

ISOPODA FROM THE COASTAL ZONE OF THE KURILE ISLANDS. III.  
THREE NEW ARCTURIDS FROM THE MIDDLE KURILES WITH  
TAXONOMIC REMARKS ON THE FAMILY ARCTURIDAE

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During the course of the hydrobiological investigations which were carried out around the middle and northern Kuriles by the Zoological Institute and the Institute of Oceanology in 1954-1955 and by the Institute of Marine Biology in 1967 and 1969, many samples were collected, containing at least five species of Arcturidae, all of which are new. Two species, collected in the intertidal zone, are described elsewhere; descriptions of the three remaining species, which were obtained in the infralittoral, are given below.

It should be noted, that identification of species of the family Arcturidae presents great difficulties because many genera in this family are inadequately, or sometimes inexactly, defined. Therefore I have examined many species of the family Arcturidae including the type species of the genera *Arcturus*, *Astacilla* and *Neastacilla*. I came to the conclusion that all described genera except *Microarcturus* and *Dolichiscus* are valid, but that their diagnoses must be revised. At present not less than 15 genera are described within this vast family. Unfortunately, when describing the genera, the authors often took into consideration characters which cannot be compared with each other. Therefore it is impossible to separate all the genera from each other on the basis of the descriptions in the literature alone. Since I did not study representatives of many tropical and subtropical genera, it is impossible to present a revision of the entire family Arcturidae. However, the study of numerous species from boreal and austral waters, belonging to nearly half the known genera, showed that we must be sceptical about such features as length and width of pereonal somite IV. As correctly pointed out by Nordenstam (1933), the number of oostegites has been inaccurately given by many authors and therefore, for many genera, this character could hardly be taken into consideration as a diagnostic one. This applies also to the presence or the absence of the ventral process of pereonal somites III and V, the more so because these features characterize only one of the sexes, and, moreover, have not been described for some genera. The relative length of antenna II and the number of the segments in the flagellum are usually good diagnostic characters for genera, but sometimes they are not sufficient for generic differentiation.

On the other hand, when studying the different morphological features of Arcturidae, I came to the conclusion that little attention has been given to the structure of pereopods I to IV. On the basis of the structure of pereopod I all examined genera can be clearly divided into two groups: in the first there are two claws on the dactylus, in the second the dactylus is more specialized and without a claw or with just one. In species belonging to the first group, and especially those of the genus *Antarcturus* sensu lato, the lateral margins of the cephalon and pereonal somite I are not expanded downward and forward, and pereopods I to IV, although turned forward, are not pressed against the ventral surface of the body. In all species of the second group, pereopods I to IV are bent forward over the mouth and are pressed against the ventral surface; and the lateral margins of the cephalon and pereonal somite I are prolonged downward and forward. Within the second group we can distinguish the species with less specialized pereopods II to IV each having a dactylus with a claw (genus *Arcturus*) and the species in which pereopods II to IV are without the dactylus or with a rudimentary dactylus in the form of a short seta (genera *Astacilla* and *Arcturella*). In most species of the second group the dactylus of pereopod I is without a claw but the dactylus of pereopod II to IV always has a claw (genera *Neastacilla*, *Pleuroprion* and *Idarcturus*). It should be noted that all examined species from the Pacific that in the literature are referred to *Astacilla*, in reality belong to the genus *Neastacilla*.

KEY TO THE GENERA OF ARCTURIDAE FROM ARCTIC AND BOREAL WATERS

1. Dactylus of pereopod I with two claws . . . . . 2
- Dactylus of pereopod I with one claw or none . . . . . 3
2. Dactylus of pereopod I robust, long, more than  $\frac{2}{3}$  as long to quite as long as propodus. Pleopod I of male specialized, with a diagonal furrow on the exopodite . . . . . *Antarcturus* Zur Strassen
- Dactylus of pereopod I narrow, rather short, less than  $\frac{2}{3}$  as long as propodus. Pleopod I of male simple, without a diagonal furrow on exopodite . . . . . *Parapleuroprion* gen. nov.
3. Dactylus of pereopod I with one distinct claw . . . . . 4
- Dactylus of pereopod I without claw . . . . . 6
4. Pereopods II to IV with dactylus bearing one claw . . . . . *Arcturus* Latreille
- Pereopods II to IV without dactylus . . . . . 5
5. Body slender, pereonal somite IV considerably longer and a little wider than the other somites, its length, even in the ovigerous females, much exceeding its width . . . . . *Astacilla* Cordiner
- Body comparatively broad and flat, pereonal somite IV longer and considerably wider than the other somites, in the ovigerous females longer than its width . . . . . *Arcturella* Sars
6. One or more pleonal somites indicated in front of the pleotelson . . . . . 7
- Pleon without indication of segmentation . . . . . *Idarcturus* Barnard
7. Two pleonal somites indicated in front of pleotelson . . . . . *Neastacilla* Tattersall
- Only one pleonal somite indicated in front of pleotelson . . . . . *Pleuroprion* Zur Strassen

