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PELAGIC GAMMARIDS (AMPHIPODA, GAMMARIDEA) OF THE NORTHWEST PACIFIC OCEAN

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Examination of numerous collections of deep-water plankton, taken in 1953 in the Kurile-Kamchatka Trench, had enabled us to record, for this part of the Pacific, 31 species of pelagic gammarids and to indicate their vertical and horizontal distribution (Birstein and Vinogradov, 1955). During 1954-1955 the Institute of Oceanology of the Academy of Science of USSR extended the region of its investigations further south and east of the Kurile-Kamchatka Trench. Participating in these voyages in the "Vitiaz" we used the previously well-tested methods of collecting deep-water macroplankton by horizontal tows with a perlon ring-trawl 160 cm. in diameter and vertical hauls with closing plankton and ichthyological nets of 80, 113 and 160 cm. diameter. In the new collections were found 11 species of pelagic gammarids not common to the northwest Pacific, among them 4 new to Science and 4 not earlier recorded for the Pacific. In addition there were several species found for the second time, which had been inadequately described by us and concerning which we now can furnish additional data to verify their systematic position.

The region from which the collected material was taken is extremely vast; it extends from 55° to 23° North Lat. from 130° to 17° East Long. Hydrological conditions in this part of the Pacific are distinguished by a great diversity, since here are represented very different water masses, resulting from the complex interaction of the warm waters of Kuroshio and the cold waters of Oyashio. Within the expanse of the area of our investigation of surface plankton the boreal, subtropical and tropical fauna replaced one another. The contour of the bottom of this part of the ocean is extremely complex. Along the chain of the Kurile Islands, northern Japan, Idzu, Bonin and Volkano there exists (approximately in a meridional direction) a narrow but extremely deep trench, the depth of which throughout its whole vast extent exceeds 6500 m. and in places reaches to 10 km. or more. The steep sides of this Trench on the east side merge into the normal depths of the ocean floor, around 4000 to 5000 m., but here are encountered isolated elevations or ridges. West of the Trench the contour is even more rugged because of the numerous islands.

Considering the variety of conditions prevailing in the part of the Pacific investigated we gave particular attention to the limits of occurrence of the species of pelagic gammarids taken by us. They [p.220] appeared to be of such a character that some species could probably be considered as indicators of specific water masses to which they are quite closely co-ordinated. It is particularly interesting to note the occurrence of certain very deep-water, so-called ultra-abyssal, species, occupying, as described, the maximum depths of the whole vast Kurile-Kamchatka-Idzu-Bonin Trench. As in our previous study we note a close dependence of the horizontal and vertical distribution of the various species. In the present paper we give a complete list of the pelagic gammarid species, caught in 1949-1955 in the course of the voyage of the "Vitiaz" to the northwest Pacific, and also indicate the location of capture, taken by tow or depth haul.

In this paper are included data on the distribution of the gammarids of the Kurile-Kamchatka Trench, published by us earlier (Birstein and Vinogradov, 1955). For the species described in the latter paper, we, for the sake of brevity, do not give the synonymy and particulars of occurrence in the oceans of the world, but limit the remarks on occurrence to the North Pacific. Where species are recorded for the first time or have been previously inadequately described we present the necessary systematic descriptions.

In the list of locations of capture of the species after the number of the station is briefly indicated the type of gear used and the depth of the haul in which the species in question was found.

Explanations of the abbreviated symbols and letters used to designate the type of gear used and also the coordinates and depths of the stations referred to in the paper are given in Appendices I and II.

FAMILY LYSIANASSIDAE

1. Cyphocaris challengeri Stebbing

Locations where taken. Stn. 2074 RT 0-250*; BR 80/113 230-550. Stn. 2076 BR 80/113 550-1150; BR 113/140 2200-4400. Stn. 2120 RT 0-2000, 0-3000. Stn. 2158 RT 0-2000, 0-3100, 0-6000. Stn. 2209 RT 0-1000, 0-2000. Stn. BR 80/113 10-25 (night), 25-50 (night), 50-125, 125-200, 200-400, 400-750. Stn. 2217 RT 0-1000, 0-2000, 0-3000. Stn. 3116 RT 0-4550, 0-5500. Stn. 3150 RT 0-1000. Stn. 3151 RT 0-3400, 0-4900. Stn. 3156 D 38 0-600. Stn. 3157 D 38 270-610. Stn. 3162 BR 80/113 0-700; RT 0-2500, 0-5100. Stn. 3163 BR 80/113 200-1200. Stn. 3166 RT 0-2800, 0-4900. Stn. 3176 RT 0-800. Stn. 3197 D 38 151-290, 290-720. Stn. 3200 D 38 246-675. Stn. 3206 RT 0-5500. Stn. 3214 RT 0-4700. Stn. 3227 RT 0-6580. Stn. 3248 RT 0-3600, 0-5500. Stn. 3252 RT 0-3200.

Described for the Gulf of Alaska (Thorsteinson, 1941).

2. Cyphocaris anonyx Boeck

Locations where taken. Stn. 2217 RT 0-1000. Stn. 3154 D 38 0-600. Stn. 3162 BR 80/113 0-700. Stn. 3206 RT 0-5500. Stn. 3214 RT 0-4700, 0-5700. Stn. 3227 RT 0-6580. Stn. 3243 RT 0-3000. Stn. 3490 BR 80/113 816-1900 [p.221]. Stn. 3502 RT 0-5250, 0-7250. Stn. 3515 RT 0-4400. Indicated also for California (Barnard, 1954).

Comments. The majority of our specimens had a hook-shaped, curved hood, similar to that described by us for specimens from the Kurile-Kamchatka Trench. However, along with these were taken individuals with a hood, round at the end, corresponding to those described by Stebbing (1888). One specimen was taken in a closing net from a haul 1900 to 816 m., which confirms the occurrence, assumed by us, of this species in the upper deep-water subzone.

3. Cyphocaris richardi Chevreux

Locations where taken. Stn. 2074 XS 0-2600. Stn. 2076 XS 0-4250; BR 113/140 4200-7800. Stn. 2119 XS 0-3000. Stn. 2120 RT 0-3000. Stn. 2208 RT 0-7200. Stn. 2217 RT 0-4000. Stn. 3146 BPS 0-7200. Stn. 3161 RT 0-2800. Stn. 3176 RT 0-6500. Stn. 3206 RT 0-5500. Stn. 3216 RT 0-4700. Stn. 3227 RT 0-4580. Stn. 3243 RT 0-3000. Stn. 3325 RT 0-4500. Stn. 3499 RT 0-7400. Stn. 3515 RT 0-4400. Stn. 3521 XS 0-1990; RT 0-2990; XS 0-3990. Stn. 3535 RT 0-6050.

Found also at two stations off the coast of California (Barnard, 1954).

Comments. Besides the typical specimens with a much elongated and pointed hood, there were in our collection several specimens with a bluntly-rounded hood, quite similar to the description and drawing of Schellenberg (1926a) for a 10.5

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*Depths of catches everywhere are as indicated by etched cable, in metres.

mm. long specimen from the Antarctic. The length of all our specimens with similarly-formed hoods was also around 10 mm.

4. Cyphocaris bouvieri Chevreux

(Fig. 1)

Chevreux, 1916 : 4; Stephensen, 1933 : 5.

Locations where taken. Stn. 3521, one specimen, 10.5 mm. long, from ring-trawl, drawn from a depth of 4990 m. (by rope) to the surface, approximate depth, 4440-4500 m.

Comments. Our single specimen was similar in all main characters with the males, 12 and 7 mm. long, reported by Chevreux, and the 15 mm. female described by Stephensen. The sword-shaped extension of the second joint of its V peraeopod was smooth and extended to the middle of the 5th joint, as described by Chevreux for the 12 mm. male and by Stephensen for the 15 mm. female. The posterior margin of the 2nd joint of the V peraeopod had 12 teeth (according to Chevreux and Stephensen, on mature individuals there are 10-11). In the young male 7 mm. long the sword-shaped protuberance is shorter and the number of teeth on the posterior margin is fewer (8). Evidently both the relative length of the protuberance and the number of teeth, just referred to, increase with growth. The comparative width of this joint in our specimens and as described for males is larger than for females (according to Stephensen) and thus demonstrates sexual dimorphism. Up to the present time this rare species was known only from 4 areas - from the south and northeast of the Azores (Chevreux, 1916, 1935), from north of Faroe Islands and Davis Strait (Stephensen, 1933). This is the first record of C. bouvieri outside the north Atlantic. Thus it is necessary to place it in the Atlantic-Pacific group of species. Moreover the possibility cannot be excluded that this [p.222] rare species may be taken also in other parts of the world and that it may actually have a much wider distribution, similar to the other species of the genus Cyphocaris.

Of the three other species of Cyphocaris, present in our collections, C. bouvieri is distinguished by the bluish-white colour of the live, unpreserved specimen.

5. Paracyphocaris brevicornis Birstein et M. Vinogradov

Locations where taken. Stn. 2208 RT 0-5500. Stn. 2217 RT 0-2000.

6. Metacyclocaris polycheles Birstein et M. Vinogradov

Location where taken. Stn. 2208 RT 0-6200.

7. Metacyphocaris helgae Tattersall

Tattersall, 1906 : 29; Shellenberg, 1926a : 216; Thorsteinson, 1941 : 60.

Locations where taken. Stn. 2217 RT 0-2000. Stn. 3200 D 38 246-675. Stn. 3521 RT 0-4990.

Known also from the Gulf of Alaska (Thorsteinson, 1941).

[p.223] Comments. Our specimens are identical with those described by Tattersall (1906), Shellenberg (1926a) and Thorsteinson (1941).

The occurrence of this species must be considered pan-oceanic, since it is common in the north Atlantic (off the coasts of Ireland, Iceland, Greenland, Madeira and Bermuda Islands), Gulf of Guinea, southern Atlantic, Indian Ocean, southern Pacific and also in the areas examined by us and from the Gulf of Alaska.

8. Crybelocephalus megalurus Tattersall

(Fig. 2)

Tattersall, 1906 : 33; Shoemaker, 1945 : 189.

Locations where taken. Stn. 3214 RT 0-5700. Stn. 3502 RT 0-7250. The lengths of the specimens caught were, respectively, 9 and 11 mm.

Comments. As distinguished from Tattersall's (1906) data, the endopodite of III uropod in our 2 specimens is not separated and the telson somewhat narrower and acute-angled at the end. In other respects they are quite similar to the descriptions and drawings of other authors. The colour of the unpreserved specimen is carmine-red.

Up to the present time this species has been known only in the north Atlantic (southwest of Ireland, south of Iceland, southeast of Greenland and from the Bermuda Islands). In addition, it has been taken by us in the Indies sector of the Antarctic. Is now reported from the Pacific for the first time.

9. Cyclocaris guilelmi Chevreux

Locations where taken. Stn. 2076 BR 113/140 2200-4400. Stn. 2116 RT 0-2000, 0-3000; BR 80/113 1430-1775. Stn. 2119 RT 0-4000. Stn. 2120 RT 0-2000, 0-3000; BR 80/113 530-1190. Stn. 2144 RT 0-7000. Stn. 2158 RT 0-2000, 0-3100, 0-6000. Stn. 2208 RT 0-1500, 0-2500, 0-3500, 0-4500, 0-5200, 0-5500, 0-6200; XS 0-5000. Stn. 2209 RT 0-1000, 0-2000. Stn. 2210 RT 0-2000. Stn. 2217 RT 0-1000, 0-2000, 0-3000, 0-4000, 0-5000. Stn. 2218 BR 80/113 530-1080. Stn. 3116 RT 0-5550. Stn. 3145 BR 113/140 0-750. Stn. 3146 KS 0-7200. Stn. 3151 RT 0-3400, [p.224] 0-4900. Stn. 3156 RT 0-3800. Stn. 3162 RT 0-2500. Stn. 3166 RT 0-2800, 0-1900. Stn. 3176 RT 0-6500, 0-8000. Stn. 3227 RT 0-6580. Stn. 3248 RT 0-3000. Stn. 3252 RT 3200.

10. Koroga megalaps Holmes

Locations where taken. Stn. 2076 BR 80/113 550-1150; BR 113/140 2200-4400. Stn. 2116 BR 80/113 965-1575. Stn. 2119 RT 0-4000. Stn. 2120 RT 0-2000, 0-3000. Stn. 2124 RT 0-1100. Stn. 2158 RT 0-2000, 0-6000. Stn. 2208 RT 0-3500, 0-4500, 0-1500, 0-2500, 0-5200, 0-5500, 0-6200. Stn. 2209 RT 0-1000, 0-2000. Stn. 2117 RT 0-1000, 0-2000, 0-3000. Stn. 3116 RT 0-4550, 0-5550. Stn. 3138 D 38 200-500. Stn. 3151 RT 0-3400, 0-4900. Stn. 3162 RT 0-2500. Stn. 3166 RT 0-2800, 0-4900. Stn. 3176 RT 0-6500, 0-8000. Stn. 3214 RT 0-5700. Stn. 3252 RT 0-3200. Stn. 3184 0-3000 (Okhotsk Sea). This species is known also from the Gulf of Funtera (Alaska) and Gulf of Alaska (Holmes, 1908; Thorsteinson, 1941).

11. Scopelocheirus schellenbergi Birstein et M. Vinogradov sp. n. aff.

Paracallisoma sp. Schellenberg, 1955 : 185

(Fig. 3 & 4)

Locations where taken. Stn. 2218 RT 0-7000, 2 specimens caught, lengths 35 & 44 mm. Stn. 3176 RT 0-8000, 2 specimens 37 & 43 mm. Stn. 3227 RT 0-6580, 3 specimens, 26, 27 & 42 mm. Atlantic Ocean 19°49'N, 65°01'E.

Description. Immature specimen 27 mm. long. Body compact with thick mantle; low, blunt keel on 3rd segment of metasome and on 1st and 2nd segments of urosome weakly indicated, but on 3rd segment of urosome a small depression. Colour: muddy-white. In preserved specimens the eye not visible. No rostrum; frontal margin semi-circular, slightly convex. III uropods project from the end of the telson; I & II uropods terminate level with its distal end. I antenna almost a third as long as II antenna. First joint of its stalk short and wide, almost twice as long as the second and third taken together. Main flagellum 9-jointed, on large specimens 11-jointed; accessory flagellum 3-jointed, somewhat shorter than the stalk; its wide first joint almost twice as long as the two preceding. II antennae do not extend to the middle of the body. Its flagellum twice as long as the stalk and has 38 joints; the linear fifth joint of the stalk $1\frac{1}{2}$ times longer than the fourth and twice the length of the third; in the proximal joints of the flagellum the length is less than the width but distally it is more.

Mandible with smooth cutting edge and short adjacent teeth on the distal part of the posterior margin; the toothed branch delicate, conical, tentacle strong, its 3rd joint for its whole length covered with spines but the 2nd has them only on the distal part; in a hollow of the body of the left mandible is found an accessory plate having the shape of a long, slightly curved, blunt spine.

The outer lobe of the I maxilla bears 11 smooth spines, of which 3 are much shorter than the rest; in addition, in the connection between the distal and the interior margin of the lobe there is a cluster of slender bristles; similar bristles are dispersed also over its distal surface. The inner lobe has 16 large feathery bristles. Tentacle, 2-jointed [p.255], slightly expanded distally; on its convex distal edge it has 10 spines and one bristle.

