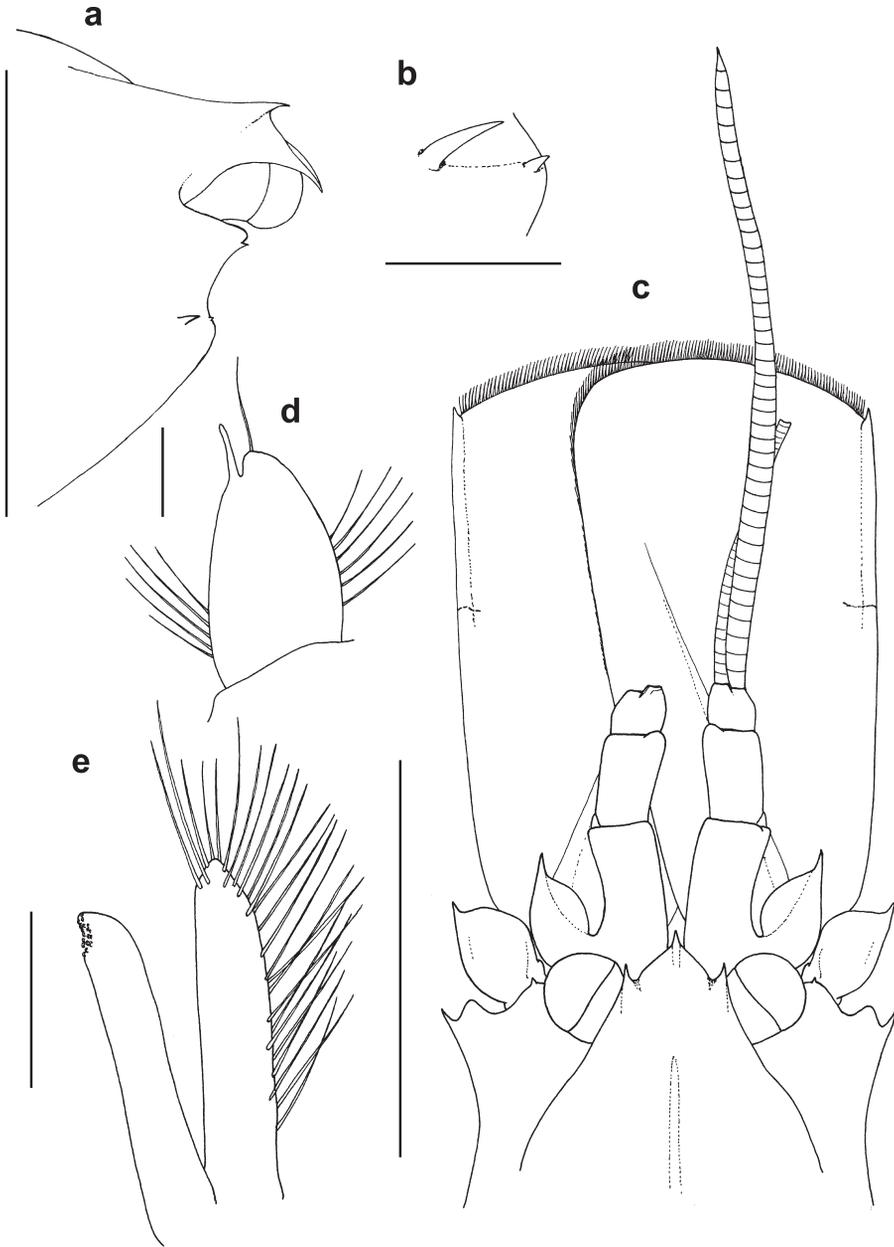


Fig. 21. *Bythocaris curvirostris* Kobjakova, 1957, holotype, male (ZISP, 1/36136), cl. 18.2 mm. a, lateral view of anterior part of carapace; b, hepatic spine and small anterior spine; c, dorsal view of anterior region; d, endopod of left first pleopod; e, appendix masculina and appendix interna. Scale a, c = 1 cm; b, d, e = 1 mm.

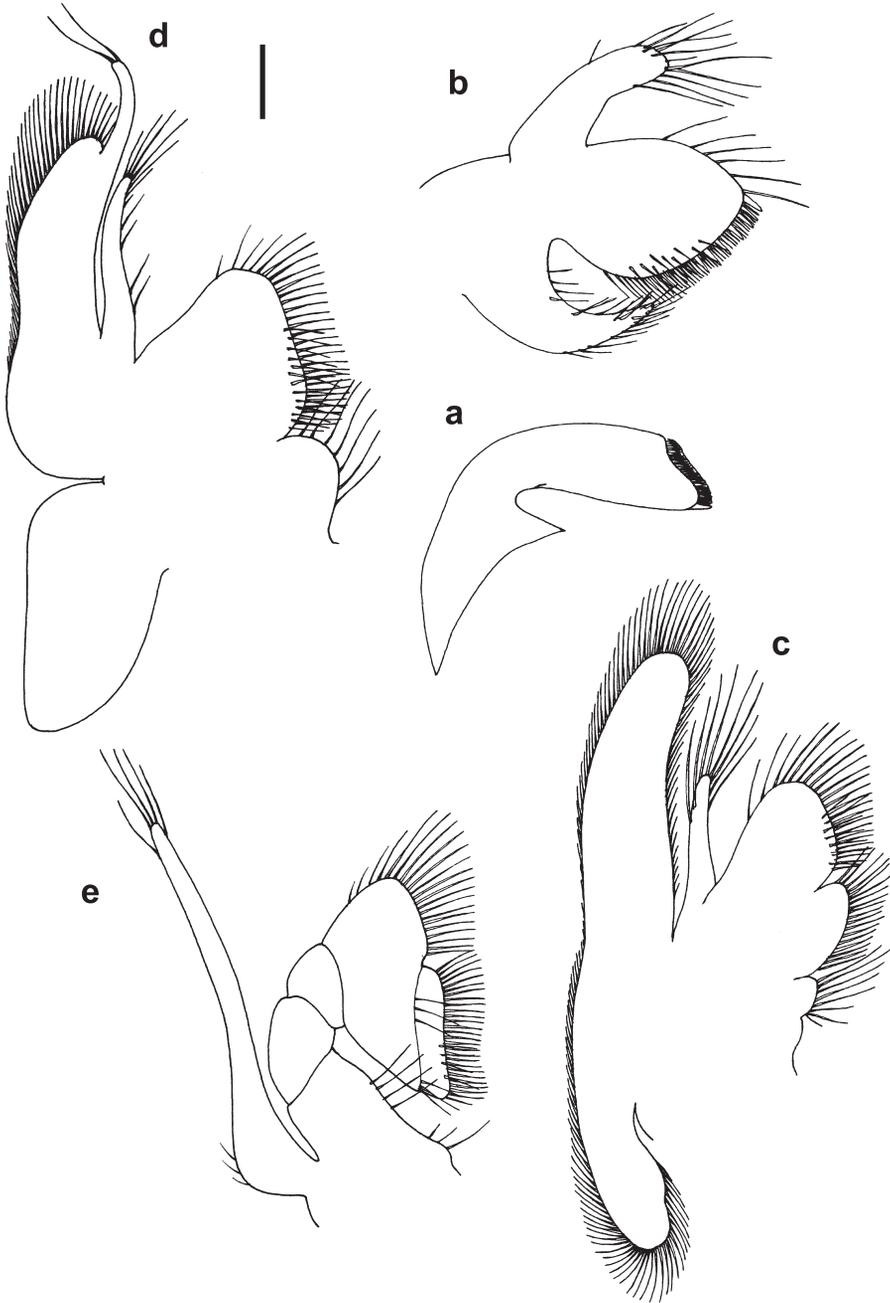


Fig. 22. *Bythocaris curvirostris* Kobjakova, 1957, holotype, male (1/36136), cl. 18.2 mm. a, right mandible; b, left first maxilla; c, left second maxilla; d, left first maxilliped; e, left second maxilliped. Scale 1 mm.

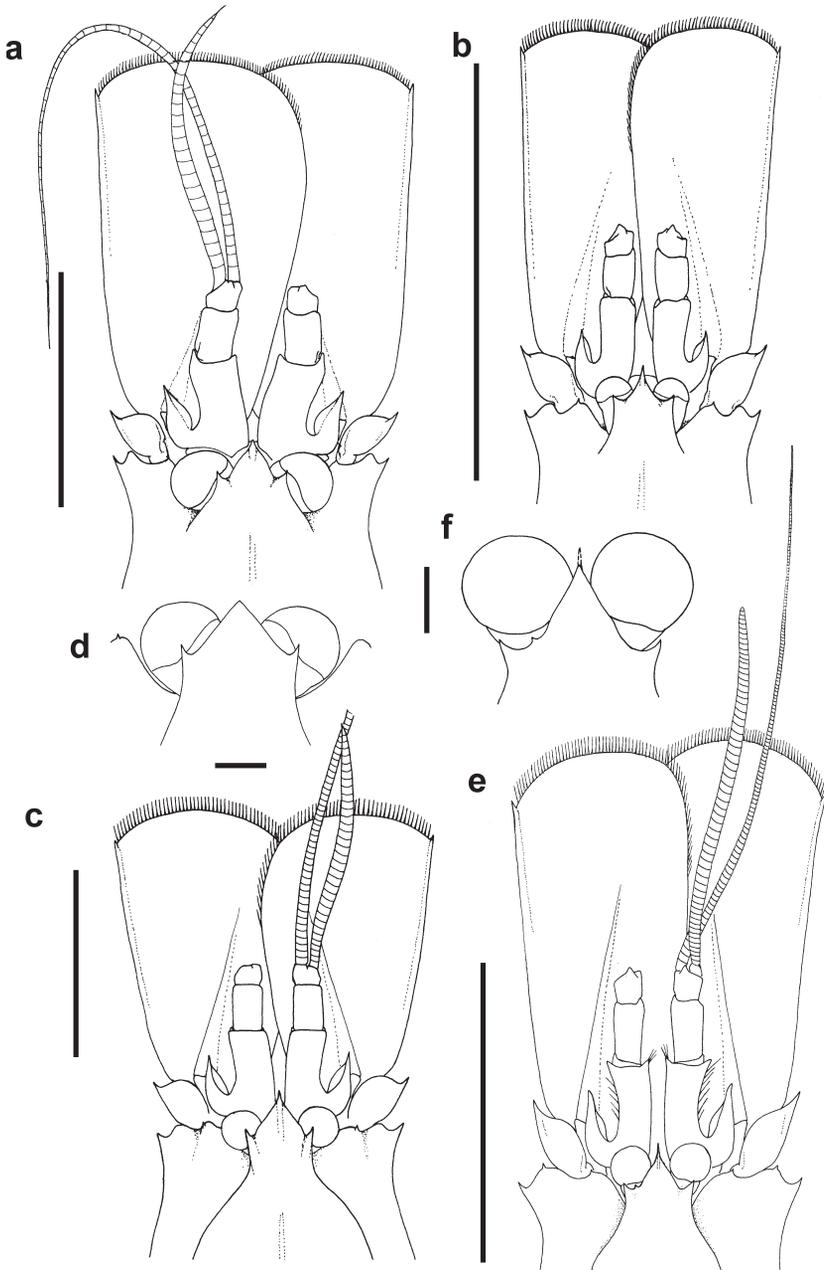


Fig. 23. *Bythocaris curvirostris* Kobjakova, 1957, dorsal view of anterior region. a, female ("Sevastopol", St. 20.3 mm), cl. 20.3 mm; b, male ("Sevastopol", St. 20.3 mm), cl. 6.5 mm; c, female (ZMMU, Ma 4125), cl. 21 mm; d, male ("Sevastopol", St. 1364), cl. 15.3 mm; e-f, female (CP 23), cl. 12.5 mm. Scale a-c, e = 1 cm; d, f = 1 mm.

ment have a proximal tooth, in the other specimens the pleura of the fifth abdominal segment are rounded. The form of the pleura of the fourth abdominal segment is rounded in 16 specimens, in two specimens it is acute, and in another two specimens it has a blunt proximal tooth.

10. The tip of the telson is truncate or slightly rounded (fig. 25e-g). The number of dorsal marginal spines on the telson is 2-3 pairs.

Remarks.— The main diagnostic characters to distinguish *B. curvirostris* from the other species of *Bythocaris* are: 1, the lack of pigmentation of the eyes; 2, the anteriorly truncate scaphocerite; 3, the unarmed meri of pereopods 3-5; 4, the rostrum extending beyond the eyes; 5, the unarmed middorsal carina of the carapace. These five characters are always present together. The small lateral spine on the scaphocerite that was noted by Kobjakova (1957) is in fact an artefact caused by folding of the scaphocerite.

At first I distinguished the specimens from the Norwegian Sea as *B. cryonesus*, because in most of them the rostrum is not downcurved in lateral aspect and the apex of rostrum is not strongly depressed. After the specimens of *B. curvirostris* (det. N.A. Zarenkov) from the Chukchi Sea were examined, with some hesitation I reidentified the specimens from the Norwegian Sea as *B. curvirostris*.

