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HYPERIIDS (AMPHIPODA-HYPERIIDEA) FROM THE NORTHWEST SECTION OF THE PACIFIC OCEAN

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1. Tribe Hyperiidea Physosomata

All representatives of the sub-order Hyperiidea have a pelagic form of life and have completely lost any connection with the bottom. As pelagic forms, they frequent all depths of water from the surface to the deepest parts of the ocean trenches. The hyperiids are free-living or may appear as symbiants or parasites of various Coelenterates and Tunicates.

Particularly rich in specific relations, the hyperiids are represented in the deep waters of the ocean (tribe Hyperiidea Physosomata) and in the surface waters of the tropical and subtropical parts (tribe Hyperiidea Eugenuina and mostly the sub-tribe Hyperiidea Curvicornia). In the surface layers of the colder seas the number of species is fewer, whereas quantitatively they are most abundant and may form vast aggregations, making up the natural components of the food of herring and of whales.

In the present work the most primitive group of hyperiids has been examined - the tribe Hyperiidea Physosomata. To it belong exclusively the deep-water species of which only a few are ever taken in the surface layers. This tribe is one of the few large groups of deep-water pelagic animals which does not have any closely-related forms, either in the surface-water pelagic fauna or among the bottom organisms. Consequently, with respect to its geographical distribution, it most clearly indicates the connection between the various sections of the abyssal pelagial of the world's oceans.

The deep-water hyperiids of the different regions have been studied most irregularly. The most complete collection was made in the northern part of the Atlantic Ocean. Somewhat less detailed was a study of the Antarctic and Indian Ocean hyperiids. As regards the Pacific and particularly the northern part, it has, in this respect, been but very little investigated. Behning (1939) describes for the Okhotsk and Bering Seas, eight species of Physosomata, E.F. Gurianova (1952) for the northwest Pacific and Thorsteinson (1941) for the Alaskan Gulf describe only one species and Hurley(1956) for the California region - five species. Only in recent times has A.I. Bulycheva (1955) published a fuller list of the hyperiids of the northwest Pacific and the Far-Eastern Seas. In this list are described 15 species, belonging to the tribe Physosomata; of these, 12 species were taken by her. We (Vinogradov, 1956) for [p. 187] the Bering Sea have described 20 species, belonging to this tribe. Of these only one species (Proscina birsteini) was not found in the present collections. Of the species, described by Hurley, there are lacking, in our material, Lanceola aestiva, Scina tullbergi and S. nana, and of the species taken in the near-Kurile region by Bulycheva, we did not find Archaeoscina stebbingi, Lanceola aestiva, Chuneola paradoxa and Scina orientalis. However the possibility exists that having found among them Ar. stebbingi, there may also occur occasionally Ar. steenstrupi. As we have indicated, we have yet to verify the presence of L. aestiva in the area under discussion.

The present paper gives the results of a study of all the material collected by the combined oceanographic expeditions of the Institute of Oceanology of the USSR Academy of Science in the research vessel "Vitiaz" in the area lying east and southeast of the Kurile Islands (fig. 1).

The material examined by us includes 34 species and 4 sub-species of the Hyperiidea Physosomata. Of these, two species and two sub-species are described for the first time.

The tribe Physosomata includes 7 families, which may be described in the following key.

Key for identification of the families of the tribe Hyperiidea Physosomata

1. Mandibular feeler present ..... (2)
--- Mandibular feeler absent ..... (4)
2. Pereiopods do not have spoon-like endings with retracted claws ..... (3)
--- At least VI and VII pereiopods have spoon-like endings with retracted claws ..... Family Lanceolidae
3. 5th joint of I and II pereiopods enlarged distally. Mandibles with long, [p. 188] very thin edges, which are only a little shorter than the width of the body of the mandibles and with reduced additional platelets ..... Family Microphasmidae
--- 5th joint of I and II pereiopods not enlarged distally. Mandibles with very short serrated thin edges and well developed additional platelets ..... Family Archaeoscinidae
4. Pereiopods III-VII do not have spoon-like endings with retracted claws. I antennae with quite long tip ..... (5)
--- Pereiopods III-VII have spoon-like endings with retracted claws. I antennae short, or only not very long tip.... Family Chuneolidae
5. Outer lobes of maxillipeds well developed, separate; both branches of uropods free ..... (6)
--- Outer lobes of maxillipeds always fused and more or less reduced, close to complete absence. Endopodites of the uropods fused with protopodites ..... Family Scinidae
6. Anterior segments of the pereiona of females greatly swollen. II antennae of males comparatively short ..... Family Mimonectidae
--- Form of the body of females the same as for males; anterior segments of pereiona not swollen. II antennae of males long and slender ..... Family Proscinidae

Family Archaeoscinidae Stebbing

Genus Archaeoscina Stebbing (= Micromimonectes Woltereck)

1. Archaeoscina steenstrupii (Bovallius)

Pirlot, 1939, p. 18 (literature); Vinogradov, 1956, p. 200. Mimonectes steenstrupii Bovallius, 1885, p. 12; 1887, p. 558; Archaeoscina bonnieri Stebbing, 1904, p. 19; Micromimonectes irene Woltereck, 1906, p. 190; Barnard, 1932, p. 250; Micromimonectes steenstrupii Stephensen et Pirlot, 1931, p. 534; Stephensen, 1933, p. 64; Micromimonectes typus physosoma Woltereck, 1906, p. 191.

Material. At our disposal were four mature females with developed (oostegitami) of 3-4 mm in size, found in samples taken at depths of 0-3100 and 0-1000 m, and one young specimen from 200-500 m.

Occurrence. Pan-oceanic species. Well known from various parts in the Atlantic between 64°46'N, 53°35'W and 43°20'S, 46°02'W, from the tropical regions in the Indian Ocean. In the Pacific, was taken in the Bering Sea up to 60°00'N and on the coast of South America (5°57'S, 80°50'W).

Taken by us at Stations 51°27'N, 158°48'E; 49°26'N, 158°42'E; 44°07'N, 150°32'E.

Family Lanceolidae (Bovallius)

A typically deep-water family, the species of which are usually not found above 200-500 m. In surface waters only Lanceola sayana was found. These heavy and sluggish animals, in every case very large individuals, live in deep-water medusae and syphonophores and feed on the tissue of their hosts or the residue of their food. All the stomachs of Lanceolidae dissected by us were packed full of dark brown reddish detritus material, containing a large number of (telets), reminiscent of the (strekatelnye) capsules of Coelenterata. Woltereck (1927) found, in the alimentary tracts of very large specimens, also the remains of Chaetognatha and also bits of the heads with tentacles and light-producing organs. He considers that bits of such large animals must be torn off with the lancets from the hunting arms of the syphonophores or medusae.

Since, as referred to above, Lanceolidae live on certain deep-water animals there seems to be good reason for the special development of the distal ends of the three (or two in the genus Prolanceola) last pairs of pereiopods.

[p. 189] The claws of these feet can be withdrawn into the spoon-like grooves on the end of the 6th joint together with the torn tissue of the host.

Their existence in very large deep-water Coelenterata permits the Lanceolidae to attain a large size - up to 60 mm.

In the family six genera (Prolanceola Wolt; Lanceola Bov.; Scypho-lanceola Wolt; Megalanceola Pirlot; Metalanceola Pirlot; Paralanceola Barnard). Of them, in our material, only three occur, which are noted in the key below by the asterisks.

Key for identification of genera of the Family Lanceolidae

1. V-VII pereiopods have spoon-like endings with retracted claws. 6th joint of I pereiopod tapered distally ..... (2)
--- Only VI and VII pereiopods with retracted claws. 6th joint of I pereiopods enlarged distally ..... *Genus Prolanceola Woltereck
2. Length of flagellum of II antennae less than 2.5 times longer than the length of the base or even shorter than it. Inner lobes of maxillipeds present ..... (3)
--- Flagellum of II antennae long, thread-like, to a slight extent longer than basal joint. Inner lobes of maxillipeds reduced .....Genus Paralanceola Barnard
3. Mandibles with broad, cutting edge and reduced supplementary platelet. 5th segment of 1st pereiopod much widened distally ..... (4)
--- Mandibles with narrow cutting edge and well developed supplementary platelet. 5th segment of 1st pereiopod scarcely widened distally. Eyes in the form of ribbon-like enlargement at the side of the head ..... Genus Megalanceola Pirlot
4. III-IV pereiopods very strong; length of their claws amounts to more than half of the length of the 6th joint. Tentacle of 1st maxillae reduced, markedly shorter than their outer lobe. II antennae only slightly longer than the base of the I antennae ..... Genus Metalanceola Pirlot
--- III-IV pereiopods weak; their claws shorter. Tentacle of I maxilli equal to or longer than their outer lobe ..... (5)

5. Eyes changed into reflecting organ, having the form of two large goblet-shaped depressions on both sides of the head ..... *Genus Scypholanceola Woltereck

--- Eyes of the usual structure, lying on the small elevations on the side of the head ..... *Genus Lanceola Say.

Genus Lanceola Say.

Up to the present 13 species of this genus have been described, of which some seem to be synonyms of other species, but the shortness of the original description does not permit definition of this with authenticity. Thus, as synonyms, appear probably L. sayana Bovallius and L. pelagica Say; L. serrata Bovallius; L. australis Stebbing and L. shumi Stebbing; L. felina Bovallius and L. murrayi Norman.

In the key which follows below these doubtful species are not included. L. felina Bovallius and L. curticeps Bovallius appear to be synonyms of Megalanceola stephenseni in the same way as L. stephenseni Chevreux. Species, present in our collections, are marked with asterisks.

Key to identification of species of the genus Lanceola

1. Segments of the metasomes with backward-directed barbs ..... *L. serrata Bovallius

--- Segments of the metasomes without barbs ..... (2)

2. Fourth joints of the III-V pereiopods strongly enlarged distally, almost triangular in shape. 1st joint of I pereiopod narrowly lancet-like ..... L. remipes Barnard

--- Fourth joints of III-V pereiopods not much enlarged distally .....(3)

3. Telson reaches to the end of the protopodite of III uropods .....(4)

--- Telson shorter than protopodites of III uropods .....(6)

4. Head with sharp, slightly recurved rostrum ..... *L. sayana Bovallius

--- Rostrum absent .....(5)

[p. 190] 5. 4th joint of V pereiopods strongly enlarged in the central section and is elongated (oblong)..... *L. laticarpa n. sp.