The outer lobe of II maxilla is somewhat narrower inside; on the distal end it is armed with a series of strong bristles; but the outer and inner margins are bordered with delicate short hairs. The inner lobe is armed with a series of strong bristles, simple on the outer part of the series but plumose on the inner.

Maxilliped large with well-developed lobes and a 4-jointed tentacle. Wide outer lobe extends no further than distal end of 2nd joint of tentacle; distal edge of it has a series of plumose bristles, on the inner around 20 tooth-like spines, behind which is located an irregular double series of small bristles. [p.226] The inner lobe rounded with an obliquely-cut top; it is armed with blunt spines on the distal margin and an oblique series of long delicate bristles. Both lobes are covered on the outer edge with delicate short hairs.

Lower lip with well-developed mandibular outgrowth and reduced inner lobes.

I coccal plate rounded-triangular, widened distally; its anterior, lower angle does not cover behind the horizontal plate. II coccal plate slightly swollen distally, with a convex, lower edge; on the lower posterior angle it bears a separate bristle. III and IV plates very large, quadrangular, IV with a small groove on the posterior margin of the oblong plate with a recess on the lower edge.

Peraeopod I strong, much shorter than II peraeopod. Its second joint enlarged distally and somewhat shorter than 5th and 6th taken together. Oblong-conical 6th joint slightly longer than 5th, on anterior and posterior margins there are clusters of bristles and on the top - a stout, thick crown of bristles, almost hiding a small claw. Peraeopod II long and thin. Its 2nd joint the same length as the 5th and 6th together; the 5th joint with parallel edges, less than 1 1/2 times shorter than the slightly-expanding-distally 6th. Both joints bear long bristles on the distal and shorter bristles on the anterior and posterior edges. The claw does not project from the end of the palm-like margin.

Peraeopods III and IV similar in structure - short and sturdy. Their 2nd joints slightly enlarged distally, equal to the length of the 4th and 5th together and twice as long as the 6th. Claw 1/2 as long as the slightly-tapering-distally 6th joint.

Peraeopods V-VII with much enlarged basal joints and a slightly enlarged 4th. On the V peraeopod a wing-shaped growth on the 4th joint is quite round, but on VI and VII, on the posterior lower part, it is slightly concave. Anterior margin of all joints armed with small spines, most numerous and longest on VII peraeopod; 5th and 6th joints rod-shaped; claws strong, approximately 1/3 as long as 6th joint.

Lower edge of III epimer bears short bristles; its posterior, lower angle drawn out into a small protuberance.

Protopodite of I uropod 1 1/2 times but II uropods only slightly longer than endopodite. Endopodite and exopodite on I uropod and endopodite on II armed with marginal bristles; endopodites of I and II uropods somewhat longer than exopodites. Uropod III with wide, lancet-like branches. Exopodite has accessory joint. It is armed with marginal spines, and the endopodite, on its outer edge, bears marginal spines and, on the inner, feather bristles but only on the distal part of the inner edge has four spines. Protopodite half as long as the branches and bears a small spine on the distal outer corner and bristles on the outer edge.

Telson oval-triangular, split for more than two-thirds, with five sub-marginal spines on each side; apical spines located in a recess of the outer edge. Length of the telson somewhat more than 1 1/2 times exceeds its width.

Comments. Of both common shallow-water species of this genus (Sc. hopei and Sc. crenatus) the species here described differs in its larger size of body, absence of compound eyes, relatively large claw on I, gnatopod, numerous sub-marginal spines on the telson, [p.228] varying length of I and II gnatopods and bottom II coccal plates. The two latter features connect it with the genus Paracallisoma.

Apparently, this same species was taken by Shellenberg (1955) in the North Atlantic (19°49'N, 65°01'W) at a depth of 7900-7625 m. However Shellenberg had only a badly damaged specimen and fragmented parts, therefore he could give only a very incomplete description and leave the species without a name, putting it temporarily in the genus Paracallisoma and characterized by a series of features which distinguish it both from the genus Paracallisoma and also from the genus Scopelocheirus.

The material available to us allowed us to study this species in detail and add to the description of Shellenberg. The minor differences between it and our data are these: in our specimens is noted a weakly-developed keel on the third segment of the metasome and on the first and second segments of the urosomes; the posterior-bottom corner of the third epimer is drawn out into a small protuberance.

Based on the length of the outer lobe of the maxilliped, we consider it more appropriate to put this species in the genus Scopelocheirus.

Since our specimens, evidently, are identical with those described by Shellenberg, we report the first instance of the occurrence of this Atlantic-Pacific species in the very deep abyssal regions of the oceans.

12. Paracallisoma alberti Chevreux

Place of occurrence. Stn. 2074 XS 0-2600. Stn. 2076 RT 0-7250; BR 113/140 2200-4400. Stn. 2116 XS 0-4700; RT 0-5000. Stn. 2120 RT 0-3000. Stn. 2114 RT 0-7000. Stn. 2158 RT 0-2000, 0-6000. Stn. 2208 RT 0-1500, 0-2500, 0-3500, 0-4500, 0-5200, 0-5500, 0-6200. Stn. 2209 RT 0-1000, 0-2000. Stn. 2210, RT 0-4000. Stn. 2217 RT 0-2000, 0-3000, 0-5000. Stn. 2218 RT 0-9000. Stn. 3248 RT 0-3600. Stn. 3252 RT 0-3200. Stn. 3364 XS 0-1425. Stn. 3368 XS 0-1000. Stn. 3371 XS 0-2000. In the northern part of the Pacific Ocean this species has been recorded from southern California (Holmes, 1908; Barnard, 1954).

13. Orchomenella affinis Holmes

Occurrence. Stn. 2208 XS 0-5000; RT 0-2000. Stn. 2217 RT 0-3000. Stn. 3116 RT 0-4550. Common in Monterey Bay (Holmes, 1908).

14. Eurythenes gryllus (Lichtenstein)

Occurrence. Stn. 2217 RT 0-4000. Stn. 3150 RT 0-1000. Stn. 3176 RT 0-6500. Stn. 3184 (Okhotsk Sea) RT 0-3000. Stn. 3248 RT 0-3600. Stn. 3252 RT 0-4700.

Remarks. Among our specimens, a female with oostegites, the length of which is 95 mm., exceeding somewhat the maximum length of this species, as described in the literature.

In his last paper Shellenberg (1955) acknowledges the species independence of Katius obesus, placing this species in the genus Eurythenes. Our review of the material indicated that all of our specimens must be put in the species E. gryllus. But we do not have sufficient information to judge of the correctness of the opinions expressed by Shellenberg.

15. Eurythenes fusiformis Birstein et M. Vinogradov

Occurrence. Stn. 2208 RT 0-5500. Stn. 3515 RT 0-4400.

16. Eurythenes microps Birstein et M. Vinogradov, sp. n.
(Fig. 5)

Occurrence. Stn. 3176 RT 0-8000, 1 specimen 10 mm. long. Stn. 3227 RT 0-6580, a 9 mm. specimen. Stn. 3514 RT 0-8480, a 7 mm. specimen.

Description. Immature specimen 9 mm. long. Species very close to Eurythenes fusiformis. Chief distinction - small, kidney-shaped eye, located on side of head, and colour of preserved specimens, brown. No rostrum; optic angle rounded. Body fusiform; segments of metasome with a low, barely noticeable keel; I segment of urosome with small depression. I coccal plate [p.230] only slightly protected by II. Colour of preserved specimens dirty-white.

Antennae I and II, as in E. fusiformis, but accessory flagellum on I antenna 5-segmented and its first joint only but little longer than second. Mandibles, maxillae I and II, as in E. fusiformis but distal edge of tentacle of I maxilla more convex, and inner lobe of II maxilla relatively narrower. Outer lobe of maxilliped narrower than in fusiformis and its inner edge bears not uncommonly a rounded tooth-like protuberance, sometimes partly reduced to a narrow lancet-like pointed spine; the inner distal angle of the inner lobe bears only one blunt, short spine and has a similar spine on the middle and outer part of the distal edge.

Coccal plates of both I and II peraeopods, as in E. fusiformis, but the groove of the posterior edge of the IV coccus deeper, and I pereaopod stronger, more heavily covered with bristles, and the locked spines of the palm-like margin longer. Peraeopods III and IV sturdy; length increases distally, that of the second joint slightly greater than the fifth and sixth taken together; fifth joint almost 1/2 as long as sixth; width of fourth joint twice that of sixth and 1 1/2 times that of fifth; claw but little shorter than half of sixth joint.

Basal segments of VI and VII peraeopods, as distinguished from E. fusiformis, does not have a convex but a straight, truncated or, in certain specimens, a slightly concave distal part of the posterior edge.

Telson less drawn out (to a different degree in different specimens) and armed with marginal spines; apical spines located in a cavity of the distal margin of the lobes of the telson.

17. Hirondellea gigas (Birstein et M. Vinogradov)
Tetronychia gigas Birstein & M. Vinogradov 1955 : 228

Occurrence. Stn. 2076 RT 0-7250. Stn. 2218 RT 0-9000; BR 113/140 6400-9000 (actual depth 6000-8500). Stn. 3176 RT 0-8000. Note - 1 specimen 46 mm. long was caught in a Sigsbi trawl at a depth of 7200 m. in the southern part of the Japan Trench.

Comments. In a paper, earlier unavailable to us, Barnard (1930) pointed out that the genus Tetronychia Stephensen, 1923, in which we had put our new species; must be considered a synonym of the genus Hirondellea Chevreux, 1889. In this genus there are five species: H. trioculata Chevreux (from the Azores), H. brevicaudata Chevreux (north Atlantic - 43°N, 19°42'W), H. abyssalis (Steph.) (south of Iceland), H. antarctica (Schellenberg) (Antarctic) and H. gigas (Birst and M. Vin.) (Kurile-Kamchatka Trench). All species of this genus are deep-water forms.

FAMILY HYPERIOPSIDAE

In addition to additional material for earlier-described representatives of this interesting family, we present, at the present time, further data on one new species and on one species, not known from the Pacific. Since the family Hyperiopsidae is represented by quite a few species in the northwest Pacific we present a table for the identification of all presently known species, with the exception of the very superficially [p.231] described Hyperiopsis australis Walker, which cannot be dealt with in detail.

Key for identification of genera and species of Family Hyperiopsidae.

1(4) Inner lobe of I maxilla enlarged distally and bears some bristles at the tips. 4th segment of III-IV peraeopods linear, not extended. Telson divided more deeply than half its length. . . . Genus Parargissa Chevreux.

2(3) Inner lobe of I maxilla with pinnate bristles; lower lip symmetrical; 2nd joint of I peraeopod longer than 5th and 6th, taken together; posterior lower corners of basal joints of V-VII peraeopods not serrated . . . . . .
P. nasuta Chevreux

3(2) Inner lobe of I maxilla with single bristles; lower lip asymmetrical; 2nd joint of I peraeopod shorter than 5th and 6th taken together; posterior, lower corners of basal joints of V-VII peraeopods serrated or notched . .
P. arcuata (Birst. et M. Vin.)

4(1) Inner lobe of I maxilla tapers distally and bears at its end a single bristle. 4th joint of III-IV peraeopods enlarged. Telson with teeth at the end, and if extended then not deeper than a quarter of its own length . . . . genus Hyperiopsis G. O. Sars

5(10) 2nd joint of VII peraeopod linear, without posterior lobe. Posterior end of telson without a protuberance in the middle.

6(9) Posterior margin of telson with notch. Stalk of I antenna shorter than I joint of its flagellum.

7(8) Notch of telson amounts to a third or fourth of its length; at the end of each lobe, one bristle. Posterior - lower corner of epimer, rounded. . . .
H. vöringi G. O. Sars

8(7) Notch of telson much less than 1/4 of its length, on each lobe, 2 bristles. Posterior-lower corner of III epimer pointed . . . .
H. vitjazi Birst. et M. Vin., sp. n.

9(6) Telson with a somewhat convex posterior margin and with teeth on its side angles. Stalk of I antenna longer than 1st joint of its flagellum . . . .
H. gibbosa Pirlot

10(5) 2nd joint of VII peraeopod enlarged and forms a much backward-projected lobe. Posterior margin of telson with a protuberance in the middle and teeth on the sides.

11(12) Greatest width of 4th joint of III peraeopod occurs at its middle, the length of 5th joint considerably greater than the width. Middle protuberance of posterior margin of telson triangular. . . . . H. tridentata Barnard

12(11) Greatest width of 4th joint of III peraeopod occurs in the distal part, length of 5th joint equal to width. Middle protuberance on posterior margin of telson with a notch at the end . . . . . H. laticarpa Birst et M. Vin.

18. Parargissa arcuata (Birstein et M. Vinogradov)

Protohyperiopsis arcuata[1] Birstein & M. Vinogradov 1955 : 237

(Fig. 6)

Occurrence. Stn. 2120 BR 113/140 4190-8050. Stn. 3176 RT 0-8000. Stn. 3514 RT 0-6485.

[p.232] Remarks. In a previous paper (Birstein, Vinogradov, 1955) we gave a diagnosis of a new genus of the family Hyperiopsidae and described a new species of the genus Protohyperiopsis arcuata, resident in the Kurile-Kamchatka and Japan Trenches at depths greater than 6000 m. However a comparison of Protohyperiopsis arcuata with the drawings and descriptions of Parargissa nasuta Chevreux leaves no doubt that both of these species are close to each other and belong to the same genus.

Parargissa nasuta was taken by Chevreux (1908, 1935) in the north Atlantic at depths of 1300-1900 m. and was taken as the type of a new genus of the family Tironidae. No diagnosis of this monotypical genus was given by Chevreux.

Inclusion of the genus Parargissa in the family Tironidae (or separable from the family Argissidae) is made without substantiation and incorrectly. Against it there are such essential features as structure of I antennae, asymmetry of I maxillae, characteristic (only of Hyperiopsidae) structure of the tentacles of the I maxillae and mandibles, relation of size and form of I and II-III coccal lobes, form of telson, etc. On the other hand there are a series of essential features connecting this genus with the genus Hyperiopsis, to which it is very close. We will not discuss them here since they are dealt with in detail in our previous paper (Birstein, Vinogradov, 1955). In the main, the genus Parargissa (= Protohyperiopsis) must be included in the family Hyperiopsidae.

The differences between the two species in question are slight and consist of the body size, detailed structure and armament of the I antennae, inner lobe of the I maxilla, lower lip, IV coccal [p.233] plate, basal joints of V-VII peraeopods and in the proportions of I peraeopods. These differences do not change the diagnosis of the genus presented by us in our previous paper.

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[1] In our previous paper the name of this species was incorrectly printed as arquata (Tr. in-ta okeanol. AN SSSR, T. XII, 1955).

Parargissa arcuata was described by us from one incomplete specimen 6 mm. long.

In 1954 and 1955 two specimens became available of larger size (10 & 13 mm.), better preserved, and both taken by ring-trawl hauled from depths of 8000 and 6435 m. to the surface. The examination of these specimens serves to add further details to our earlier descriptions.