Only one specimen out of five from the Chukchi Sea is similar to the holotype regarding the form of the rostrum. In fact all transitions between the downcurved and straight rostrum in lateral view are present. Only in one specimen the pleura of the fifth abdominal segment is rounded, in two specimens it is produced, in one specimen it is acute, and in another one bears a proximal tooth.

Three species, *B. leucopis*, *B. curvirostris* and *B. cryonesus* (only known from the holotype specimen), have the third, fourth and fifth pereopods with unarmed meri, and the eyes without dark pigment. *B. curvirostris* and *B. cryonesus* differ from *B. leucopis* in lacking a middorsal tooth on the carapace and by the relative length of the antennular flagellum. In *B. leucopis* the inner antennular flagellum is 2.6-3.3 times as long as the outer flagellum while in *B. curvirostris* the inner antennular flagellum is 1.8-2.6 times as long as the outer flagellum and in *B. cryonesus* it is less than twice as long as the outer flagellum (Bowman & Manning, 1972).

I could not find any important differences between *B. curvirostris* and the description of *B. cryonesus*. The holotype of *B. curvirostris* differs from *B. cryonesus* by the form of the tip of the telson and by the form of the rostrum: in *B. curvirostris* the rostrum is strongly downcurved in lateral view and the apex of the rostrum strongly depressed while in *B. cryonesus* the rostrum is not downcurved and the apex is not depressed. As was noted above, the form of the rostrum in *B. curvirostris* varies. There are other differences between the holotype of *B. curvirostris* and *B. cryonesus*: 1, in *B. cryonesus* the third maxilliped overreaches the scaphocerite with its distal 3 spines of the ultimate segment while in the holotype of *B. curvirostris* the third maxilliped only reaches the anterior margin of the scaphocerite; 2, in *B. cryonesus* the exopod of the third maxilliped extends beyond the midlength of the basal segment while in the holotype of *B. curvirostris* it is 0.3 times the basal segment length; 3, in *B. cryonesus* the supraorbital teeth are not rising above the rostrum (Bowman & Manning, 1972: fig. 1B) while in *B. curvirostris* the supraorbital teeth clearly rise above the rostrum. In large specimens of *B. curvirostris* the third maxilliped overreaches the scaphocerite

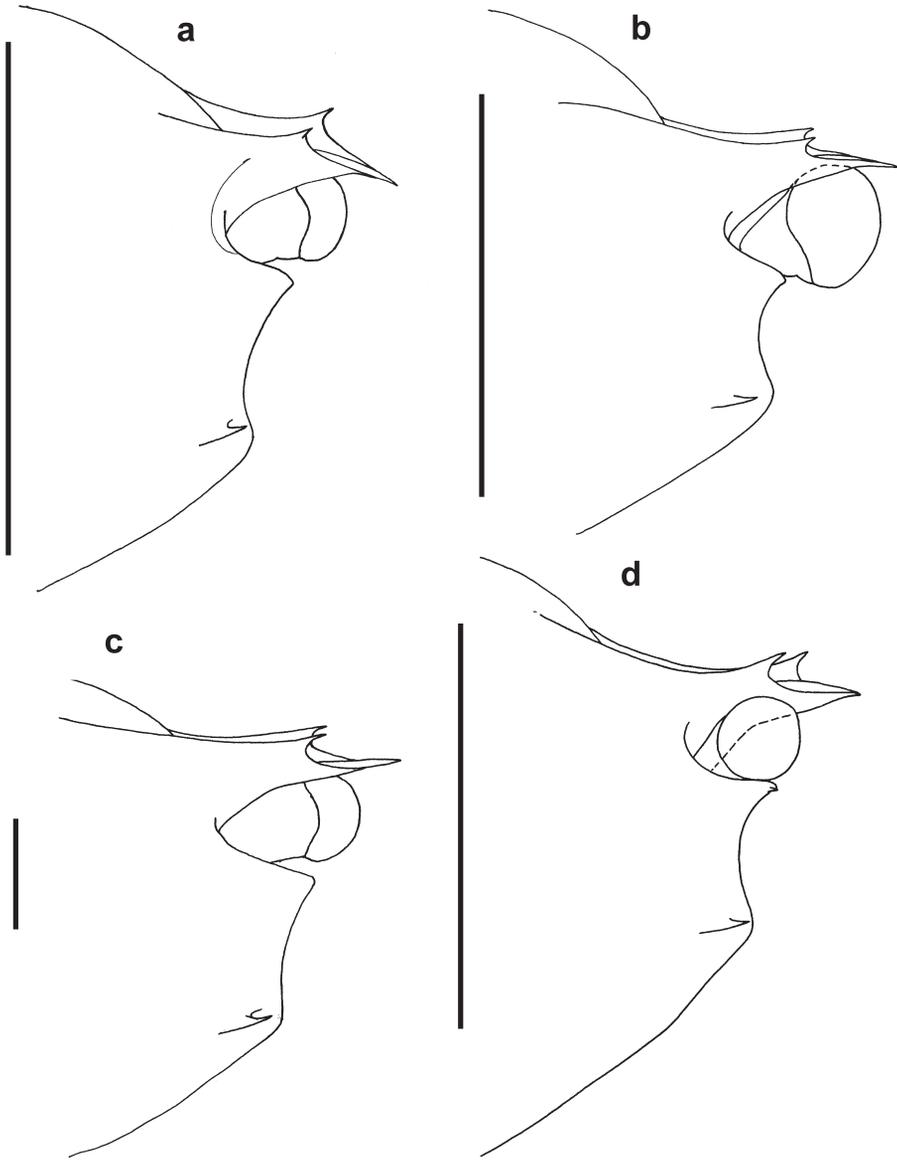


Fig. 24. *Bythocaris curvirostris* Kobjakova, 1957, lateral view of anterior part of carapace. a, male ("Sevastopol", St. 1364), cl. 16.5 mm; b, female (CP-23), cl. 21 mm; c, male ("Sevastopol", St. 1364), cl. 9.3 mm; d, female (ZMMU, Ma 4125), cl. 21 mm. Scale a, b, d = 1 cm; c = 1 mm.

with the distal one-fourth to one-third of its ultimate segment, in small specimens it usually does not extend beyond the scaphocerite. In one female of *B. curvirostris* with a downcurved rostrum the exopod of the third maxilliped reaches the midlength of its basal segment. Consequently, these two species differ by the configuration of the supraorbital spines and rostrum.

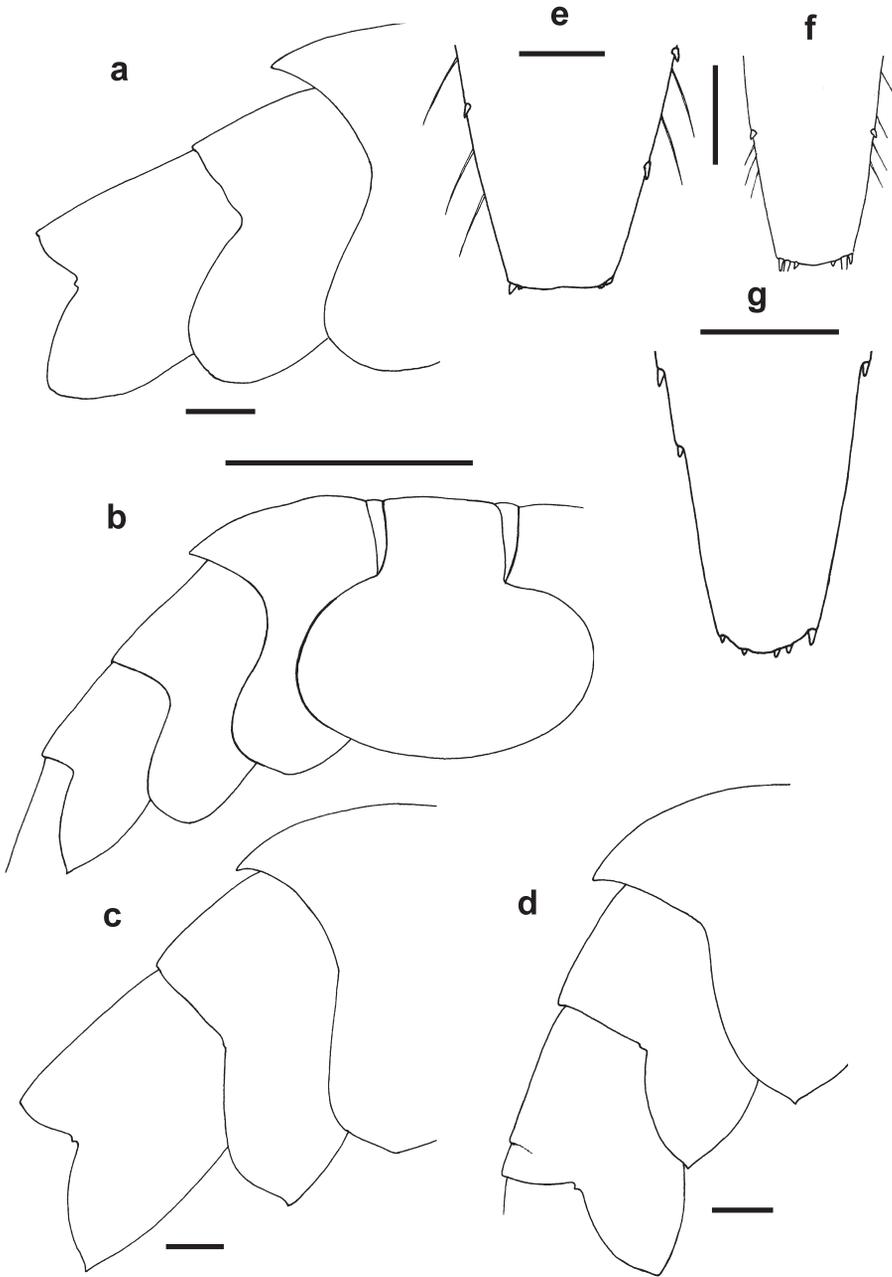


Fig. 25. *Bythocaris curvirostris* Kobjakova, 1957. a-d, lateral view of abdominal pleura 3-5; e-g, tip of telson in dorsal view. a, female ("Sevastopol", St. 1364), cl. 9.5 mm; b, female (CP-23), cl. 16 mm; c, male ("Sevastopol", St. 1364), cl. 10.7 mm; d, male ("Sevastopol", St. 1364), cl. 9 mm; e, female (ZMMU, Ma 4125), cl. 21 mm; f, female (CP-23), cl. 12.3 mm; g, female (CP-23), cl. 21. Scale a, c-g = 1 mm; b = 1 cm.

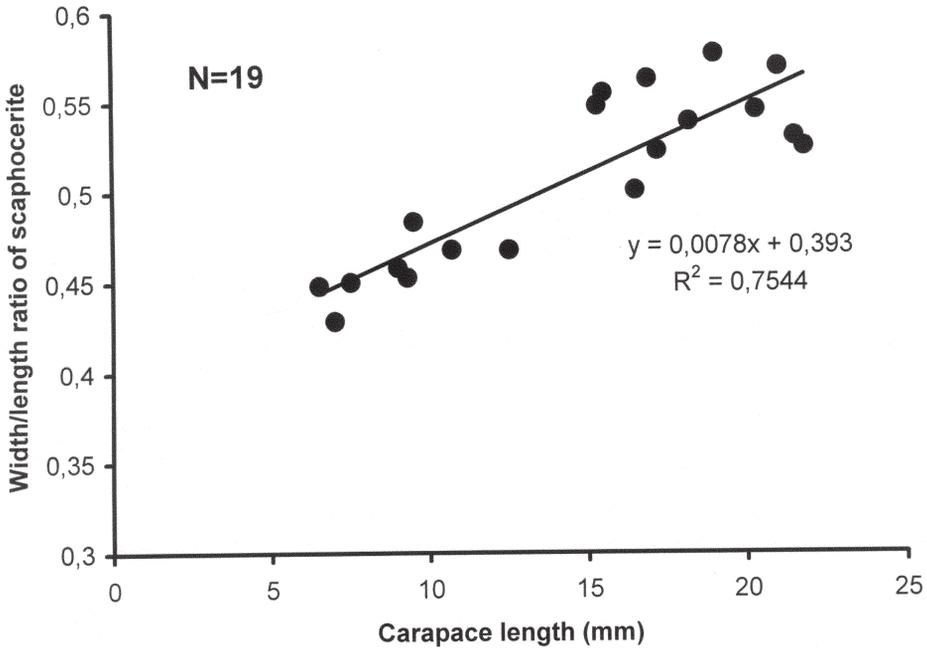


Fig. 26. *Bythocaris curvirostris* Kobjakova, 1957. Graph showing width/length ratio of scaphocerite in relation to carapace length.

Distribution.- Arctic Ocean, Chukchi Sea, Norwegian Sea in depth between 2730-3440 m.

