

Description of *Xanthocalanus quasiprofundus* sp. n. from the Arctic and redescription of *X. obtusus* and *X. kurilensis* from the North Pacific (Copepoda: Calanoida: Phaennidae)

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The Arctic *Xanthocalanus quasiprofundus* sp. n. differs from *X. profundus* Sars, 1907 in the larger size (7.6 vs. 6.2 mm), presence of 10 teeth on masticatory edge of Md gnathobase and of spinules near bases of central teeth, 1 very enlarged brush-like seta of distal endopodal complex of Mx2, presence of 3 sensory setae on syncoxa of Mxp and of transverse row of spinules on Re1 of P4, and some details of P5 structure. Females of *X. obtusus* and *X. kurilensis* have 1 worm-like and 7 slender brush-like sensory setae differing in length on distal endopodal complex of Mx2. Male of 5th copepodid stage of *X. kurilensis* has an additional rudimentary seta, i.e. 9 elements, on distal endopodal complex of Mx2 (number primitive for Bradfordian families). Adult male of *X. kurilensis* has here 1 enlarged brush-like seta, 4 very slender brush-like setae and 1 rudimentary seta. The presence of 1 and 2 worm-like sensory setae on Li3 and Li5 of Mx2 is noted in all 3 examined species.

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The Phaennidae genus *Xanthocalanus* is the largest among the genera of the Bradfordian families. As much as 67 species were described in *Xanthocalanus* (Razouls, 1995), but subsequently 17 species were tentatively or definitely transferred to Tharybidae or Scolecitrichidae (Bradford, 1973; Roe, 1975; Campaner, 1978; Bradford et al., 1983; Ohtsuka et al., 1998; Markhaseva, 1998; Vyshkvartzeva, 2000). Three new species of the genus have been described recently (Markhaseva, 1998). Now, about 50 species are listed in *Xanthocalanus*. The diagnosis and species composition of the genus are still not definite, as many species are poorly described, both sexes are known only for 6 species, 11 species are known after male only and some species possibly belong actually to *Thalacalanus* Wolfenden, 1911. The latter genus was redefined by Campaner (1978) and Bradford et al. (1983), but Park (1983) considered it to be a synonym of *Xanthocalanus*, so both genera need redefinition. In this paper, description of a new Arctic species and redescription of *X. obtusus* Farran, 1905 (with a new record) and *X. kurilensis* Brodsky, 1950 are presented.

Specimens for examination were selected from plankton samples preserved in 4% formaldehyde. The techniques of measurements and prepara-

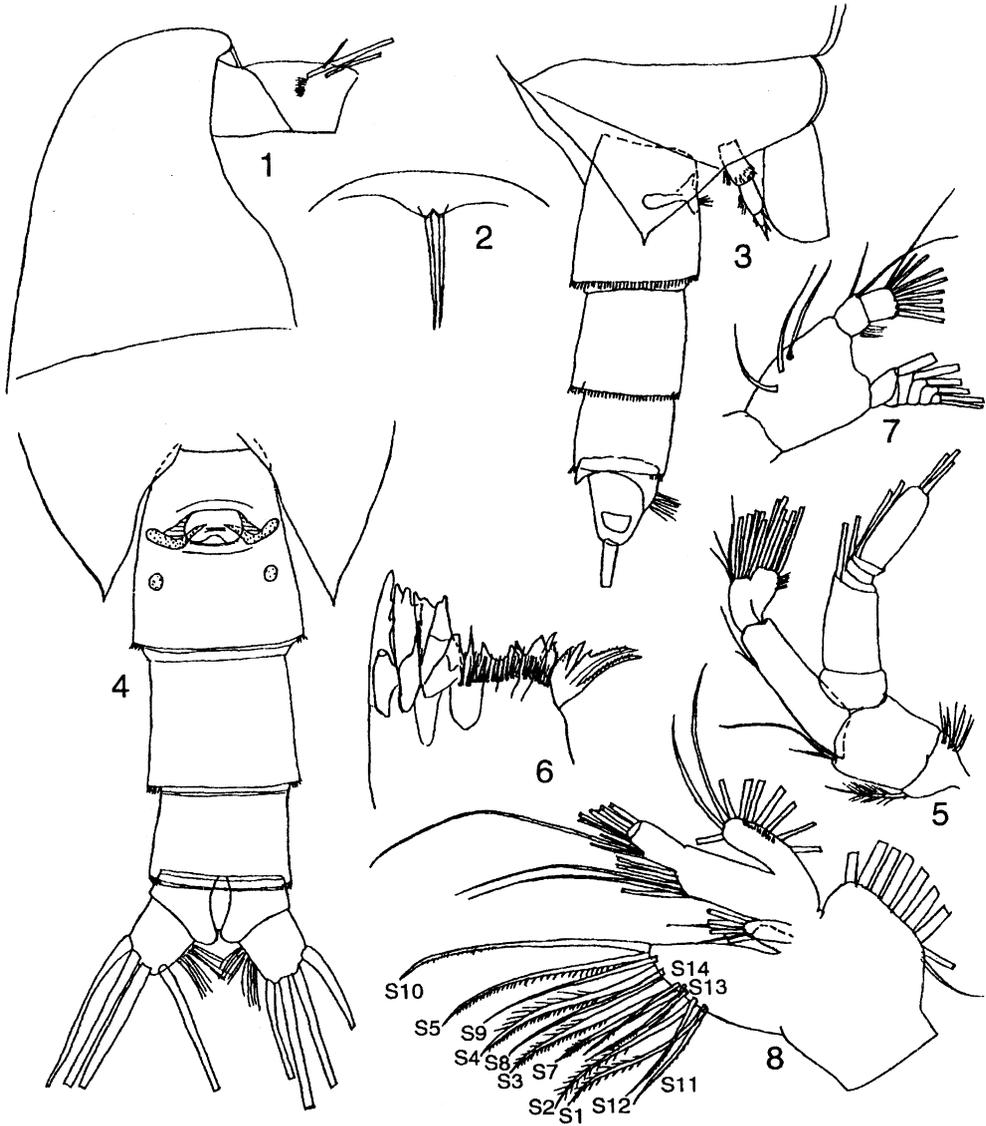
tion of slides and drawings are described by Vyshkvartzeva (2000). All specimens examined are kept in the collection of Zoological Institute, St.Petersburg (ZIN).

The following abbreviations are used in the descriptions: SmP1-SmP5 – somites bearing 1st-5th swimming legs; Ur – urosome; Ur1-Ur5 – 1st-5th urosomal somites; A1 – antennule; A2 – antenna; Md – mandible; Mx1 – maxillule (Li1 – praecoxal arthrite or gnathobase; Li2 – coxal endite; Li3 and Li4 – basal endites; Le1 – coxal epipodite); Mx2 – maxilla (Li1 and Li2 – praecoxal endites; Li3 and Li4 – coxal endites; Li5 – basal endite); Mxp – maxilliped (Li1-Li4 – 1st-4th endites of syncoxa); P1-P4 – swimming legs of 1st-4th pairs; P5 – 5th pair of legs; Re1-Re7 – 1st-6th segments of exopod; Ri1-Ri3 – 1st-3rd segments of endopod; s – seta of A1; e – aesthetasc; S1-S14 – setae of gnathobase of Mx1.