**Parapleuroprion** gen. nov.

Diagnosis. — The lateral parts of the head and the first pereonal somite are produced forward and downward, covering laterally the mouth parts and the anterior pereopods. Pereonal somite IV differs slightly from the other somites

by its length, which is less than twice that of somite III; it is not expanded. The pleon is rather long with only one short somite in front of the pleotelson. Antenna II is thick and stout, but rather short, it is considerably shorter than the body; the flagellum consists of three segments and a distal claw. The flagellum of antenna I has numerous aesthetascs, arranged along the lower margin. The dactylus of the first pereopod is small, with two claws. Pereopods II to IV have a small claw-like dactylus. The exopod of the first pleopod of the male shows no diagonal furrow.

Type species. — *Pleuroprion tarasovi* Gurjanova.

***Arcturus asper* sp. n. (figs. 1, 2)**

Material examined. — Off Paramushir, depth 76-77 m, July 1954, coll. Spirina, 1 ♂ holotype. Okhotsk Sea near Paramushir, depth 52-53 m, July 1954, 3 specimens.

Simushir, depth 50-60 m, stones with sponges and hydroids, 15 October 1969, coll. Shornikov, 1 sample (66 specimens).

Urup, depth 30-48 m, 8-11 September 1969, coll. Shornikov, 2 samples (21 specimens).

The holotype is deposited in the collection of the Zoological Institute of the Academy of Sciences, U.S.S.R., with the catalogue number N 1/50032.

Description. — Holotype male. The body is elongate, filiform, with nearly parallel lateral margins, it is 6 times as long as wide (width measured across pereonal somite V). The integument is covered with tiny conical blunt tubercles, whereby the surface of the body appears granular.

The frontal margin is a little excavated, with a small median point. The anterolateral angles of the cephalon are rounded, the dorsal surface has indistinct tubercles. The eyes are of moderate size, rounded, triangular, with blackish-brown pigmentation in alcohol.

Pereonal somite I is distinctly demarcated from the cephalon by a rather deep

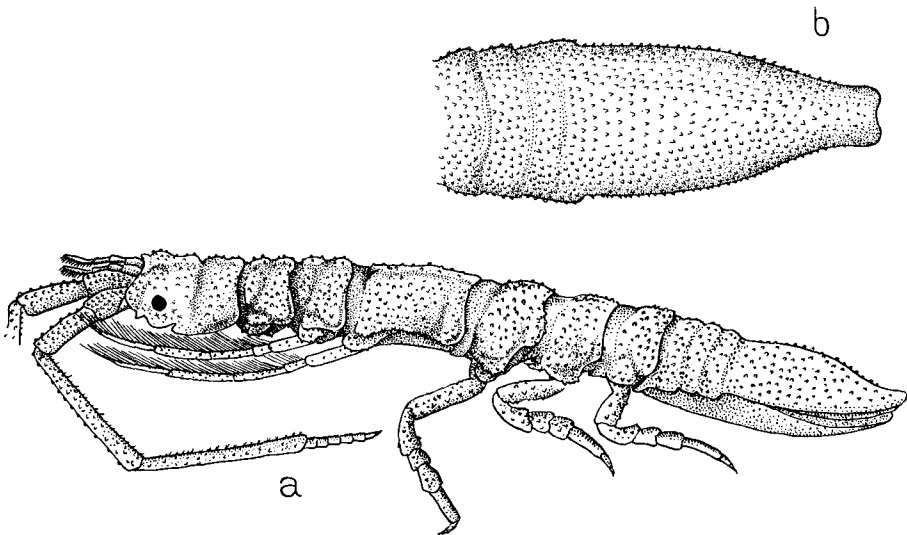


Fig. 1. *Arcturus asper* sp. n., holotype, male. a, entire animal; b, pleon.