--- 4th joint of V pereiopods very wide at distal end .....*L. pacifica Stebbing

6. Pereiopods VI approximately of the same length as metasomes, or longer. They quite exceeded the length of III and IV pereiopods ..... (7)

--- Pereiopods VI shorter than metasomes. Almost equal in length to III and IV pereiopods ..... (9)

7. 5th joint of II pereiopods markedly enlarged distally. Its greatest width 2 to 2.5 times less than length..... L. felina Bovallius

--- 5th joint of II pereiopods scarcely enlarged distally. Length more than 3 times exceeds the width ..... (8)

8. 6th joint of I pereiopod oval. Distal edge of 5th joint straight, or 1.5 times wider than the distal part of 6th joint ..... *L. loveni Bovallius

--- 6th joint of I pereiopods tapered lengthwise. Distal edge of 5th joint concave, twice the width of the distal part of the 6th joint ..... L. aestiva Stebbing

9. Width of 2nd joint of I pereiopod only 1.5 times less than the length. Width of 4th joint of III pereipods but little less than the length ..... L. pirloti Shoemaker

--- Width of 2nd joint of I and 4th joint of III pereiopod more than twice less than the length.....*L. clausi Bovallius

2. Lanceola sayana Bovallius (fig. 2 a)

Bovallius, 1885, p. 7; 1887, p. 30; L. sayana var. typica + var. longipes Woltereck, 1909, p. 158; Lanceola pelagica Shoemaker, 1945, p. 206.

Material. At our disposal were 56 specimens of this species, from 4 to 26 mm long; among them, one mature female, 23 mm and two mature males 24 and 26 mm. Not considering the continuous hauls at depths more than 1000 m up to the surface, the specimens were found in samples taken at depths of 0-1000, 0-630, 0-530 and 0-300 m.

Remarks. This form, probably, is identical to that described by Say (1818) as Lanceola pelagica, which a series of authors has observed, among them that described as L. sayana Bovallius. Moreover the brevity of the diagnosis of Say does not allow with certainty the identification of both these species, as it is given by Shoemaker (1945).

The specimens available to us were somewhat less typical. Bovallius (1885) gives for L. sayana a length of 30-42 mm, Woltereck - 31 and 27 mm, but Stephensen (1918) gives a sketch of a male with a length of 27 mm.

Distribution. A widely-scattered species, well known from the northern (to 63°N and 54°W), tropical and southern (to 60°35'S and 18°W) Atlantic, from the Indian and Pacific Oceans. It was taken by us at many stations in all regions explored. Usually encountered at depths over 1000 m, but repeatedly noted, particularly at night time, in surface catches (Tattersall, 1906; Barnard, 1932; Chevreux, 1935).

3. Lanceola loveni Bovallius

Bovallius, 1885, p. 6; 1887, p. 36; Shoemaker, 1945, p. 206.

Material. In our collections are 12 specimens of this species, from 9 to 23 mm in size, found in samples taken at depths of 0-7000, 0-6000, 0-5500, 0-5000, 0-3000, 0-2000 and 1220-2320 m. Among them was one mature female 23 mm long in the 0-7000 m catch.

Remarks. Some of the specimens had the same slight differences from the drawings and descriptions of Bovallius as the samples, described in the drawings of Shoemaker but namely: the 6th joint of [p. 191] V pereiopods somewhat shorter but not longer than the 5th; the 6th joint of IV pereiopod somewhat longer but not shorter than 5th.

Distribution. The species was well-known from Davis Strait, the Bermuda Island region and Kamchatka Strait. Found by us in a series of stations in the Kurile-Kamchatka Trench area between 49°26'N, 158°42'E; 49°48'N, 157°45'E and 43°44'N, 149°44'E; 43°19'N, 157°41'E. The species was at no time taken at depths less than 1000 m.

4. Lanceola loveni var. grossipes Shoemaker

Shoemaker, 1945, p. 209.

Material. One mature female 27 mm long was found in a haul at 0-5500 m.

Remarks. This variety was established by Shoemaker on the basis of the unusual structure of the 6th joint of the VI pereipods, which terminates in a swelling, divided by a deep slot into which the claws retract. The maximal length is 29 mm (♀) while the maximal length of the type form is 23 mm (♀)

Distribution. Described by Shoemaker for the Bermuda Islands region. Taken by us at a station 30°52'N, 153°16'E.

5. Lanceola pacifica Stebbing (fig. 2, 6)

Stebbing, 1888, p. 1302; var. robusta Woltereck, 1909, p. 160.

Material. In our collections 24 specimens were taken of this species, from 6 to 3 mm long in samples from 0-7000, 0-6000, 0-5500, 0-5000, 0-4550, 0-3500, 0-3000, 0-2500, 0-2000, 0-300, 4190-8050 and 2200 m.

Remarks. The greatest size attained by this species is 38 mm (Barnard, 1932).

Occurrence. The species is well known from the northern (up to 50°11'N, 12°05'W), tropical and southern (to 39°50'S, 36°23'W) Atlantic. In the Pacific was taken by Stebbing (1888) - 35°41'N, 157°42'E, Woltereck (1909) on the coast of Peru, Bulycheva (1955) in the Kurile-Kamchatka Trench area, Behning (1939) and Vinogradov (1956) in the Bering and Okhotsk Seas. Encountered by us in a series of stations in all the region examined.

[p. 192] Usually found at depths over 1000 m, although has been frequently found at depths of 850-950 and 0-650 m (Barnard, 1932).

6. Lanceola serrata Bovallius

Bovallius, 1885, p. 7; 1887, p. 34; (?) Lanceola suhmi Stebbing, 1888, p. 1313; (?) Lanceola australis Stebbing, 1888, p. 1315.

Material. In our collections there were 52 specimens of the species, with sizes from 8-34 mm, among which were 3 mature females, 29, 33 and 34 mm long and one mature male 28 mm long. Not counting the continuous hauls from over 1000 m to the surface, the organisms were present in samples from depths of 1220-2320, 1565-1900, 530-1190, 0-1000 and one specimen 23 mm long from a haul at 0-500 m.

Remarks. From the structure and relation of the length of the tips and from the form of the antennae our specimens were quite identical with the descriptions of Bovallius (1887) but somewhat different from them in the relatively long length of the telson, reaching the end of the protopodite of the III uropods. The greatest length of the specimens of this species is 42 mm (♀) and 40 mm (♂).

Occurrence. The species has been taken in the Atlantic Ocean from 64°22'N, 53°48'W to 52°25'S, 9°40'E. Is known in the Pacific from 50°1'S, 123°4'W (L. australis) to 60°50'N (in the Bering Sea). Taken by us at stations throughout the whole area examined.

7. Lanceola laticarpa M. Vinogradov sp. n. (fig. 3 and 4)

Material. Two males, both 21 mm long, taken in hauls of 0-5200 m at stations 49°23'N, 158°30'E and 0-4900 m at station 44°19'N, 170°04'E.

[p. 193] Description. Male, 21 mm long. Body smooth with very weakly swollen mezosoma. On the dorsal surface of the segments the mezo- and metasomes are as indicated in the drawings. On the anterior part of the first segment of the metasomes is a deep depression, tapering down to nothing at the posterior edge. No rostrum. Eyes of normal structure for Lanceola located on the side of the head in the lower part of it and not visible from above. Antenna I short and wide; of the three basal joints the 1st is very long; the 1st joint of the flagellum very wide and on the inner side thickly covered with fine bristles; the three distal joints very small. Antenna II much longer than I; [p. 194] the 4th segment of the base 4 times longer than the 3rd, and half as long as the 5th; the length of the 1st segment of the flagellum exceeds the length of the 4th and 5th segments of the base taken together.

The upper jaw is deeply cleft with almost parallel lateral edges. The mandible with a relatively short cutting edge and strong feelers, exceeds by twice the length of the body of the mandible. On the surface the tentacle has a paddle-like protuberance. The oblong-oval tentacle of the I maxilla bears on the distal end three spines and bristles and in addition, a series of small spines on the inner and bristles on the external margin; the external lobe is strongly tapered distally and bears on the distal end five smooth spines; in addition the inner edge of the lobe is slightly depressed; the inner lobe with slightly concave distal edge covered with numerous fine bristles. The outer lobe of II maxilla somewhat longer and wider than internal; both lobes bear several strong apical spines. Maxillipeds well developed. Outer lobes oblong-oval - characteristic of all Lanceola forms, covered with short spines; inner lobe with slightly pointed inner distal angle, not armed.

The coccial platelet of the I pereiopod with a smooth depression on the lower margin and a slightly drawn-out, curved lower anterior angle; on the posterior lower angle are several bristles. The width of the 2nd joint of the I pereiopod is more than half its length; the 5th joint strongly enlarged distally and almost equal to the length of the tapered 6th; both joints bear bristles on the anterior and posterior margins and on the distal surface. 2nd joint of II pereiopod also very wide, its width half the length; 5th joint enlarged distally and somewhat longer than the extended tapering 6th. Pereiopods III and IV of similar structure, although IV somewhat longer; their second joints enlarged more strongly than in other species of Lanceola, but not as

strongly as on I and II pereiopods; length of these joints exceed the width by 2 1/2 times; 4th joint almost equal to 2nd and 1 1/2 times longer than the 5th, which in turn is equal to the 6th. V pereiopod with a strongly enlarged central section of the 4th joint, the greatest width of which is 2 1/2 times less than the length; the relation of the length of the joints similar to III and IV pereiopods. In the VI pereiopod the 4th joint is equal to the 2nd, but little longer than 5th and somewhat shorter than 6th. VII pereiopod almost half as long as VI.

The branches of the uropods I and II narrowly lencet-shaped. Branches of III uropods widely lencet-like; endopodite hardly shorter than protopodite. In all uropods the endopodites longer than the exopodites. Telson reaches to the distal end of the protopodites of the III uropods.

Remarks. Our species differs from all the well-known species of the genus first of all in the unusually wide second joints of I-IV and 4th joint of the V pereiopods and the deep cleft on the first segment of the metosomes. The long VI pereiopods and II antennae, and also the form and length of the telson, reaching the end of the protopodites of III uropods, unite this species with L. sayana and L. pacifica. However the structure of I antennae is different from these species and resembles L. clausi and L. pirloti.