***Xanthocalanus quasiprofundus* sp. n.** (Figs 1-16)

Holotype. ♀, ZIN No. 1/90710, collected by 19th Arctic Drifting Station, 9.1.1973, station 15, catch 58, 85°54'6"N, 47°02'4"W, depth 3090 m, layer 3020-0 m.

Description. Female 7.6 mm long. Prosoma oblong. Forehead broadly rounded in dorsal and lateral view (Fig. 1). Rostrum as a short plate with



Figs 1-8. *Xanthocalanus quasiprofundus* sp. n., female. 1, forehead, right lateral view; 2, rostrum; 3, Smp5 and Ur, right side; 4, Smp5 and Ur, ventral view; 5, A2; 6, Md, gnathobase; 7, Md, palp; 8, Mx1.

two long delicate filaments directed posteriad (Fig. 2). Cephalosome and Smp5, as also Smp4 and Smp5 fused, but thin articulation sutures visible. Posterolateral corners of Smp5 produced distally as a triangular lobe with a spine-like, acute tip reaching about two-thirds of genital somite length.

Urosome (Figs 3, 4) as long as 1/4 of prosome. Four urosomal somites and furca in proportional length 39 : 24 : 18 : 9 : 10 = 100. Ur1-Ur3 striated along posterior margin. Caudal rami as long

as wide; inner margin with long setules; dorsal (S7) and ventral (S2) setae absent. Genital somite 1.3 times as long as wide, laterally without genital swelling, with a tuft of setules near genital opening (Fig. 3). Transverse genital opening and comparatively small operculum located just before midlength of genital segment. Spermatheca elongate; lateral triangular skeletal plates well developed. Paired copulatory pores lie behind genital opening (Fig. 4).



Figs 9-16. *Xanthocalanus quasiprofundus* sp. n., female. 9, Mx2; 10, Mx2, distal endopodal complex; 11, Mxp; 12, P1; 13, P2; 14, P3; 15, P4; 16, P5.

A1 24-segmented, reaching posterior margin of Ur1. Endopod of A2 about 0.75 times as long as 6-segmented exopod; Re1-Re6 with 0, 1, 1, 1, 1, 0+3 setae, respectively (Fig. 5). Mandibular gnathobase (Fig. 6) with 10 teeth and one slender dorsal spinulose seta; there are spinules of various sizes along bases of central teeth. Three ventral teeth much higher than the rest, with multicusped crowns; two central teeth unicusped; two other central and three dorsal teeth bicusped; one tip of dorsalmost tooth remarkably elongate.

Mandibular basis (Fig. 7) with 3 long inner setae; endopod as long as exopod, Ri1 with 2, Ri2 with 9 setae. Maxillule (Fig. 8): Li1 with 9 marginal, 4 posterior (S11-S14) and 1 anterior (S6) setae, length of marginal setae remarkably increase distally; Li2 with 2 long and 1 short setae; Li3 with 2 long and 2 shorter setae; Li4 with 3 long, 2 shorter and 1 small setae; Ri1 fused with basis, with 3 setae; Ri2 fused with Ri1, with 2 setae; Ri3 with 4 setae; exopod with 10 and Le1 with 9 setae.

Mx2 (Figs 9, 10) compact; Li1-Li3 short, subequal; Li1 with 5 setae (4 long plumose and 1 shorter and thinner); Li2 with 2 long plumose and 1 shorter but more coarsely plumose setae; Li3 with 1 long, plumose seta, 1 short, coarsely plumose seta, and short, worm-like sensory seta; Li4 with 1 long plumose seta, 1 shorter and more coarsely plumose seta and 1 more strongly sclerotised long seta tapering distally, with long, strong, dense spinules; Li5 with 2 strong claw-like setae (one plumose and one with very strong spinules) and 2 worm-like setae, of which one is tapering and seems only partly transformed; endopod (Fig. 10) indistinctly 4-segmented; Ri1-Ri3 each bearing 2 brush-like sensory setae; one brush-like seta of Ri3 much shorter and thicker, with apical brush formed of numerous long setules; Ri4 with 1 brush-like and 1 worm-like sensory seta (distal part of worm-like seta seems to be missing).

Syncoxa of Mxp with 1 plumose seta and 2 worm-like setae proximally, the latter with setular rows along their length; with 1 seta and 1 brush-like sensory seta medially; with 3 plumose setae subterminally and patch of minute spinules terminally; basis slightly longer than syncoxa, bearing patch of minute spinules proximally and 3 plumose setae medially; endopod as long as 2/3 of basis, with 2+4, 4, 4, 3, 3+1 outer and 4 terminal setae respectively; one of the setae on each Ri1-Ri3 stout, spinulose, with scythe-shaped terminal part (Fig. 11).

P1-P4 (Figs 12-15) with segmentation typical of the family. Ri2 of P2 on posterior surface of both legs (Fig. 13) with two rows of 6 and 7 long spinules, respectively, and arc of small spinules distally. Posterior surface of P3 (Fig. 14): Ri2 with 2 rows of 5 long and 5 shorter spinules on both legs; Ri3 medially with row of 5 long and 2 short spinules on one leg and row of 6 long spinules on the other and an arc of small spinules distally on each leg. Posterior surface of P4 (Fig. 15): Ri2 with patches of short spinules; Ri3 with 3 patches of spinules of various sizes; Re2 with transverse row of spinules proximally and arc-like patch of spinules distally; Re3 with spinules along segment. Ri2 of P3-P4 with a row of 12-14 long spinules along outer margin near the base of outer distal spine-like process; Re2 of P2-P4 with 10-13 short spinules along inner margin of shorter outer spine.

P5 (Fig. 16) uniramous, 3-segmented; proximal segment on inner margin with row of small spinules proximally and short thickened spinules distally; second segment twice as long as wide and slightly longer than distal segment, with patch of long lancet-like spinules along distal half of outer margin; distal segment 2.2 times as long as wide, its posterior surface with long spinules

plus group of shorter spinules distally, terminally there are 4 serrate spines: 2 apical (inner slightly longer than outer), one, the longest, inner, and one outer spine as long as 2/3 of inner and situated opposite to inner spine.