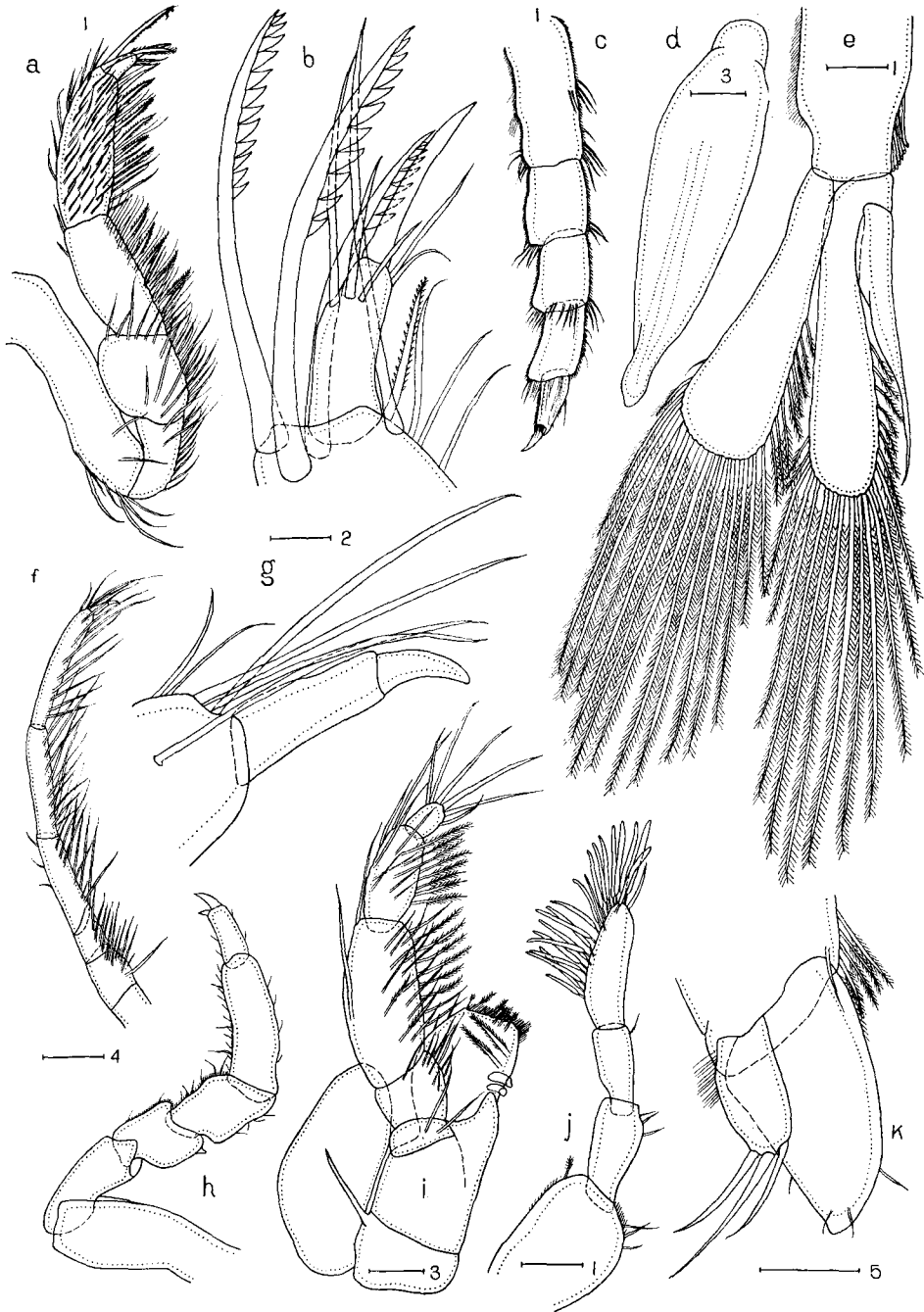


Fig. 2. *Arcturus asper* sp. n., holotype, male. a, first pereopod; b, distal part of first pereopod; c, flagellum of second antenna; d, penis; e, second pleopod; f, second pereopod; g, distal part of second pereopod; h, seventh pereopod; i, maxilliped; j, first antenna; k, tip of uropod, seen from inner side. Scale 1 represents 0.25 mm; scale 2 represents 0.05 mm; scale 3 represents 0.15 mm; scale 4 represents 0.5 mm; scale 5 represents 0.2 mm.

transverse depression; the anterolateral margins are separated from the cephalon by a deep, but narrow incision. Pereonal somite II has the same length as somite I, and is a little shorter than somite III. Pereonal somite IV is somewhat longer than the others and is at least 1.5 times longer than somite III, it is distinctly longer than pereonal somite V. Pereonal somite VI is a little shorter than somite V, and a little longer than somite VII. The posterior margins of pereonal somites I to III are slightly produced backward along the median line. The coxal plates of pereonal somites II to IV are small, and not visible from above; those of somites V to VII are rather large, well visible from above, and subtriangular.

The pleon is considerably shorter than the posterior four pereonal somites together. At the base of the pleotelson there is a pair of very short, but wide processes with rounded margins. The lateral margins of the pleotelson are convex, the posterior margin is slightly produced backward, and has a small rounded median notch.