8. Lanceola clausi Bovallius

Bovallius, 1885, p. 8; 1887, p. 40; Shoemaker, 1945, p. 209.

Material. In our collections there are 86 specimens from 7 to 14 mm long. The organisms were taken in samples from depths [p. 195] of 2200-5250, 2200-4600, 1565-1900 and 0-500 m.(not counting the continuous hauls from depths greater than 1000 m to the surface).

Remarks. Bovallius states that the greatest size reached by individuals of this species is 20 mm. Woltereck (1927) and Barnard (1932), for example, give 19 mm, while other authors describe mature specimens of 10-13 mm (Stephensen, 1933). The length of mature individuals in our material similarly did not exceed 10-14 mm.

Occurrence. Almost universal, but found up to the present only in the Indian and tropical part of the Pacific Oceans. Penetrates into the high Arctic. It was taken by us at many stations in all regions examined.

9. Lanceola clausi Bovallius var. gracilis M. Vinogradov (fig. 5)

Vinogradov, 1956, p. 196.

Material. Eight specimens, 8-11 mm long, taken in samples from depths of 0-8000, 0-6200, 0-5700, 0-5500, 0-2800, 4200-7800 and 4295-6550 m.

Remarks. Besides having been described by us earlier as distinct from the type (Vinogradov, 1956), it is necessary to observe the greater (than in the type form) width of the abdominal segments and the longer telson, almost reaching the end of the protopodites of the III uropods, and the broad, richly ciliacovered inner margin of the I antennae of the males, very similar in structure with the I antennae of the males of Lanceola laticarpa.

Occurrence. This Lanceola was taken firstly in the southwest part of the Bering Sea in hauls of 0-2000 and 0-3700 m. In the ocean they were encountered at stations at 49°23'N, 158°30'E; 44°50'N, 154°02'E; [p. 196] 43°44'N, 149°44'E; 43°41'N, 149°21°E; 43°39'N, 152°03'E; 38°16'N, 143°48'E.

One of the most deep-water hyperiids, living, evidently, only in the lower subzone of the deep-water zone and probably, found in the zone of the Trench.

10. Lanceola clausi Bovallius var. sphaerica. M. Vinogradov n. var. (fig. 6)

Material. Two specimens - a mature female 8 mm long and a male 9 mm taken respectively at a station in 43°41'N, 149°21'E in a haul from a depth of 4200-7800 m and at a station at 49°23'N, 157°45'E in a 0-6500 m haul.

Remarks. Distinguished from the typical form of L. clausi in the sphaerical swelling of the mezasomites of the females and males and the unusual length, particularly in the males, of the claws of the III to VII pereiopods, resembling the length of the claws of Metalanceola.

Genus Scypholanceola Woltereck

This genus, established in 1905 by Woltereck, is distinguished from Lanceola in the unusual structure of the eyes, which were changed into reflecting organs. The eye has a form of curvature in half of the band, widened at the end which lies in the depths of the funnel-like recesses, formed at the lateral partitions of the head. The refractive elements and optic pigments disappeared whereas the receptive elements are very strongly developed and ennervated [p. 197] from the cephalic brain. The eyes of similar form are known not only among the Scypholanceola but also in certain other deep-water animals (Cephalophanes, Giganthocypris). In the opinion of Woltereck (1909) they reflect the rays falling on them from the luminous organs of other deep-water animals and, flashing in the darkness, attract to them their prey or frighten off the animals.

11. Scypholanceola vanhoeffeni Woltereck

Woltereck, 1909, p. 161; 1927, p. 65; Scypholanceola richardi Chevreux, 1920; Pirlot, 1930, p. 45; Scypholanceola chuni Woltereck, 1909, p. 161.

Material. In our collection there were 58 specimens of this species ranging from 8 to 34 mm. Among them are two mature females 27 and 34 mm long and two males, 30 and 31 mm long.

The main mass of organisms was taken in a continuous haul from a depth over 2000 m, which seemed to us to indicate this species as characteristic of the lower subzone of the deep-water zone (Birstein, Vinogradov, Chindonova, 1954). Individual specimens were found in hauls taken from depths of 0-1500, 1220-2320, 952-1500 and 2200 m. Two juvenile specimens 10.5 and 9 mm in size were taken, respectively, at depths of 0-530 and 0-110 m.

Remarks. The specimens available to us do not differ from the descriptions of Woltereck (1909) and Chevreux (1920) and from diagrams given by Shoemaker (1945). We are inclined to subscribe to the opinion of Barnard (1932) regarding the identification of Sc. vanhoeffeni and Sc. chuni which are differentiated only by the width of the optic strip and the form of the optic lenses. In the large specimens at our disposal, the form and structure of the optic lenses do not differ from those described by Woltereck for Sc. vanhoeffeni, but in the smaller ones they vary somewhat. The variability in the shape of the optic lenses on Sc. richardi have been described by Chevreux (1920). It is entirely probable that the structure of the optic lenses of Sc. chuni is an extreme departure from the natural large specimens. The length of Sc. chuni amounts to 61 mm (Woltereck, 1927). The greatest length of Sc. vanhoeffeni is 41 mm (Shoemaker, 1945).

In the structure of its appendages this species is very similar to Lanceola aestiva Stebbing. The structure of the eyes, by which Lanceola is distinguished from Scypholanceola, in L. aestiva is described very indefinitely by Stebbing (1888). Not excluding the possibility of this, these species were identified.

Occurrence. A widely distributed species. In the Atlantic Ocean it occurred from 46°29'N, 5°18'W (Chevreux, 1935) to 33°53'S, 9°26'E (Barnard, 1932). It is well-known also from the Antarctic (64°29'S, 85°27'E - Woltereck, 1927) and from the equatorial regions of the Indian Ocean. In the Pacific Ocean basin it has been described for the Okhotsk and Bering Seas (Vinogradov, 1956). This species was found by us at all stations in the region examined by us.

12. Scypholanceola agassizi Woltereck

Woltereck, 1909, p. 167.

Material. In our collections there are four specimens of this species, 9, 24, 25 and 36 mm long, in samples taken from depths 0-5500, 0-5700, 0-7485 and 0-8485 m.

Remarks. Sc. agassizi was set up by Woltereck chiefly on the basis of structure of the optic lenses, absence of rostrum [p. 198] and small size; the males described by him had a length of 17 mm. Pirlot (1939) made the assumption that this species possibly could be identified as Sc. vanhoeffeni. However, the absence of a rostrum and the structure of the optic lenses substantially distinguish these two species and indicate the specific independence of Sc. agassizi.

Occurrence. This species was taken by Woltereck on the coast of Peru. It was taken by us at stations 30°52'N, 153°16'E; 38°16'N, 143°48'E and 27°55'N, 143°18'E.

Genus Prolanceola Woltereck

Marked difference in structure of I antennae of males and females, unusual structure of I pereiopods, plain, claws not withdrawn on V pereiopods and finally, structure of the eyes consisting of a series of optic spots, puts this genus specifically in the family Lanceolidae. The genus includes a single species.

13. Prolanceola vibiliformis Woltereck (fig. 7 and 8)

Woltereck, 1907, p. 7 and 8; 1909, p. 157.

Material. We have two mature females, 13 and 11 mm long, in hauls from 0-2000 and 0-3000 m.

Remarks. Since Woltereck gave only a very short description and schematic total drawing of this species, we consider it desirable to describe anew this rare hyperiid.

Female 13 mm long. Body smooth, well proportioned. Mezasoma not swollen. Head high, approximately equal in length to first segment of metosomites. [p. 199] Rostrum absent. Besides the usual eye, up from it runs a series of four optic spots. I antenna with 3 jointed base, of which the first joint increases somewhat and exceeds the length of the 2nd and 3rd together with the claws; 1st joint of cilium elongated - tapered, rapidly tapered distally; small 2nd joint three times shorter than 3rd; end of antenna broken. II antennae much longer than I; 6th jointed cilium exceeds the length of the basal joint.

[p. 200] Upper jaw rounded with a shallow recess on the anterior margin. Mandibles with relatively short serrated cutting edge and well-developed accessory plates; 3rd joint of tentacle exceeds the length of 1st and 2nd along with the claws; length of whole tentacle less than 1 1/2 times the greater length of the body of the mandible. Outer lobe of I maxilla tapers distally and bears on the distal part, 5 short spines but on the inner edge tufts of short bristles; inner lobe oval; tentacle linear, slightly curved and bears on the straight truncated distal edge, 3 spines with two bristles between them. Both lobes of II maxilla of the same length, short and broad; on the distal border they bear a series of small spines with long, strong bristles, fixed to their base. The outer lobe of the maxillipeds with a prominent curved edge but straight inner edge; on the surface parallel to the inner edge they bear 2 rows of long and one row of short bristles; inner lobe with pointed inner distal corner, slightly depressed.

Coccal plate of I pereiopods oval, slightly constricted distally. Sharply expanding distally 5th joint of I pereiopods almost equal to the length of 6th, its lower anterior angle drawn out in the shape of a lobe or paddle; 6th joint also expands distally, its upper and lower distal angles drawn out in a round lobe, protruding from the base are straight and strong claws; on both edges and on the distal surface both joints bear bristles. 5th joint of II pereiopod not swollen distally, sometimes wider and 1 1/2 times shorter than 6th. Pereiopods III and IV are of similar structure; their 2nd segment equal to the length of the 4th and 5th together with claw; 6th segment somewhat longer than 5th and 1 1/2 times longer than the 6th. The rod-shaped 4th segment of V pereiopod is equal to the length of 2nd, but quite narrower than it; the delicate, slightly curved 6th segment is less than half as short as the 5th and less than one quarter as short as the 4th. Claw small, slightly curved, not hidden. VI pereiopod shorter than V; the width of its 2nd segment is 3 times less than the length; 4th segment swells out distally, 1 1/2 times longer than 5th and equal in length to the delicate 6th. VII pereiopod has almost the same proportions and length as the VI but much weaker; the width of its 2nd segment only 1/4 its length. Endopodite of I uropod 1 1/2 shorter than protopodite, of II almost equal to it and of III exceeds it in length. Length of telson somewhat exceeds the length of the protopodites of the III uropods.