Bythocaris spec. A
(figs 27-29)

Material.— 1 non-ovigerous female, cl. 7.5 mm (ZISP, 6/40612); Arctic Ocean; 1750 m depth; 6.x.1955; I/S "F. Litke", st 41, det. Z.I. Kobjakova (as *B. leucopis biruli*).— 1 non-ovigerous female, cl. 5.3 mm (ZISP, 5/40611); Arctic Ocean, 80°30'N-176°57'E; 2352 m depth; 6.xi.1954-8.xi.1954; CP-4, st. 4, sample 2, det. Z.I. Kobjakova (as *B. leucopis biruli*).— 1 non-ovigerous female, cl. 7.3 mm (ZISP, 7/40613); Arctic Ocean; 2040 m depth; 28.ix.1955; I/S "F. Litke", st.3 2, det. Z.I. Kobjakova (as *B. leucopis biruli*).

These three females are quite different from the other specimens of *B. leucopis* and *B. biruli* on some characters.

The largest female (cl. 7.5 mm) is the most complete specimen, and has proliferated oocytes clearly visible through the carapace. The description of this specimen is given below.

Description (figs 27-29).— Carapace smooth. Rostrum unarmed, triangular in dorsal view, apex sharp, depressed, overreaching base of cornea (fig. 27b). Rostrum flanked by pair of acute, strong supraorbital teeth, slightly above level of rostrum (fig. 27c); distance between these spines slightly more than one-fifth of carapace width. Strong dorsal median carina present from small acute forwardly directed spine,

extending posteriorly to about middle of carapace. Small knob present just behind middorsal tooth (fig. 27a, c). Lower orbital angle rounded. Antennal spine present just below lower orbital angle. Robust hepatic spine present below antennal spine.

Abdomen smooth. Pleura of first, second and third abdominal segments rounded, pleura of fourth and fifth abdominal segments with prominent posterolateral tooth (fig. 27a). Telson (fig. 28g) 1.1 times as long as sixth abdominal segment; dorsal surface with 4 pairs of minute spines situated close to lateral margin at 0.43-0.52-0.75-0.94 of telson length on the right side and at 0.41-0.52-0.73-0.85 of telson length on left side. Posterior tip of telson truncate, armed with 3 pairs of distolateral spines (fig. 28h).

Eyes small, cornea rounded, without any dark pigment.

Antennular peduncle with basal segment longer than combined distal segments; penultimate segment about twice as long as ultimate segment. Basal segment with small spine present on inner margin, about one-third distance from distal margin. Stylocerite produced laterally, extending to about distal fourth of distal margin of basal segment. Outer antennular flagellum damaged, inner flagellum as long as carapace length, overreaching scaphocerite with half its length.

Scaphocerite as long as carapace, 2.1 times longer than antennular peduncle and 2.7 times as long as its greatest width; anterior margin rounded, projecting well beyond distolateral tooth. Basal segment of antennal peduncle with strong distolateral spine.

Mandible (fig. 29a) simple, incisor process and palp absent.

First maxilla (fig. 29b) with broad upper endite with stout median setae; lower endite turned towards upper one, with few slender, serrate setae; palp truncate anteriorly, with 7 long, slender, distal setae.

Second maxilla (fig. 29c) with well-developed bilobated upper endite; distal lobe slightly larger than proximal lobe, both lobes with many setae. Lower endite reduced to single lobe with 5 long setae. Unsegmented palp with 5 long setae. Scaphognathite well developed.

First maxilliped (fig. 29d) with well-developed distal endite; mesial margin straight with many slender short setae. Basal endite rounded with 5 setae. Unsegmented palp long, with 3 setae. Exopod normally developed, with caridean lobe. Epipod rather broad.

Second maxilliped (fig. 29e) of usual shape. Exopod slender. No distinct epipod at base.

Third maxilliped overreaching distolateral tooth of scaphocerite. Ultimate segment damaged, with few transverse rows of setae on mesial surface. Basal segment 2.6 times as long as penultimate segment, slightly curved, with distolateral tooth. Exopod extending slightly beyond midlength of basal segment, with few distal setae.

First pereopod (fig. 28a) short, reaching to first third of ultimate segment of third maxilliped. Chela simple with entire cutting edges; fingers 0.6 times palm length; merus 1.2 times as long as carpus and about twice as long as ischium.

Second pereopod (fig. 28b) long and slender, overreaching scaphocerite with distal carpal segment. Fingers of chela with entire cutting edges, 0.7 times palm length. Carpus slightly shorter than merus and ischium together; subdivided into 9 articles; merus 0.56 times as long as carpus, divided in 2 articles; ischium 0.8 times as long as merus.

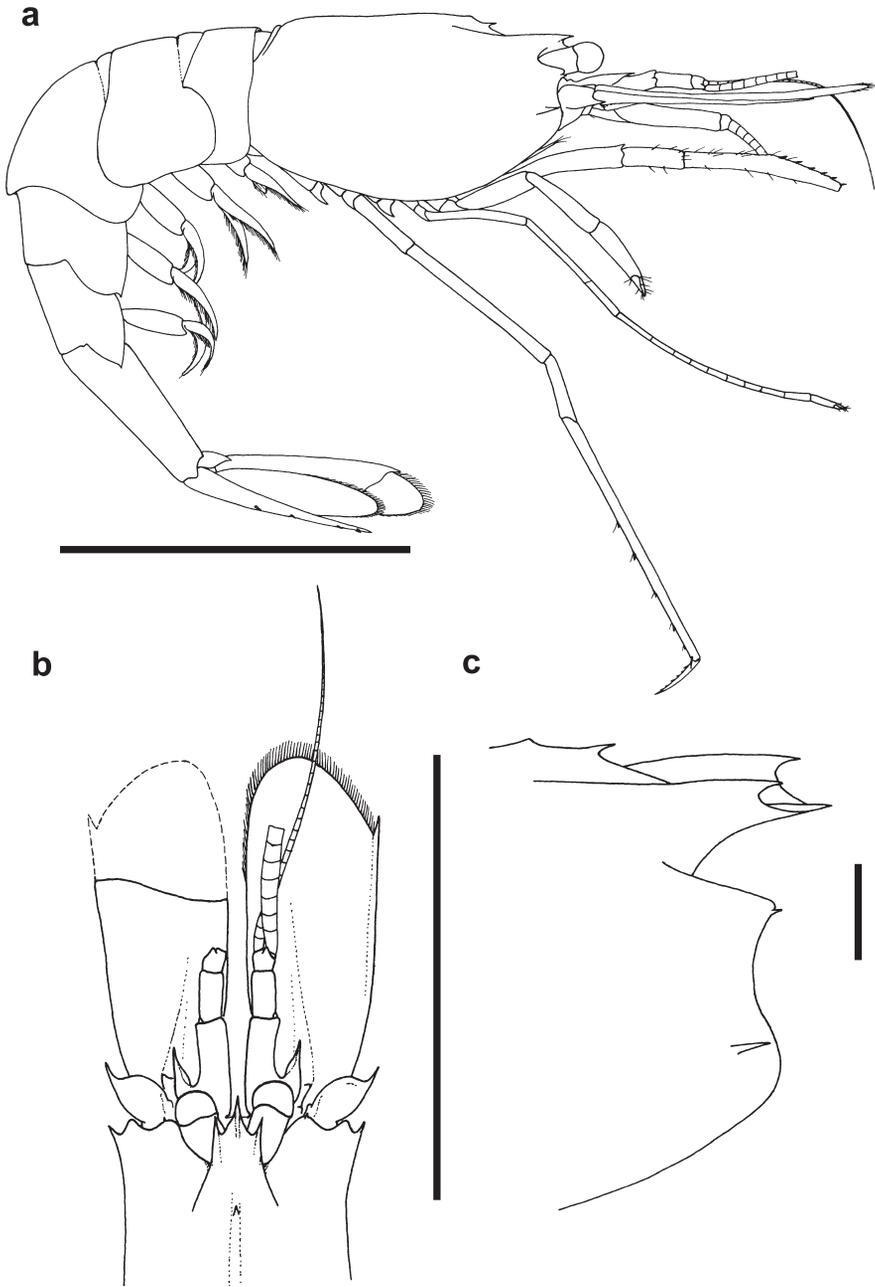


Fig. 27. *Bythocaris* sp. A, female (ZISP, 6/40612), cl. 7.5 mm. a, common view; b, dorsal view of anterior region; c, lateral view of anterior part of carapace. Scale a,b = 1 cm; c = 1 mm.

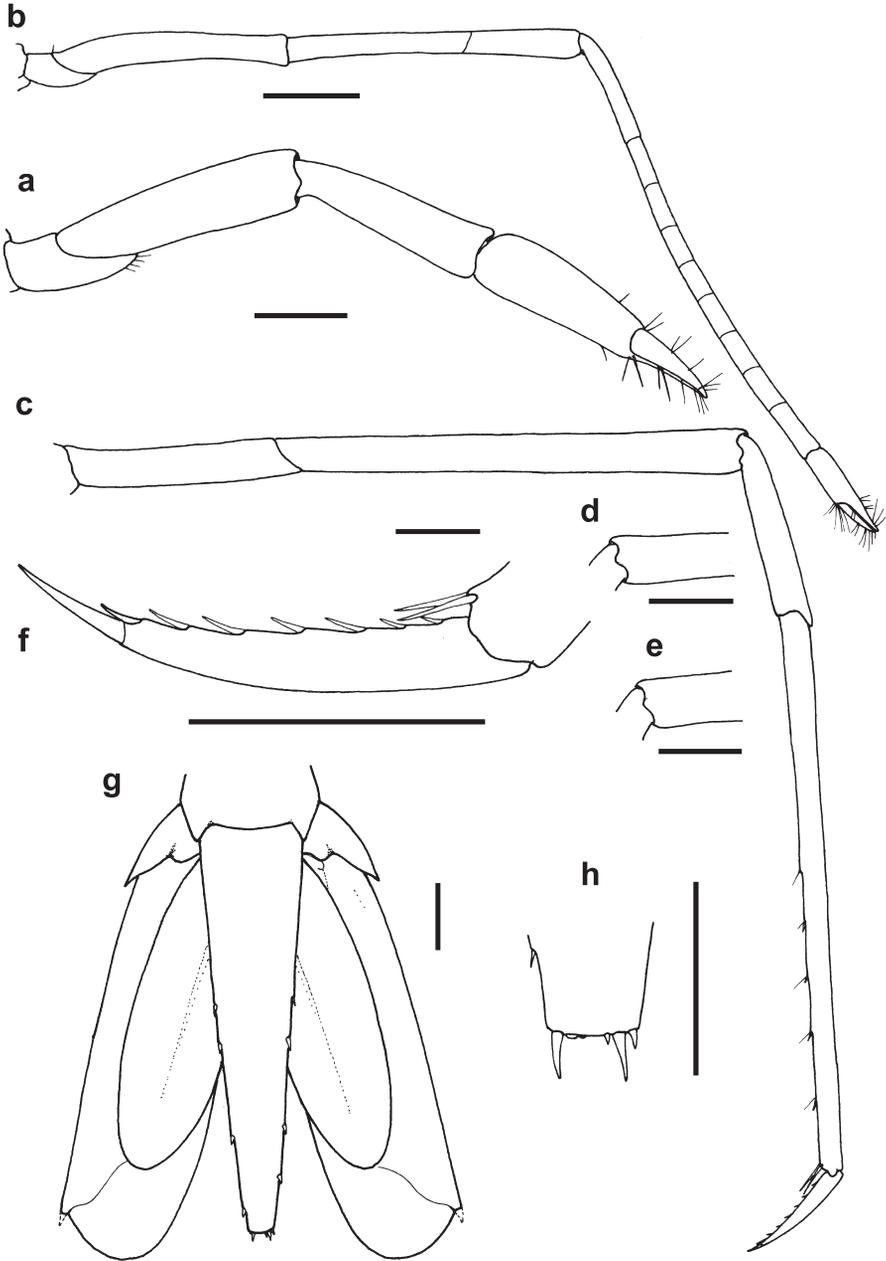


Fig. 28. *Bythocaris* sp. A, female (ZISP, 6/40612), cl. 7.5 mm. a, right first pereiopod; b, right second pereiopod; c, right fourth pereiopod; d, distal part of merus of left third pereiopod; e, distal part of merus of left fifth pereiopod; f, dactylus of right fourth pereiopod; g, telson in dorsal view; h, tip of telson in dorsal view. Scale 1 mm.