Antenna I is rather short, extending a little beyond the distal margin of the second peduncular segment of antenna II. The basal segment is broad, about  $\frac{4}{3}$  as long as the second segment. The third segment is a little shorter than the second; the flagellum is rather thick, and about as long as the basal segment of the peduncle. Antenna II is robust and considerably shorter than the body. Its basal segment is short; the second segment is a little thicker than the third and considerably shorter than the cephalon. The third segment is rather short, it is about 1.5 times as long as the second. Segment IV is nearly twice as long as segment III and a little longer than segment V; it bears a longitudinal row of small low tubercles along its entire inner margin. Segment V has a similar row of tubercles, which, however, are lower. The flagellum is short, it is nearly half as long as segment V, and is composed of 5 segments and a claw.

The propodus of pereopod I is slightly shorter than the ischium and merus together and about  $\frac{2}{3}$  as long as the basis; the merus measures about  $\frac{2}{3}$  of the length of the carpus and is a little shorter than the ischium; the dactylus is half as long as the carpus, and about twice as long as its claw. Pereopods II to IV are very slender and long; the propodus and carpus of pereopod VI are of equal length; the merus is a little shorter than the propodus; the dactylus measures slightly more than  $\frac{1}{5}$  of the length of the propodus, and is slightly less than three times as long as the claw.

The penis is broadly lanceolate, it is nearly four times as long as wide; its lateral margins are evenly convex throughout their length; its distal part narrows abruptly. The male process on the second pleopod is rather long, the distal third is narrow and tapers towards the end, it is slightly curved and its end reaches to the distal extremity of the endopodite. The endopodite of the uropod is comparatively wide, being less than twice as long as wide; the exopodite is nearly oval, with convex lateral margins, it tapers slightly to the distal end, and is provided with three long stout setae; the length of the exopodite is about equal to the width of the endopodite.

The colour in alcohol is yellowish grey with small dark pigment spots.

The length is 16 mm.

Remarks. — This species differs from *A. granulatus* Richardson in the following respects: the body is less robust, there are no small tubercles along the margins of the pereonal somites, and the eyes are considerably smaller. *A. asper* differs from *A. beringanus* Benedict and *A. crenulatus* Gurjanova in having only a very short distal part of the pleotelson narrowed.

***Pleuropriion chlebovitschi* sp. n. (figs. 3, 4)**

Material examined. — Onokotan, depth 33 m, rocks and gravel, 25 August 1955, coll. V. Chlebovitsch, 1 ♀ holotype (Zoological Institute, N 1/49356) and 6 ♂ ♂ paratypes.

Paramushir, depth 27 m, sand and gravel, July 1954, 1 ♀.

Simushir, depth 50-65 m, rocks and stones with sponges and hydroids, September-October 1969, 6 samples (194 specimens).

Urup, depth 6-48 m, rocks with sponges and hydroids, September 1969, 8 samples (267 specimens).

Description. — Holotype, female with oostegites, length 10 mm. The body is strongly convex, stout, and spindle-shaped, it is about 3.2 times as long as wide (width measured across pereonal somite IV). The dorsal surface bears numerous large and small high tubercles, many of these tubercles are somewhat mushroom-shaped, strongly bulbous at the apex and narrowing to the base.

The frontal margin is strongly concave, with a very short median point. The posterolateral angles of the head are produced into wide lobes which have a distinct notch in the middle of their anterior margin and are separated from the lateral margin of the head by a deep incision. The dorsal surface of the head shows 11 rounded tubercles, most of which are arranged in two transverse rows. Furthermore, a pair of small tubercles is situated behind the eyes and another pair stands above each lateral margin of the cephalon. The eyes are large and nearly triangular.

Pereonal somite I is separated from the cephalon by a shallow but wide groove.

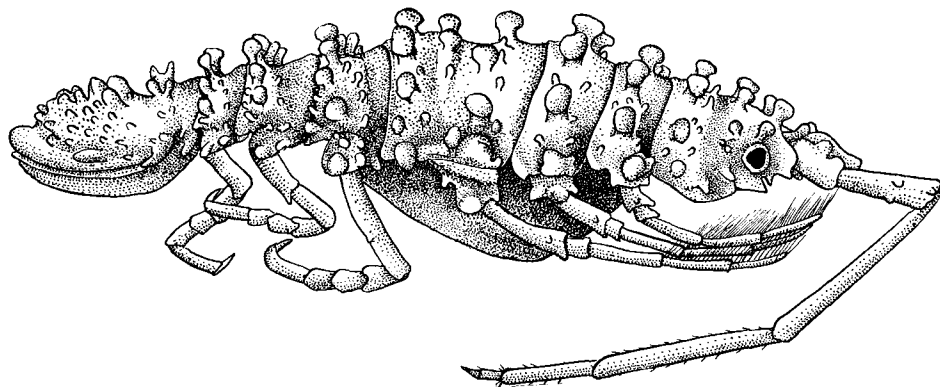


Fig. 3. *Pleuropriion chlebovitschi* sp. n., holotype, female.