Occurrence. One male of this species was taken in the Indian Ocean and a female in the Pacific on the coast of Peru (Woltereck, 1909). Prolanceola vibiliformis was described also by A.I. Bulycheva (1955) for the northwest part of the Pacific. Our specimens were taken at stations 44°07'N, 150°32'E and 42°52'N, 164°10'E.

Family Chuneolidae Woltereck

Structure of pereiopods provided with retractible claws and the structure of the mouth parts connect this family with Family Lanceolidae, from which it is readily distinguished by the absence of mandibular spines and rudimentary II antennae.

Retractible claws on II-VII pereiopods, delicate pleiopods and uropods, dorso-ventrally compressed body no doubt indicates the parasitic form of life of representatives of this family. Evidently, the loss of the mandibular spines and reduction of the II antennae also indicates its adaptation [p. 201] to a parasitic life and was developed independently from the separate Incompleta.

The family includes only one genus.

Genus Chuneola Woltereck

To this genus two species belong. Ch. paradoxa Woltereck and Ch. parasitica M. Vinogradov. Below we describe a third species.

All three species were taken in the northern part of the Pacific Ocean. They may be identified from the following key.

Key for identification of species of the genus Chuneola

1. Small distal segments of I antenna well marked. Branches of all uropods with pointed apexes. Telson almost reaches to the end of the protopodites of the III uropods..... Ch. major n. sp. M. Vinogradov
--- These features do not occur ..... (2)
2. Cilium of I antennae equal to length of the base. Inner plate of maxillipeds small, oval, armed with short weak bristles. Both branches of II uropods rounded at apex. Exopodite of III uropods much wider than endopodite..... Ch. paradoxa Woltereck
--- Cilium of I antenna longer than base. Inner plate of maxilliped narrowed distally and armed with strong apical bristles. Inner branch of II uropods with pointed distal ends. Width of both branches of III uropods similar ..... Ch. parasitica M. Vinogradov

14. Chuneola parasitica M. Vinogradov

Vinogradov, 1956, p. 196.

Material. At our disposal were three specimens of this species 10.6 and 7 mm in size, taken respectively in hauls from depths of 0-5000, 550-1150 and 0-750 m.

Occurrence. This species was described from the Bering Sea (55°18'N, 172°04'E) with one specimen from a depth of 0-3700 m. Taken by us at stations 50°59'N, 159°56'E; 49°23'N, 158°30'E and 43°41'N, 149°21'E.

15. Chuneola major M. Vinogradov n. sp. (fig. 9 and 10)

Material. Two specimens 19 and 21 mm long were found in samples taken from depths 0-5300 and 0-1000 at stations 39°58'N, 164°55'E and 44°31'N, 170°06'E.

Description. Immature specimen. Length 21 mm. Body (BalbkoBatoe), somewhat depressed dorso-ventrally, smooth. Head with very strong protuberance in the shape of a blunt deflector on the front, almost completely covering over the top of the I antenna.

I antennae equal in length to the first two joints of the mezazomi; shaft 3-jointed, cilium in two with 1/2 the length of the base, 3-jointed; its first joint slightly constricted distally; distal joints rudimentary, II antennae, as in Ch. parasitica, but distal joints do not have 2 but 5 apical bristles. Mandibles, as in other species of the genus. Outer lobe of I maxilla wide with straight truncated apex, bearing 5 strong spines and a series of short bristles; the same bristles present on the inner and outer margins and on the surface of the lobe; [p. 202] inner lobe, small, oval; tentacle with a series of spines on the inner edge, the length of which increase in size toward the distal end. II maxilla, as in Ch. paradoxa. Outer lobe of maxillipeds oval, slightly constricted distally and armed with long, strong bristles; inner lobes comparatively large, larger than in Ch. paradoxa, and armed with 2-4 strong bristles. Coccal plates, as in Ch. parasitica; II and VI plates do not have drawn-out corners, as in Ch. paradoxa. Structure of pereiopods similar to that of other species in the genus but somewhat different from them in the following features: in III-VII pereiopods, 6th joint long but not shorter than 5th, which in V-VII pereiopods equal to 4th; 5th and 6th segments of III-IV pereiopods bear, on the distal surface, short bristles; 6th segment of V-VII pereiopods almost not swollen distally.

Protopodite of I uropods with strong, arched outer edge; both branches pointed; endopodite somewhat shorter than protopodite and longer than exopodite. Protopodite of II uropods swollen distally and equal in length to exopodite; both branches pointed. Protopodites of III uropods short and broad, slightly swollen distally; branches of same length, widely lencet-shaped, with sharp apex. Widely oval telson almost reaches the distal end of the protopodites of III uropods.

Colour of unfixed specimens - cherry-rose.

Occurrence. As indicated in the description, Ch. major differs from other species of the genus by such features as the shape of the head, relation of lengths of joints of pereiopods, shape of branches of uropods and length of telson.

Family Microphasmidae Stephensen et Pirlot

In structure of antennae, mandible, I and II pereiopods and a series of other features, very close to Family Lanceolidae, from which it differs only in the absence of spoon-shaped recess with drawn-in claws on V-VII pereiopods and strongly inflated pereion of female.

[p. 203] Genus Mimonecteola Woltereck

Barnard (1932), Shoemaker (1945) and we in a previous paper (Vinogradov, 1956) included this genus in the family Archaeoscinidae. However, while the genus Archaeoscina differed from the genus Mimonecteola in such general features as the structure of the antennae, mandible, I and II pereiopods and others, from the genus Microphasma (with which in general it is very much alike) it differs [p. 204] only in the absence of the false claws on III-V pereiopods. This gives us a basis for taking the genus Mimonecteola from the family Archaeoscinidae and placing it in the family Microphasmidae.

16. Mimonecteola beebi Shoemaker (fig. 11)

Shoemaker, 1945, p. 224.

Material. In our collection there are 51 specimens of this species from 5 to 12 mm long. Among these are 3 mature females 11-12 mm long and the 2 males 10.5-11 mm long. Most of the organisms were taken in hauls from depths more than 2000 m to the surface. In addition, 5 specimens were taken in hauls 0-2000 m and in one from 0-1500 m and 0-1000 m.

Description. We give a description of I and II antennae, poorly preserved in Shoemaker's specimens. A young female 9 mm long. On I antennae the joints of the stalk are short and wide; 1st almost equal to the length of 2nd and 3rd taken together. The strong 1st joint of the cilium narrowed distally; the cilium terminates in three small joints, the distal exceeds the length of the preceding two together and bears apically 2 bristles. The 2nd joint of II antennae elongated to a narrow blade, reaching to the base of the 4th joint; 5th joint 1 1/2 times longer than 3rd. First joint of cilium long, contracted distally, bears short bristles on the upper edge; cilium terminates in 2 small joints from which the last is twice as long as the preceding.

Remarks. Specimens, found in our collections, similar to those described by Shoemaker (1945) though differing from them in a series of minor features. The 4th joint of II antennae in our specimens is 1 1/2, not twice shorter than the 5th; branches of the uropods III comparatively narrower but the telson twice and not 1 1/2 shorter than the protopodite of III uropods. M. beebi is very close to the description of Barnard (1932) from the East Atlantic (2°49'S, 9°25'W)of M. macronyx, differing from it in the shape [p. 205] of the 5th joint of the II pereiopods. From the third species of the genus, M. diomedae, described by Woltereck (1909) from the coast of Peru, both of the other two species differ in the shape of the 5th joints of the III-IV pereiopods, long length of the 3rd segment of the mandibular spines and longer claws on the III to VII pereiopods.

Colour of unfixed specimens, olive-green.

Occurrence. This species was described by Shoemaker (1945) from the Bermuda Islands. In the Pacific was found in the southwest part of the Bering Sea. Taken by us in a series of stations in all areas examined. Dwells at depths of more than 1000 m, however, in the Bering Sea one specimen was taken in a 0-500 m haul (Vinogradov, 1956).

Genus Microphasma Woltereck

Genus includes only one species.

17. Microphasma agassizi Woltereck

Woltereck, 1909, p. 153; Stephensen et Pirlot, 1931, p. 539.

Material. Four specimens from 6-10 mm in size were found in hauls from depths of 0-5500, 0-3800, 0-3000 and 0-2000 m.

Remarks. Specimens in our collection all identical to description and drawings of Stephensen and Pirlot (1931) and differed from specimens, sketched by Woltereck (1909), in narrower 6th joints of III to V pereiopods.

Colour in unpreserved specimens, cherry-red.

Occurrence. In Atlantic Ocean this species was found in Bay of Gascony, in the Madeira Islands, in the Azores and Bermuda Islands. In the Pacific was found by Woltereck on coast of Peru. We found it at stations: 49°29'N, 158°30'E; 46°31'N, 154°22'E; 44°07'N, 150°32'E and 39°58'N, 164°55'E. (After the present paper was submitted for publication, this species was taken by us in the Indian Ocean (19°04'S, 63°07'E) in a 0-3300 m haul).

Family Mimonectidae Bovallius

Family includes one genus.

Genus Mimonectes Bovallius

The genus Mimonectes was formed by Bovallius in 1885 and served mainly as the basis for setting up the family Mimonectidae. In this same family Woltereck (1904) put the genus Sphaeromimonectes and Stebbing (1904) - the genus Parascina. Subsequently Woltereck (1909, 1927) came to the conclusion that Parascina was a small form or a male of Sphaeromimonectes.

In the description of the genus Mimonectes, Bovallius admitted certain errors (incorrectly pointed out a number of gills) and included in this genus the species Mimonectes steenstrupi (= Archaeoscina steenstrupi) which is distinguished from other species of the genus by the presence of mandibular spines. Differences between the genera Sphaeromimonectes and Mimonectes, noted by Woltereck (1904), were almost entirely due to the mistakes in the descriptions by Bovallius. If these are not taken into consideration then the bases for separating these genera disappear and we can subscribe to the opinion of Stephensen and Pirlot (1931) joining the genera Mimonectes, Sphaeromimonectes and Parascina in one genus Mimonectes. Thus [p. 206] the series of species was placed by them, and also by Pirlot (1939) and Shoemaker (1945) in the synonomy.