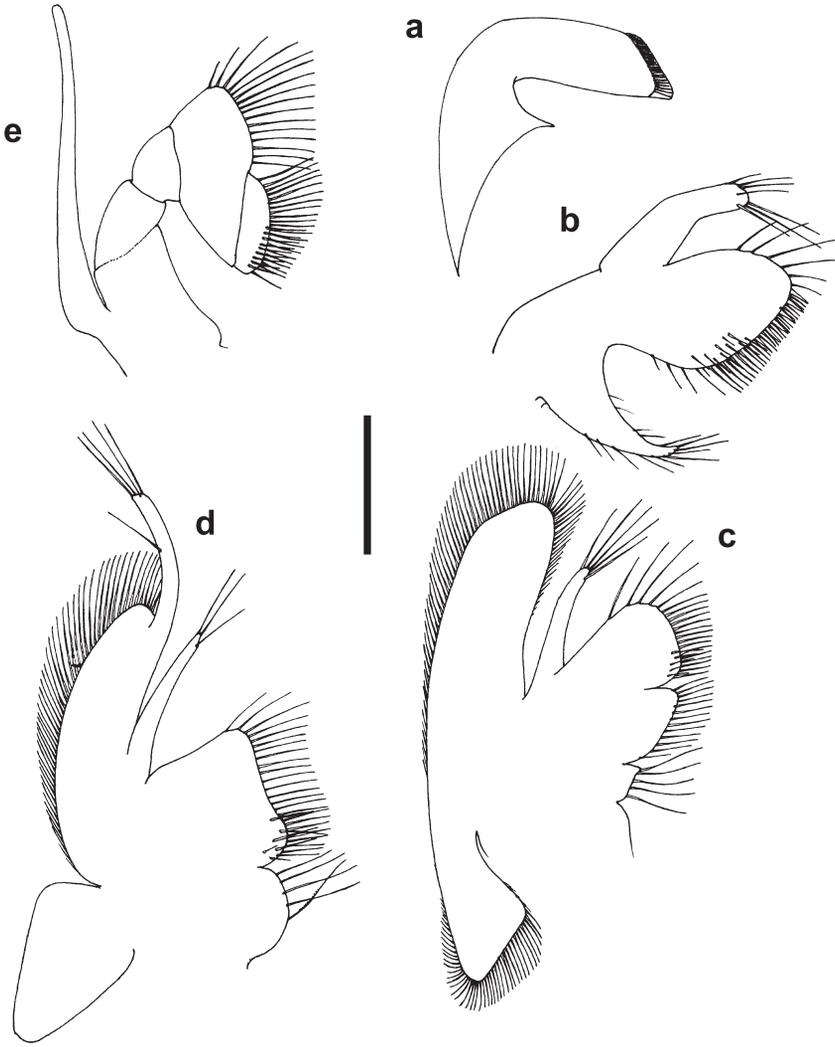


Fig. 29. *Bythocaris* sp. A, female (ZISP, 6/40612), cl. 7.5 mm. a, right mandible; b, left first maxilla; c, left second maxilla; d, left first maxilliped; e, left second maxilliped. Scale 1 mm.

Third and fifth pereiopods damaged; fourth pereiopod (fig. 28c) overreaching scaphocerite with distal third of propodus. Dactylus of fourth pereiopod (fig. 28f) 0.22 times propodus length, with 7 spinules on flexor margin; propodus with 5 ventral and 2 distoventral spines; merus 0.62 times as long as propodus, unarmed. Carpus slightly longer than ischium, 0.44 times as long as merus. No spines on meri of third and fifth pereiopod (fig. 28d, e).

Endopod of first pleopod subovate. Appendix interna on pleopod 2-5.

The two other specimens have the following differences with the female described above. In the female with cl. 5.3 mm, only one middorsal knob is present on

the carapace. In the female with cl. 7.3 mm, one middorsal tooth is present on the carapace and the tip of telson is slightly rounded. All other characters of these specimens are similar.

Discussion.— These specimens resemble *B. floridens* and *B. gorei* in having the rounded scaphocerite and a proximal tooth on the pleura of the fourth and fifth abdominal segments. They differ from these species in lacking the pigmentation of the eyes and the morphology of the rostrum.

These specimens are most similar to *B. leucopis* and *B. biruli* from which they differ by the rounded scaphocerite and short inner flagellum of the antennula. Another differences between *B. leucopis*, *B. biruli* and these specimens are not so clear: 1, in these specimens the meri of pereopods 3-5 are devoid the spines like in *B. leucopis*, while in *B. biruli* the meri of pereopods 3-5 bear 1-5 spines; 2, the scaphocerite of these specimens is narrower than in *B. leucopis* (in these specimens the width/length ratio is between 0.36 and 0.42 while in *B. leucopis* it is between 0.44 and 0.63).

Hansen (1908) and Fransen (1993) noted that in small specimens of *B. leucopis* sensu Hansen and Fransen the scaphocerite is more rounded than in larger ones. But *B. leucopis* and *B. biruli* are quite large and I did not find females of these species with proliferated oocytes visible through the carapace, or with eggs on the pleopods with a carapace length smaller than 13.2 mm while among the present specimens the largest female with cl. 7.5 mm has well developed oocytes. Unfortunately almost no information is available on the biology of these species. That is why I have some doubts establishing a new species.

Bythocaris spec. B
(figs 30-32)

Material.— 1 ovigerous female, cl. 7.7 mm, 6 non-ovigerous females, cl. 3-7.5 mm, 1 male, cl. 6 mm (ZISP), Arctic Ocean, 14.09.1955, I/S "F. Litke", st. 9, 82°20'N-47°17'E, depth 392 m, det. Z.I. Kobjakova (as *Bythocaris payeri*).

Description of ovigerous female, cl. 7.7 mm.— Carapace smooth. Rostrum unarmed, triangular in dorsal view (fig. 30c); ventral margin sinuate in lateral aspect (fig. 30b). Apex sharp, reaching to base of cornea (fig. 30c). Rostrum flanked by pair of acute, small, supraorbital teeth, slightly above level of rostrum; distance between these spines about one-fourth carapace width. Strong dorsal median carina present from small acute forwardly directed spine, extending posteriorly to about last third of carapace. Lower orbital angle produced, rounded. Antennal spine present just below lower orbital angle. Robust hepatic spine present below antennal spine.

Abdomen smooth. Pleura of first five abdominal segments rounded (fig. 30a). Telson (fig. 31i) 1.2 times as long as sixth abdominal segment; dorsal surface with 2 minute spine on right side and 3 on left side. Posterior tip of telson concave, armed with 2 pairs of distolateral spines (fig. 30j).

Eyes small, cornea rounded, without any dark pigment.

Antennular peduncle with basal segment 1.5 times longer than combined distal segments; penultimate segment twice as long as distal segment. Basal segment with small spine present on inner margin at about one-third distance from distal margin.

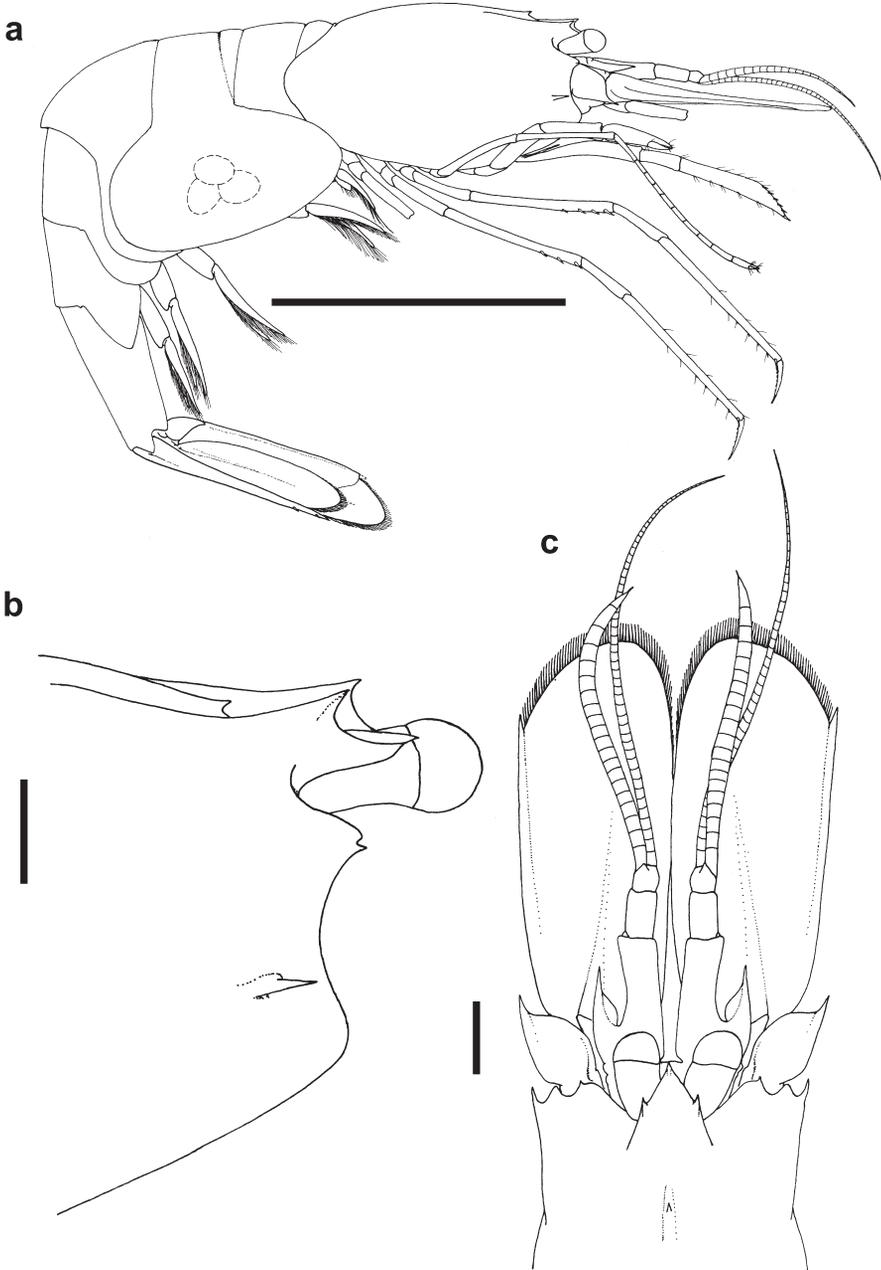


Fig. 30. *Bythocaris* sp. B, female ("Litke", St. 9), cl. 7.7 mm. a, lateral view; b, lateral view of anterior part of carapace; c, dorsal view of anterior region. Scale a = 1 cm; b, c = 1 mm.

Stylocerite produced laterally, reaching distal fourth of basal segment. Outer antennular flagellum overreaching scaphocerite with distal 4 articles, composed of 20 articles, inner flagellum 1.3 times as long as than outer flagellum.

Scaphocerite 0.9 times carapace length, twice as long as antennular peduncle and 2 times as long as its greatest width; anterior margin rounded, projecting well beyond distolateral tooth. Basal segment of antennal peduncle with strong distolateral spine.

Mandible (fig. 32a, b) simple, incisor process and palp absent.

First maxilla (fig. 31c) with broad upper endite with stout median setae; lower endite turned towards upper endite, narrow with many slender, serrate setae, palp with 5 slender distal setae.

Second maxilla (fig. 32d) with well-developed bilobated upper endite, distal lobe larger than proximal lobe, both lobes with many setae. Lower endite reduced to single lobe with few long setae. Unsegmented palp with two distal setae. Scaphognathite well developed.

First maxilliped (fig. 32e) with well-developed distal endite; mesial margin straight with many slender short setae. Basal endite rounded, with few setae. Unsegmented palp long, with 3 long distal setae and 2 lateral setae. Exopod normally developed, with caridean lobe. Epipod rather broad.

Second maxilliped (fig. 32f) of usual shape. Exopod long, slender, with 4 distal setae. No distinct epipod.

Third maxilliped (fig. 31a, b) reaching distolateral tooth of scaphocerite. Ultimate segment 2.7 times as long as penultimate segment, armed with 7 strong and one small spines along distoventral border. Basal segment about 3 times as long as penultimate segment, with 2 distolateral teeth. Exopod short, reaching to first third of basal segment, with few distal setae.

First pereopod (fig. 31c) short, reaching first third of ultimate segment of third maxilliped. Chela simple with entire cutting edges; fingers slightly shorter than half length of palm; carpus 1.1 times palm length; merus 1.2 times carpus length and 2.2 times as long as ischium.

Second pereopod (fig. 31h) long and slender, overreaching scaphocerite with chela. Fingers of chela with entire cutting edges, 0.8 times palm length. Carpus slightly shorter than merus and ischium together, subdivided into 9 articles; merus and ischium subequal, 0.53 times carpus length.

Third, fourth and fifth pereopods similar; ratio of lengths of third, fourth and fifth pereopods 1.1: 1.04: 1. Third pereopod overreaching scaphocerite with distal fourth of propodus. Dactylus of third pereopod (fig. 31g) 0.22 times propodus length, with 7 spinules on flexor margin, propodus with 4 ventral spines and 2 distoventrally. Ischium and carpus subequal, 0.36 times as long as propodus. Merus 0.79 times propodus length, with 4 distolateral spines (fig. 31e). Fourth pereopod (fig. 31d) with 3 distolateral spines on merus (fig. 31e). Fifth pereopod with one distolateral spine on merus (fig. 31 f).

Endopod of first pleopod subovate. Appendix interna on pleopod 2-5.