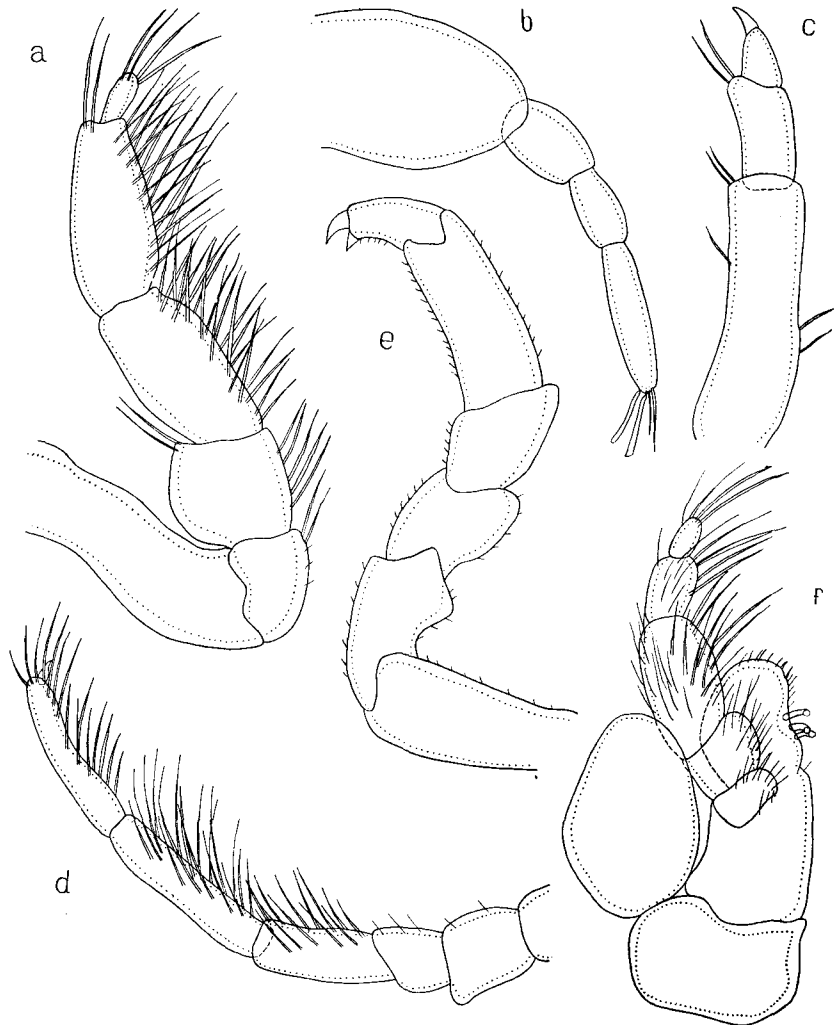


Fig. 4. *Pleuropriion chlebovitschi* sp. n., holotype, female. a, first pereopod (3); b, first antenna (3); c, flagellum of second antenna (3); d, second pereopod (1); e, seventh pereopod (1); f, maxilliped (3). The numbers in parentheses refer to the corresponding scales in fig. 2.

The dorsal surface of the somite bears 4 pairs of large rounded tubercles arranged in a median transverse row and two pairs of very small tubercles situated behind the large ones. Pereonal somites II and III each have three pairs of large tubercles, disposed in a transverse row and 5 or 6 pairs of small tubercles situated in front of and behind the large ones. Pereonal somite IV is nearly twice as long as somite III, it is trapeziform and narrows posteriorly; its dorsal surface is provided with about 14 pairs of tubercles of different sizes, 8 or 9 pairs of these are large and are arranged in 3 transverse rows. On pereonal somites V and VI there are three

pairs of large tubercles and on somite VII two pairs, these tubercles are disposed in a single transverse row on each somite and in addition, on each somite 5 to 8 pairs of very small tubercles are present, the number of these tubercles decreasing from somite V to somite VII. The coxal plates of pereonal somite V have 5 and those of somites VI and VII have three tubercles each.