In the abdominal segments of the large specimens a weakly-marked keel was noted; the protuberances on the 1st and frequently on the 2nd joint of the stalk of the I antenna are much longer than in the earlier-described smaller specimens. The II antenna is longer than half the length of the body and has a flagellum of around 20 joints. The structure of the V-VII peraeopods, torn from the first specimen of this species, is quite characteristic. The 2nd joint of these extremeties are very wide and form a large posterior lobe with a serrated lower posterior corner and a weakly-toothed convex posterior margin. The width of the 2nd joint of the V-VI peraeopods is somewhat greater than the length; the anterior and posterior margins are almost to the same degree strongly curved convexly. The width of the 2nd joint of the VII peraeopod is one-half the length; its anterior margin is almost straight, its posterior - convex. Generally, both in form of posterior peraeopods and in certain other features, Parargissa approximates the representatives of the family Lysianassidae.

19. Hyperiopsis vitjazi Birstein et M. Vinogradov, sp. n.

(Fig. 7)

Occurrence. Stn. 3535 RT 0-6050.

Material. One male 9 mm. long (without uropods), with broken III, V & VI peraeopods and uropods, in a ring-trawl catch from a depth of 6050 m. to the surface.

Description. In shape of body, similar to other species of the genus. Rostrum small, eyes not conspicuous. I antenna approximately 3 1/2 times shorter than II antenna. Its stalk short and broad, Ist joint twice as long as the remainder, together with the claws; its width greater than length. Flagellum with 25 joints; 1st joint 1 1/2 times shorter than the rest of the flagellum. Accessory flagellum much shorter than 1st joint of rest of flagellum; its first joint twice as long as both terminal joints together, 2nd joint twice as long as the 3rd. Stalk of II antenna somewhat longer than stalk and 1st joint of flagellum of II antenna, with an unusually long penultimate and very short terminal joint. Flagellum much longer than stalk. Mandibles, as in other species of the genus, with two bristles in a tooth-like series. Mandibular tentacle long, its 1st joint over 1/2 as long as the 2nd, which is slightly longer than the 3rd. I maxilla is asymmetrical and quite similar to the maxillae of the other species of the genus. Tentacle on the right side not shorter but narrower than the tentacle on the left maxilla. Lobe of II maxilla the same width as H. vöringi and H. gibbosa, and much narrower than in H. tridentata, and, in particular, to H. laticarpa. Inner lobe of maxilliped but little exceeds the base of the 2nd joint of tentacle and distally armed with 4 teeth and with a submarginal series of six plumose bristles. Outer lobe does not much more than reach the middle of the 2nd joint of the tentacle; its inner edge bears around 12 spines, somewhat enlarged distally, but on the distal [p.234] edge - around 15 fine bristles. Lower jaw with much narrower and longer lateral lobes than on other species.

I and II coccal plates with parallel anterior and posterior margins; anterior margin convex, posterior concave. I peraeopod, as in other species of the genus. II peraeopod, as in H. vöringi, its 6th joint somewhat shorter than 5th, with convex anterior and posterior margins. 4th joint of IV peraeopod similar in form to that in H. vöringi; its length somewhat more than 3 times exceeds its greatest width, in the middle part of the joint. 5th joint very narrow, 3 1/2 times narrower than 4th. 6th joint also very narrow, almost linear; its length less than 1 1/2 [p.235] times the length of the 5th joint. VII peraeopod extremely long. Its 2nd and 3rd joints of almost equal length; on the posterior-lower angle of 2nd joint are 2 curved teeth; 4th joint almost 4 times longer than 3rd, linear, with numerous spines on the anterior and posterior edges; 5th joint almost equal to length of 3rd; dactyl crescent-shaped, slightly shorter than 5th joint.

III epimer with straight posterior-lower margin, prolonged into a small tooth. Length of telson a little more than its width. At its end has a shallow, semicircular depression. Each lobe bears 2 bristles of different lengths; besides them, on the distal part of the telson from each side projects one submarginal bristle.

Remarks. A new species close to H. vöringi, distinguished from it as follows: much shallower depression and a different form of telson; form of posterior-lower angle of III epimer; with longer, sharper and more curved teeth on the posterior-lower angle of 2nd joint of VII peraeopod; with longer 5th and 6th joints of IV peraeopod; a different form of I-IV coccal plates; narrower lower lip; much more elongated 1st joint of flagellum of I antenna and penultimate joint of stalk of II antenna.

20. Hyperiopsis laticarpa Birstein et M. Vinogradov
(Fig. 8)

Occurrence. Stn. 2218 BR 113/140 6400-9000 (actual depth 6000-8500). Stn. 3514 RT 0-8480. Stn. 3528 RT 0-7200.

Remarks. Hyperiopsis laticarpa, described by us from 2 incomplete specimens, was found later on much further south of the first location, by ring-trawl, hauled from 8480 m. to the surface. This was a male, 13 mm. long, preserved much better than the first specimen and its examination serves to appreciably supplement our description.

1st joint of flagellum of I antenna bears many long bristles; on the remaining joints of the flagellum they are less frequent. In the earlier-studied specimens these bristles were broken off and their bases were described by us as papillae. The III and IV peraeopods were clearly differentiated between themselves by the form of the fourth joint. The greatest width of this joint in the 4th peraeopod is approximately in the middle and, in all, one-half its length; its anterior edge is quite curved, its posterior edge almost straight, only slightly curved. The VII peraeopod, relatively shorter than in H. vöringi and H. vitjazi, in general structure resembles H. tridentata. The 2nd joint has from behind a wide lobe with an acute-angled posterior-lower corner; the 4th is quite wide and in all is 1 1/2 times shorter than the 5th, which, in turn, is twice as long as the 6th. The distinct difference in the form of the 4th joint of the III and IV peraeopods, together with the unusual width of their 5th joint, serves, all in all to distinguish this species from other species of the genus Hyperiopsis. In addition to this male and also at another station was found one incomplete female with egg masses but with torn limbs. In structure of the mouth parts, the base of the I antenna and the proximal part of the VII peraeopod which, in one case, was preserved, they can be positively considered as H. laticarpa. However they are different from the presently well-known males in the rectangular, and not oval posterior-lower angle of the III epimer, which, undoubtedly [p.236] is due to sexual dimorphism. In one of these females the telson was preserved, the structure of the end of which, for H. laticarpa, has not, up to the present, been known. In the basal half of the telson its lateral margins are parallel; in the distal half they come together at the posterior end of the telson. [p.237] The posterior margin of the telson has teeth or barbs at the corners and in the middle has a lyre-shaped protuberance, with a semicircular depression at the end. In the depressions between the middle protuberance and the lateral teeth are single long bristles. In addition, on the distal half of the telson are one - three submarginal bristles. The length of the telson is somewhat more than 1 1/2 times its width.

All these particulars in structure of H. laticarpa serve to connect it with H. tridentata, which possesses also the developed 2nd joint of the VII peraeopod, three-lobed terminal end of the telson and a somewhat different form of 4th joints of III and IV peraeopods.

21. Hyperiopsis vöringi G. O. Sars

(Fig. 9)

G. O. Sars, 1885 : 231; Stephensen, 1934 : 5

Occurrence and material available. Stn. 2208, 1 specimen around 8.5 mm. long, female with eggs, taken by ring-trawl hauled from 5000 m. to surface.

Remarks. In all main features our specimen is similar to the mature female, 10 mm. long, described by Stephensen, differing from it by its rather wider 4th joints on III and IV peraeopods [p.238] and somewhat shallower depression on the telson, which amounts to one-fourth and not one-third the length of the telson.

This species was known only from the Scandian Trench at a depth of 1095-2341 m. and was described first from the North Atlantic. It is possible that it belongs to the group of Atlantic-Pacific species.

22. Hyperiopsis tridentata Barnard

Occurrence. Station near Petropavlovsk in Kamchatka BR 80/113 300-500. Stn. 3184 RT 0-3000.

FAMILY STEGOCEPHALIDAE

23. Parandania boecki (Stebbing)

Occurrence. Stn. 2076 RT 0-7250; BR 80/113 550-1150; BR 113/140 2200-4400. Stn. 2116 RT 0-1000. Stn. 2120 RT 0-2000, 0-3000. Stn. 2124 RT 0-1100. Stn. 2144 RT 0-7000. Stn. 2158 RT 0-6000. Stn. 2208 RT 0-1500, 0-2500, 0-3500, 0-4500, 0-5000, 0-5200, 0-5500, 0-6200; BR 80/113 580-3000. Stn. 3116 RT 0-4550.

Stn. 3138 RT 0-530. Stn. 3145 D 38, 245-600. Stn. 3146 D 38, 220-550. Stn. 3150 RT 0-1000. Stn. 3151 RT 0-4900. Stn. 3156 RT 0-3800, 0-5300. Stn. 3162 RT 0-2500, 0-5100. Stn. 3166 RT 0-2800. Stn. 3176 RT 0-8000. Stn. 3184 RT 0-3000. Stn. 3124 RT 0-5700. Stn. 3248 XS 0-5000; RT 0-3600. Stn. 3252 RT 0-3200. Stn. 3521 RT 0-2990.

24. Andaniexis subabyssi Birstein et M. Vinogradov

Occurrence. Stn. 2218 BR 113/140 6400-9000.

FAMILY PARDALISCIDAE

25. Halice aculeata Chevreux

Occurrence. Stn. 2076 BR 113/140 4200-7800. Stn. 2119 BR 113/140 2200-5250. Stn. 2120 BR 113/140 4190-8050. Stn. 2208 KS 0-5000; RT 0-5200, 0-5500, 0-6200. Stn. 3116 RT 0-5550. Stn. 3151 RT 0-4900. Stn. 3116 RT 0-5550. Stn. 3206 RT 0-5500. Stn. 3214 RT 0-4700. Stn. 3528 RT 0-7200 (7600).

In his last paper Shellenberg (1955) expressed the opinion, concerning the identification of Halice aculeata Chevreux and the forms, described by Shoemaker (1945) under the same name, that the species should be put in the synonymy of Synopioides secunda. We are not able to agree with Shellenberg, since examination of the material at our disposal indicated that, firstly, the forms, described by Chevreux and Shoemaker, belonged to different species and, secondly, the species Halice aculeata Chevreux is quite separate but the genus Synopioides does not have a really separate position. This question was dealt with in full detail by us in a previous paper (Birstein & Vinogradov, 1955).

[p.239] 26. Halice shoemakeri Birstein et M. Vinogradov

Occurrence. Stn. 2144 RT 0-7000. Stn. 2208 RT 0-2500, 0-5500; KS 0-5000. Stn. 2217 RT 0-3000, 0-5000. Stn. 3502 RT 0-5250.

27. Halice quarta Birstein et M. Vinogradov

(Fig. 10)

Occurrence. Stn. 2218 BR 113/140 6400-9000. Stn. 3176 RT 0-8000. Stn. 3490 BR 113/140 0-9000. Stn. 3514 RT 0-8480.

Remarks. This species has been described by us from small specimens 3.5-5.5 mm. long. Subsequently at three stations from depths of 8600 and 8340 m. by open ring-trawl catches from 8000 m. we were successful in capturing another small and 2 much larger specimens 12 and 13 mm. long. These specimens differed from the small ones in having a 5-jointed accessory cilium on the I antenna, more numerous and longer bristles on the 5th joint of the II peraeopod and the presence of peculiar bristles, plumose in their basal parts but smooth in the distal halves, on the 5th and 6th joints of the III-IV peraeopods.

28. Halice secunda (Stebbing)

(Fig. 11)

Synopioides secundus Stebbing, 1888 : 1223; S. secunda Schellenberg, 1926a : 224; S. macronyx Schellenberg, 1926 : 336.

Occurrence. Stn. 3490 RT 0-9000. Stn. 3499 RT 0-7400. Stn. 3528 RT 0-7200 (7600). Stn. 3243 RT 0-3000.

Remarks. This species was described by Stebbing from the Tropical Pacific, concerning which the author assumed that it could be distinguished from Synopioides macronyx Stebbing, since the latter was known only from a female and the second from a male. Subsequently specimens of this species from the Atlantic were described by Schellenberg (1926) in the form of males of C. macronyx and only in collections made by the "Valdive" did Schellenberg (1926a) find mature females of S. secunda and determine clearly the differences between this species and S. macronyx. Later on Pirlot (1934) gave a description of the male of S. macronyx, well-distinguished from the male of S. secunda. We (Birstein and Vinogradov, 1955) showed that there was no foundation for recognizing the independence of the genus Synopioides and referred the earlier above-mentioned species, and S. secunda, to the genus Halice Boeck.

[p.241] In the southern part of the region examined by us, at four stations were obtained 4 specimens of H. secunda, 10, 10.5, 11 and 12 mm. long; the largest of these was a female with eggs; the 10 and 11 mm. individuals were males. Examination of them confirmed the accuracy of the descriptions given by Schellenberg (1926) and served to provide only very unimportant differences between our samples and those described by that author.

In the tooth pattern of the mandible of our specimens there were not two but three spine-like bristles, on the tentacle of the I maxilla are large spines and on the outer plate or lobe there are seven and not six bristles. The inner lobe of the maxilliped of our specimens is furnished with three bristles (Schellenberg noted several bristles). In all other respects there was complete similarity.

A comparison of H. secunda with other species of the genus Halice, in so far as our material permitted it, served to confirm that this species in all features and in all outward appearances is very close to H. shoemakeri. The chief differences between them are as follows: in H. secunda the inner lobe of the I maxilla is rectangular in shape and bears one bristle, while in H. shoemakeri it tapers down distally and has two bristles; the inner tooth on the outer plate of the I maxilla of H. secunda is longer than in H. shoemakeri and does not have the barbs which are characteristic of the latter species; the inner plate of the maxilliped of H. secunda has 3 bristles while H. shoemakeri has only one; finally, the 6th joint of the III and IV peraeopods and the 2nd joint of the IV peraeopod in H. secunda are narrower than in H. shoemakeri. The differences between H. secunda and H. macronyx have already been reported by Schellenberg (1926a).

Earlier H. secunda was taken only at 3 stations in the tropical Pacific and Atlantic, in hauls from 3000 and 3700 m. to the surface. In the northern half of the Pacific this species is reported for the first time and, according to our observations, has considerably extended its distribution range in a northerly direction.

FAMILY VITJAZIANIDAE

29. Vitjaziana gurjanovae Birstein et M. Vinogradov

Occurrence. Stn. 2076 BR 113/140 4200-7800. Stn. 2144 RT 0-7000. Stn. 2218 RT 0-7000; BR 113/140 6400-9000. Stn. 3176 RT 0-6500, 0-8000. Stn. 3514 RT 0-8480.

Remarks. This species was confined usually within the limits of the oceanic trenches, regularly taken in hauls of the ring-trawl from depths of more than 6000 m. The largest specimens had a length of 33 mm.

FAMILY ASTYRIDAE

30. Astyra zenkevitchi Birstein et M. Vinogradov

Occurrence. Stn. 2074 XS 0-4600. Stn. 2119 RT 0-4000. Stn. 2120 RT 0-3000. Stn. 2144 RT 0-7000. Stn. 2158 RT 0-6000. Stn. 2208 KS 0-5000, RT 0-5200, 0-5500, 0-6200, Stn. 3116 RT 0-5550. Stn. 3176 RT 0-6500, 0-8000.

Remarks. Antennae I have small, one-jointed additional cilia, which were not referred to in the description of the species, made earlier by us (Birstein, Vinogradov, 1955).