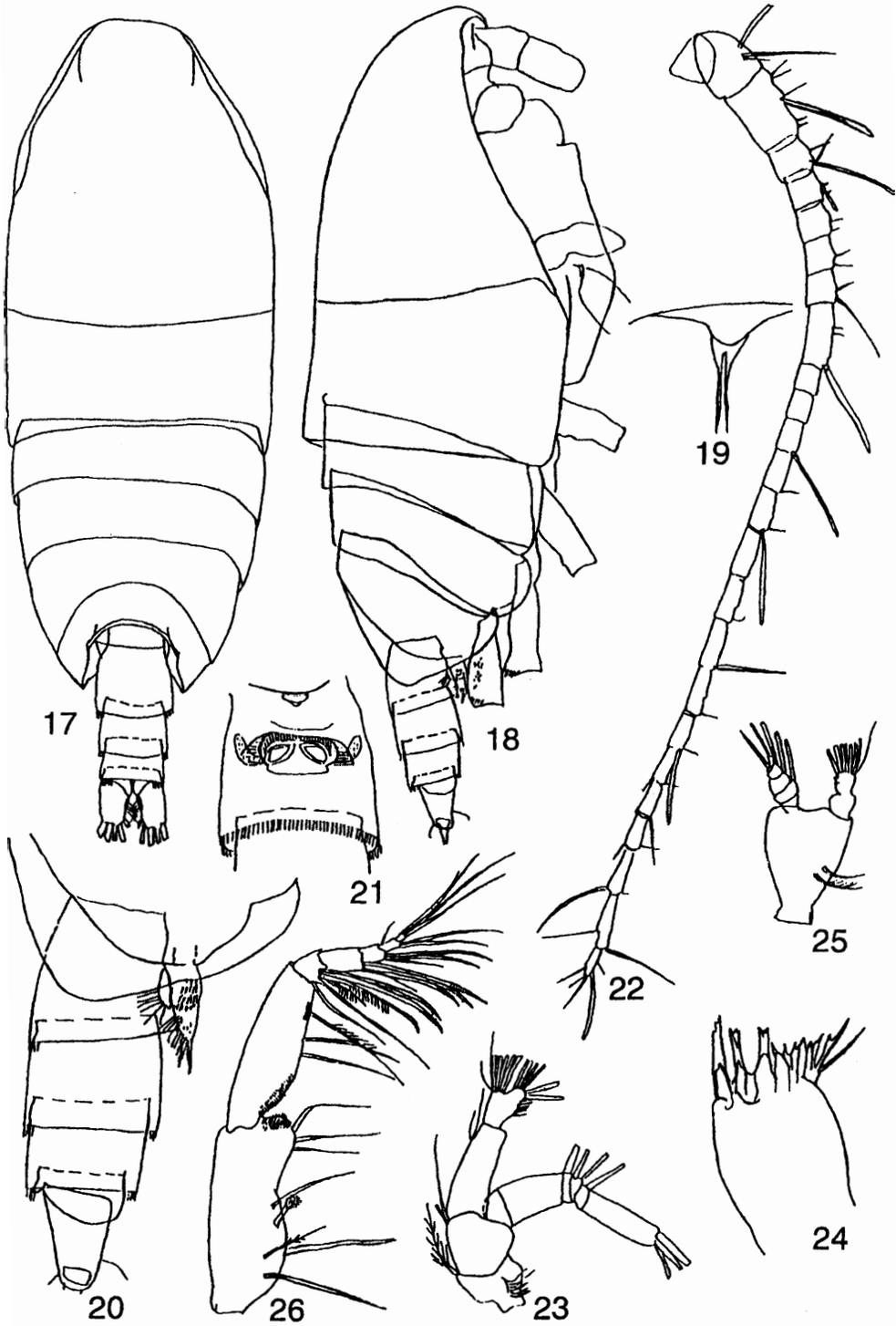
Comparison. The new species is very close to *X. profundus* Sars, 1907 (Sars, 1924-1925: 125, Pl. 34), but differs in the larger size (7.6 vs. 6.2 mm), presence of 10 teeth on masticatory edge of Md gnathobase (vs. 8 teeth, according to Sars's Fig. 6) and of spinules near bases of central teeth, one worm-like sensory seta and 2 plumose setae on Li3 of Mx2 (vs. 3 plumose setae, according to Sars's Fig. 8), one brush-like seta of Mx2 endopod much thicker and shorter compared with 6 others, apical filaments of brush-like sensory setae longer (vs. all brush-like setae similar and delicate, according to Sars's description and Fig. 8), syncoxa of Mxp with 8 setae (as in Sars's Fig. 9), but in the new species there are 3 sensory setae, of which 2 are worm-like and 1 short brush-like (vs. only plumose setae, according to Sars's Fig. 9), Re1 of P4 with transverse row of spinules.

P5 of the new species has the second segment slightly longer than the distal one and the inner spine on the distal segment placed opposite to the outer one. P5 of Sars's specimens (his Fig. 14) has the distal segment longer than the second one and placement of inner and outer spines on distal segment non-opposite; one female has P5 (Fig. 15) with almost opposite placement of inner and outer spines, but the comparative length of terminal spines differs from that of the new species.