The pleon is about as long as the posterior three pereonal somites together. The first pleonite has two pairs of large tubercles arranged in two longitudinal rows, one on either side of the median line, and has 3 or 4 small tubercles placed on either lateral part of the somite. Each lateral margin of the first pleonite shows two curved pointed processes, the posterior of these is considerably longer than the anterior. The pleotelson is short, wide, strongly convex and approximately pentagonal; its dorsal surface bears 18 to 20 pairs of tubercles of various sizes, 3 of these are larger and are arranged in two longitudinal rows on either side of the median line; furthermore, in the middle of the lateral part of the pleotelson there are two pairs of curved, pointed processes, which are directed outward and backward. The posterior margin of the pleotelson is bluntly truncated and slightly convex.

Antenna I is short and reaches the distal end of the second peduncular segment of antenna II; its basal segment is somewhat expanded with the inner margin finely denticulated. The third segment is slightly shorter than the second, their combined length is rather less than the length of the first segment, and slightly more than that of the flagellum. Antenna II is considerably shorter than the body, it is robust, when curved backward it extends to the posterior half of pereonal somite V. The dorsal surface of the second peduncular segment is provided in the middle with a large, oblong, but rather low tubercle, the distal margin has three low tubercles. The third segment of the peduncle is comparatively short, being about twice as long as the second, its dorsal surface has two pairs of tubercles. The fourth segment is rather long, and is somewhat expanded distally. The fifth segment is a little longer and thinner than the fourth, its surface is smooth. The flagellum is short, it consists of three rather robust segments and a short claw; it is 1.5 times as long as the basal peduncular segment.

Pereopod I is robust and wide; the propodus is slightly longer than the carpus and a little shorter than the merus and ischium together; the merus is wide, nearly quadrate, and about as long as the ischium; the dactylus is not large, being 0.3 times as long as the propodus. Pereopods II to IV are rather long and slender; the outer distal angle of the basis bears a high, conical, blunt tubercle; the carpus is somewhat longer than the propodus and slightly shorter than the merus and ischium together; the dactylus is small, claw-like, measuring about  $\frac{1}{7}$  of the length of the propodus. Pereopods V to VII are robust; the basis of pereopod VII is considerably longer than the ischium and nearly as long as the merus and carpus together; the propodus is slightly shorter than the basis and twice as long as the dactylus; the length of the dorsal claw is less than  $\frac{1}{3}$  that of the dactylus; the dorsal claw is almost three times as long as the ventral one.



The endopodite of the uropod is triangular, elongate, and nearly  $1 \frac{2}{3}$  as long as wide; its distal end is evenly rounded. The exopodite is less than half as long as the endopodite, and is twice as long as wide; its distal end carries two long robust setae, which are 1.5 times as long as the exopodite itself.

The male is distinguished by its smaller size and more slender body, which is not expanded in the middle.

The female is about 13 mm long, the male about 10 mm.

Remarks. — In *P. chlebovitschi* the sculpturing on the dorsal surface varies greatly. In the majority of the specimens it is similar to that of the holotype described above; each rounded tubercle is set on a narrow peduncle which varies markedly in length, often in one and the same specimen. In some of the specimens the tubercles are much longer and have the appearance of bulbous spines. In other specimens, especially young ones, the spines are thick, robust and blunt, without a bulbous apex. And finally, some specimens have a varied assortment of spines and tubercles.

### *Pleuropriion toporoki* sp. n. (figs. 5, 6)

*Pleuropriion toporkovi* Gurjanova, 1959: 229 (nom. nud.).

Material examined. — Shikotan Island, depth 50 m, 1 ♀ holotype and 1 ♂, paratype.

Iturup, Pacific coast, depth 40-41 m, rocks and stones with sponges and hydroids, October 1969, 3 samples (107 specimens).

Urup, depth 5 m, rocks, September 1969, 1 specimen; depth 46-60 m, rocks with sponges and hydroids, October 1969, 1 sample (6 specimens).

The types are deposited in the Zoological Institute of the Academy of Sciences, U.S.S.R., with the catalogue number N 1/22157.

Description. — Holotype, female with brood pouch (length 10 mm). The body is widely spindle-shaped, stout, four times as long as wide (width measured across pereonal somite IV). The dorsal surface bears robust, bluntly pointed spines.