[p.243]

31. Astyra bogorovi Birstein et M. Vinogradov

Occurrence. Stn. 2120 BR 113/140 2200-4600. Stn. 2158 RT 0-6000. Stn. 2208 RT 0-2500 (Juv), 0-5500, 0-6200; KS 0-5000. Stn. 2218 RT 0-9000. Taken by us also in the southwest part of Bering Sea.

FAMILY CALLIOPIIDAE

Reported for the first time for the plankton of the Pacific Ocean.

32. Stenopleura atlantica Stebbing

(Fig. 12)

Stebbing, 1888 : 950; Stephensen, 1915 : 45; Schellenberg, 1926 : 353.

Occurrence. Stn. 3154 D 38 0-600. Stn. 3206 RT 0-5500. Stn. 3475 IKS 0-500. Stn. 3491 IKS 0-200. Stn. 3514 XS 0-7458.

Remarks. The description, given this species by Stebbing (1888), was later added to and clarified by Stephensen (1915) and Schellenberg (1926). Our specimens in general correspond to the description and drawings, given by the first author but, as noted by Schellenberg, III epimer of St. atlantica has a square and not round posterior-lower angle; on the distal part of the telson, besides a pair of large teeth, are found a more delicate pair and the eyes are widest in the vertical part. The end of the telson in our specimens, is triangular, as illustrated and described by Stebbing, and not oval, as in the specimens of Stephensen and Schellenberg.

St. atlantica was described from the tropical Atlantic. Later it was noted to be widely distributed in the Atlantic between 36°N. and 35°S. In addition, it was found in the western and southeastern parts of the Indian Ocean. In the Pacific this species is reported for the first time. In general, St. atlantica has the same circum-tropical distribution as Eusiropsis riisei.

FAMILY PARAMPHITHOIDAE

Noted for the first time in Pacific Ocean plankton.

33. Epimeria pelagica Birstein et M. Vinogradov, sp. n.

(Fig. 13, 14, 15)

Occurrence. Stn. 162 IKS 0-8000. Stn. 45°14'N., 156°17'E. RT 0-5000. Stn. 3162 RT 0-5100.

Material. 3 specimens, 10, 12, and 23 mm. long.

Description. Specimen 12 mm. long. Rostrum short, apex does not exceed half of 1st joint of stalk of I antenna; optic lobe well developed, tapered; eyes largely unpigmented; on III abdominal and I urosomal segments there are low, dorsal, dull keels, terminating in round protuberances. Colour of unfixed specimens cherry-rose; eyes white.

Length of 1st joint of stalk of I antenna approximately equal to the width and only a little longer than 2nd and 3rd joints, taken together; [p.244] no additional cilia. II antennae of same length as I; its stalk 5 times shorter than flagellum and 1 1/2 times longer than stalk of I antenna.

Formation of mouth parts typical for the genus. Mandibles with wide serrated cutting edge, with serrated additional blade and with strong cylindrical toothed extension, covered with fine bristles and provided with teeth on the apex, as in E. pacifica Gurianova; on the toothed part a series of 11 stout bristles, tentacle equal to the length of the body of the mandibles and attached on a level of the toothed extension. Outer plate of I maxilla bears on the straight distal end 10-11 stout teeth and fine, hair-like bristles; a wide, inner plate with six plumose bristles on the distal edge and with numerous fine bristles on the inner margin; tentacle, 2-jointed; its second joint wide, slightly curved, and bears nine short bristles apically and two bristles on the outer margin. Inner lobe of II maxilla a little shorter and wider than outer; on distal edge it bears around 20 strong bristles, plumose on the inner section of the series; all bristles on outer lobe smooth. Inner lobe of maxilliped with an oblique series of strong, plumose bristles and four small teeth on the distal inner angle; outer lobe wide, oval with five spines and several bristles on the apex and with serrated, inner margin; tentacle strong, its smooth claw somewhat shorter than 3rd joint. Lower jaw, as in E. pacifica.

I and II coccal plates rounded-triangular in form, narrowing distally; III-IV plates long, slightly curved, tapered; V-VII coccal plates small, round without protuberances; [p.246] I-III plates bear short bristles on the posterior margin. I and II peraeopods of similar form, II only somewhat weaker; 2nd joint equal to 5th and 6th together; 5th joint widened distally, its length only slightly exceeding the greatest width; 6th joint almost right angular with a slightly bevelled palmar edge; length of joint 1 1/2 times width; devoid of locking spines of palmar margin the same as for the posterior, bears numerous short fine bristles; in addition, several series of strong bristles are present on surface of joints; serrated claw somewhat longer on palmar edge. III and IV peraeopods with long joints and comparatively long, slightly curved claws. V and VI peraeopods almost twice the length of III and IV; their 6th joint exceeds in length the 4th and 5th, together; claw fine, long, almost straight; keels on longest two joints but very poorly developed. VII peraeopod somewhat shorter than V and VI, as a result of which the 6th joint is shorter; 2nd joint narrows distally.

I-III epimeral plates with pointed and drawn-out posterior lower corner, which reaches to the III epimer of the posterior edge of the I urosomal segments; in I and II epimers of the posterior lower angle drawn out somewhat poorly. Uropods as in the other species of the genus.

Telson with deep depression which makes up a third of its length, and armed on the distal part of the outer edge with two short bristles.

Remarks. This deep-water pelagic species differs from the other species of the genus in the unusually developed growths and keels; in this regard it is very close to E. semicarinata Barnard. Such a weak armature on E. pelagica can be considered either as a primitive sign (Gurianova, 1955) or as an adaptation to the pelagic form of life. As is well known, among the other families of gammarids the pelagic representatives to a considerable degree lose their armature, characteristic of their bottom-living relatives (e.g., family Eusiridae).

For E. pelagica the relatively strong gnatopods, the very short rostrum and the equal lengths of I and II antennae are characteristic features.

FAMILY EUSIRIDAE

34. Pareusirogenes carinatus Birstein et M. Vinogradov

Occurrence. Stn. 2217 RT 0-3000. Stn. 3184 RT 0-3000 (Okhotsk Sea).

35. Eusirogenes homocarpus Birstein et M. Vinogradov

Occurrence. Stn. 2217 RT 0-2000.

36. Eusiropsis riisei Stebbing

Stebbing, 1897 : 39

Occurrence. Stn. 3470 IKS 0-500. Stn. 3475 IKS 0-500. Stn. 3477 IKS 0-500. Stn. 3492 IKS 0-100. Stn. 3506 IKS 0-500. Stn. 3514 IKS. Stn. 3535 RT 0-6050.

[p.247] Remarks. Within the expanse of the area investigated by us in the south, in the upper 200 m. stratum we frequently caught this circumtropical species, absent in the Kurile-Kamchatka Trench and adjacent waters. Our specimens were quite typical ones.

37. Meteusiroides plumipes Birstein et M. Vinogradov

Occurrence. Stn. 2208 RT 0-3500, 0-4500. Stn. 3156 RT 0-3800.

38. Eusirella multicalceola (Thorsteinson)

Occurrence. Stn. 2076 BR 80/113 550-1150; BR 113/140 2200-4400. Stn. 2116 RT 0-3000, 0-5000. Stn. 2119 RT 0-4000. Stn. 2120 RT 0-2000, 0-3000; BR 80/113 530-1190; BR 113/140 2200-4600. Stn. 2124 RT 0-1100. Stn. 2144 RT 0-7000. Stn. 2158 RT 0-2000, 0-6000. Stn. 2208 RT 0-1500, 0-2500, 0-3500, 0-4500, 0-5200, 0-5500, 0-6200; KS 0-5000. Stn. 2209 RT 0-1000, 0-2000. Stn. 2110 RT 0-2000. Stn. 2217 RT 0-1000, 0-2000, 0-3000, 0-4000. Stn. 3116 RT 0-4550, 0-5550. Stn. 3146 IKS 0-7200. Stn. 3150 RT 0-1000. Stn. 3151 RT 0-3400. Stn. 3156 RT 0-3800, 0-5300. Stn. 3162 RT 0-2500. Stn. 3163 BR 80/113 1190-3110. Stn. 3166 RT 0-2800, 0-4900. Stn. 3176 RT 0-8000. Stn. 3184 RT 0-3000. Stn. 3206 RT 0-5500. Stn. 3232 RT 0-5800. Stn. 3243 RT 0-3000. Stn. 3252 RT 0-3200. Stn. 3475.

39. Cleonardo longirostris Chevreux

Occurrence. Stn. 2116 BR 80/113 1000 (?) - 1775.

40. Cleonardo macrocephala Birstein et M. Vinogradov

Occurrence. Stn. 2116 RT 0-3000. Stn. 2119 BR 113/140 2200-5250. Stn. 2120 BR 113/140 2200-4600, 4190-8050. Stn. 2158 RT 0-3100. Stn. 2208 KS 0-5000; RT 0-5500; BR 80/113 1300-2200. Stn. 2217 RT 0-2200. Stn. 2218 BR 113/140 4295-6550. Stn. 3116 RT 0-4550, 0-5550. Stn. 3146 IKS 0-7200. Stn. 3214 RT 0-5700.

41. Rhachotropis natator (Holmes)

Occurrence. Stn. 2076 BR 80/113 550-1150. Stn. 2116 RT 0-2000; BR 80/113 415-900. Stn. 2119 RT 0-4000. Stn. 2120 RT 0-3000; BR 80/113 530-1190. Stn. 2124 RT 0-1100. Stn. 2144 RT 0-7000. Stn. 2158 RT 0-2000, 0-6000. Stn. 2208 RT 0-1500, 0-2500, 0-3500, 0-4500, 0-5200, 0-5500, 0-6200; KS 0-5000. Stn. 2209 RT 0-1000. Stn. 2210 RT 0-2000. Stn. 2217 RT 0-1000, 0-2000, 0-4000. Stn. 3206 RT 0-5500. Stn. 3243 RT 0-3000. Recorded, also, for the Bering Sea (Birstein and Vinogradov, 1955), Gulf of Alaska (Thorsteinson, 1941) and California (Barnard, 1954).

[p.248] 42. Rhachotropis distincta (Holmes)

Occurrence. Stn. 2144 RT 0-7000. Stn. 3227 RT 0-6580.

DISTRIBUTION OF PELAGIC GAMMARIDS WITHIN THE BOUNDARIES OF THE AREA OF EXAMINATION

An analysis of the locations of catches of pelagic gammarids made by us within the area examined suffices to establish the essential differences in distribution of individual species in the northwest part of the Pacific Ocean. Some species have a much wider distribution than others; some extend to the south and others to the northern part of the area investigated, being coordinated with different water [p.249] masses, and are present at different levels. A similar analysis makes it possible to understand the relationship of species occurring repeatedly but we do not exclude from these species those only taken once or twice.

From the point of view of distribution within the limits of the northwest part of the Pacific Ocean the pelagic gammarids may be arranged in the following groups.

1. Southern forms. All the places of occurrence or of the vast majority of them are located south of 40°N. North of 43°N. none are taken. Here are found Halice secunda (Stebbing), Crybelocephalus megalurus Tattersall, Eusiropsis riisei Stebbing, Stenopleura atlantica Stebbing, Cyphocaris anonyx Boeck (Fig. 16, 17). Among them H. secunda occurs in the southwest part of the region examined, limited to 40°N. and 159°E. Cr. megalurus has a similar distribution, but extends north to 38°18'N. The surface species E. riisei and St. atlantica [p.250] conversely, are coordinated with the southeast part of the area examined. The more northerly occurring of the other species of this group is C. anonyx, extending to the southern margin of the Kurile-Kamchatka Trench.

2. Northern forms. The great majority of the places of occurrence or all of them are located north of 40°N. In this group are Cyphocaris challengeri Stebbing, Cyclocaris guilelmi Chevreux, Koroga megalops Holmes, Paracallisoma alberti Chevreux, Orchomenella affinis Holmes, Eurythenes gryllus (Lichtenstein), Parandania boecki (Stebbing), Pareusirogenes carinatus Birst. et M. Vin., Eusirella multicalceola (Thorsteinson), Rhachotropis natator (Holmes). Of these P. alberti, O. affinis, P. carinatus and E. gryllus do not occur south of 40°N., C. guilelmi, K. megalops and E. multicalceola extend to 37°N., and P. boecki and C. challengeri are found south to 30°N., but are taken here very rarely in single stations and in single specimens.

3. Forms, limited to the Kurile-Kamchatka Trench, occur only at depths of more than 6,000 m. but not on the ocean floor. Such forms are Scopelocheirus schellenbergi Birst. et M. Vin., Cleonardo macrocephala Birst. et M. Vin.[1], and possibly, Andaniexis subabyssi Birst. et M. Vin. To this group of species belong Astyra zenkevitchi Birst. et M. Vin., taken, besides in the Kurile-Kamchatka Trench, in the northern part of the Japan Trench also.

4. Forms in the Kurile-Kamchatka-Japan-Idzu-Bonin Trenches, all have places of occurrence which are connected together like links in a chain in the designated order and which do not appear on the ocean bottom, living only in the deeps greater than 6,000 m. In this way have spread Hirondellea gigas (Birst. et

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[1] In 1956, from a study of the complex Antarctic expedition in the "Obi", this species was taken by us in the Indian sector of the Antarctic.

M. Vin.), Eurythenes microps Birst. et M. Vin., Vitjaziana gurjanovae Birst. et M. Vin., Hyperiopsis laticarpa Birst. et M. Vin.

5. Forms, widely scattered over the whole region examined: Cyphocaris richardi Chevreux and Halice aculeata Chevreux.

In our previous paper an explanation was given of the character of the vertical distribution of the pelagic gammarids of the Kurile-Kamchatka Trench. It was indicated that each of the species taken in this part of the Pacific was coordinated with one of the vertical zones, determined from studies of the vertical distribution of plankton (Birstein, Vinogradov and Chindonova, 1954). It is possible to distinguish the species of the upper subzone of the deep-water zone (500-2000 m.), species of the lower subzone of the deep-water zone (2000-6000 m.) and species of the Trench zone (deeper than 6000 m.). In the extension of the region of our investigation to the south we encountered also species confined to the surface zone (0-200 m), absent in the boreal waters of the Kurile-Kamchatka Trench - Eusiropsis riisei Stebbing and Stenopleura atlantica Stebbing.

Assignment of the remaining species recently found by us to any specific vertical zone cannot at the present time be accurately made. Taking into account the depths at which Cyphocaris bouvieri, Metacyphocaris helgae, Crybelocephalus megalurus, Hyperiopsis vöringi and Halice secunda were found in the Atlantic, all these species, with the exception of the last, may occur in the upper subzone, but H. secunda - in the lower subzone [p.251] of the deep-water zone. However the possibility cannot be excluded that the vertical distribution of all these species is much wider and that the first may penetrate into the lower deep-water subzone and the latter into the upper deep-water subzone. To explain the spread within the limits of the deep-water zone of the two new species - Hyperiopsis vitjazi and Epimeria pelagica - is not possible from the present data. Two other new species - Scopelocheirus shellenbergi and Eurythenes microps - are, obviously, confined to depths greater than 6000 m., and mainly, living in the Trench zone. Cyphocaris richardi is confined, in the region of the Kurile-Kamchatka Trench, to the lower deep-water subzone in the more southerly part of the region of our investigation while in other parts of the world's oceans it lives also in the upper deep-water subzone.

In comparing the vertical and horizontal distribution of the pelagic gammarids within the limits of the northwest part of the Pacific, it is possible to note certain characteristic features of the fauna of these crustaceans in each of the vertical zones (see tabulation).