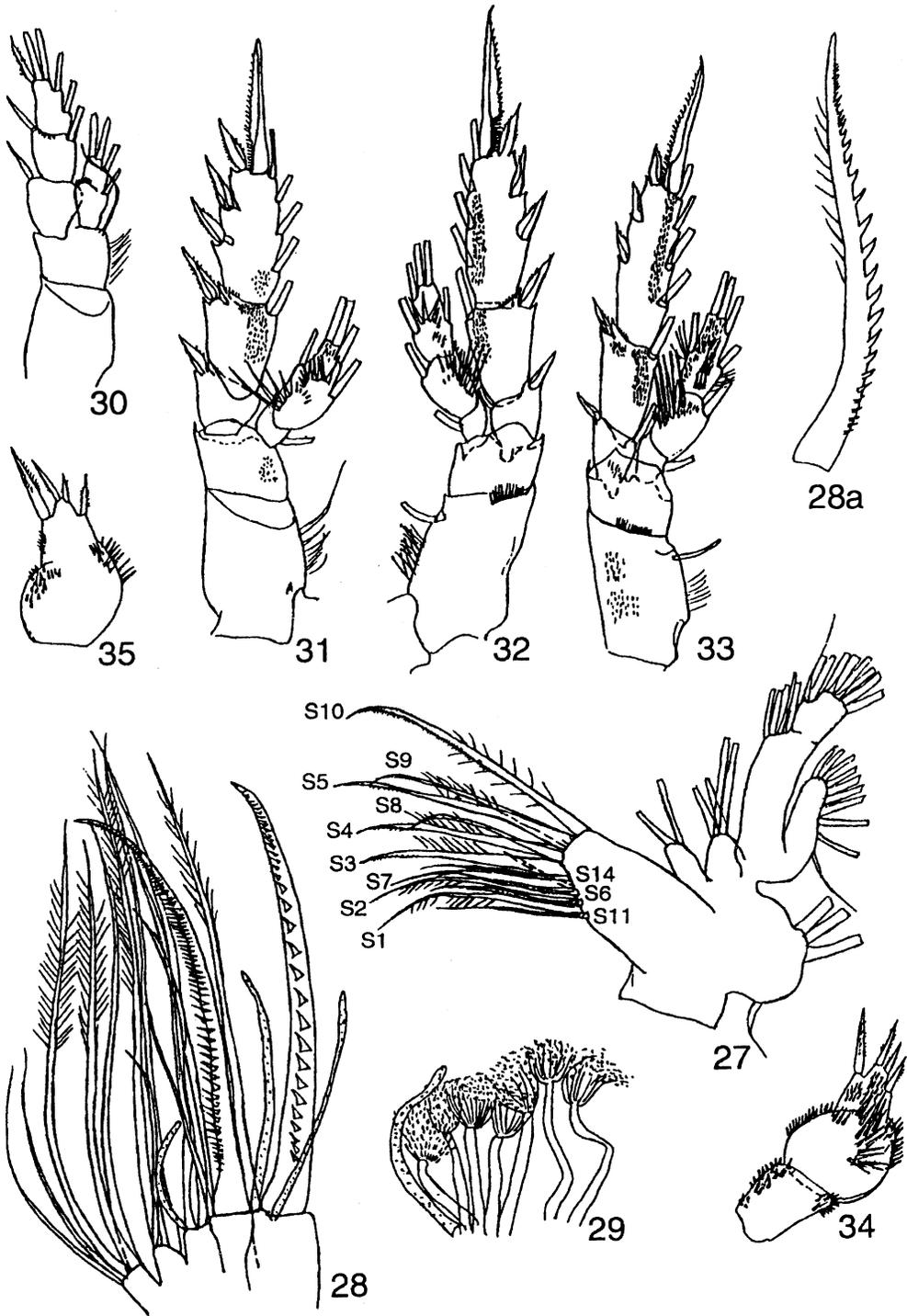
X. profundus recorded from the North-West Pacific and poorly described by Tanaka (1960: 89, Fig. 83) has smaller size (female length 4.69 mm), A1 reaching SmP4, segments of exopod of P4 without spinules on posterior surface; these features distinguish it from Sars's species as also from *X. quasiprofundus* sp. n., but feet *X. pinguis*, and, as noted by Tanaka (p. 90), the specimen seems in fact "to be an example of *X. pinguis* Farran, 1905 which has deformed P5". Campaner (1978) tentatively placed *X. profundus* in the *X. agilis* group characterised by slender subequal brush-like setae of endopodal complex of Mx2. *X. quasiprofundus*, in contrast to *X. profundus*, could belong to the *X. minor* group, where one brush-like seta of endopod of Mx2 is enlarged, shorter and wider than 6 other brush-like setae.

***Xanthocalanus obtusus* Farran, 1905** (Figs 17-34)

Xanthocalanus obtusus Farran, 1905: 28-29, 40, Pl. 9, Figs 10-19; Sars, 1924-1925: 131, Pl. 35, Figs 11-13; Rose, 1933: 130, Fig. 119; Sewell, 1948: 501; Grice & Hulsemann, 1967: 16; Campaner, 1978: 968; Bradford et al., 1983: 71; Razouls, 1995: 298.



Figs 17-26. *Xanthocalanus obtusus* Farran, 1905, female. 17, habitus, dorsal view; 18, the same, right lateral view; 19, rostrum; 20, Smp5 and Ur, right side; 21, genital somite, ventral; 22, A1; 23, A2; 24, Md, gnathobase; 25, Md, palp; 26, Mxp.



Figs 27-35. *Xanthocalanus obtusus* Farran, 1905, female. 27, Mx1; 28, Mx2, Li1-Li5; 28a, Mx2, claw-like seta of Li5 in another position; 29, Mx2, sensory setae of distal endopodal complex; 30, P1; 31, P2; 32, P3; 33, P4; 34, P5, dorsal side; 35, P5, two distal segments, ventral side.

Material examined. 1 ♀ collected in 39th cruise of R/V Vitjaz, 23-24.VIII.1966, St. 55626, 45°11'N, 152°28'E, layer 5020-6140 m, collected by BR 113.

Description. Female, 3.12 mm in length. Body (Figs 17, 18) oblong oval. Cephalon narrowly rounded in lateral and almost truncated in dorsal view. Rostrum (Fig. 19) as a short plate with 2 thin filaments. Cephalosome and SmP1, as also SmP4 and SmP5 separated by thin sutures. Posterolateral corners of SmP5 slightly produced, broadly rounded in lateral view, triangular in dorsal view.

Urosome (Fig. 20) as long as 1/4 of prosome. Genital somite as long as wide, laterally with a small genital swelling in distal half of somite. Transverse common genital opening (Fig. 21) located ventrally just before midlength of genital segment; lateral triangular skeletal plates well developed; spermatheca elongate, its distal part curved forward. Ur2 and Ur3 wider than long; posterior margin of Ur1-Ur3 striated. Caudal rami longer than wide, with 4 long apical and short inner and outer setae.

A1 (Fig. 22) of 24 segments, reaching posterior margin of Ur1. Coxa of A2 with 1, basis and Ri1 with 2 setae; Ri2 with 6+7 setae; endopod as long as 2/3 of exopod; Re1-Re6 with 0, 1, 1, 1, 1, 0+3 setae, respectively (Fig. 23). Mandibular gnathobase (Fig. 24) with 10 teeth and 1 dorsal, slender, spinulose seta on cutting edge. Three ventral teeth with tall and narrow multicusped crowns; central and dorsal teeth shorter, without crowns; one tip of dorsalmost tooth remarkably elongate, as long as dorsal seta; mandibular basis (Fig. 25) with 2 strong inner setae; Ri1 without setae; Ri2 with 8 setae; endopod as long as exopod.

Mx1 (Fig. 27): Li1 with 9 marginal, 4 tapering, with short spinules posterior (S11-S14), and 1 short, slender anterior setae (S6). Marginal setae longer than Li1, and their lengths remarkably increase distally; S1 and S2 tapering towards the tip, with long staff spinules; S3-S5 and S10 strongly sclerotised, with scythe-like tip, with setules along their length and sharp spinules along proximal margin in distal half. Li2 with 2 long and 1 short setae; Li3 with 2 long and 2 shorter setae; Li4 with 3 long and 2 shorter setae; Ri1 partly fused with basis; Ri2 fused with Ri1, each with 2 very long and 1 short setae; Ri3 with 4 setae; exopod with 10 and Le1 with 9 setae.

Mx2 (Figs 28, 29) compact; Li1-Li3 short, subequal; Li1 with 5 setae (3 long plumose and 2 naked and shorter); Li2 with 2 long plumose and 1 shorter but more coarsely plumose setae; Li3 with 1 long plumose and 1 shorter plumose seta and short worm-like sensory seta; Li4 with 1 long plumose seta, 1 shorter and more coarsely plumose seta and 1 more strongly sclerotised long

seta with long, strong, dense spines; Li5 with 1 strong claw-like seta furnished with 31 strong, widely spaced spines (Fig. 28a), 1 slightly longer plumose seta and 2 worm-like sensory setae; distal endopodal complex (Fig. 29) indistinctly 4-segmented, with 7 brush-like and 1 worm-like sensory setae; brush-like setae slender, slightly differing in length.