Discussion.— These specimens most resemble *B. payeri* by having a rounded scaphocerite, rounded pleura of the abdominal segments and similar rostrum morphology. They differ from *B. payeri* in the absence of pigmentation of the eyes. The cornea of these specimens are not damaged but I could not find any trace of pigmen-

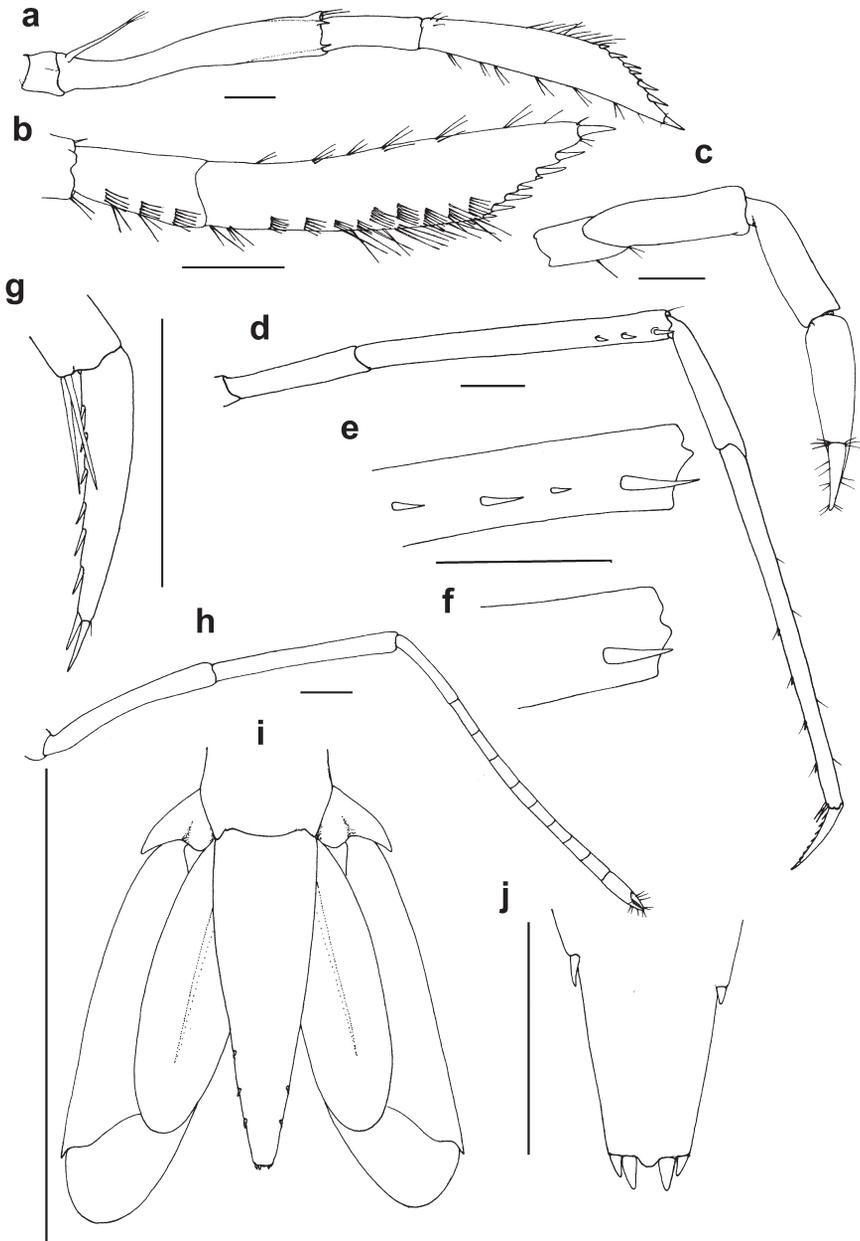


Fig. 31. *Bythocaris* sp. B, female ("Litke", St. 9), cl. 7.7 mm. a, left third maxilliped; b, detail of ultimate and penultimate segment of left third maxilliped; c, right first pereiopod; d, right fourth pereiopod; e, distal part of merus right third pereiopod; f, distal part of merus of right fifth pereiopod; g, dactylus of right third pereiopod; h, right second pereiopod; i, telson in dorsal view; j, tip of telson in dorsal view. Scale a-f, j = 1 mm; i = 1 cm.

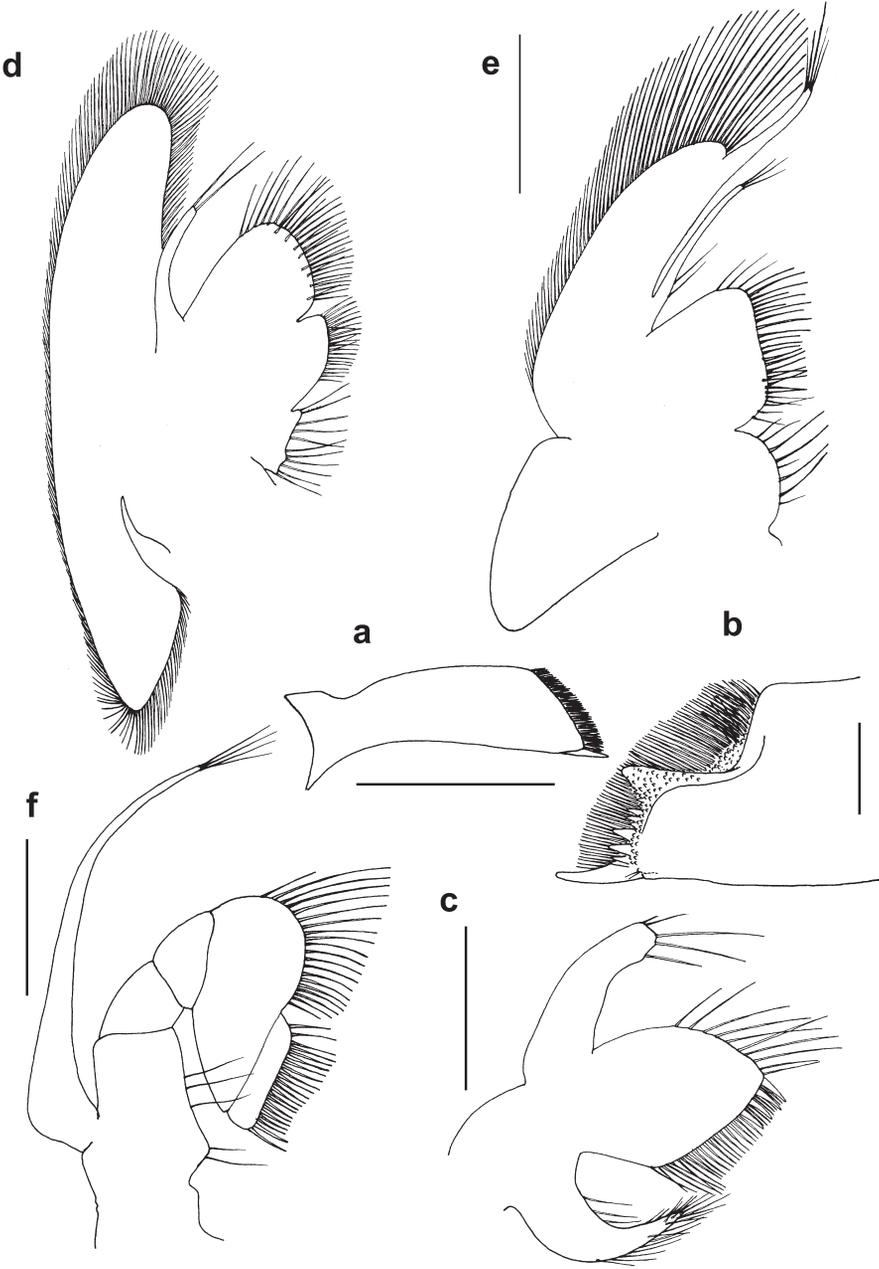


Fig. 32. *Bythocaris* sp. B, female ("Litke", St. 9), cl. 7.7 mm. a, right mandible; b, distal part of mandible; c, left first maxilla; d, left second maxilla; e, left first maxilliped; f, left second maxilliped. Scale a, c-f = 1 mm, b = 0.2 mm.

tation in it. These specimens were in alcohol for 43 years while other specimens of *Bythocaris* species with dark pigmentation did not lose it during the same time period. Another suggestion is that some specimens of *B. payeri* can lack the pigmentation of the eyes like in *B. leucopsis* or *B. irene*. It seems to me very doubtful although it has been observed for deep-water forms of *B. nana* (Abele & Martin, 1989).

Bythocaris spec. C
(fig. 33)

Material.— 1 non-ovigerous female, cl. 6.5 mm (ZISP, 14/44791); Kara Sea, 81°11'4N-66°53'E 52 m depth; 28.viii.1935; R/V "Sadko", st. 35/71, det. Z.I. Kobjakova (as *Bythocaris payeri*).— 1 non-ovigerous female, cl. 8.5 mm (ZISP, 21/53373); Kara Sea; 513 m depth; 21.viii.1934; I/S "G. Sedov", st. 34, det. L.O. Retowsky (as *Bythocaris payeri*).

Both specimens are damaged, therefore only a short description is given below.

Description.— Carapace smooth. Rostrum unarmed, triangular in dorsal view; ventral margin of rostrum concave in lateral aspect (fig. 33b). Apex sharp, strongly depressed, extending beyond eyestalks, but not overreaching eyes (fig. 33a). Rostrum flanked by pair of acute, small supraorbital teeth, slightly above level of rostrum; distance between these spines about one-fourth carapace width. Strong dorsal median carina present from level of basis of supraorbital teeth, extending posteriorly to about middle of carapace. Lower orbital angle produced. Antennal spine present just below lower orbital angle. Antennal spine developed on left side and absent on right side in female with cl. 6.5 mm. Robust hepatic spine present below antennal spine.

Abdomen smooth. Pleura of abdominal segments 1-5 rounded (fig. 33c). Dorsal surface of telson of female with cl. 6.5 mm with 4 pairs of minute spines situated close to lateral margin. Female with cl. 8.5 mm with 3 spines on right side and 4 spines on the left side. Posterior tip of telson concave (fig. 33e).

Eyes small, cornea rounded, as wide as distal part of eyestalks, with dark pigment.

Antennular peduncle with basal segment longer than combined distal segments; penultimate segment longer than distal segment. Basal segment with small spine on inner margin at about one-third distance from distal margin. Stylocerite produced laterally, extending slightly beyond midlength of basal segment.

Both scaphocerites of female with cl. 6.5 mm damaged. Scaphocerite of other specimen (fig. 33d) 0.9 times carapace length, about twice as long as antennular peduncle and 2.53 times as long as its greatest width; anterior margin rounded, projecting well beyond distolateral tooth; distolateral tooth of scaphocerite very small, hardly visible. Basal segment of antennular peduncle with strong distolateral spine.

All pereopods of female with cl. 6.5 mm, and most pereopods of other specimen lost. Second pereopod of female with cl. 8.5 mm long and slender, overreaching scaphocerite with distal 2 carpal articles. Fingers of chela with entire cutting edges. Carpus as long as merus and ischium together, subdivided into 9 articles.

Endopod of first pleopod ovate.

Discussion.— These two specimens are similar to *B. payeri*, from which they differ in the following characters: 1, in *B. payeri*, the ventral margin of the rostrum is dis-

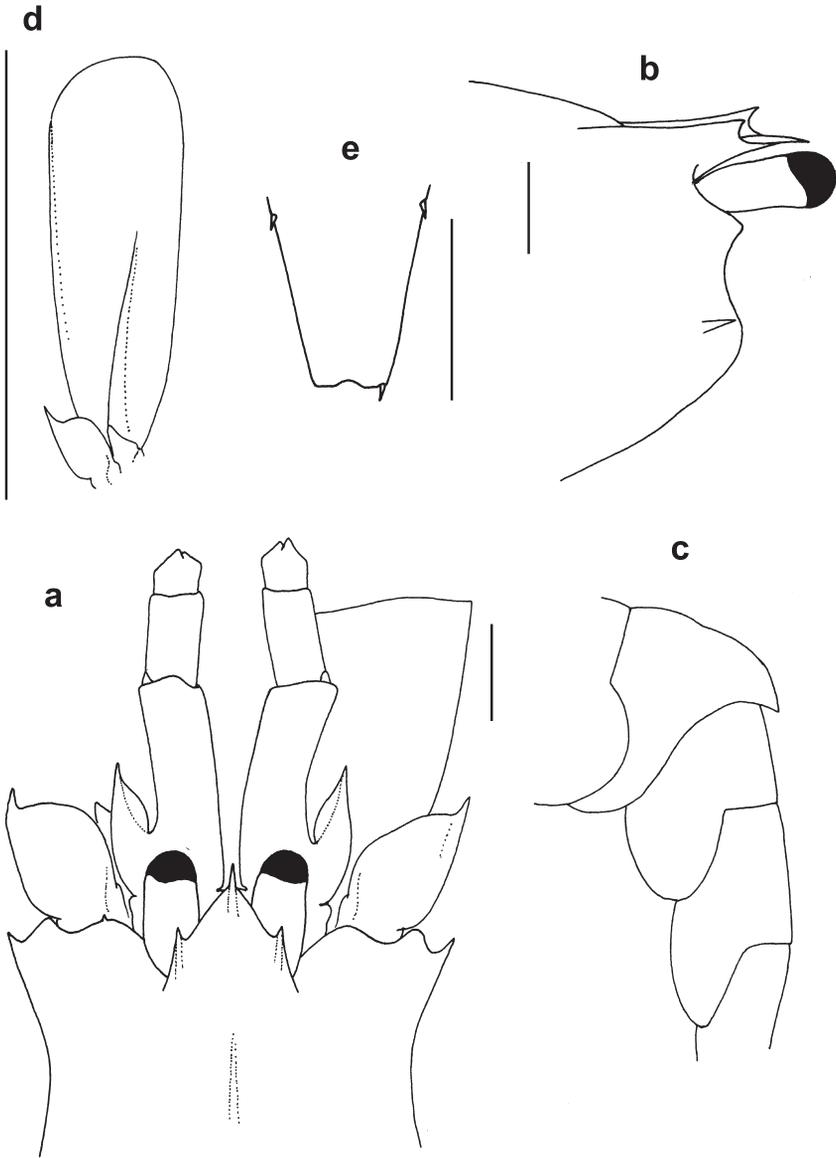


Fig. 33. *Bythocaris* sp. C. a-c, e, female (ZISP, 14/44791), cl. 6.5 mm; d, female (ZISP, 21/53373), cl. 8.5 mm. a, dorsal view of anterior region; b, lateral view of anterior part of carapace; c, lateral view of abdominal pleura 3-5; d, scaphocerite; e, tip of telson in dorsal view. Scale a, b, e = 1 mm; c, d = 1 cm.