Key for identification of species of the genus Mimonectes

1. 6th joint of I and II pereiopods terminates in a sharp protuberance, prominent on the base of the claw. Six joints of the III and IV pereiopods are sharply constricted distally ..... (2)
—— 6th joint of I and II pereiopods do not have protuberances on the distal part. The six joints of III and IV pereiopods only slightly constricted distally ..... (3)
2. 6th joint of I pereiopods tapered, narrowed distally. Protuberance on claw narrow ..... M. gaussi (Woltereck)
—— 6th joint of I pereiopods oval, almost not constricted distally. Protuberance on claw broad ..... M. diomedae (Woltereck)
3. 6th joint of II pereiopods with a recess in the distal part of the rear edge ..... M. sphaericus Bovallius
—— Recess on distal part of rear margin of 6th joint of II pereiopods absent ..... (4)
4. Pereiopods VI and VII with long, slightly curved claw. The 3rd joint only a little (approximately 1 1/2 times) shorter than 4th ..... M. spandlii Stephensen and Pirlot
—— Pereiopods VI and VII with short hook-like curved claw. Their 3rd joints not less than 2-2.5 times shorter than 4th ..... M. loveni Bovallius

18. Mimonectes sphaericus Bovallius

Bovallius, 1885, p. 11; 1889, p. 66; Stephensen et Pirlot, 1931, p. 516; Behning, 1939, p. 364. (?) Sphaeromimonectes valdiviae Woltereck, 1904, p. 621 et alii.

Material. In our collection there are 6 immature specimens of this species (2♀, 1♂ and 3 juveniles) from 3 to 9 mm in size, in samples from depths of 0-5000, 0-4900, 0-3000, 0-2000 and 0-300 m.

Remarks. Shoemaker (1945) considers this species identical with M. valdiviae, explaining the differences in structure of the 6th joint of II pereiopods of the males as developmental variations. In our collection there were no mature or even nearly mature individuals, therefore we leave this question open.

Occurrence. In the Atlantic Ocean, well known in the Canary and Bermuda Islands and from the Bay of Biscay. M. valdiviae was found by Woltereck (1927) near the Madeira Islands. In the Pacific basin M. valdiviae was found in the Galapagos Islands (10°15'S, 95°40'W) and M. sphaericus - in Bering Sea[1]. Taken by us at stations 50°15'N, 159°43'E; 49°23'N, 158°30'E; 49°48'N, 157°45'E; 46°31'N, 154°22'E and 44°19'N, 170°04'E.

Encountered at depths greater than 1000 m up to the surface.

---

[1] Specimens, taken by Behning (1939) in the Bering Sea, judging from the structure of II antennae, are small females and not males, as suggested by the author. In addition, in the drawings presented by him the VI pereiopods is called 7th and on the contrary, the VII pereiopod, the sixth.

19. Mimonectes loveni Bovallius

Bovallius, 1885a, p. 3; 1889, p. 60; Sphaeromimonectes cultricornis Woltereck, 1906, p. 862; 1927, p. 83; Parascina chevreuxi Pirlot, 1929, p. 56; Barnard, 1932, p. 253; Mimonectes chevreuxi Stephensen et Pirlot, 1931, p. 531; Barnard, 1937a, p. 179.

Material. 3 specimens, 5.5-7 mm in size, were taken in hauls from depths of 0-1250, 0-2990 and 0-500 m.

Remarks. Maximum sizes of individuals of this species were 24-28 mm (♀) and 13 mm (♂).

Occurrence. This widely distributed species was found in many parts of the North Atlantic from the Bermuda and Azores Islands to Greenland (63°19'N, 26°50'W - Stephensen, 1933). Evidently, [p. 207] the same species occurs in the Gulf of Guinea (12°11'S, 6°16'W). In the Indian Ocean it was reported by Barnard (1937) for the Arabian Sea. In the Pacific it was found by Pirlot (1930) in the Celebes Islands (3°20'S, 127°22'E) and by Bulycheva (1955) in the northwest Pacific. Taken by us at stations 38°16'N, 143°48'E; 29°56'N, 137°02'E and 26°14'N, 143°43'E. Encountered both at depths and at the surface. Vosseler (1901) found it at the surface in the Sargassa Sea and Barnard (1932) in a haul at 0-250 m in the tropical part of the Atlantic.

20. Mimonectes gaussi (Woltereck)

Stephensen et Pirlot, 1931, p. 531; Shoemaker, 1945, p. 221; Sphaeromimonectes gaussi Woltereck, 1904, p. 627; 1927, p. 80; Parascina fowleri Stebbing, 1904, p. 21; Mimonectes fowleri Stephensen et Pirlot, 1931, p. 519.

Material. At our disposal were 2 mature females 11 mm in size from depths of 0-5700 and 0-2000 m, one small female 8 mm long from a depth of 0-2000 m and 2 immature males 7.5 and 8 mm in size from depths of 0-2500 and 0-1100 m.

Occurrence. A widely distributed species. In the North Atlantic was taken from the Davis Strait (63°06'N, 56°W) and Iceland (61°30'N, 17°08'W), off the coast of Portugal, in the Bay of Gascony, north of Hebrides Islands, in the Madeira and Bermuda Islands. In the South Atlantic was taken by Barnard (1932) in South Africa 33°53'S, 9°26'E. In the Pacific was found by us at stations 49°23'N, 158°30'E; 50°02'N, 157°38'E; 44°07'N, 150°32'E and 38°16'N, 143°48'E.

Encountered usually at depths over 500-1000 m but rising to surface layers (Woltereck, 1927; Pirlot, 1929).

[p. 208] 21. Mimonectes diomedae (Woltereck) (fig. 12)

Stephensen et Pirlot, 1931, p. 531; Sphaeromimonectes diomedae Woltereck, 1909, p. 148.

Material. At our disposal, one young male, 11 mm long, taken in a 0-5300 m haul.

Remarks. In 1909 Woltereck described this species from an immature 14 mm male which he, as refuted by Shoemaker (1945) mistook for a female.

According to Woltereck, this species is close to Sphaeromimonectes gaussi and Parascina fowleri but differs from them in a series of features, in particular the broad and not narrow, as in P. fowleri, distal protuberance of the 6th joint of the I and II pereiopods, occurring at the base of the claw. Later this species was placed by Shoemaker (1945) in the synonomy as M. gaussi.

Our specimen differs from the drawings of M. gaussi, given by Stebbing (1904), Woltereck (1904), Stephensen (1918), Stephensen and Pirlot (1931) and Shoemaker (1945) and from our specimens of M. gaussi by the wide, only slightly constricted distal six joints of the I and II pereiopods with wide distal protuberances. Such structure of I and II pereiopods serve to put our specimens in the species M. diomedae, considering this species quite independent. From M. gaussi it differs also in the thin border of the distal part of the outer margin of the outer plates of the maxillipeds and the very weak distal spines on the outer plate of the I maxilla.

Occurrence. This species is well known only in the Pacific, taken by Woltereck on the coast of Peru (11°59'S, 83°40'W) in a 0-600 haul and by us at a station at 39°58'N, 164°55'E.

Family Proscinidae Pirlot

Of the two genera of this family Proscina Stephensen et Pirlot and Mimoscina Pirlot, one genus is represented in our collection.

Genus Proscina Stephensen et Pirlot

This genus was separated by Stephensen and Pirlot (1931) from the genus Parascina (= Mimonectes) mainly on the basis of the chain-like, unswollen (un-inflated) form of the body of the females, presence on the males of long and delicate II antennae and development of apical spines on the outer lobes of the I maxilla in two groups.

The genus includes 3 species, of which two are present in our collection and the third - P. birsteini was named by us (1956) from the Bering Sea and undoubtedly might be met with in the northwest part of the ocean.

22. Proscina stephenseni (Pirlot) (fig. 13)

Stephensen et Pirlot, 1931, p. 544; (?) Barnard, 1937, p. 179; Parascina stephenseni Pirlot, 1929, p. 57; Proscina magna Pirlot, 1939, p. 25 (partie).

Material. In our material were a small female, 10 mm long and an almost mature male of 9 mm, found, respectively, in hauls at dephts of 0-3000 and 0-2000 m.

Remarks. This species was described by Pirlot (1929) from a single female 9 mm long. Later Barnard (1937), also from one specimen, described a male of the same or a very close species, distinguished from the Pirlot specimen by the features, possibly, which are dependent on the sex variability.

[p. 209] The structure of the female in our material is different, except for a shorter distal segment of the I antennae, differs from the females described by Pirlot[1]. The male is different from the female in the good development of the long and delicate II antennae, much smaller than in the females, recess in the distal part of the inner edge of the outer plate of the maxillipeds, longer claws on the I and II pereiopods and generally weaker pereiopods, serrated outer edge of the protopodites of the I uropods, shorter and broader protopodites of the III uropods and, finally, the curved and enlarged part of the endopodite. The male, described by Barnard (1937), differs from our specimen only in the absence of the brush of long [p. 210] bristles on the 6th joint of the I pereiopods, somewhat longer telson and reduced exopodite of the III uropods. If these characteristics are sound then, possibly, his specimen must belong to another species.

Occurrence. Taken by Pirlot (1929) in the North Atlantic (47°10'N, 18°2'W) in a 0-2240 m haul, by Barnard (1937) in the Arabian Sea in a 0-1500 m haul. Both our specimens were found at a station 44°07'N, 150°32'E.

23. Proscina magna Stephensen et Pirlot (fig. 14)

Stephensen et Pirlot, 1931, p. 545; Pirlot, 1939, p. 25 (partie); Parascina fowleri Chevreux, 1905 (partie).

Material. One female, 18 mm long in a 0-5500 m haul.

Remarks. Up to now was known from a single male, 9 mm long. We have a female which differs from it only in the reduced II antennae, shorter claws on I and II pereiopods and also straight endopodites on III uropods. These differences seem to be associated with the sex of the organisms, since they occur also between males and females of P. stephenseni.

Both species of Proscina differ in a series of features quite independent of sex, which are indicated in table 1.

Table 1. Differences between P. magna and P. stephenseni

Character	P. magna	P. stephenseni
I antennae of males and females	Weakly bordered	Very strongly
Mandibles	Additional plate occupies 1/2 the cutting edge. On distal part bordered by small number of long setae.	Additional plate occupies 3/4 cutting edge. On distal part covered with short setae.
Maxillipeds of female	Outer plate without recess in distal part of inner edge. Inner plates more than 1/2 of outer.	Outer plate with recess in distal part of inner edge. Inner plates less than 1/2 of outer.

[1] The nature of the structure of the 6th joint of the II pereiopods explains how, in the drawing, Pirlot described its ventral but not the lateral view.