In the surface zone there dwell exclusively southern tropical forms, the northern boundary of which lies much more southerly than the northern limit of all the surface tropical plankton, indicated for the area examined by us by V. G. Bogorov and M. E. Vinogradov (1955) and K. A. Brodsky (1955). The difference between these boundaries is indicated by a comparison with the compilation of Masuzawa (1950) of the plan of distribution of the waters of Kurosio along the coast of Japan. The northern boundary of the tropical mizoplankton approximately coincides with the northeast branch of Kurosio, and the northern boundary of distribution of Stenopleura and Eusiropsis terminates approximately along the main branch of Kurosio, along the "drift" of this current.

[p.252] The pelagic gammarids characteristic of the transitional zone have not yet been specified; here sometimes are found only the northern Cyphocaris challengeri, limited chiefly to the upper deep-water subzone. This latter is

Variation in character of distribution of pelagic gammarids in the northwest part of the Pacific in relation to depth of residence.

Zones m.	Southern form		Northern form		Endemic to the Kurile-Kamchatka Trench		Species occurring in the Trench		Widely-distributed forms		Total
	No. of species	%	No. of species	%	No. of species	%	No. of species	%	No. of species	%	
Surface (0-200)	2	100	-	-	-	-	-	-	-	-	2
Transitional (200-600)	-	-	1*	100	-	-	-	-	-	-	(1)
Upper deep-water (500-2000)	2	15	10	77	-	-	-	-	1*	8	13
Lower deep-water (2000-6000)	-	-	-	-	3-4	75-80	-	-	1-2	25-20	4-6
Trench zone >(6000)	-	-	-	-	1-2	20-33	5	80-67	-	-	6-7
Total	4		10		4-6		5		2-3		25-28

* Occurs both in this and in lower-lying zone; in the total it is taken into consideration once (in zone 500-2000 m).

distinquished by the greatest number of species indigenous to it and the greatest variety of types distributed in it. The majority of inhabitants of the upper deep-water subzone belong to the northern form but together with them there are here also representatives of the southern forms (Cyphocaris anonyx and Crybelocephalus megalurus) and one widely distributed species (Cyphocaris richardi), occurring also in the lower deep-water subzone. In the lower deep-water subzone dwell species, not found in the Kurile-Kamchatka Trench, in which occur two widely distributed species (C. richardi and Halice aculeata); the northern and southern forms, occupying a dominant position in the overlying layers of water, are here absent. Finally, of the eight ultra-abyssal species in the Trench zone, six populate the whole deep-water trough from the Kurile-Kamchatka Trench to the north up to the Bonin Trench and to the Volkano Islands in the south. Only one species Scopelocheirus schellenbergi is confined only to the strictly Kurile-Kamchatka Trench and at no time occurs south of it. The same applies in relation to the eighth species in the Trench zone - Andaniexis subabyssi, but this small form was taken in the Kurile-Kamchatka Trench only once and its actual distribution has been really only conjectured.

The data obtained and presented serve to indicate the latitudinal zonation of distribution of the inhabitants of the different layers of the many-kilometre depths of water in the oceanic trenches.

In the surface zone between the boreal and tropical plankton of the northwest Pacific there is a sharp boundary running in a latitudinal direction or from northwest to southeast between 40° and 45° N. (Bogorov and Vinogradov, 1955; Brodsky, 1955). The tropical pelagic gammarids are also definitely limited in their distribution but in more southern latitudes and higher temperatures. In the deep-water zone (from both subzones) the difference between the northern and southern forms is rather obliterated. Part of the northern forms occur far to the south, both along the coasts of Japan (Koroga megalops, Parandania boecki) and in the central part of the region investigated (Cyphocaris challengeri); on the contrary, a southern form - Cyphocaris anonyx - occurs in the north, going beyond the southern part of the Kurile-Kamchatka Trench; two species are also common both in the northern and southern parts of the region investigated (Cyphocaris richardi, Halice aculeata). Turning to the Trench zone it may be emphasized that in the dispersion of the fauna of this zone the latitudinal zonation does not display much influence. One and the same species are encountered within the boundary depths of the vast Trench running from north to south approximately at 20°, not departing, however, from its limits.

In general, in the case of the pelagic gammarids one can see that the influence of latitudinal zonation is a basic factor determing the distribution of the organisms in the surface strata of the ocean in proportion as the depth gets less and less and at the maximum depths of the oceanic trenches dwindles to nothing.

This regularity is demonstrated by the findings of Wüst (1929) and confirmed by the studies of the Institute of Oceanology of the movements of the water masses of the north Pacific. According to Wüst, in this section of the Pacific, at depths of 1500-3000 m.occur the waters of Pacific Ocean origin, which Wüst terms "the deep current" and below [p.253] 3000 m.is found the "polar near-bottom" water of Antarctic origin. The temperature and salinity of both deep-water water masses retain a remarkable uniformity, they fluctuate within the narrow limits and do not vary in dependence on latitude. Above 1500 m.there was observed a much more complex picture of the meeting of mixed water masses of subarctic and tropical character.

It is evident that the species of the lower deep-water zone and the Trench zone are associated with the polar near-bottom water mass of Wüst and therefore may be freely distributed in a longitudinal direction in this water mass which possesses uniform hydrological features. The species of the upper deep-water subzone reflect the influence from the point of view of the superincumbent water masses. It may be readily noted that the distribution of our northern forms in general features reflects the distribution of the subarctic waters, and certain northern pelagic gammarids (as explained above) penetrate along the coasts of Japan far to the south together with the cold subarctic waters of Oishio. The southern forms disperse northward together with the Pacific Ocean waters. Since within the limits of the upper deep-water subzone (500-2000 m.) to a varying degree there takes place a mixing of the oceanic and subarctic waters, we find here also species with different types of geographic distribution. However, many details of the sketch with respect to certain general features of the picture remain quite definitely unclear. We still know far too little, not only about the distribution and association with a definite depth for the different species of the pelagic gammarids, but also about the hydrological regimé of the deep-water masses. In particular, it is difficult to say whether the boundaries of distribution of many of the deep-water species of the pelagic gammarids depend on certain gradients of a hydrological character, not fully established for the waters at the depth at which they live or are determined by the conditions in the more surface waters, with which the gammarids might be connected by a system of vertical migration, in the intake of food material or something else.

Agreement between the distribution of our species within the boundaries of the northwest part of the Pacific Ocean with those in the general geographic distribution also indicates the extent of the difficulties which cannot be overcome until we can more accurately know their actual zone of occurrence in certain regions of the world's oceans. Thus, for example, Cyphocaris challengeri, which is overwhelming in the northern part of the region of our investigations, belongs to a number of pan-oceanic species since it is found in the Pacific, Atlantic and Indian Oceans and also in the Atlantic.

The question arises, can this be considered a "northern form", if it is found in the Atlantic and Indian Oceans and especially in the tropical parts? However for the tropical part of the Pacific this species has not been reported; but we do not know whether it is actually absent from there or whether the tropical part of the Pacific just hasn't been sufficiently studied. Such a question arises in relation to Parandania boecki, Eurythenes gryllus, Paracallisoma alberti. Judging by the data now available to us, certain species, the zones of which in the Atlantic are continuous, unbroken, in the Pacific Ocean display a tendency to bi-polar distribution.

There can be no doubt about the different locations of the northern and southern boundaries of distribution of some of the species of pelagic gammarids in the Pacific and Atlantic Oceans. Thus, for example, in the Pacific Cyphocaris anonyx is not found north of 43° N. whereas in the Atlantic it goes to 65° N. (Stephensen, 1933). Crybelocephalus megalurus in the Pacific was not found by us north of 38° N., but in the Atlantic this species is known between 57° and 63° N.

[p.254] A similar mixture of zones of occurrence in the Atlantic Ocean (in comparison with the Pacific) is natural for certain other deep-water pelagic crustacea. Thus, for example, according to the findings of Fage (1941) the deep-water mysid Gnathophausia zoea in the Atlantic was found much further north than in the Pacific. If these "southern forms" in the Atlantic are distributed much further north than in the Pacific, then some "northern forms" appear to have a contrary tendency. Cyclocaris guilelmi in the Atlantic does not penetrate south of 60° N. but in the Pacific, according to our findings, it occurs up to 38° N. The same southern occurrence applies to Koroga megalops, 63° N. in the Atlantic and 38° N. in the Pacific.

The mixing of the boundaries of the zones of occurrence of certain deep-water pelagic crustacea in the Pacific, in comparison with the Atlantic, is connected with the sudden changes in temperature conditions of the deep waters of these oceans. The simultaneous publication in Vol. II of "Marine Atlas" (1953) of the hydrological profiles of the Pacific and Atlantic Oceans substantiates that in the deep waters of the latter in its northern part, there is naturally a very much higher temperature than in the Pacific deep waters at the same latitude. Thus, for example, below 40° N. in the Atlantic the stratum of water between 1000 and 2000 m. has a temperature from 4° to 10° but in the Pacific - from 2° to 3°. Farther north the temperature of this stratum in the Atlantic equals 3° but in the Pacific the main mass of water in this stratum has a temperature of less than 3°. Similar temperature differences in the deeper strata are no less marked. North of 40° N. the temperatures of the vast mass of water between 2000 and 4000 m. in the Atlantic are above 2° but in the Pacific they are below 2°. In general, if consideration is given to the considerable degree (extent) of stenothermy of the species in question, there becomes clear the mixing, to the south of the zones of occurrence, of relatively cold-loving species in the Pacific and the mixing to the north of the zones of occurrence of warm-loving species in the Atlantic.

APPENDICES

Appendix I. List of symbols denoting type of collecting gear

D 38 - Juday closing net, diameter of inlet opening - 37 cm. Filtering cone of fine mesh silk, No. 38 (38 openings per cm.). Vertical hauls.

BR 80/113 - Juday closing net, 80 cm. diameter opening, diameter of filtering cone 113 cm. Filtering cone made of coarse mesh, No. 140 (14 mesh per cm.). Vertical hauls.

BR 113/140 - As above, but with ring diameter of net - 113 cm. and diameter of filtering cone - 140 cm.

IKS - Open conical net, diameter of opening - 90 cm. Coarse mesh - No. 140. Vertical and horizontal hauls.

KS - Conical net, diameter of opening - 160 cm. Horizontal and vertical hauls.

XS - "Khamserosnaya" conical net of 160 cm. diameter. Horizontal and vertical hauls. [Type of net used for catching "Khamsa" or anchovy in the Black Sea.]

RT - Perlon ring-trawl - 160 cm. diameter. Size of mesh around 2 mm. Horizontal tows. ["Perlon" is a synthetic fibre, much like nylon].

BPS - Large pelagic net. Conical net with diameter of opening - 525 cm. - with a cone of "khamserosnoi" netting, of coarse mesh. Vertical hauls.

For horizontal catches nets were not closed and therefore captured forms not only during the horizontal haul but also during descent and ascent.

Appendix II. List of coordinates and depth of stations, referred to in text.

No. of station	Date when station occupied	Coordinates N. Lat.	Coordinates E. Long.	Depth m.
	1949			
162	10. XII	43°39'	152°03'	8100
	1953			
2074	1. V	42°28'	150°19'	4990
2076	9. V	43°39'	149°24'	9170
2110	19. V	46°11'	152°51'	3970
2116	21. V	45°16'	156°13'	4560
2119	24 - 25. V	46°11'	154°55'	5125
2120	25 - 26. V	46°31'	154°22'	7820
2124	27. V	47°36'	153°04'	840
2144	1 - 2. VI	48°25'	156°34'	7340
2158	5 - 6. VI	49°12'	158°35'	6700
2207	21. VI	50°16'	159°45'	7570
2208	21 - 23. VI	49°29'	158°41'	1800
2209	23 - 24. VI	49°46'	157°48'	3270
2217	29 - 30. VI	44°08'	150°32'	9800
2218	30. VI - 2. VII	43°48'	149°55'	9180
	1954			
3116	28. VIII	51°46'	161°48'	5830
3138	15. IX	51°26'	158°52'	2460
3145	18. IX	50°59'	159°56'	4890
3146	18. IX	50°47'	160°22'	7586
3150	24. IX	44°31'	170°07'	1250
3151	24. IX	44°19'	170°04'	5160
3156	28. IX	39°57'	164°52'	5500
3157	29. IX	40°43'	163°58'	5190
3162	1. X	43°19'	157°46'	5560
3163	2. X	43°46'	156°34'	5440
3166	3. X	44°50'	154°02'	5410
3176	6. X	44°08'	150°22'	8900
3184	11. X	45°19'	145°11'	2960
3185	11. X	45°05'	145°36'	2950
3197	14. X	40°03'	151°14'	5540
3200	16. X	37°26'	153°10'	5850
3206	20. X	30°53'	153°09'	5930
3214	25. X	38°11'	143°56'	6560
	1955			
3227	2. V	38°03'	143°57'	7200
3232	5. V	33°31'	149°33'	6050
3243	11. V	39°43'	159°40'	5490
3248	13. V	42°52'	164°10'	5740
3252	15. V	46°00'	160°21'	5520
3320	26. V	53°35'	160°56'	
3325	27. V	52°03'	166°45'	4040

No. of station	Date when station occupied	Coordinates N. Lat.	Coordinates E. Long.	Depth m.
3364	10. VI	48°19'	169°09'	2960
3368	12. VI	49°45'	166°39'	5400
3371	14. VI	50°49'	162°25'	5460
3470	25. IX	34°50'	151°51'	6137
3475	27. IX	31°22'	151°10'	1510
3477	28. IX	31°20'	150°04'	5965
3490	6. X	29°59'	142°37'	9007
3491	7. X	30°34'	142°41'	7200
3492	7. X	29°21'	143°34'	5870
3493	8. X	29°04'	142°35'	6080
3498	10. X	26°14'	143°43'	2620
3499	12. X	25°27'	143°22'	4900
3502	13. X	23°35'	144°12'	7630
3506	16. X	23°15'	140°40'	3850
3514	19. X	27°55'	143°18	9270
3515	22. X	28°08'	141°08'	4150
3521	24 - 25. X	29°56'	137°02'	4740
3528	28. X	27°49'	130°37'	6590
3535	30 - 31. X	29°04'	131°47'	5600