The frontal margin shows a deep trapeziform emargination. The anterolateral angles of the head each have a small pointed tooth. The dorsal surface has 9 spines

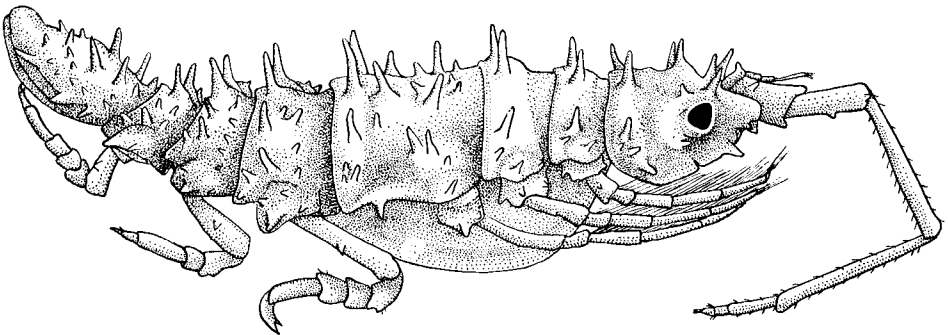


Fig. 5. *Pleuropriion toporoki* sp. n., holotype, female.

arranged in two transverse rows; the anterior consists of 3 spines and is situated between the eyes, the median of those spines is longer than the lateral ones; the posterior row consists of three pairs of spines, and is placed slightly behind the eyes. On each side of the cephalon a short conical spine is located below and a little behind the eye. The eyes are large, strongly bulging and rounded.

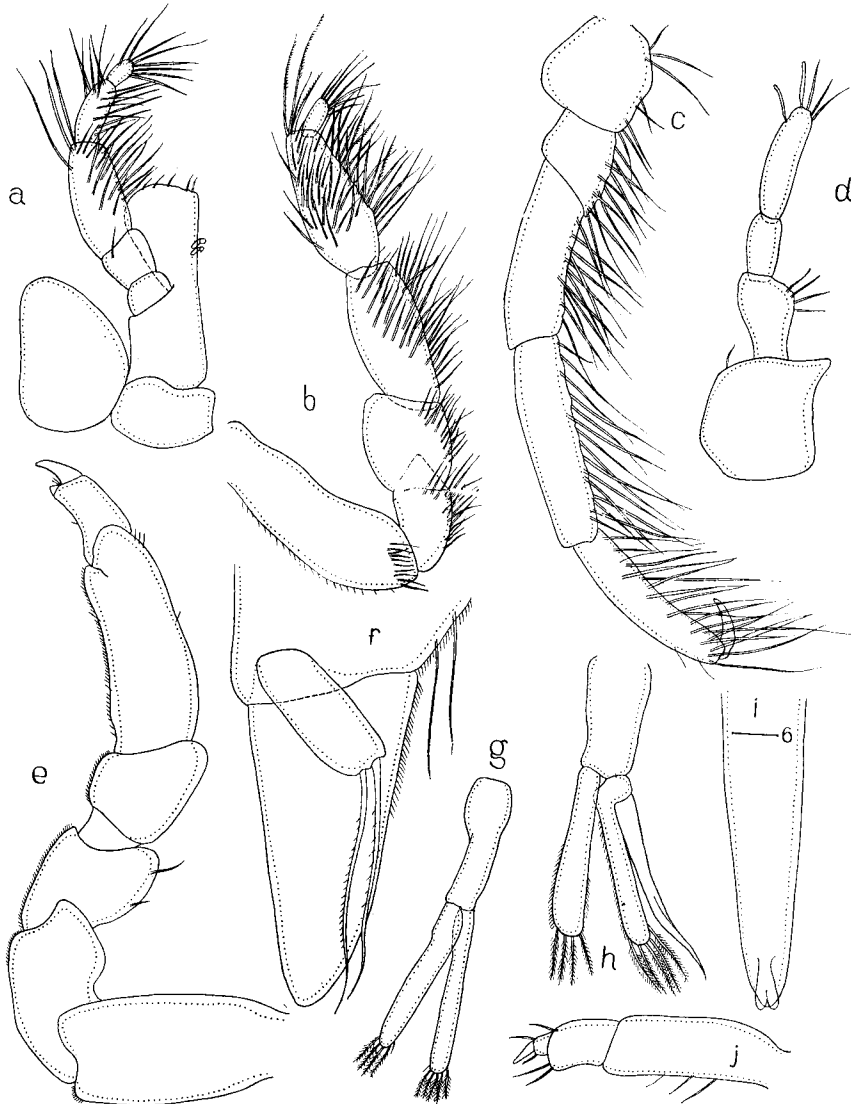


Fig. 6. *Pleuropriion toporoki* sp. n. a-g, j, holotype, female. a, maxilliped (3); b, first pereopod (3); c, second pereopod (3); d, first antenna (3); e, seventh pereopod (3); f, tip of uropod, seen from inner side (3); g, first pleopod (3); j, flagellum of second antenna (3). h, i, paratype, male. h, second pleopod (3); i, penis. The numbers in parentheses refer to the corresponding scales in fig. 2. Scale 6 represents 0.05 mm.