Table 1 (cont'd)

Character		P. magna	P. stephenseni
Pereiopods	I	6th joint shorter than 5th	6th joint longer than 5th
	II	6th joint only slightly longer than 5th	6th joint twice the length of 5th
	V	Much stronger than VI and VII	Just as strong as VI and VII

These well substantiated differences do not at all support the statements of Barnard (1937) regarding the identification of both species.

Occurrence. Taken by Chevreux (1905) in the Atlantic Ocean (36°17'N, 28°53'W) in a 0-3000 m haul. Found by us at station 30°52'N, 153°16'E.

[p. 211] Family Scinidae Stebbing

This family includes around 40 species, represented by 3 genera, Scina Prestandrea, Acanthoscina Vosseler and Ctenoscina Wagler.

Below we give a key to the species, present in the waters of the northwest part of the Pacific and in adjacent seas.

Key to identify the species of Scinidae, occurring in the northwest Pacific

1. Segments of pereiona and pleona elongated dorsally in large spines .....(15)
--- Segments of body without spines ..... Genus Scina (2)
2. V pereiopods: 4th joint about as long as 5th or only slightly longer ..... (3)
--- V pereiopods: 4th joint much longer than 5th ..... (6)
3. I pereiopods: 6th joint ends in a distal tooth ..... (4)
--- I pereiopods without distal tooth on 6th joint ..... (5)
4. VI-VII pereiopods: 6th joint shorter or equal to 5th. Extremities short and weak. Claws of 3 last pairs of pereiopods hooked .....S. submarginata Tattersall
--- VI-VII pereiopods: 6th joint longer than 5th. Extremities long and stout. Claws almost straight.....S. incerta Chevreux
5. Stocky organisms with sturdy I antennae. Claws on strong VII pereiopods leg-like, points bent at a right angle .....S. spinosa Vosseler
--- Well-shaped organism. Claws of VII pereiopods not leg-like ..... (7)
7. Exopodites of I and II uropods in shape of short spines, their length less than width of endopodite at the base ..... (8)
--- Exopodites of I and II well developed; their length exceeds width of endopodite at base ..... (12)
8. 6th joint of VII pereiopods longer than 5th ..... (9)
--- 6th joint of VII pereiopods shorter than 5th ..... (11)
9. I antennae much longer than pereiona. Large species ..... (10)
--- I antennae not much longer than pereiona. Organism not longer than 8 mm ..... S. borealis (G. Sars.)

10. VI pereiopods: claw almost straight, 4th joint equal to 6th and each longer than 5th ..... S. crassicornis (Fabricius)
--- VI pereiopods: claw short, hook-shaped; 4th joint much longer than 5th or 6th ..... S. curvidactyla Chevreux
11. 2nd joint of V pereiopods not armed ..... S. stebbingi Chevreux
--- 2nd joint of V pereiopods serrated on rear edge .....S. curilensis M. Vinogradov
12. I uropods bear on inner edge large spines. Outer lobes of maxillipeds long and narrow ..... (13)
--- I uropods smooth on inner edge. Outer lobes of maxillipeds short and broad ..... S. typhlops Wagler
13. Distal branch of 2nd joint of V pereiopods reach to the end of 3rd joint. Length of telson greater than width..S. wagleri Behning
--- Distal branch of 2nd joint of V pereiopods reaches only to 1/3 length of 4th. Length of telson equal to width ..... S. orientalis Bulitheva
6. I uropods on inner edge opposite outer branch have separate large spines. Lobes of maxillipeds very much elongated and narrow..... S. wolterecki Wagler
--- I uropods of inner edge opposite outer branch do not have a conspicuous single spine. Length of outer lobe of maxillipeds less than 5× greater than width .....(14)
14. V pereiopods: 2nd joint has spines on both edges; 6th joint almost same length as 5th ..... S. antarctica Wagler
--- V pereiopods: 2nd joint bears spines only on rear edge, on anterior edge only at distal end are there 2 or 3 spines; 6th joint much shorter than 5th ..... S. rattrayi Stebbing
15. On V pereiopods 4th, 5th and 6th joints fused. Outer plate of maxillipeds reduced to more or less 2 tubercles. Feeler of I maxillae reduced. I pereiopods simple.....Genus Acanthoscina
--- These characteristics not present .....Genus Ctenoscina (16)
16. Dorsal spines on segments of the metasomes and mezasomes smooth on anterior edge. I and II segments of mezasomes divided. Maxillipeds without inner lobes..... Ct. brevicaudata Wagler
--- Dorsal spines on segments of metasomes and mezasomes long, strongly serrated on anterior edge. I and II segments of mezasomes fused. Maxillipeds with well-developed inner lobes ..... Ct. spinosa (Chevreux)

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Genus Scina Prestandrea

24. Scina crassicornis (Fabricius)

Stebbing, 1904, p. 24; Wagler, 1926, p. 324; Astacus crassicornis Fabricius, 1775, p. 415; Tyro atlantica Bovallius, 1885, p. 14; Tyro sarsi Bovallius, 1887, p. 9; Scina cornigera Stebbing, 1888, p. 1273; Scina edwardsii Vosseler, 1901, p. 103.

Material. Available to us were 9 specimens from 10.5 to 16 mm in size, taken in hauls at 0-2500, 0-700, 0-350, 0-250 and 0-225 m.

Occurrence. Widely distributed, found at many points in the Atlantic from 64°N and 55°W to the southern end of Africa, in the Mediterranean Sea, in the Indian Ocean from Arabian Sea to 40°S, in the northern and southern (from

34°30'S, 171°53'E) part of the Pacific and at two stations in the Antarctic (64°15'S, 80°39'E; 65°57'S, 88°50'E - Wagler, 1927).

It seems odd that this very widely distributed and, apparently, eurythermal species, encountered not only in Antarctic waters with 0° temperature but also in surface waters of the tropics, in the north Pacific was taken by us only in the warm waters of Kuroshio but quite absent from the temperate zone waters. The northern stations where it occurred are: 43°19'N, 157°46'E; 41°09'N, 167°06'E.

Occurs mainly above 500 m. Repeatedly found at the surface.

25. Scina curvidactyla Chevreux

Chevreux, 1914, p. 3; Wagler, 1926, p. 328.

Material. Available to us were 5 specimens from 5.5 to 21 mm in size, taken in 0-5100, 0-3500 and 0-1000 m hauls.

Occurrence. Widely distributed, common in the warm waters of the Atlantic and also in the Mediterranean Sea and in the tropical regions of the Indian Ocean. Present also in northern stations 49°19'N, 13°11'W and 40°19'N, 13°11'W (Wagler, 1927) - lying in the Gulf Stream influence; found in the south - 43°20'S, 46°02'W (Barnard, 1932). In the north Pacific was taken for the first time, as with S. crassicornis, only in the warm areas of Kuroshio - 43°19'N, 157°46'E and 39°58'N, 164°55'E.

Rarely occurring above 200 m.

26. Scina curilensis M. Vinogradov

Vinogradov, 1956, p. 203.

Material. Nine specimens, 5-15 mm long (mature ♀), were found in samples taken at depths of 500-1020, 0-500 and 0-300 m and also in open hauls from depths greater than 1000 m to the surface.

Occurrence. Noted by us in Bering (up to 62°06'N) and Okhotsk Seas. In the ocean found only in the temperate zone; did not occur in the warm waters of Kuroshio. Most southern record: 42°30'N, 150°19'E and 47°36'N, 153°04'E.

[p. 214]

27. Scina incerta Chevreux

Chevreux, 1900, p. 123; Wagler, 1926, p. 331.

Material. 46 individuals of this species are available, ranging from 6.5 to 16 mm in size, among them 7 mature females (12-15mm) and 3 mature males (14-16 mm). Not considering continuous hauls from more than 1000 m to the surface, specimens were found in samples from depths of 500-1000 m, 415-900 m, 240-470 m, 0-600 and 0-500 m.

Occurrence. Widely distributed, common in various parts of the Atlantic from 46°15'N, 50°09'W (Chevreux, 1935) to 35°18'S, 19°01'W (Barnard, 1932), from the tropical part of the Indian Ocean, from the Bering Sea up to 62°06'N and Kurile Strait (Vinogradov, 1956). In the Pacific was taken at a series of stations throughout the region examined.

28. Scina borealis (G. Sars)

Sars, 1890, p. 20; Wagler, 1926, p. 337; Clyadonia borealis G. Sars, 1882, p. 77; Tyro clausi Bovallius, 1885, p. 14; Tyro clausi, Tyro borealis Bovallius, 1887, p. 550; Scina clausi Vosseler, 1901, p. 104.

Material. 342 specimens available to us. Not counting the continuous hauls from depths greater than 1000 m to the surface, individuals were taken in samples from depths of 2200-4600 m, 1565-1900, 1430-1775, 1190-2500, 1000-2000, 550-1150, 500-840, 486-1000, 240-470, 200-500, 0-400 and 0-300 m.

Remarks. In samples, taken in June to August, several females were taken with eggs, the number varying from 60-80.

Occurrence. A universally distributed species occurring in all the oceans in the Arctic and Antarctic. In the north occurred at 80°N, 134°E (Sars, 1900), in the south - 64°29'S, 85°27'E (Wagler, 1927) and 71°49'S, 167°32'W (Barnard, 1930). In the Pacific - from 60°12'N (Vinogradov, 1956). For the northwest Pacific was reported by E.F. Gurianova (1952) and A.I. Bulycheva (1955) and for the eastern (Hurley, 1956). Taken by us at all stations.

29. Scina spinosa Vosseler

Vosseler, 1901, p. 108. Scina spinosa spinosa Wagler, 1926, p. 350; 1927, p. 95.

Material. Five specimens from 3.5 to 10.5 mm in size, among which were 2 mature females, 9 and 10.5 mm, were found in samples, taken from depths of 0-5500, 0-4000, 0-3000, 496-960 and 415-900 m.

Remarks. Present in our collection were specimens very closely related to S. spinosa spinosa, differing only in the form of the outer lobe of the maxillipeds, which (fig. 15 b) were more strongly constricted distally than the specimens described by Wagler (1926).

Occurrence. Common in the tropical and south Atlantic, from the Bermudas to the Buvas, in the southern Indian Ocean, Antarctic and in the Bering and Okhotsk Seas. Taken at stations: 49°23'N, 158°30'E; 45°14'N, 156°17'E and 44°07'N, 150°32'E.