tinctly sinuate in lateral view (Fransen, 1993) while in these specimens the rostrum has a concave ventral margin; 2, in *B. payeri*, the distolateral tooth of the scaphocerite is always strong and distinctly visible while in the female with cl. 8.5 mm the distolateral tooth of the scaphocerite is very small and hardly distinguishable; 3, in *B. payeri*, the posterior margin of the telson is slightly convex while in the present specimens

the posterior margin of the telson is distinctly concave; 4, in *B. payeri*, the rostrum usually does not reach the base of the cornea or slightly overreaches it while in the present specimens the rostrum distinctly overreaches the eye-stalks.

It is quite possible that these specimens do not belong to *B. payeri* or another known species of *Bythocaris*, but because of the following reasons I hesitate to describe these specimens as a new species: 1, these specimens are incomplete and I have no other specimens available with similar characters; 2, some of the diagnostic characters, that are given above, are quite variable in other species of *Bythocaris*.

Bythocaris spec. D
(figs 34-36)

Material.— Non-ovigerous female, cl. 8.4 mm (ZMMU); 9.viii.1957, R/V "Sevastopol", Cruise 5, st.1232.

Description.— Carapace smooth. Rostrum unarmed, triangular in dorsal view, apex sharp, slightly depressed, extending beyond eyestalks (fig. 35a). Rostrum flanked by pair of acute supraorbital teeth, slightly above level of rostrum (fig. 35b); distance between these spines about one-fourth carapace width. Strong dorsal median carina present from small acute forwardly directed spine, extending posteriorly to about middle of carapace. Lower orbital angle produced. Antennal spine present just below lower orbital angle. Robust hepatic spine present below antennal spine.

Abdomen smooth. Pleura of first two abdominal segments broadly rounded, pleura of third with blunt tooth ventrally, pleura of fourth and fifth with prominent posterolateral tooth (fig. 34a, 35c). Telson 1.3 times as long as sixth abdominal segment; dorsal surface with 4 pairs of minute spines situated close to lateral margin at 0.83-0.63-0.5-0.36 of telson length. Posterior tip of telson slightly convex and armed with 4 disto-lateral spines on right side and with 3 spines on left side (fig. 34g).

Eyes small, cornea rounded, with dark pigment.

Antennular peduncle with basal segment longer than combined distal segments; penultimate segment longer than distal segment. Basal segment with small spine present on inner margin at about one-third distance from distal margin. Stylocerite produced laterally, extending beyond midlength of basal segment. Outer antennular flagellum about twice time as long as scaphocerite, composed of 21 articles, inner flagellum about 1.5 times longer than outer flagellum.

Scaphocerite 0.9 times carapace length, 2 times longer than antennular peduncle and 2.96 times as long as its greatest width; anterior margin rounded, projecting well beyond distolateral tooth. Basal segment of antennal peduncle with strong distolateral spine.

Mandible (fig. 36a) simple, incisor process and palp absent.

First maxilla (fig. 36b) with broad upper endite with stout median setae; lower endite turned towards upper endite, narrow, with few slender, serrate setae; palp with 5 long, slender, distal setae.

Second maxilla (fig. 36c) with well-developed bilobated upper endite; distal lobe larger than proximal lobe, both lobes with many setae. Lower endite reduced to single lobe with long setae. Unsegmented palp with 4 long setae. Scaphognathite well developed.

First maxilliped (fig. 36d) with well-developed distal endite; mesial margin straight with many slender short setae. Basal endite rounded with few setae. Unsegmented palp long, with 2 long distal setae. Exopod normally developed, with caridean lobe. Epipod rather broad.

Second maxilliped (fig. 36e) of usual shape. No distinct epipod at base.

Third maxilliped (fig. 34b) overreaching scaphocerite. Ultimate segment nearly two times as long as penultimate segment, armed with 7 strong spines along distoventral border. Basal segment about 3 times as long as penultimate segment. Exopod short, with few distal setae.

First pereopod (fig. 34c) short, reaching midlength of ultimate segment of third maxilliped. Chela simple with entire cutting edges; fingers slightly longer than half length of palm; carpus 1.1 times palm length; merus slightly longer than carpus and 2.5 times as long as ischium.

Second pereopod (fig. 34d) long and slender, overreaching scaphocerite with distal 5 carpal articles. Fingers of chela with entire cutting edges. Carpus as long as merus and ischium together, subdivided into 10 articles on right side and 6 articles on left side; merus 0.6 times as long as carpus and 1.2 times as long as ischium.

Fourth pereopod lost. Third and fifth pereopods similar; third pereopod overreaching scaphocerite with half-length of propodus; ratio of lengths of third and fifth pereopods 1.0: 1.1. Dactylus of third pereopod (fig. 34f) 0.21 times propodus length, with 8 spinules on flexor margin; propodus with 7 ventral spines and 2 distoventrally. Ischium and carpus subequal, 0.41 times as long as propodus. Merus slightly shorter than propodus, with 6 distolateral spines. Fifth pereopod (fig. 34e) with one distolateral spine on merus.

Endopod of first pleopod subovate. Appendix interna on pleopod 2-5.

Discussion.— This specimen is similar to *B. payeri* (Heller, 1875), *B. miserabilis* (Abele & Martin, 1989) and *B. floridensis* (Abele & Martin, 1989). From *B. payeri* and *B. miserabilis* this specimen differs in the following characters: 1, it has the pleura of the fourth and fifth abdominal segments with a prominent posterolateral tooth and the pleura of the third with a blunt tooth ventrally while in *B. payeri* and *B. miserabilis* all the pleura are rounded; 2, in *B. payeri*, the rostrum usually does not reach the eye-stalk while in the present specimen the rostrum extends beyond the eye-stalks; 3, in *B. payeri*, the outer and inner antennular flagellum are almost equal, as long as the scaphocerite, while in the present specimen the outer antennular flagellum is about twice as long as the scaphocerite and the inner flagellum 1.5 times longer than the outer flagellum; 4, in *B. miserabilis*, the third maxilliped reaches almost to the distal margin of the scaphocerite, while in the present specimen the third maxilliped overreaches the scaphocerite by its distal 3 spines.

This specimen is most similar to *B. floridensis*. It differs in the following characters: 1, in *B. floridensis*, the pleura of the third abdominal segment is rounded, while it has a blunt tooth ventrally in the present specimen; 2, in *B. floridensis*, the rostrum does not reach the eye-stalk of the eye, while in this specimen the rostrum extends beyond the eye-stalks; 3, the telson of *B. floridensis* is armed with 6 pairs of dorsal spines, whereas in the present specimen it is armed with 4 pairs of minute spines; 4, in *B. floridensis*, the meri of the third, fourth and fifth pereopods are armed in their distal third with 2 or 3 small spines, whereas in the present specimen the merus of the

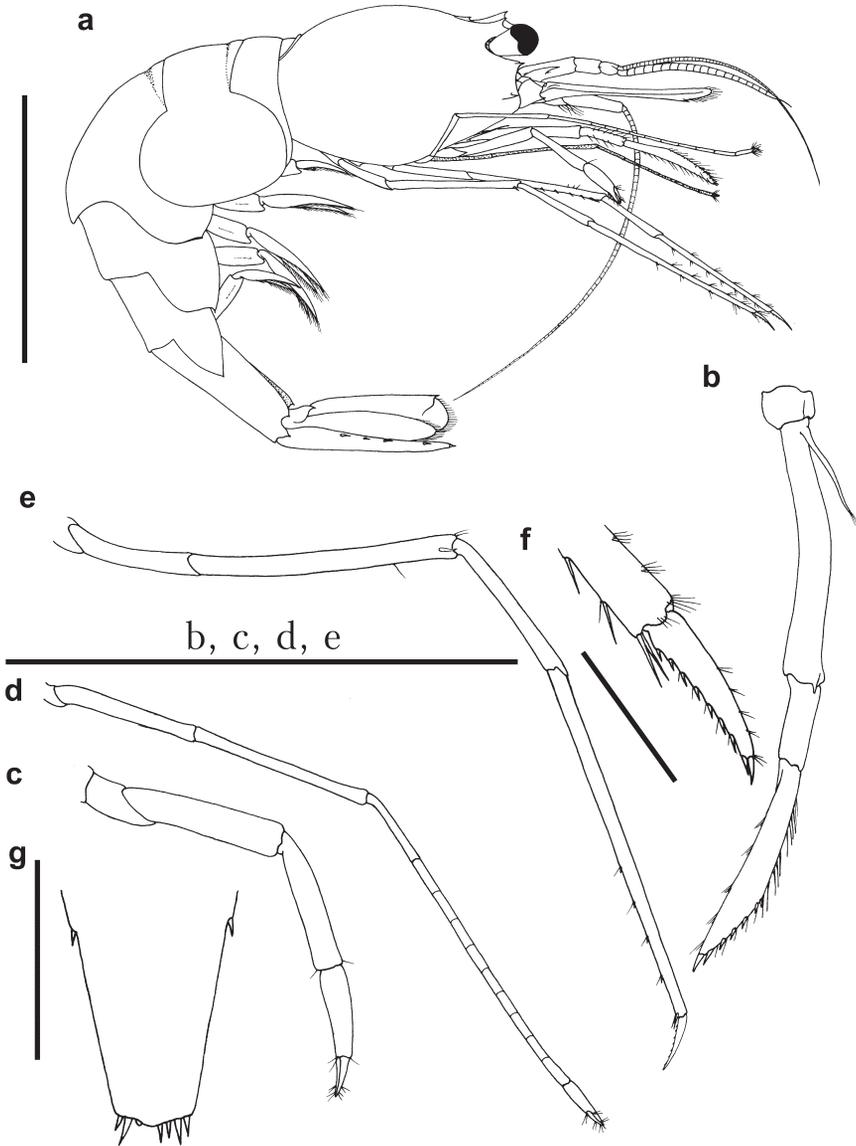


Fig. 34. *Bythocaris* sp. D, female ("Sevastopol", St. 1232), cl. 8.4 mm. a, lateral view; b, right third maxilliped; c, right first pereiopod; d, right second pereiopod; e, right fifth pereiopod; f, dactylus of right fifth pereiopod; g, tip of telson in dorsal view. Scale a-e = 1 cm; f, g = 1 mm.