Pereonal somite I is separated from the cephalon by a deep and wide groove, the dorsal surface has 5 pairs of spines including the spine situated on each anterolateral angle and a small one at each posterolateral angle. Pereonal somites II and III are short, they are about of the same length as somite I; the dorsal surface of either shows 3 pairs of spines situated in one transverse row; the lateral of these spines are very short; apart from these transverse rows of 6 spines there is a small spine in the posterolateral part of either of these somites. Pereonal somite IV is trapeziform and slightly longer than somites II and III together, its dorsal surface bears 9 pairs of spines of different lengths, arranged in 3 transverse rows. On the dorsal surface of pereonal somite V there are 6 pairs, on somite VI 5 pairs, and on somite VII 4 pairs of short, blunt spines and tubercles. The coxal plates of somites II to IV are small, each has a small tubercle on the distal extremity; the coxal plates of somites V to VII are large, wide and produced outwards; the coxal plates of somite V have rounded margins. The lateral margins of the coxal plates of somites VI and VII are produced into triangular pointed processes, each with one short spine or tubercle on the anterolateral angle.

The pleon is short, being slightly shorter than the posterior three pereonal somites together. The dorsal surface of pleonite I bears 5 pairs of small spines; the lateral margins are produced into small pointed processes. The pleotelson is pentagonal, with 6 or 7 pairs of short, robust spines on the dorsal surface; on each side of the lateral margins there are two large, curved, triangular processes, directed outwards and posteriorly; one of these processes is situated near the base of the pleotelson and the other not far from the centre, somewhat closer to the posterior margin. The posterior margin of the pleotelson is rounded.

Antenna I is short, reaching a little beyond the distal margin of the second peduncular segment of the second antenna; the basal segment is strongly expanded, it is slightly wider than long, the outer distal angle is provided with a heavy conical spine-like process; the second segment is slightly more than  $2/3$  as long as the basal segment, while the third segment is a little more than half as long as the latter; the flagellum is relatively short, it is as long as the basal segment. Antenna II is thick, robust and rather short, it is considerably shorter than the body; the dorsal surface of the second peduncular segment bears two short, but thick conical spines, the longest of which is situated almost in the centre of the segment, while the shorter is situated near the distal margin; the third segment is a little shorter than the second, and has two short, conical spines in its posterior half and one spine at the outer distal angle; the fourth segment is about half as long as and considerably thinner than the third; the fifth segment is as long as the fourth; the flagellum is short, more than half as long as the fifth peduncular segment, its proximal segment is as long as the rest of the flagellum.

The propodus and carpus of the first pereopod are of equal length, each is a little shorter than the merus and ischium combined and considerably shorter than the basis; the dactylus is small, about  $1/4$  as long as the propodus. The propodus and merus of pereopod II are equal in length, each is a little shorter than the

carpus; the dactylus is narrow, claw-like and about  $1/5$  as long as the propodus. The basis of pereopod VII is about as long as the ischium and merus together and a little longer than the propodus; the carpus is slightly longer than the merus and a little shorter than the ischium; the dactylus is about half as long as the propodus; both claws are short, but rather thick; the dorsal claw is more than twice as long as the ventral; the distal margin of the ischium is produced into a wide, triangular process.

The endopodite of the uropod gradually tapers to an evenly rounded distal end, it is twice as long as wide; the exopodite tapers slightly towards the distal end, it is somewhat less than half as long as the endopodite, and  $2 \frac{3}{4}$  times as long as wide; the distal extremity bears two long robust setae, which are about 1.5 times as long as the exopodite.

The male has a more slender subcylindrical body, which is 6 times as long as wide across pereonal somite V (length 7.7 mm). The penis is lanceolate, it tapers evenly towards the rounded distal end, and is about 4 times as long as wide. The penial filament on pleopod II is long and curved in the distal half, it tapers evenly towards the awl-shaped pointed distal end, and extends beyond the distal margin of the exopodite by almost one-third of its length.

The colour of both sexes is light greyish-yellow.

#### RÉSUMÉ

Pendant les recherches hydrobiologiques de 1954, 1955 et 1969 dans les eaux littorales des Kouriles Moyennes, 5 espèces de la famille des Arcturidae (Isopoda, Valvifera) ont été trouvées, toutes nouvelles pour la science. Trois espèces, *Arcturus asper*, *Pleuropriion cblebovitschi* et *P. toporoki*, sont décrites dans l'article présent. En outre l'auteur donne une clé d'identification des genres d'Arcturidae des eaux tempérées de l'Hémisphère boréal et décrit un nouveau genre: *Parapleuropriion*.

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