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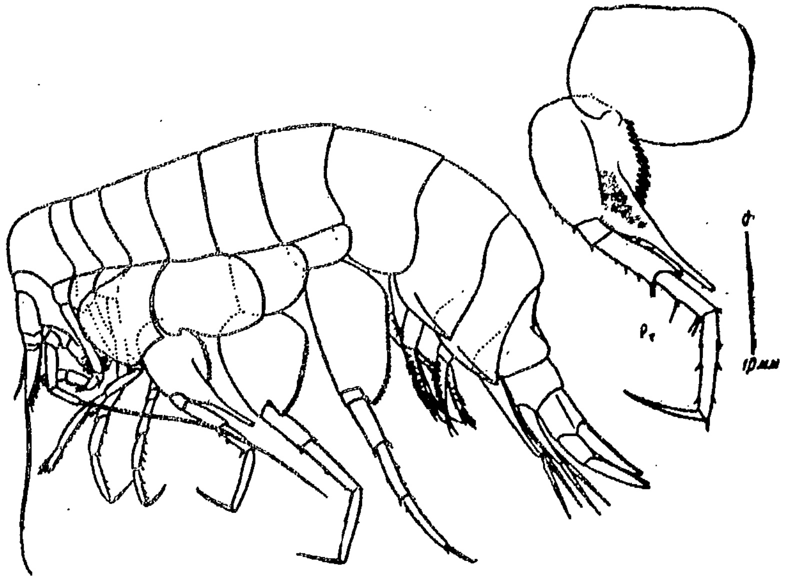
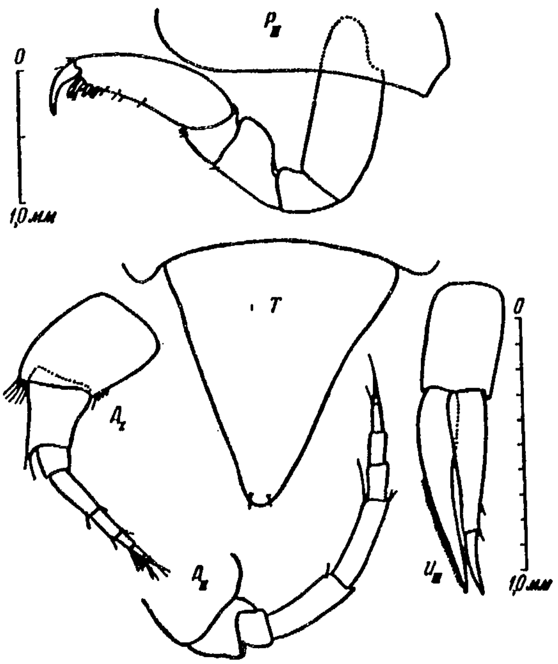
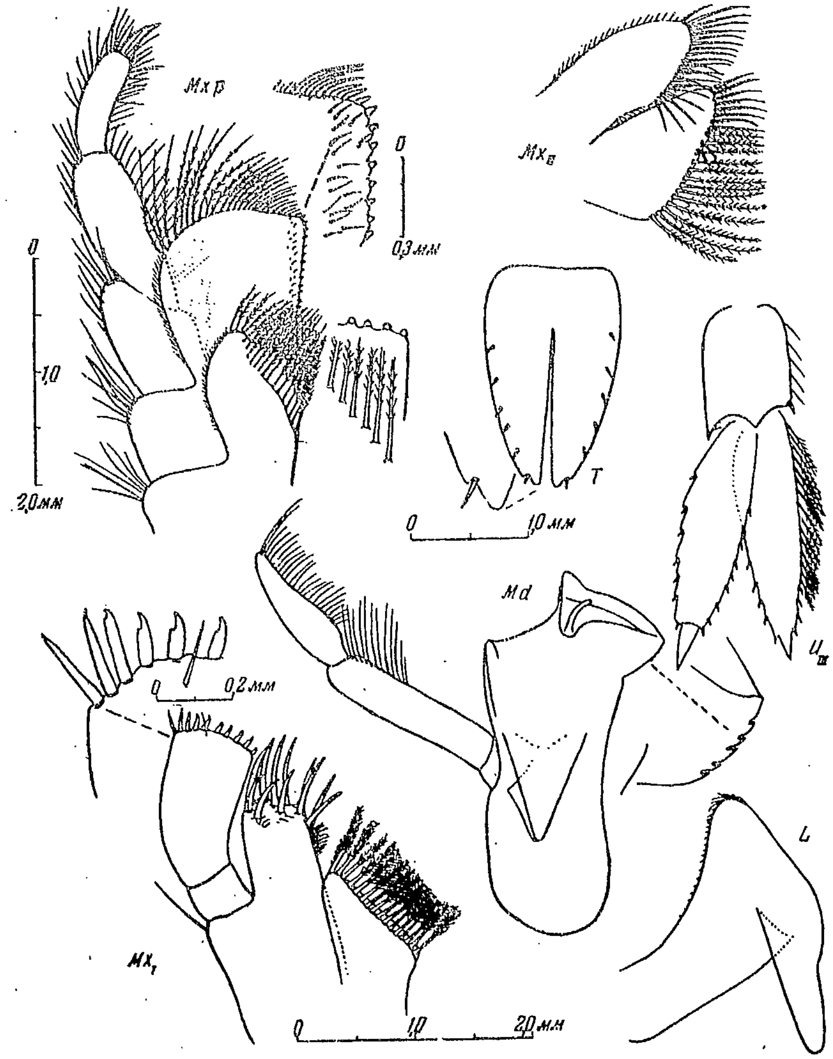


[P.222] Fig. 1. Cyphocaris bouvieri Chevreux

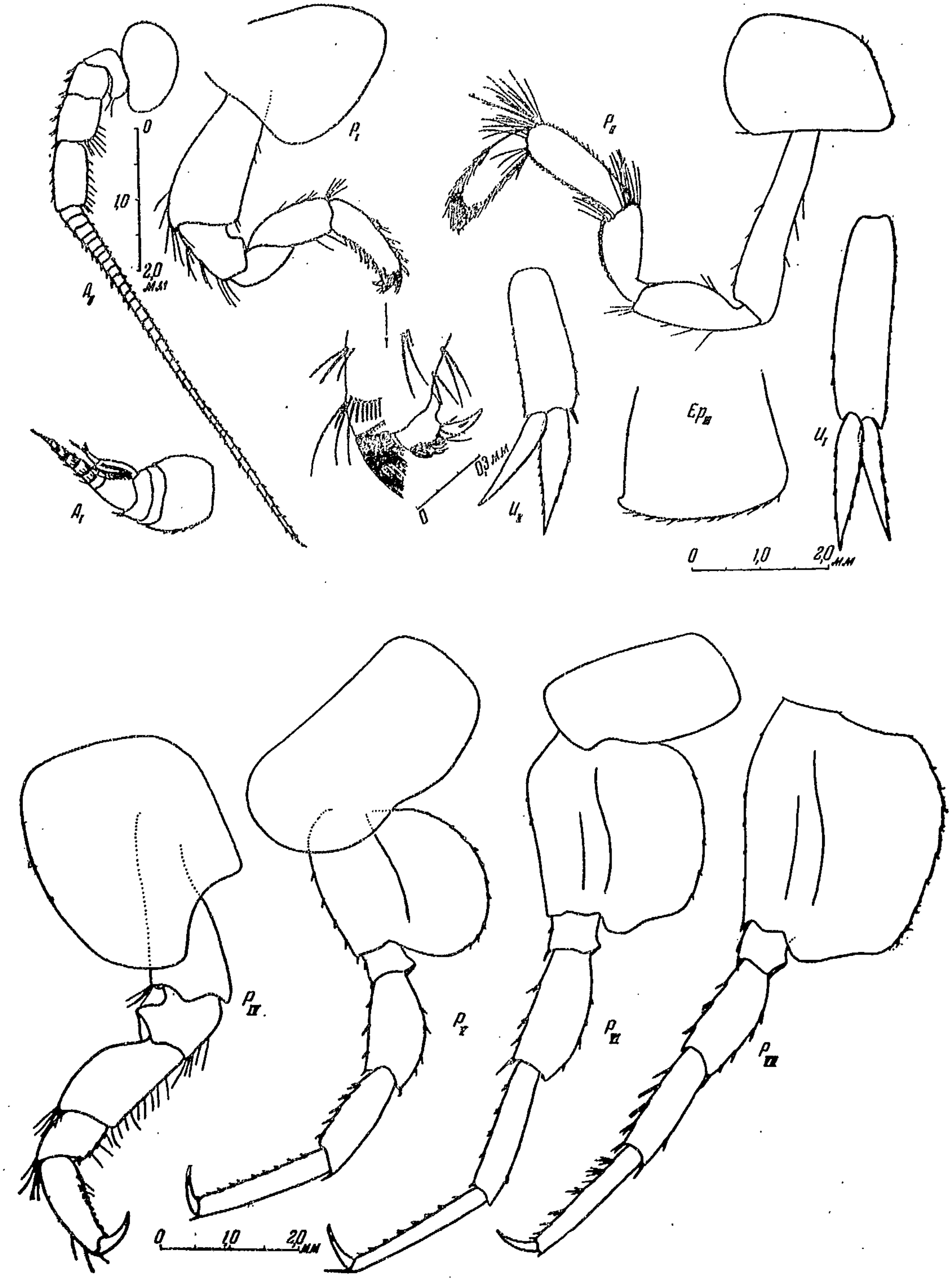
A_I + A_{II} - I + II antennae; Md - mandible; Mx + Mx - I + II maxillae; L - upper jaw; Mxp - maxilliped; P_I - P_{VII} - I - VII peraeopods; U_I - U_{III} - I - III uropods; Ep_{III} - III epimer; T - telson.



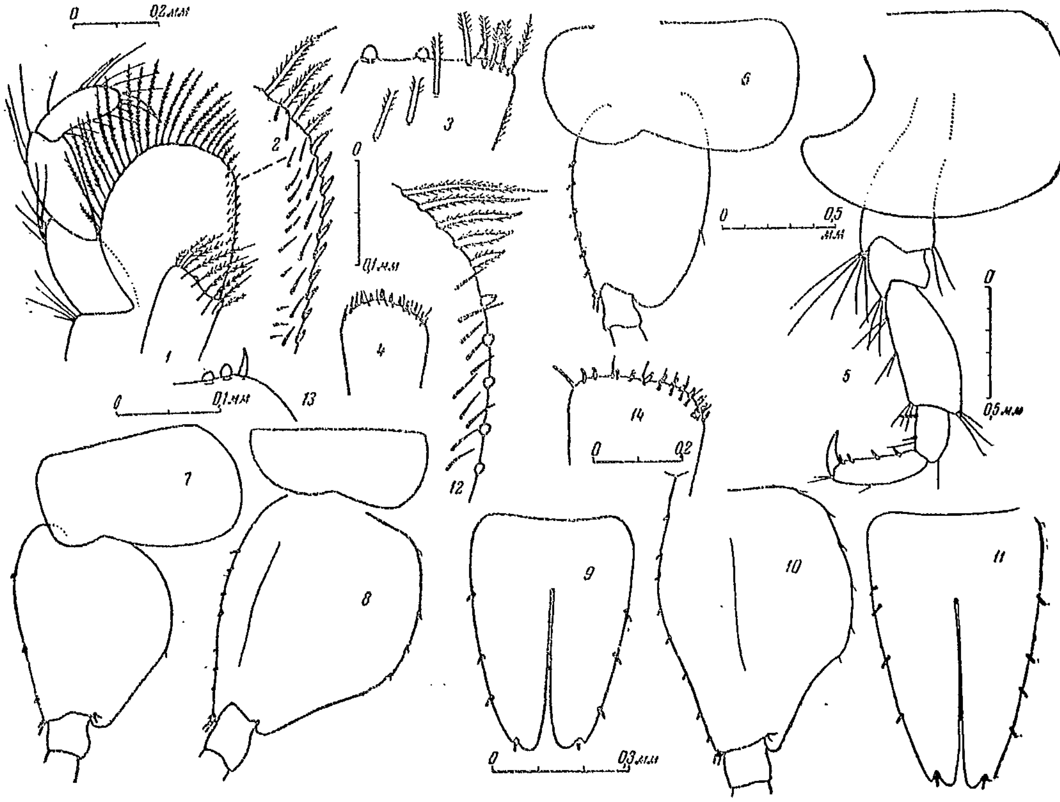
[P.223] Fig. 2. Crybelocephalus megalurus Tattersall



[P.225] Fig. 3. Scopelocheirus schellenbergi, sp. n.

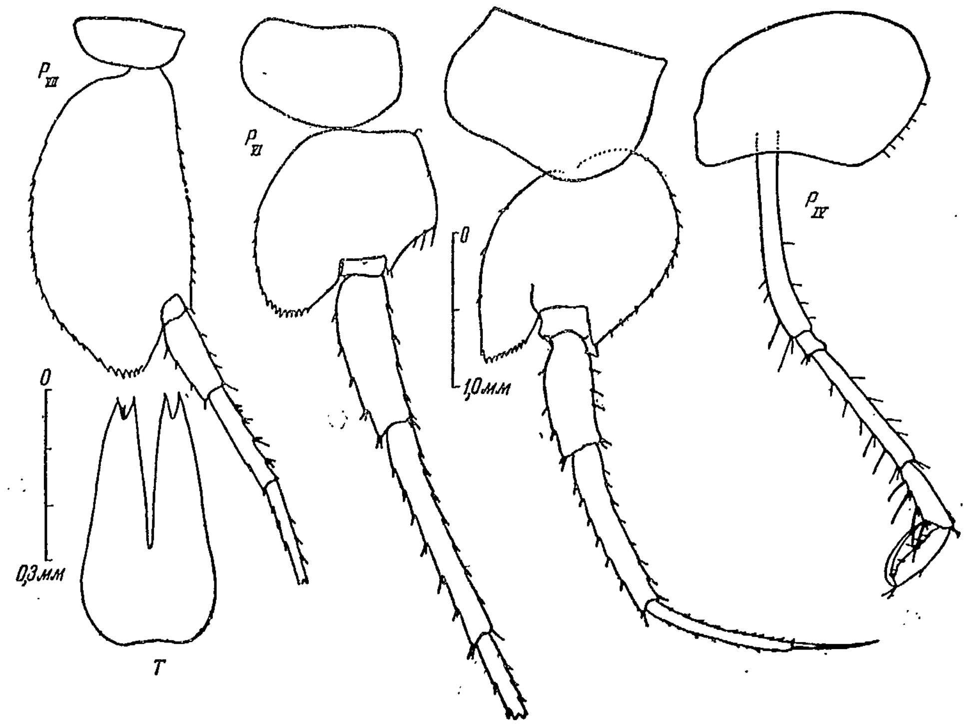


[P.227] Fig. 4. Scopelocheirus schellenbergi, sp. n.