[p. 215]

31. Scina stebbingi Chevreux

Chevreux, 1919, p. 1; Wagler, 1926, p. 356; Scina armauer-hanseni Pirlot, 1929, p. 72.

Material. One immature female 8 mm long, taken in a 0-2000 m haul.

Remarks. From the typical form our specimens differ somewhat in the shorter and wider outer lobes of the maxillipeds. These same differences were present in specimens taken by us in the Bering Sea (fig. 15a).

Occurrence. Reported for the tropical and north Atlantic from 28°29'S, 6°14'E (Wagler, 1926) to 38°20'N, 9°20'W (Pirlot, 1929) and the Mediterranean. In the Pacific was frequently taken only in the southwest part of the Bering Sea from 58°08'N. Taken by us at station 49°23'N, 158°30'E.

32. Scina submarginata Tattersall

Tattersall, 1906, p. 12; Wagler, 1926, p. 367; Scina marginata Garbowski, 1896; Scina latipes Stephensen, 1918.

Material. 7 specimens of this species are available to us, 4-7 mm in length of which 4 are mature females, 5-6.5 mm long and one 7 mm male. They were all taken in hauls made from depths of 0-5500, 0-4500, 0-3000, 0-2500 and 200-500 m.

Occurrence. Widely distributed. Found in many parts of the Atlantic from 53°N15°W to 55°57'S, 16°15'E in the Mediterranean and Ionian Seas, in the Indian Ocean north of 30°S and in the southwest part of the Bering Sea. Taken by us at stations 46°31'N, 154°22'E; 49°23'N, 158°30'E; 51°16'N, 159°13'E and 38°16'N, 143°48'E.

33. Scina wolterecki Wagler

Wagler, 1926, p. 372; Barnard, 1932, p. 261.

Material. 15 specimens of this species, among which occurred 7 mature females, 7-8.5 mm in size and 2 mature males, 10 mm long; taken in hauls from depths of 2200-4600, 1190-3110, 0-2000, 0-1500 m and also in free hauls from depths of more than 2000 m to the surface.

[p. 216] Remarks. The specimens available to us varied considerably in the relation of length of 5th and 6th joints on V-VII pereiopods. On the V pereiopods the 6th joint constituted from 1/2 to 1/3 of 5th, on VI it was 1 1/2 to 2 times shorter than the 5th, and on VII somewhat shorter, equal to or a bit longer than 5th. These variations do not depend neither on age or sex. The armature of I uropods, as in the specimens described by Wagler, do not have those characteristics, referred to by Barnard (1932).

Occurrence. The species is common in the tropical and southeastern part of the Atlantic Ocean, in the Bering Sea (from 60°50'N), in the southern part of the Okhotsk Sea and in the Kurile Gulf. Taken by us at a series of stations over the whole area examined.

Not met with at depths less than 1000 m.

34. Scina rattrayi var. keilhacki Wagler

Wagler, 1926, p. 380; Vinogradov, 1956, p. 207.

Material. In our collections were 55 specimens of this species, from 3 to 6 mm long, among them 4 mature females, 4-5 mm and 3 males, 5-6 mm. Not counting the free hauls from depths of more than 1000 m to the surface, specimens were taken in samples from depths of 4295-6550, 2200-4600, 1565-1900, 530-1190, 486-1000, 415-900, 240-470, 0-630 and 0-300 m.

Remarks. Two individuals of 55 available to us vary from the type described by Wagler (1926). In one (a female, 4 mm long) on the inner edge of III uropods and on the outer edge of II uropods there were spines, as in S. rattrayi f. typica, moreover the armature of I uropods were the same as in var. keilhacki. Another specimen (a young male) differs from S. rattrayi in the length of the 6th joint of V pereiopods, amounting to more than half the length of 5th joint, and with long claws on V and VI pereiopods, connecting it by these features, to S. antarctica. From the latter it differs in the armature of the uropods and the absence of spines on the anterior edge of the 2nd joint of the V pereiopods which are characteristic for S. rattrayi var. keilhacki. Barnard (1930) has also noted the existence of intermediate specimens between S. rattrayi and S. antarctica.

Occurrence. This sub-species is common in the Atlantic (17°28'N, 29°42'W), in the central part of the Indian Ocean (northeast of the Madagascar Islands and east of Ceylon) and in the Pacific (southwest part of Bering Sea). Found by us at many stations in the whole area examined.

35. Scina wagleri Behning

Behning, 1939, p. 357.

Material. 9 specimens from 3-5.5 mm long (♀) and from 3.0-6.5 mm (♂), found in samples from depths of 0-8000, 0-6000, 0-5000, 0-3000, 0-2000 and 1190-2500 m.

Occurrence. Common in Okhotsk Sea. In the Pacific was found not further than 200 miles from the Kurile chain at stations 43°39'N, 152°03'E; 44°07'N, 150°32'E; 46°31'N, 154°22'E; 49°23'N, 158°30'E; 49°26'N, 158°42'E and 50°02'N, 157°38'E. In the north penetrates into the Kamchatka Gulf.

[p. 217] 36. Scina wagleri Behning var. abyssalis n. var. M. Vinogradov (fig. 16)

Material. At our disposal were 3 mature females 7-7.5 mm long, taken in samples from depths of 4200-7800, 6400-9000, 0-8480 m.

Description. The structure of the maxillipeds and also the structure and armature of the uropods, characteristic for S. wagleri, compel us to place our specimens in the species S. wagleri. Moreover the relatively larger sizes, the elongated form of the mezazomes and the relatively longer extremity clearly separates them from the typical specimens. The differences between the specimens which were captured at the maximal depths of the Kurile - Kamchatka and Idzubonin depressions, and the typical specimens in the shallower depths might be settled in the following manner (Table 2).

Table 2. Differences between the typical S. wagleri and var. abyssalis

Character		Typical specimen	var. abyssalis
Maximum size of mature females		5.5 mm	7.5 mm
Form of mezozomes		Round	Elongated - oval
Maxillipeds		Inner lobe 3-3.5 times shorter than outer	Inner lobe 5 1/2 times shorter than outer
Pereiopods	I	5th joint equal to 6th	5th joint 1 1/2 times longer than 6th
	II	5th joint shorter than 6th	5th joint equal to 6th
	III	Claw less than 3 times shorter than 6th joint	Claw more than 3× shorter than 6th joint
	III, IV VI	2nd joint equal to 4th and 5th, taken together	2nd joint shorter than 4th and 5th together
	VII	2nd joint less than 2× longer than 6th	2nd joint twice the length of 6th

[p. 218] Occurrence. Taken at 3 stations, 43°41'N, 149°21'E; 43°44'N, 149°44'E and 27°55'N, 143°18'E in hauls at maximum depths of the Kurile - Kamchatka and Idzu - Bonin deeps.

37. Scina typhlops Wagler

Wagler, 1926, p. 407.

Material. One female 3 mm long, taken by us in a 0-3100 m haul.

Remarks. Our specimen completely similar to the description and drawing of Barnard, differing only in the smooth recess on the distal part of the inner edge of the outer lobe of the maxillipeds and the longer apical bristles on their inner plates (fig. 15c).

Occurrence. The only known at the present time specimen of this species (♂ 3 mm long) was taken by Wagler in the Atlantic, south of the Canary Islands. Our specimen was found at station 49°26'N, 158°42'E.

Genus Ctenoscina Wagler

Wagler set up this genus, in which he combined 4 species (C. tenuis Wagler, C. brevicaudata Wagler, C. macrocarpa Chevreux and C. spinosa Chevreux), taken from the genus Acanthoscina on the basis that in these species the first two segments of the mezozomes are not fused; the maxillae and the outer lobes of the maxillipeds are not reduced; the 6th and 5th joints of I pereiopods are enlarged distally but the lower edge of the 5th joint is drawn out into a blade (lobe); 4th, 5th and 6th joints of V pereiopods not fused. As we have seen, the first of these features are not characteristic of all species of the genus Ctenoscina.

38. Ctenoscina brevicaudata Wagler

Wagler, 1926, p. 435.

Material. 4 specimens of this species, 2.5 to 4 mm in size, were found in samples taken at depths of 0-8000, 0-2500, 2200-5250 and 952-1500 m.

Remarks. The specimens in our collection agree completely with the description of Wagler, differing only in that the number of lobes on the posterior margin of the 2nd joint of V pereiopods according to the drawing is 7, while in our specimens they vary from 8-10 (fig. 17).

Occurrence. Up to the present only 3 specimens have been found: at Cape Dobroi Nadezhdy, in the southern part of the Indian Ocean at 60° S and in the Seychelle Islands. Our specimens were taken at stations 49°23'N, 158°30'E; 46°11'N, 154°56'E; 45°14'N, 156°17'E and 43°39'N, 152°03'E.

[p. 219]

39. Ctenoscina spinosa Chevreux

(fig. 18)

Chevreux, 1914, p. 7; 1935.

Material. In our collection there was one mature female, 8.5 mm long, which was taken in a haul from 2200-5250 m.

Remarks. Chevreux has not given a description of the mouth parts of this species and we now fill in this gap.

The outer lobe of the I maxilla is constricted distally and terminates in a strong spine; in addition, on the outer margin of the lobe there are also 3 spines; the inner and outer lobes are covered with fine setae. The outer and inner lobes of II maxilla have two teeth separated by a deep notch. The outer lobes of the maxillipeds are broad and bear, on their obliquely truncated distal margin, several setae; also there is one seta on the distal portion of the outer edge. The inner lobes are well developed and extend half the length of the outer; on its distal end they carry two setae.

This species is distinguished from all the other species of Ctenoscina by the well developed inner lobes of the maxillipeds, which in this family are characteristic only for the genus Scina. Others of its differences from the genus Ctenoscina, also not mentioned by Chevreux, consist in the fact that the first two segments of the mezozomes are fused, as in Acanthoscina, and the gills are not only present on IV-VI segments, as in the rest of the Ctenoscina, but also on III segments.

Nevertheless, the characteristic structure of the I pereiopods, the presence of well-developed setae on the I maxillae and free terminal joints of the V pereiopods oblige us to place the present species in the genus Ctenoscina, including, in the diagnosis of this genus, as indicated by Wagler, the following additions.