Syncoxa of Mxp (Fig. 26) with 1 plumose and 2 worm-like setae proximally, 1 spinous seta and 1 brush-like sensory seta medially, 3 plumose setae subterminally, and patch of minute spinules terminally; basis slightly shorter than syncoxa, bearing patch of minute spinules proximally, 3 plumose setae medially and a row of thin spinules near distal seta; endopod as long as 2/3 of basis, with 2+4, 4, 3, 2+1 outer and 4 terminal setae, respectively; 3, 3 and 2 setae on Ri1-Ri3, respectively, stout, sabre- or scythe-like, spinulose.

P1 (Fig. 30), P2 (Fig. 31), P3 (Fig. 32) and P4 (Fig. 33) with armament of posterior surface as shown in the figures. Anterior surface of coxa on P2-P4 with patches of small spinules; Ri2 of P3-P4 with row of 12-13 long, thin spinules along outer margin; inner margin of second, smaller outer spine of Re2 of P2-P4 with row of 6-7 short spinules.

P5 (Figs 34, 35) uniramous, 3-segmented; proximal segment slightly longer than wide, with patch of short, thickened spinules along inner margin and on outer distal margin; second segment about as long as wide, globular, slightly longer than distal segment, with patches of spinules along inner margin and distal half of lateral margin and with a row of long, lancet-like spinules on posterior surface; distal segment the shortest, separated from preceding only on one side (Fig. 35); posterior surface covered with spinules; segment bearing 4 serrate spines: one, the longest, inner; one, outer, 2/3 times as long as inner, situated opposite to the inner, and 2 apical (inner apical as long as outer; outer apical slightly shorter).

Distribution and size variation. Northern Atlantic: west of Ireland, 53°58'N, 12°28'W, 706 m, 2.4 mm (Farran, 1905); near Azores and Madeira Islands, in trap placed at the bottom, depth 3465 and 2680 m, respectively, 3.3 mm (Sars, 1924-1925). North-West Atlantic, south of Woods Hole, 20-50 cm above bottom, depth 1500 m, length not indicated (Grice, 1972). Western Indian Ocean, 2000-3000 m, length not indicated (Grice & Hulsemann, 1967). North-West Pacific (new record), 45°11'N, 152°28'E, layer 5020-6140 m, 3.12 mm. So the species seems to be planktobenthic-bathypelagic.

Remarks. The specimen described above is similar in the body shape and size and in the length of spines of P5 distal segment to that de-

scribed by Sars (length 3.3 mm) rather than to that of Farran (2.4 mm); the armament of P1-P4 seems quite well coincide with Farran's description; mouthparts are described by Farran and Sars very generally. P5 of the examined specimen differs slightly from that described by Farran and Sars in the presence of spinules on outer distal corner of first segment, more globular second segment partly separated from the third one, presence on posterior surface of 2nd segment of spinules much longer than the other spinules. But with regard to the very characteristic broadly rounded posterolateral corners of SmP5 and similar armament of P1-P4, the specimen from the North Pacific is assigned to *X. obtusus* till more detailed reexamination of mouthparts of the type specimen.

***Xanthocalanus kurilensis* Brodsky, 1950**
(Figs 35-70)

Xanthocalanus kurilensis Brodsky, 1950: 229, Fig. 142.

Material examined (syntypes). 3 ♀, 3 ♂, 2 ♀ of 5th copepodid stage and 1 ♂ of 5th copepodid stage, Sea of Okhotsk, Iturup Island, Bay of Maskasy, 44°35'N, 147°00'E, depth 545 m, layer 0-390 m, 8.IX.1948, r/v "Toporok", Kuril-Sakhalin expedition.

Description. Female. Length 3.4-3.5 mm. Body oblong oval. Cephalon narrowly rounded in lateral (Fig. 36) and broadly rounded in dorsal view. Rostrum (Fig. 36) as a short plate with 2 thin filaments. Cephalosome and SmP1, as also SmP4 and SmP5 fused, but thin sutures sometimes visible. Posterolateral corners of SmP5 produced, triangular, pointed, reaching just beyond middle of genital somite in lateral (Fig. 37) and dorsal view (Fig. 38).

Urosome (Figs 37, 38) about as long as 1/4 of prosome. Genital somite as long as wide, laterally without genital swelling, with a patch of setules just behind midlength of genital segment, just behind the genital opening. Spermatheca oblong oval, directed dorsad. Ur2 and Ur3 slightly longer than wide or thick; posterior margin of Ur1-Ur3 striated. Caudal rami as long as wide, with 4 long apical setae (S3-S6; S4 twice as long as S5) and short outer (S2) and inner (S7) setae.

A1 of 24 segments, reaching the middle of Ur2. Coxa of A2 (Fig. 44) with 1 seta, basis and Ri1 with 2 setae each; Ri2 with 6+8 setae; endopod as long as 2/3 of exopod; Re1-Re6 with 0, 1, 1, 1, 1, 1+3 setae, respectively. Mandibular gnathobase with 10 teeth and 1 dorsal, slender, spinulose seta on cutting edge. Mandibular basis (Fig. 45) with 3 inner setae; Ri1 with 2 and Ri2 with 9 setae; endopod as long as exopod.

Mx1 (Figs 46, 47): Li1 with 9 marginal, 4 tapering, with short spinules posterior (S11-S14), and 1 short, slender anterior setae (S6). Marginal