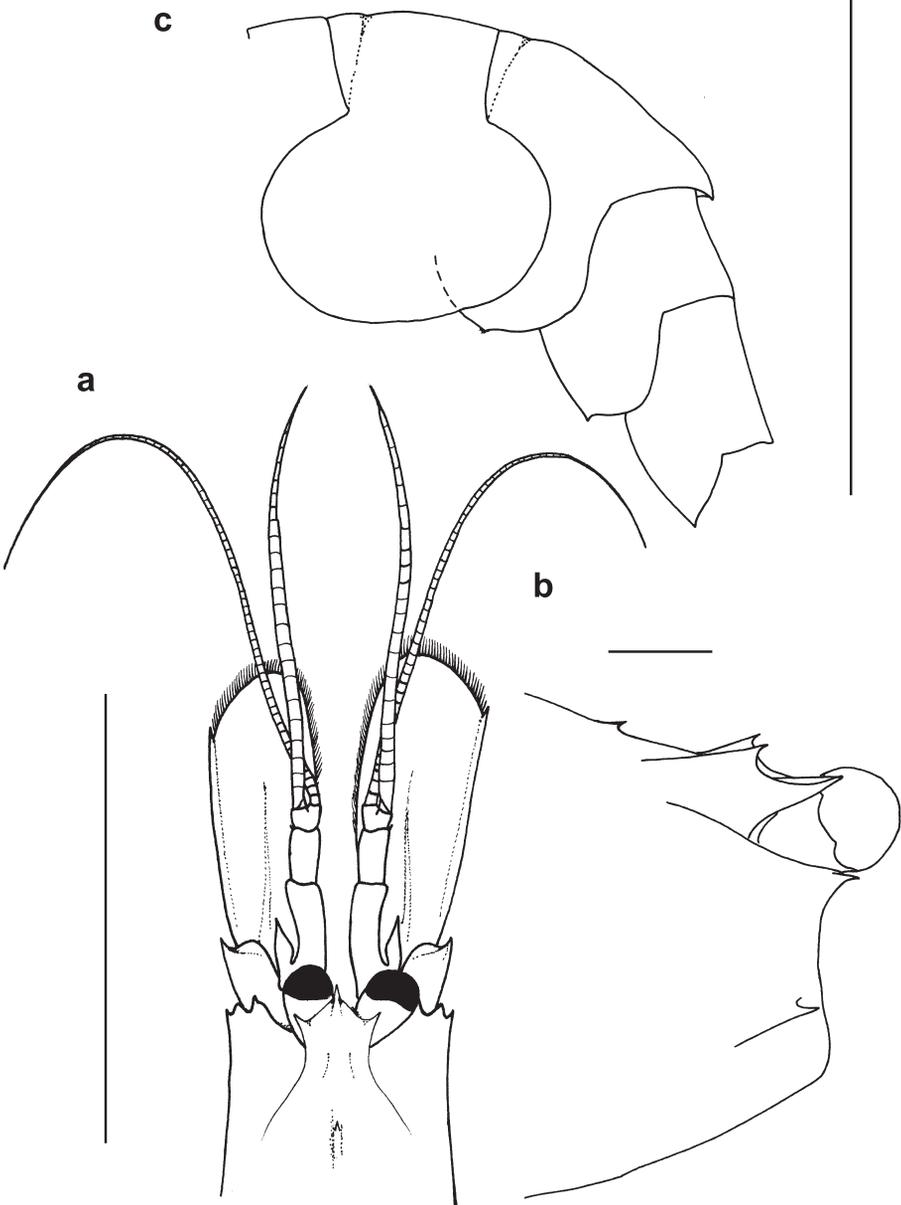


Fig. 35. *Bythocaris* sp. D, female ("Sevastopol", St. 1232), cl. 8.4 mm. a, dorsal view of anterior region; b, lateral view of anterior part of carapace; c, lateral view of abdominal pleura 2-5. Scale a, c = 1 cm; b = 1 mm.

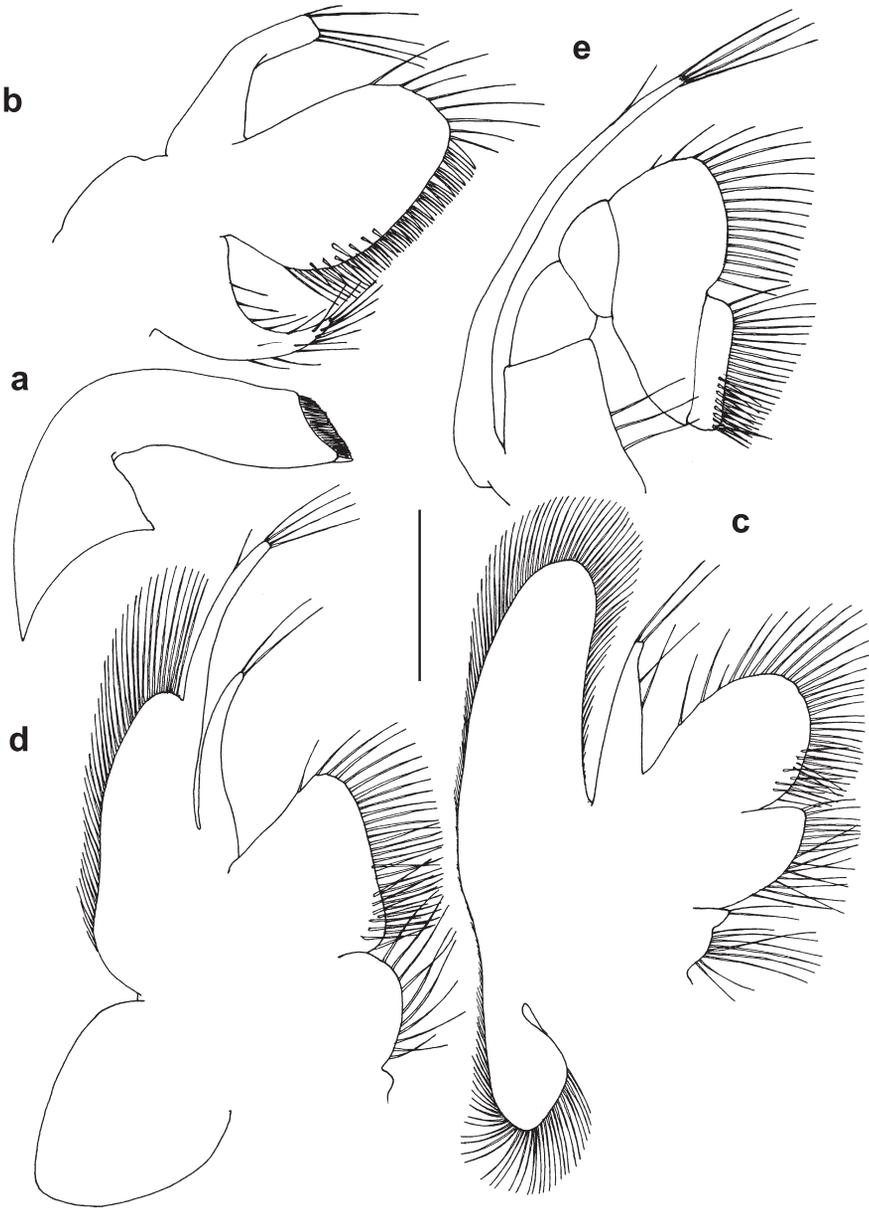


Fig. 36. *Bythocaris* sp. D, female ("Sevastopol", St. 1232), cl. 8.4 mm. a, right mandible; b, left first maxilla; c, left second maxilla; d, left first maxilliped; e, left second maxilliped. Scale 1 mm.

third pereopod is armed with 6 spines in its distal third and the fifth pereopod with one; 5, by the frontal area of the carapace and rostrum morphology. All known specimens of *B. floridensis* are small (carapace length of the largest known ovigerous female is 3.5 mm (Abele & Martin, 1989)) while the carapace length of this single female is 8.4 mm. *B. miserabilis* and *B. floridensis* are distributed along the eastern and southern coast of Florida, in depths between 220 and 815 m.

Bythocaris floridensis is known only from 6 specimens and no information is available on its intra-specific variation. I do not establish a new species for the present single specimen as it is incomplete, and as some of the diagnostic characters are quite variable in the genus, it is not possible to investigate the possible intra-specific variation.

Bythocaris kobjakovae spec. nov.
(figs 37-39)

Material.— **Holotype**: 1 non-ovigerous female, cl. 4.5 mm (ZISP, 2/40608); Laptev Sea; 1368 m depth; High latitude air expedition 1948, st. 145, led. Vagin, det. Z.I. Kobjakova (as *Bythocaris leucopis biruli*).

Description of holotype (figs 37-39).— Carapace smooth. Rostrum unarmed, with low median carina, triangular in dorsal view; apex sharp, slightly depressed, not reaching base of antennular peduncle, extending to first third of eyestalks (fig. 38a). Rostrum flanked by pair of acute, strong supraorbital teeth, slightly above level of rostrum (fig. 38b); distance between these spines about one-fourth carapace width. Strong dorsal median carina present from base of supraorbital teeth, extending posteriorly to about middle of carapace, armed with acute tooth. Lower orbital angle rounded. Antennal spine present just below orbital angle. Robust hepatic spine present below antennal spine.

Abdomen smooth. Pleura of first five abdominal segments with ventral tooth (fig. 37a). Telson (fig. 38c) and sixth abdominal segment subequal; dorsal surface of telson with 3 pairs of minute spines situated close to lateral margin at 0.81-0.54-0.47 of telson length. Posterior tip of telson slightly convex and armed with 3 pairs of distolateral spines (fig. 37h).

Eyes rather long, reaching to midlength of basal segments of antennular peduncle (fig. 38a), cornea rounded, without any dark pigment.

Antennular peduncle with basal segment 1.2 times longer than combined distal segments; penultimate segment about 1.5 times length of distal segment. Basal segment with small spine present at midlength of inner margin. Stylocerite produced laterally, extending to about distal third to distal margin of basal segment (fig. 38d). Outer antennular flagellum extending slightly beyond anterior margin of scaphocerite, composed of 10 articles, inner flagellum slightly longer than outer flagellum.

Scaphocerite 1.1 times carapace length, 2.2 times longer than antennular peduncle and 2.6 times as long as its greatest width; anterior margin rounded, projecting well beyond distolateral tooth. Basal segment of antennal peduncle with strong distolateral spine almost reaching to distal margin of basal segment of antennular peduncle.

Mandible (fig. 39a) simple, incisor process and palp absent.

First maxilla (fig. 39b) with broad upper endite with stout median setae; lower

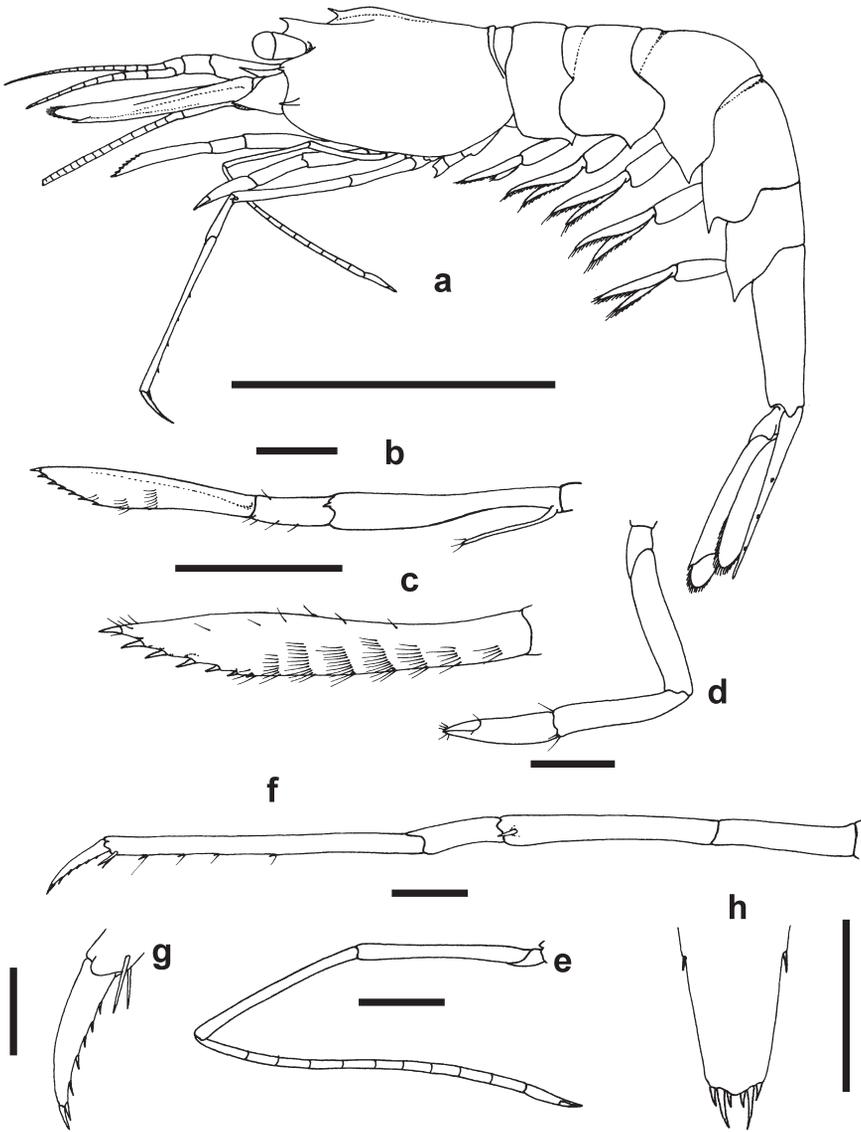


Fig. 37. *Bythocaris kobjakovae* spec. nov., female (ZISP, 2/40608), cl. 4.5 mm. a, lateral view; b, left third maxilliped; c, detail of ultimate segment of left third maxilliped; d, left first pereiopod; e, left second pereiopod; f, left fourth pereiopod; g, dactylus of left fourth pereiopod; h, tip of telson in dorsal view. Scale a = 1 cm; b-h = 1 mm.