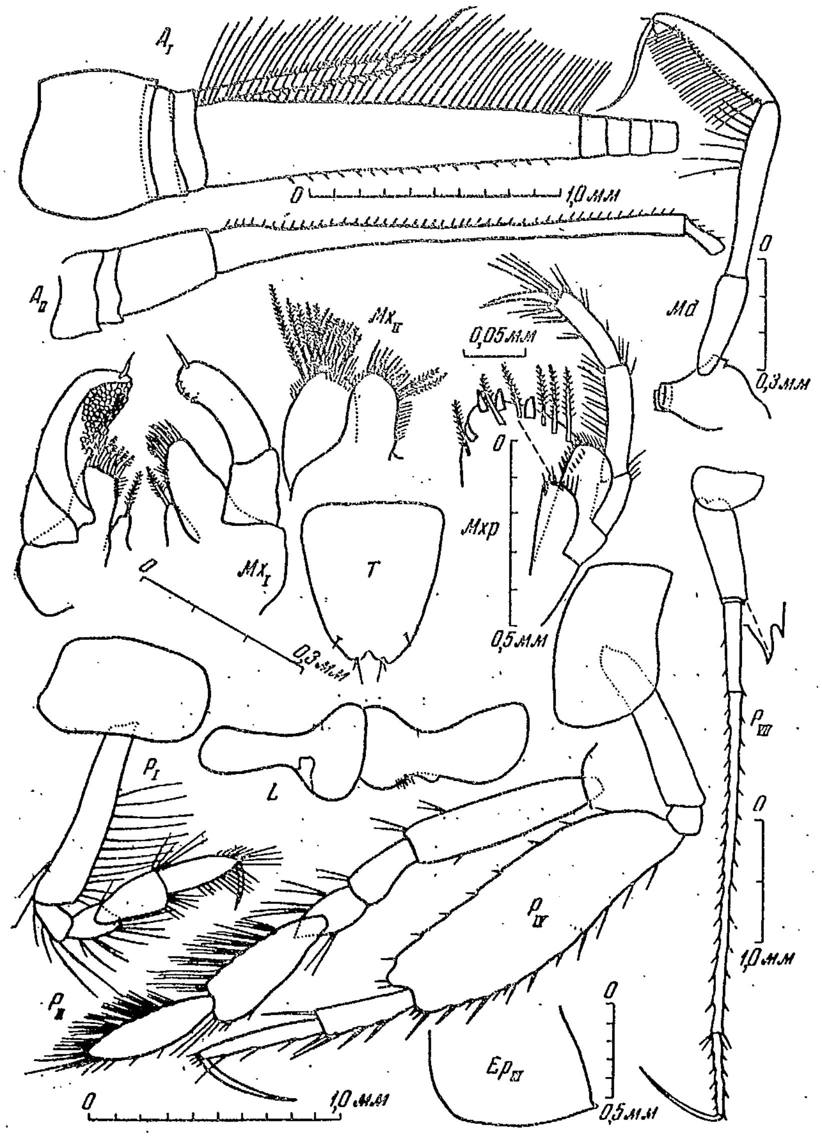


[P.229] Fig. 5. Eurythenes microps, sp. n., specimen 9 mm. long (1-10) and Eurythenes fusiformis, specimen 17 mm. long (11-14).

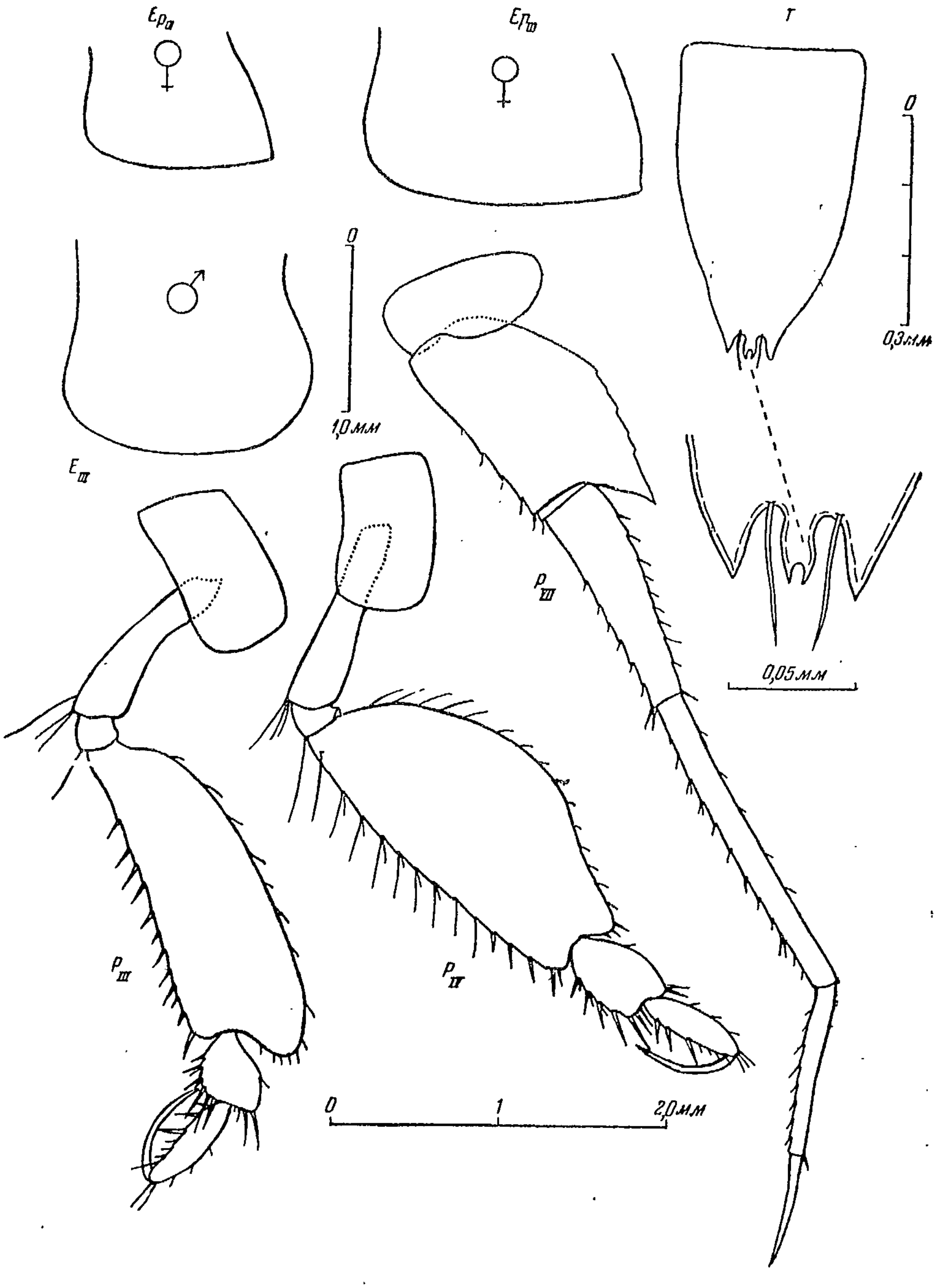
1 - maxilliped; 2 - distal part of inner margin of outer lobe of maxilliped; 3 - distal edge of inner lobe of maxilliped; 4 - distal margin and bristles of I maxilla; 5 - IV peraeopod; 6 - proximal section of V peraeopod; 7 - proximal part of VI peraeopod; 8 - proximal part of VII peraeopod; 9 - telson of specimen 10 mm. long; 10 - basal joint of VII peraeopod; 11 - telson; 12 - distal part of inner margin of outer lobe of maxilliped; 13 - distal margin of inner plate of maxilliped; 14 - distal margin of spines of I maxilla.



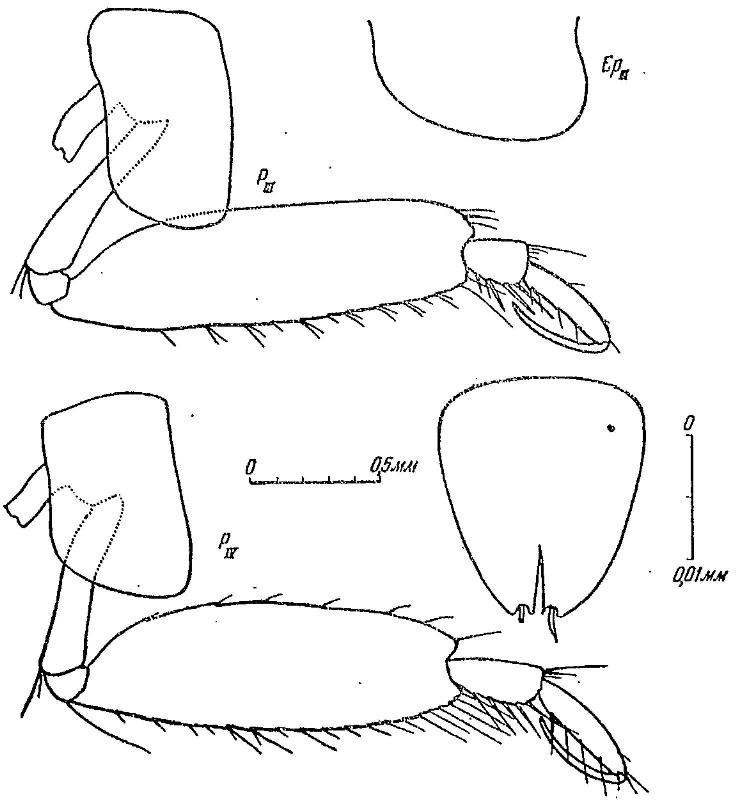
[P.232] Fig. 6. Parargissa arcuata (Birst. et M. Vin.)



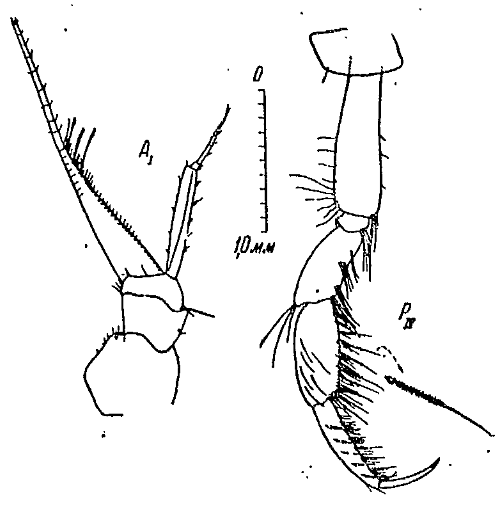
[P.234] Fig. 7. <u>Hyperiopsis vitjazi</u>, sp. n.



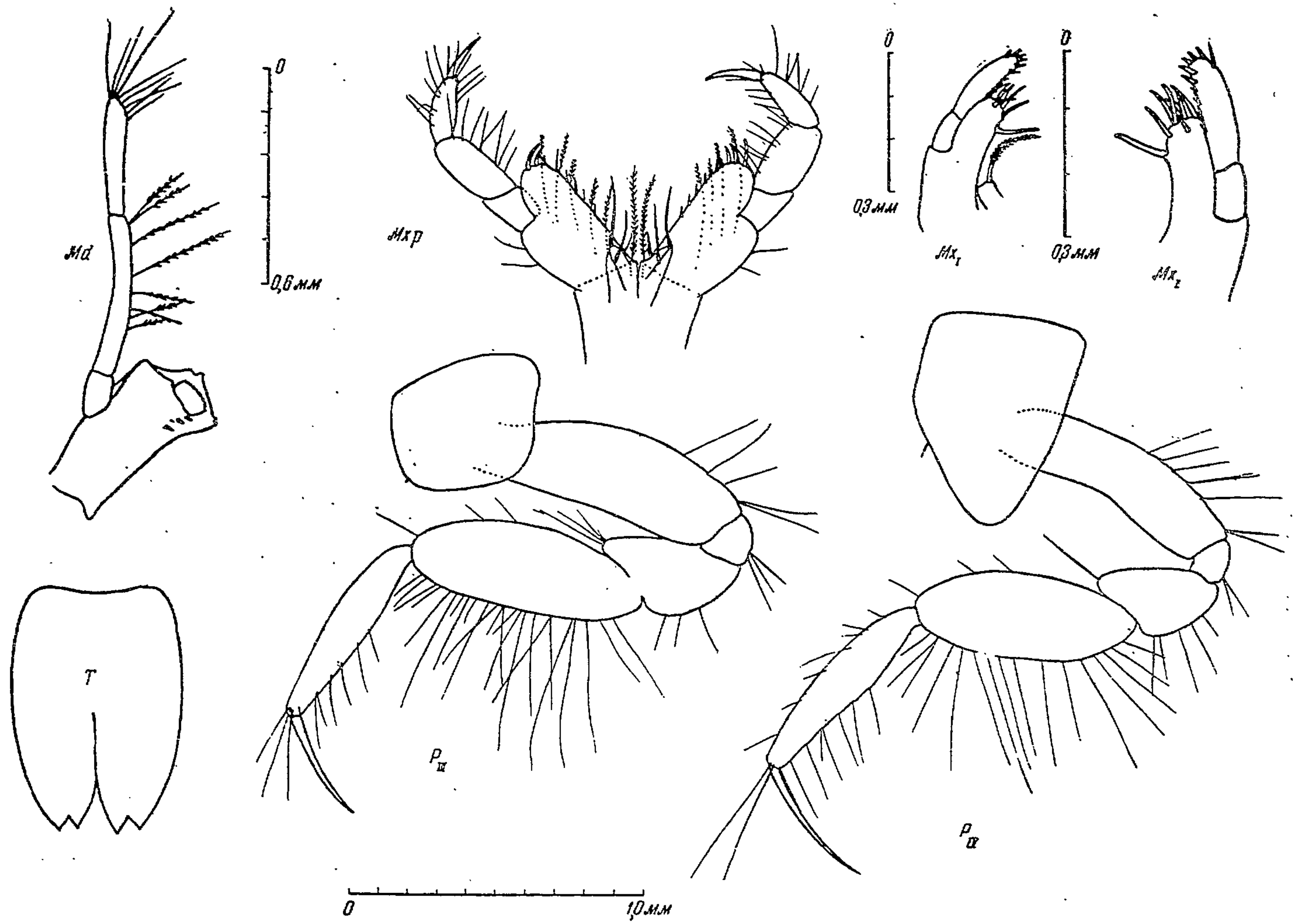
[P.236] Fig. 8. Hyperiopsis laticarpa Birst. et M. Vin.



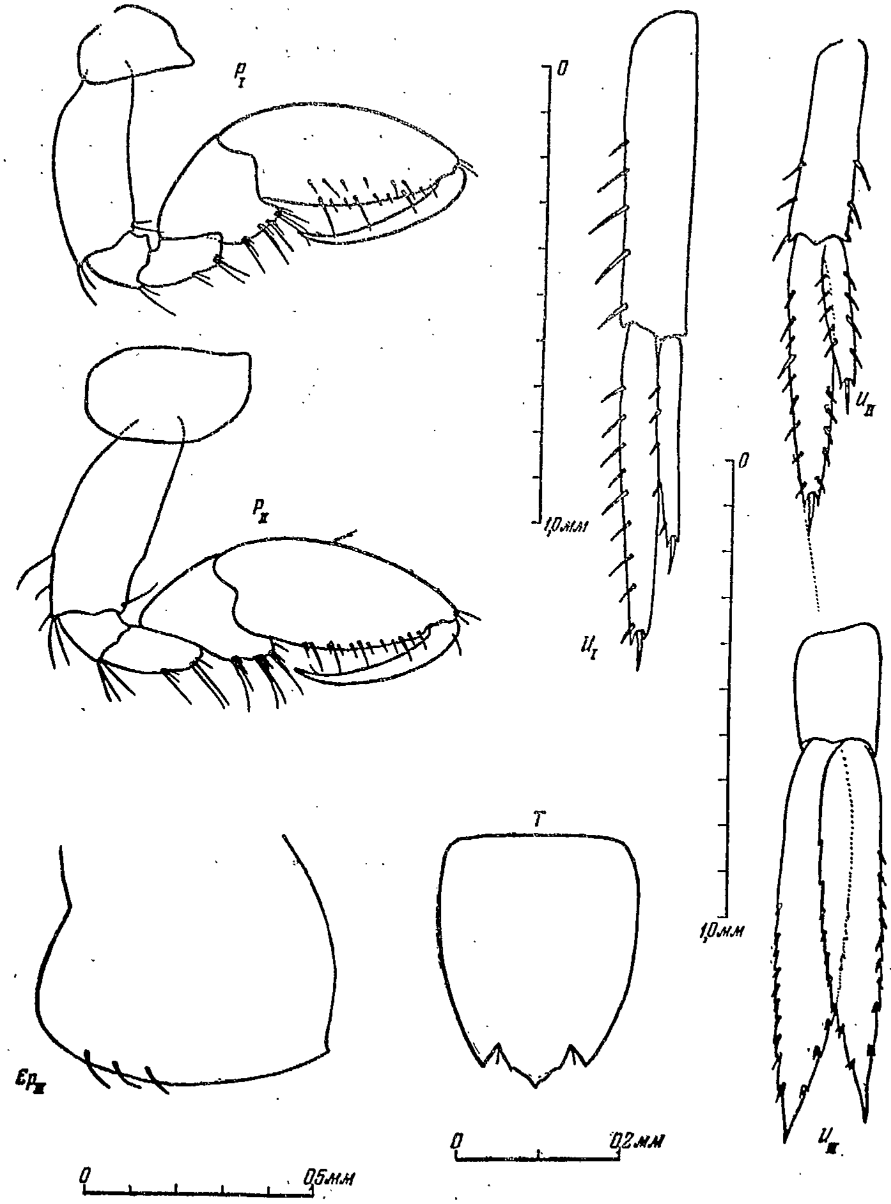
[P.237] Fig. 9. Hyperiopsis voringi G. O. Sars.