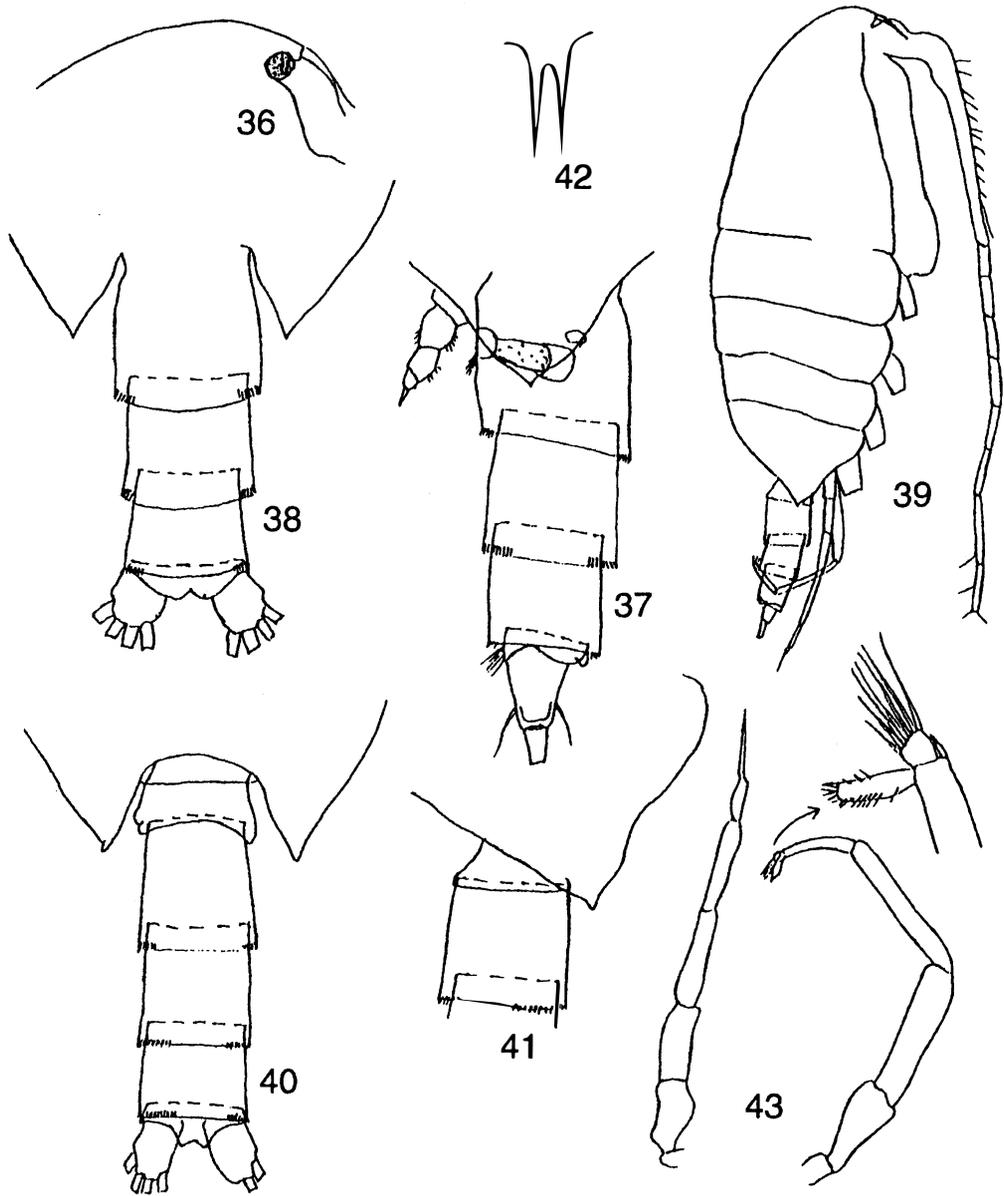
setae longer than Li1, and their lengths remarkably increase distally; S1 and S2 tapering towards tip, with long staff spinules; S3-S5 and S10 more strongly sclerotised, with scythe-like tip, with setules along their length and sharp minute spinules along proximal margin in distal half. Li2 with 2 long and 1 short setae; Li3 with 2 long and 2 shorter setae; Li4 with 3 long and 2 shorter setae; Ri1 fused with basis, Ri2 fused with Ri1, each with 2 very long and 1 short setae; Ri3 with 4 setae; exopod with 9 and Le1 with 7 long and 2 short setae.

Mx2 (Fig. 48) compact; Li1-Li3 short, subequal; Li1 with 5 setae (all setae plumose); Li2 with 2 long plumose and 1 shorter and more coarsely plumose setae; Li3 with 1 long plumose, 1 shorter plumose seta, and 1 short worm-like sensory seta; Li4 with 1 long plumose, 1 shorter and more coarsely plumose setae, and 1 strongly sclerotised long seta with long, strong, dense spines; Li5 with 1 strong claw-like seta furnished with about 50 strong, widely spaced spines, 1 not so strong claw-like and plumose seta and 2 worm-like sensory setae; endopod indistinctly segmented, with 7 brush-like and 1 worm-like sensory setae; brush-like setae slender, differing in length.

Syncoxa of Mxp (Fig. 49) with 1 plumose and 2 worm-like setae proximally, the latter bearing setules in proximal half; with 1 spinous seta and 1 brush-like sensory seta medially; and with 3 plumose setae subterminally. Basis of Mxp slightly longer than syncoxa, bearing 2 plumose setae medially and 1 seta more distally; endopod as long as 2/3 of basis, with 2+4, 3, 3, 3+1 outer and 4 terminal setae, respectively; 1 seta on Ri1, Ri2 and Ri4 and 2 setae on Ri3 stout, sabre-like, spinulose.

P1 (Fig. 50), P2 (Fig. 51), P3 (Fig. 52) with armament of posterior surface as shown in figures. Ri2 of P3 with row of 7 spinules along outer margin; inner margin of second, smaller outer spine of Re2 of P2-P3 with row of 6-7 short spinules. P4 as in male; posterior surface of Re2 with transverse row of spinules, of Ri2-Ri3 with spinules of different sizes; Ri2 of P4 with row of 5-7 spinules along outer margin.

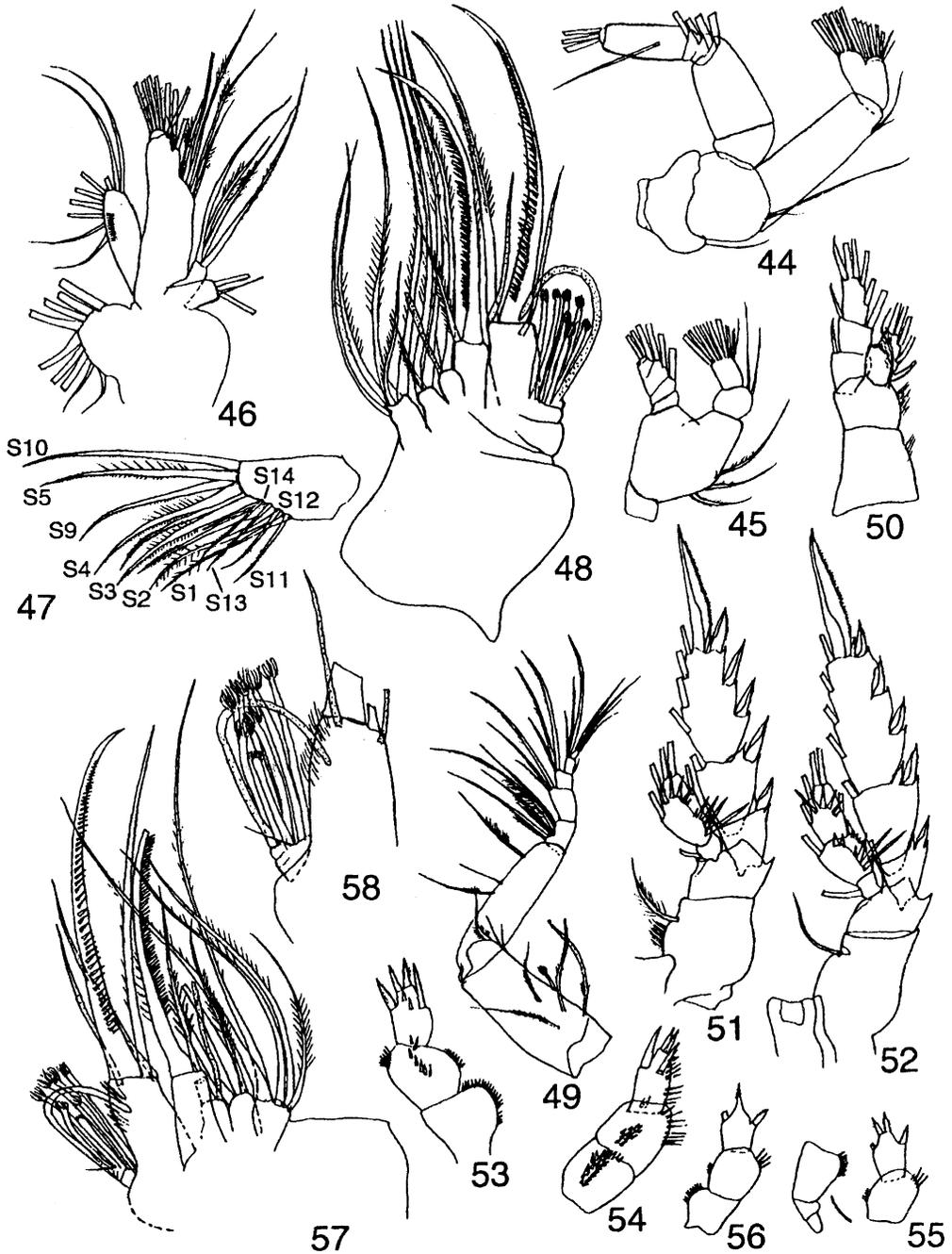
P5 (Figs 53, 54) uniramous, 3-segmented; proximal segment as long as wide, with inner swelling, small spinules proximally and more strong spinules distally along inner margin; second segment about as long as wide, globular, with patches of spinules along inner margin and distal half of outer margin, and with a row of spinules on posterior surface; distal segment about as long as preceding, with spinules on posterior surface more abundant on one leg, with 4 serrate spines: inner the longest, outer spine as long as 2/3 of inner, situated opposite to the inner, 2 apical spines subequal.