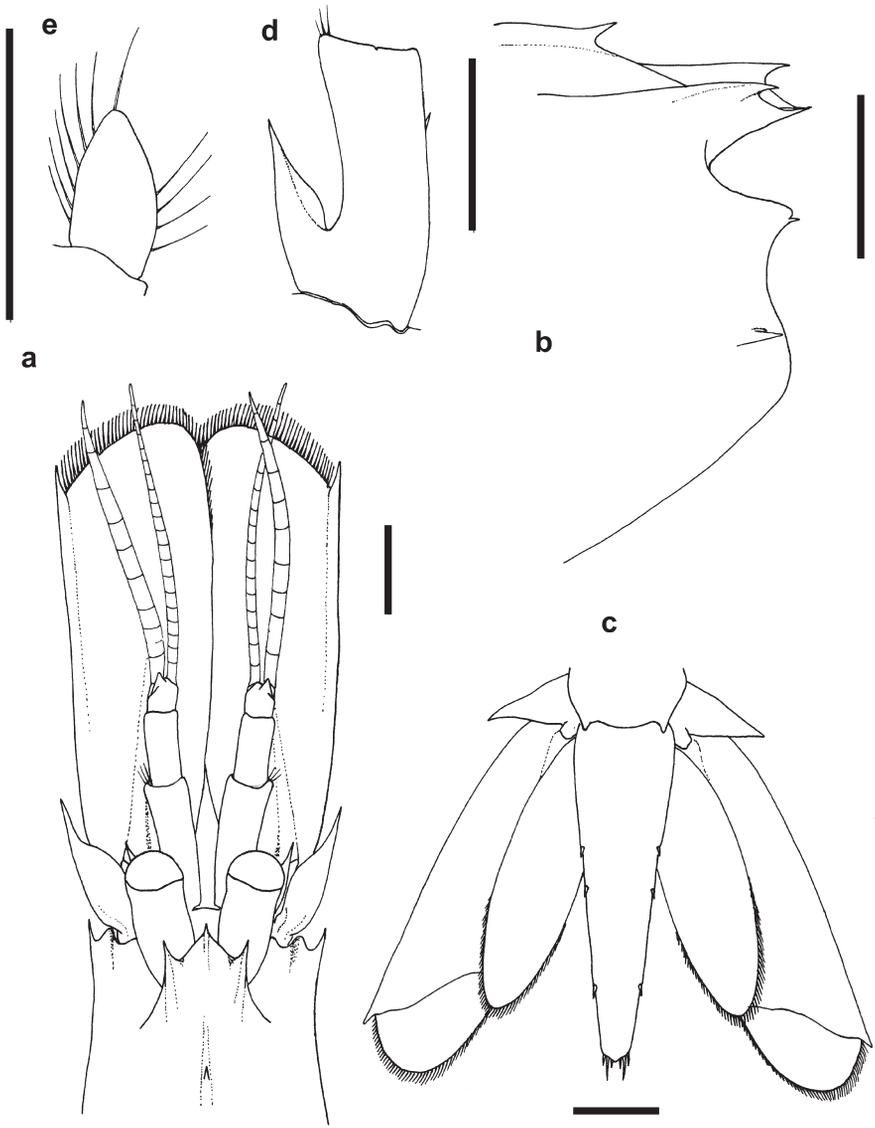


Fig. 38. *Bythocaris kobjakovae* spec. nov., female (ZISP, 2/40608), cl. 4.5 mm. a, dorsal view of anterior region; b, lateral view of anterior part of carapace; c, telson in dorsal view; d, stylocerite; e, endopod of first pleopod. Scale 1 mm.

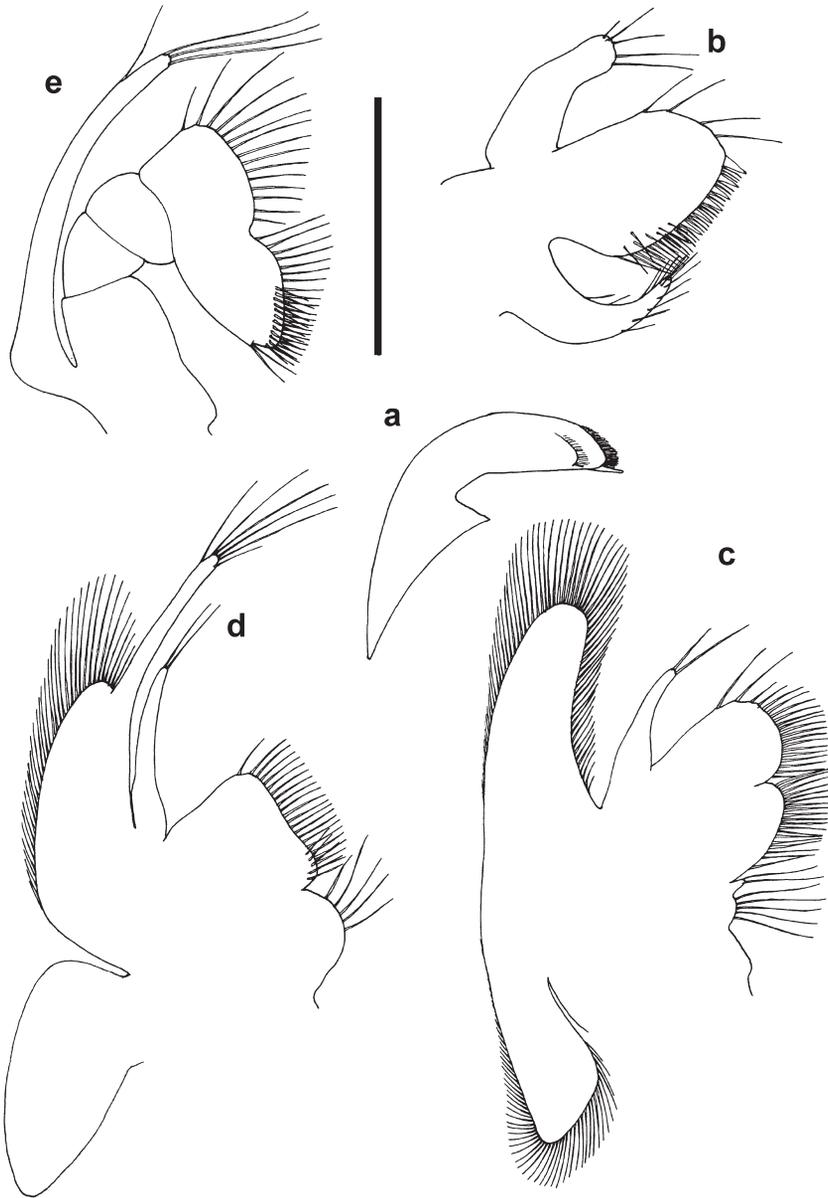


Fig. 39. *Bythocaris kobjakovae* spec. nov., female (ZISP, 2/40608), cl. 4.5 mm. a, right mandible; b, left first maxilla; c, left second maxilla; d, left first maxilliped; e, left second maxilliped. Scale 1 mm.

endite turned towards upper one, with few slender, serrate setae. Palp truncate anteriorly, with 5 long, slender, distal setae.

Second maxilla (fig. 39c) with well-developed bilobated upper endite; distal and proximal lobes subequal, with many setae. Lower endite reduced to single lobe with 7 long setae. Unsegmented palp with 2 long setae. Scaphognathite well developed.

First maxilliped (fig. 39d) with well-developed distal endite; mesial margin straight with many slender short setae. Basal endite rounded with 5 long setae. Unsegmented palp long, with 2 distal setae. Exopod normally developed, with caridean lobe. Epipod rather broad.

Second maxilliped (fig. 39e) of usual shape. Exopod slender, with 3 distal long setae and one distolaterally. No distinct epipod at base.

Third maxilliped (fig. 37b, c) reaching distolateral tooth of scaphocerite. Ultimate segment 2.7 times as long as penultimate segment, armed with 7 strong spines along distoventral border, with few transverse rows of setae on mesial surface. Basal segment 2.5 times as long as penultimate segment, slightly curved, with distolateral tooth. Exopod short, extending slightly beyond proximal third of basal segment, with few distal setae.

First pereopod (fig. 37d) short, reaching proximal third of ultimate segment of third maxilliped. Chela simple with entire cutting edges; fingers as long as half length of palm; merus and carpus subequal, about twice as long as ischium.

Second pereopod (fig. 37e) long and slender, reaching anterior margin of scaphocerite. Fingers of chela with entire cutting edges, 0.5 times palm length. Carpus slightly shorter than merus and ischium together, subdivided into 10 articles; merus 0.56 times carpus length and 1.1 times as long as ischium.

Third and fifth pereopods absent. Fourth pereopod (fig. 37f) overreaching scaphocerite with distal third of propodus. Dactylus (fig. 37g) 0.24 times propodus length, with 7 spinules on flexor margin; propodus with 4 ventral and 2 distoventral spines; merus 0.92 times as long as propodus, with one distolateral spine. Ischium 1.2 times carpus length and 0.38 times as long as merus.

Endopod of first pleopod subovate (fig. 38e). Appendix interna on pleopod 2-5.

Etymology.— The specific name *kobjakovae* is derived from the surname of the Russian carcinologist Z.I. Kobjakova, who described two species in the genus *Bythocaris*.

Remarks.— The new species resembles *B. simplicirostris* in having a proximal tooth on all pleura of the abdominal segments and an anteriorly rounded scaphocerite. They differ in the following characters: 1, in *B. simplicirostris* the rostrum always overreaches the base of the antennular peduncle and usually extends beyond the eyes, while in the new species the rostrum is short and does not reach the base of the antennular peduncle; 2, in *B. simplicirostris* the eyes have a dark pigmentation while in the present species they lack pigmentation; 3, in *B. simplicirostris* the posterior margin of the telson has a median notch while in the new species the tip of the telson is convex.

Although only a single specimen is available, the distinguishing characters are very distinct justifying the recognition of the specimen as a new species of *Bythocaris*.

Key to the species of the genus *Bythocaris*

1. Pleura of all abdominal segments with posterolateral tooth. Antennal scale anteriorly rounded 2
 - At least pleura of first two abdominal segments rounded 3
2. Rostrum reaching cornea of eyes. Eyes with dark pigment *B. simplicirostris* Sars, 1869
 - Rostrum not reaching cornea of eyes. Eyes without pigmentation *B. kobjakovae* spec. nov.
3. Inner side of eyestalk ornament with quadrangular compressed lobe. Carapace devoid hepatic, branchiostegal or pterygostomial spines *B. cosmetops* Holthuis, 1951
 - Carapace with distinct hepatic, branchiostegal or pterygostomial spine 4
4. Rostrum laterally compressed, rising above level of supraorbital teeth. Stylocerite reaching end of second segment of antennular peduncle *B. grumanti* Burukovsky, 1966
 - Rostrum dorsally compressed, not rising above level of supraorbital teeth 5
5. Meri of pereopods 3-5 devoid of spines. Eyes without pigmentation 6
 - Meri of pereopods 3-5 armed with spines 8
6. Median dorsal carina of carapace unarmed 7
 - Median dorsal carina with at least one tooth *B. leucopis* Sars, 1879
7. Rostrum at same level as supraorbital spine in lateral aspect *B. cryonesus* Bowman & Manning, 1972
 - Supraorbital teeth rising above rostrum *B. curvirostris* Kobjakova, 1957
8. Eyes with dark pigment 11
 - Eyes without dark pigment or with very light pigment 9
9. Eyestalk long, more than twice as long as wide, with broad basal and narrow distal part. Cornea small, as wide as distal part of eye-stalk .. *B. irene* Retowsky, 1946
 - Eyestalk short, with broad distal part. Cornea wider than distal part of eye-stalk .. 10
10. Eyes with very light pigment. Antennal scales rounded anteriorly. Supraorbital teeth extending to about same level as rostrum or overreaching it *B. gorei* Abele & Martin, 1989
 - Eyes without pigment. Antennal scales truncate or oblique anteriorly. Rostrum clearly overreaching supraorbital teeth *B. biruli* Kobjakova, 1964
11. Pleura of fourth abdominal segment rounded 13
 - Pleura of fourth abdominal segment with spiniform process 12
12. Median dorsal carina of carapace unarmed. Supraorbital spines reaching slightly beyond tip of rostrum *B. akidopleura* Fransen, 1993
 - Median dorsal carina of carapace with tooth. Rostrum clearly overreaching supraorbital teeth *B. floridensis* Abele & Martin, 1989
13. Hepatic spine present. Pterygostomial spine absent 14
 - Hepatic spine absent. Pterygostomial spine present *B. miserabilis* Abele & Martin, 1989
14. Rostrum short, broadly triangular in dorsal view. Supraorbital spines extending to level of rostrum or slightly overreaching it *B. nana* Smith, 1885

- Rostrum clearly overreaching supraorbital spines 15
- 15. Antennal peduncle half-length of scaphocerite or longer. Pereiopods slender
..... *B. gracilis* Smith, 1885
- Antennal peduncle less than half-length of scaphocerite. Pereiopods stout.....
..... *B. payeri* (Heller, 1875)

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