[P. 239] Fig. 10. Halice quarta Birst. et M. Vin.



[P. 240]   Fig. 11. Halice secunda (Stebbing).



[P.242] Fig. 12. Stenopleura atlantica Stebbing.

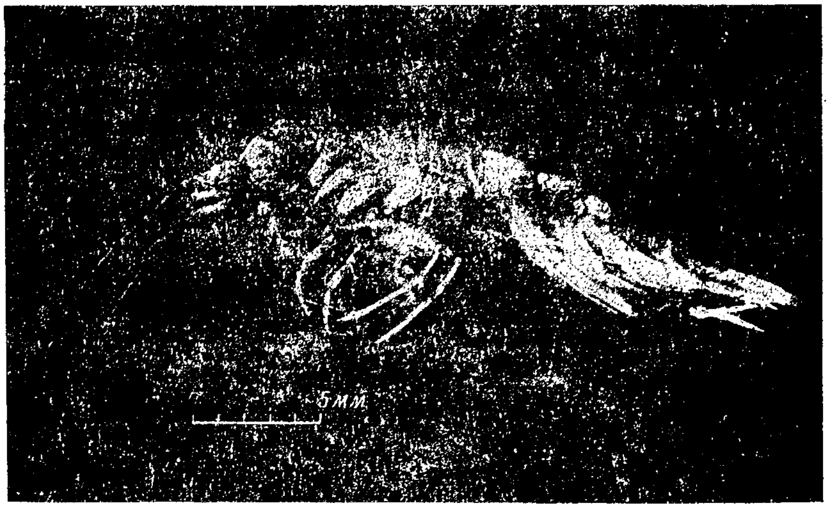
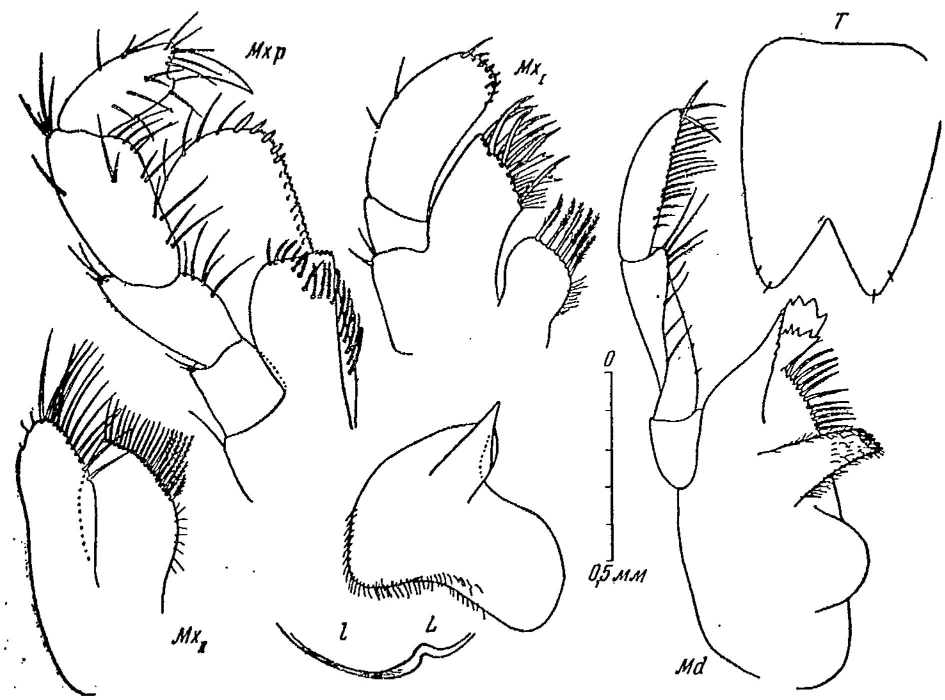
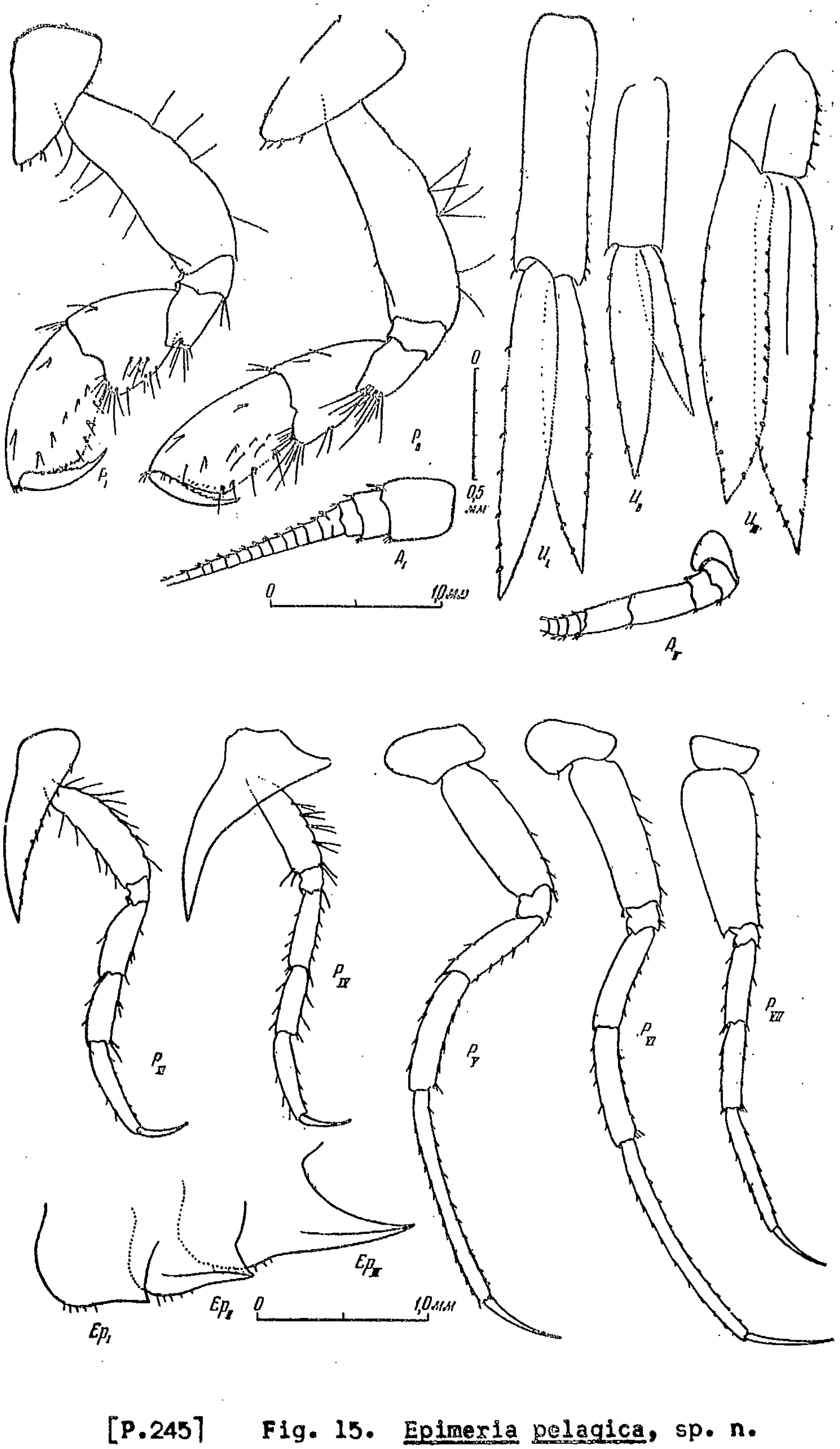


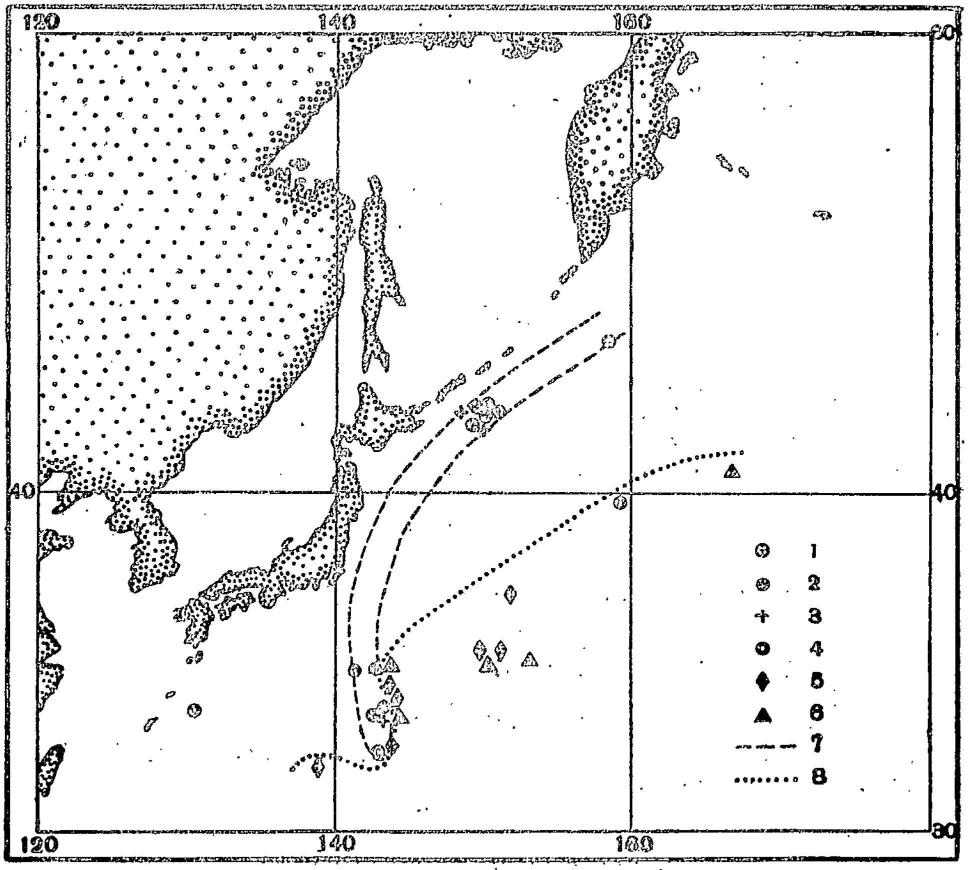
Fig. 13. Epimeria pelagica, sp. n.



[P.244] Fig. 14. Epimeria pelagica, sp. n. 23 mm. long.

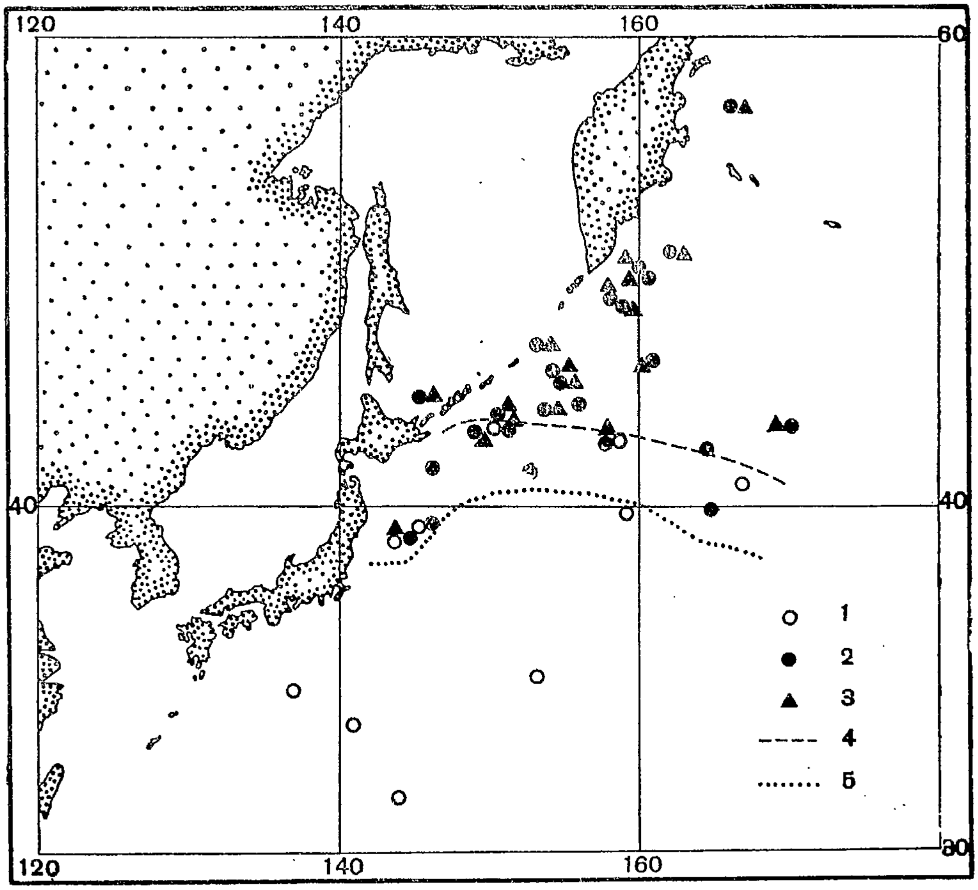


[P.245] Fig. 15. Epimeria pelagica, sp. n.



[P.248] Fig. 16. Distribution in the northwest Pacific of the southern forms (Eusiropsis riisei, Stenopleura atlantica & Halice secunda) and the forms from the Kurile-Kamchatka-Japan-Idzu-Bonin Trenches (Vitjaziana gurjanovae, Halice quarta, Parargissa arcuata).

1 - V. gurjanovae; 2 - H. quarta; 3 - P. arcuata; 4 - H. secunda; 5 - E. riisei; 6 - St. atlantica; 7 - depth contour of 6000 m. (diagramatic); 8 - northwest boundary of distribution of shallow-water southern forms.



[P.249]

Fig. 17. Distribution in the northwest Pacific of the southern form (Cyphocaris anonyx) and the northern forms (Cyclocaris guilelmi and Koroga megalops).

1 - Cyphocaris anonyx; 2 - Cyclocaris guilelmi; 3 - Koroga megalops; 4 - northern boundary of distribution of C. anonyx; 5 - southern boundary of distribution of C. guilelmi & K. megalops.