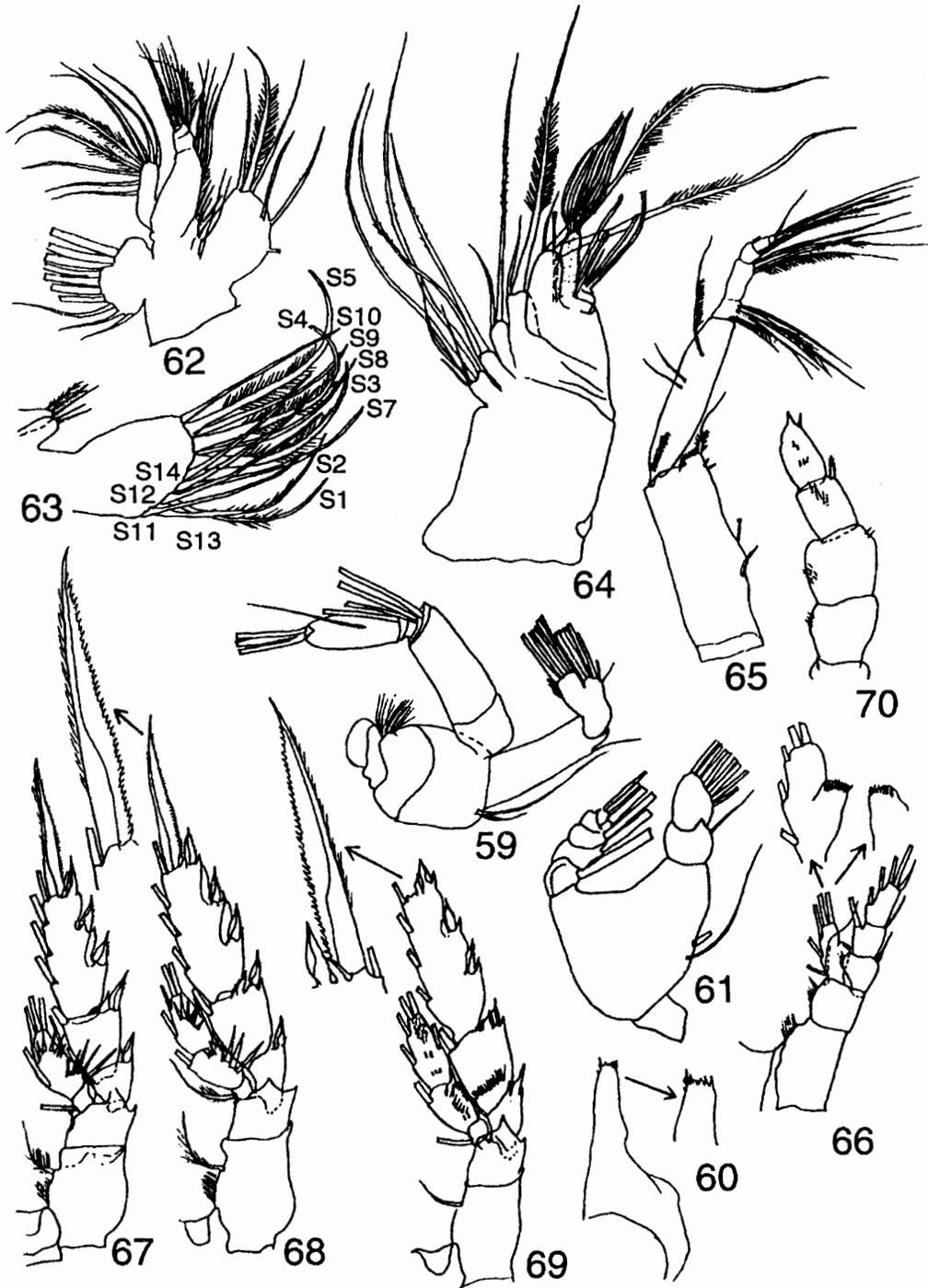
Figs 36-43. *Xanthocalanus kurilensis* Brodsky, 1950 (36-38, female; 39-43, male). 36, forehead, right lateral view; 37, SmP5 and Ur, left lateral view; 38, SmP5 and Ur, dorsal view; 39, habitus, right lateral view; 40, SmP5 and Ur, dorsal view; 41, SmP5 and Ur1-Ur2, right lateral view; 42, rostrum; 43, P5.

Male. Body length 3.3 mm; shape almost as in female (Fig. 39), but with slightly shorter, triangular, pointed posterolateral corners of SmP5 reaching just beyond Ur1 (Figs 39-41). Rostrum (Fig. 42) with 2 more rigid than in female, tapering filaments. Prosome 3.4 times as long as urosome. Ur2-Ur4 slightly longer than wide (Fig. 40).

A1 reaching caudal rami, of 21 segments, 8-9th and 10-12th segments of typical 25-segmented A1 fused. Armature as follows: I - 1 s, 1 e; II - 2 s, 1 e, 1 s, 1 e, 2 s, 2 e; III - 2 s, 2 e; IV - 1 s, 1 e; V - 1 s, 2 e; VI - 1 s, 1 e; VII - 2 s, 1 e; VIII - 1 s, 1 e, 2 s, 2 e; IX - 1e, 1s?; X - ?; XI - 1e; XII - 1e; XIII-XV - 1 s, 1 e; XVI - 1 e; XVII - 1 s; XVIII-XIX - 2 s, 1 e; XX - 2 s; XXI - 3 s, 1 e.



Figs 44-58. *Xanthocalanus kurilensis* Brodsky, 1950 (44-54, adult female; 55-56, female of 5th copepodid stage; 57-58, male of 5th copepodid stage). 44, A2; 45, Md, palp; 46, Mx1, without Li1; 47, Mx1, Li1, gnathobase, another specimen; 48, Mx2; 49, Mxp; 50, P1; 51, P2; 52, P3; 53, P5, dorsal side; 54, P5, inner side; 55, P5; 56, P5, another specimen; 57, Mx2; 58, Mx2, Li5 and distal endopodal complex.



Figs 59-70. *Xanthocalanus kurilensis* Brodsky, 1950 (59-69, adult male; 70, male of 5th copepodid stage). 59, A2; 60, Md, gnathobase; 61, Md, palp; 62, Mx1; 63, Mx1, L11-L13, another specimen; 64, Mx2; 65, Mxp; 66, P1 and endopods of both P1; 67, P2; 68, P3 and apical spine of Re3; 69, P4 and apical spine of Re3, another leg; 70, P5.

A2 (Fig. 59) almost as in female, but coxa with a patch of setules on inner side. Md with rudimentary gnathobase (Fig. 60) and wider than in female basis (Fig. 61). Mx1 (Figs 62, 63) and Mx2 (Fig. 64) smaller and more poorly sclerotised than in female and copepodid of 5th stage. Setae of Li2-Li4 and endopod of Mx1 shorter and slenderer than in female; setae on Li1 of Mx1 more poorly sclerotised; S3-S5, which are scythe-like in female, with thickened basal part, more strongly plumose, with more rigid setules, distal part of S3-S5 transparent, seems aesthetask-like; S7-S10 and S11-S14 slenderer than in female, transparent, seem aesthetask-like, with sparse rudimentary setules.

Mx2 (Fig. 64) with Li1-Li3 small, subequal, with 5, 2, 2 slenderer setae, respectively; their armament rudimentary compared with that of female; Li4 with 1 short, naked, rudimentary seta, claw-like seta of female replaced by 1 strongly plumose, tapering seta; Li5 with 2 tapering, strongly plumose and 1 rudimentary setae. Distal endopodal complex of Mx2 with 1 distal, probably worm-like, seta the longest (its distal part seems to be missing), 1 greatly enlarged and 4 slenderer than in female, rudimentary brush-like setae, and 1 short rudimentary seta.

Mxp (Fig. 65) slightly slenderer than in female. Syncoxa with short, poorly sclerotised, probably worm-like seta, 1 short, thin brush-like seta about at midlength, and 1 distal subapical seta with thickened hairy basal and filamentous distal half and apically with patch of spinules. Basipod longer than syncoxa, slender, with elongate patch of spinules on inner margin proximally, slender medial setae and 1 longer distal seta with long spinules along proximal margin. Ri1 with 2+4 long setae bearing long spinules along proximal margin; 3rd seta the longest. Ri2-Ri5 with 4, 3, 2+1, 4 tapering spinulose setae, respectively, outer seta short, reaching distal segment.

P1 (Fig. 66), P2 (Fig. 67), P3 (Fig. 68) and P4 (Fig. 69) as in female. P5 slightly longer than urosome. Both legs uniramous, subequal in length, 5-segmented (Fig. 43). Terminal segment of left leg very short, with 7 setules; subterminal segment with outer terminal spine and long thick inner subterminal spinulose process.

Copepodids of 5th stage of female and male very similar to each other and to adult male, length 2.9 mm. Mx1 as in female; Mx2 of male (Figs 57, 58) almost as in female, but distal endopodal complex with 1 worm-like, 7 slender, differing in length brush-like sensory setae and short rudimentary seta, that is with 9 setae in total. P5 of 5th copepodid stage of female 3-segmented, very similar to that of adult female, but 4 spines of terminal segment in one specimen subequal (Fig. 55), in the other specimen termi-

nal segment with apical acute process and 1 inner and 1 outer spine (Fig. 56). P5 of 5th copepodid stage of male (Fig. 70) 4-segmented; segments with spinules as in Fig. 70; subterminal segment with 1 outer distal spinulose spine; terminal segment with apical acute process and outer subapical spine.

Distribution. The species is only known from the type series (Sea of Okhotsk Sea, off the Iturup Island).

Comparison. The North Pacific *X. kurilensis* (♀ 3.4-3.5 mm, ♂ 3.3 mm), Antarctic *X. gracilis* Wolfenden, 1911 (♀ 2.65-3.2 mm), North Atlantic *X. subagilis* Wolfenden, 1904 (♀ 2.6 mm, ♂ 2.3 mm) and *X. fallax* Sars, 1921 (♀ 2.9-3.5 mm, ♂ 2.5 mm) from the western coast of Norway and from North Atlantic near Ireland (?; description very poor) and Azores (Sars, 1903, 1921, 1924-1925; ?Farran, 1905, Figs 14, 16) are very close to each other in the body shape, 9 setae on exopod of Mx1, 7 slender brush-like setae of endopod of Mx2 in female, as well as in structure of P1-P4. *X. fallax* differs in the more acute posterolateral corner of female SmpP5, subequal in length brush-like setae of endopod of Mx2 and strongly asymmetrical P5 of the male. *X. gracilis* is very similar to *X. kurilensis*, but smaller, Ur1-Ur3 covered with scale-like structures, shape of spermatheca different, male unknown. *X. subagilis*, very poorly described and figured by Wolfenden (1904), is smaller and has only 3 spines on terminal segment of female P5.

P5 in males of *X. kurilensis*, *X. subagilis* and *X. macilentus* (Grice & Hulsemann, 1970, as *Amalophora*) is very similar in the shape, terminal segment of left leg very short, with spinules, subterminal segment with stylet-shaped process distally, terminal segment of right leg with long spine. However, *X. macilentus* is larger (5.16-5.41 mm), with rounded posterolateral corners of SmpP5, Re of Mx1 with 10 setae, setae on Li1 of Mx1 and enlarged brush-like seta of endopod of Mx2 more strongly modified. The body shape of the male of *X. subagilis*, judging from the description by Wolfenden, is very similar to that of *X. agilis*, so, possibly, posterolateral corners of SmpP5 are narrowly rounded, not pointed, in contrast to *X. kurilensis*.

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