1. First two segments of mezozomes may be fused.
2. Inner lobes of maxillipeds may not be reduced.
3. Gills may be present also on III segments of mezozomes.

Occurrence. This species was taken by Chevreux in the eastern Azores (34°02'N, 12°21'N) at a depth of 0-4000 m and by Pirlot (1929) in a haul at 0-1500 m (33°14'N, 19°38'W). Found by us at a station on 46°11'N, 154°56'E, a third specimen appears to be the first record of C. spinosa outside the limits of the Atlantic.

The collections of hyperiids in the northwest Pacific were taken with Juday closing nets with aperture openings of 0.1, 0.5 and 1.0 m^2, also with horizontal towed, usually not closing ring-trawl with openings of 2.0 m^2. In addition, in the course of fishing, hyperiids were taken in a Sigsbi trawl and in large pelagic nets with openings of 25 m^2. With all these collecting devices, collections were made up to depths of 8000-9500 m, i.e., down to the extreme depths of the Kurile-Kamchatka Trench. Hyperiids of the tribe Physosomata were taken in 25 samples, caught in closing nets and in 96 samples, caught in ring-trawls or other non-closing gear. Of these, 90 samples were taken at depths of more than 1000 m. Many hauls, made with coarse gauge nets at various depths, give, evidently, a sufficiently complete representation of the hyperiid fauna of the region in question and serve [p. 220] to provide a series of records concerning the geographical and vertical distribution of these animals.

Examining the vertical distribution of the hyperiids of the Bering Sea, we separated some of the groups of species, on the basis of their depth of occurrence (Vinogradov, 1956). The material, collected in the ocean, serve to define more accurately the range of residence of these groups and clarify their composition. In order to determine the vertical distribution range of all of these varied species we have had to consider also the depth of their occurrence in other oceans of the world.

a) Species, dwelling mainly in the surface and transitional zones, i.e., above 500 m (Berstein, Vinogradov and Chindonova, 1954). In this group there are very many species of the Tribe Eugenuina. To the Tribe Physosomata can be assigned only Scina crassicornis and, possibly, Scina orientalis, occurring in surface strata.

b) Species, confined mainly to the upper subzone of the deep-water zone and sometimes found at depths of 100-200 m, but some (marked with an asterisk) also at the surface: Archaeoscina steenstrupi, Lanceola sayana*, L. clausi, Mimonectes sphaericus, M. loveni*, M. gaussi*, Scina curvidactyla*, Sc. curilensis, Sc. incerta, Sc. borealis, Sc. stebbingi, Sc. submarginata, Sc. rattrayi var. keilhacki, Sc. wagleri; some of them, for example, L. sayana, L. clausi, Sc. borealis, Sc. rattrayi, descend to the lower subzone of the deep-water zone.

[p. 221] c) Species, not occurring, as a rule, above 500 m. Some of these confined to the upper subzone of the deep-water zone, i.e., at depths less than 2000 m, but the majority descend down to 4000-6000 m and possibly deeper. To this group can be assigned: Lanceola pacifica, L. serrata, Scypholanceola vanhoffeni, Chuneola parasitica, Ch. major, Mimonecteola beebi, Scina spinosa. Undoubtedly, to it can be assigned also the less frequently occurring specimens of Mimonectes diomedae, Prolanceola vibiliformis, Proscina stephenseni and, missing from our collections, Chuneola paradoxa.

d) Species, not occurring above 1000-2000 m, i.e., species of the lower subzone of the deep-water zone: Lanceola loveni, L. loveni var. grossipes,

L. laticarpa, L. clausi var. gracilis, Microphasma agassizi, Scina wolterecki, Sc. typhlops, Ctenoscina brevicaudata, Ct. spinosa and, probably, Proscina magna and Scypholanceola agassizi.

e) Species, confined to depths over 4000-6000 m, i.e. mainly to the trench zone: Lanceola clausi var. sphaerica and Scina wagleri var. abyssalis.

As noted, these 5 groups differ primarily in the depth of the upper limit of zone inhabited by these species, since the lower limit of occurrence of the majority of the species is not clear, and available records indicate that many of them descend down to the maximal ocean depths.

In comparing the vertical distribution of the hyperiids Physosomata with the distribution of other groups of deep-water pelagic animals, for example the gammarids (Birstein and Vinogradov, 1955) or copepods (Brodsky, 1952, 1955), two features may be noted: firstly, the majority of the hyperiid species have a very wide vertical distribution and, secondly, the very limited isolation of the fauna in the Trench zone. Actually, many of the species, living in the transitional zone or in the upper strata of the deep zone, are found also throughout the depths investigated. Thus, for example, Lanceola pacifica was found in hauls at 0-300 and 8000-4000 m, Lanceola clausi at 100-500 and 5250-2200 m, Scina borealis at 100-200 and 4600-2200 m, Scina rattrayi var. keilhacki at 0-300 and 4000-6000 m, etc.

It is possible that the hyperiids, being in overwhelming majority commensals or parasites of the deepwater Coelenterates[1], are not associated with any specific species of host (Stephensen, 1918; Woltereck, 1927, etc.). Therefore they may, changing the host but actually not varying, moreover, the conditions of their feeding, exist in different zones of the deep-water pelagial and have an unusually wide range of vertical distribution.

The wide range of the majority of species of this group emphasizes the small peculiarities of the fauna of the separate deep zones, in particular the fauna of the Trench zone. For the hyperiids of this zone there are characteristically only 2 sub-species, while in the only haul in the Trench zone, made by K. A. Brodsky (1955a), there were taken 2 genera, 9 species and 2 varieties of copepods, not found in shallower depths. Among the pelagic gammarids (Birstein and Vinogradov, 1955) in the Trench zone live 6 species (19% of all the fauna of the pelagic gammarids, living in this region), 2 genera and also one family.

[p. 222] The very wide vertical distribution of the hyperiids can explain also their wide horizontal occurrence for, as stated by N.G. Vinogradov (1955) among the deep-water animals the latitude of the geographical area in the majority of cases is directly dependent on the degree of eurybathnost of the species.

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[1] By us were found more than 100 different hyperiid Physosomata - Lanceola, Scypholanceola, Chuneola, Scina and others. In the great majority of them the intestines contained a brownish, orange or red mass, reminiscent of the colour and structure of the pigment layer of deep-water medusae, and a large number of nematocysts of these Coelenterates. Only in the stomach of Microphasma agassizi were there found fragments of the skeletons of radiolarians and chitinous remains of Copepoda, which suggests that it had been feeding on minute deep-water organisms but not on coelenterates.

The range of occurrence of the various species of hyperiids is represented in Table 3.

Table 3. Geographic distribution of certain hyperiid species in the northwest Pacific

Species	North Pacific	South Pacific	North Atlantic	South Atlantic	Indian Ocean	Antarctica	North Polar Basin
Archaeoscina steenstrupi	+	(+)	+	+	+	+	-
Lanceola sayana	+	+	+	+	+	+	-
Lanceola loveni	+	-	+	-	-	-	-
Lanceola loveni var. grossipes	+	-	+	-	-	-	-
Lanceola pacifica	+	+	+	+	-	-	-
Lanceola serrata	+	+	+	+	-	+	-
Lanceola clausi	+	+	+	+	-	+	+
Scypholanceola vanhoffeni	+	-	+	+	+	+	-
Scypholanceola agassizi	+	+	-	-	-	-	-
Prolanceola vibiliformis	+	+	-	-	+	-	-
Chuneola parasitica	+	(+)	-	-	(+)	-	-
Mimonecteola beebi	+	(+)	+	(+)	-	+	-
Microphasma agassizi	+	+	+	-	+	-	-
Mimonectes sphaericus	+	+	+	+	-	+*	-
Mimonectes loveni	+	+	+	+	+	-	-
Mimonectes gaussi	+	-	+	+	-	-	-
Proscina stephenseni	+	-	+	-	+	-	-
Proscina magna	+	-	+	-	-	-	-
Scina crassicornis	+	+	+	+	+	+	-
Scina curvidactyla	+	+	+	+	+	-	-
Scina incerta	+	-	+	+	+	-	-
Scina borealis	+	+	+	+	+	+	+
Scina spinosa	+	-	+	+	+	+	-
Scina stebbingi	+	-	+	+	-	-	-
Scina submarginata	+	-	+	+	+	+	-
Scina wolterecki	+	-	+	-	+	+	-
Scina rattrayi var. keilhacki	+	-	-	+	+	-	-
Ctenoscina brevicaudata	+	-	-	+	+	+	-
Ctenoscina spinosa	+	-	+	-	-	-	-

* Mimonecteola, Mimonectes sphaericus, Scina wolterecki and Ctenoscina brevicaudata were taken in the Indian sector of the Antarctic Complex of the Antarctic expedition in the vessel "Ob" in 1956.

Note. In parenthesis are indicated the occurrence of closely-related species, e.g., M. beebi, M. diomedae, M. macronyx or Ar. steenstrupi and A. stebbingi.

[p. 223] As seen from the table, most of the species, taken in the northern part of the Pacific, are common also in the north Atlantic, and partly also in other regions of the oceans of the world. The almost complete absence of the Physosomata hyperiids in the fully well-investigated depths of the Polar basin causes us to surmise that the connection between the northern parts of the Pacific and Atlantic Oceans is accomplished across the Indian Ocean or Antarctic. In this case the absence in the Indian Ocean and the Antarctic of many species, taken in the boreal zone of the Pacific and Atlantic may be explained more readily by the incompleteness of the collections and the lack of study of the waters of the southern hemisphere than by the actual absence of these species. It is all the more probable, then, that the separate Atlantic-Pacific areas have, in the main, species represented only by 2-3 or a few more specimens (Proscina magna, Microphasma agassizi, Scina typhlops, Ctenoscina spinosa, etc.). Thus, it is necessary to recognize that the great majority of the deep-water hyperiids have a pan-oceanic distribution.

But then, if it be considered that the available data fully characterize the true distribution of the Physosomata hyperiids, then, in this instance the natural areas of the species of this group are found to be much wider than, for example, for the pelagic gammarids or copepods. So, the species found only in the Pacific compose only 22.5% of the total number of species, found in the northern part of the Pacific while, in the case of the gammarids, they constitute 55% (Birstein and Vinogradov, 1955) and, in the case of copepods, more than 50% (Brodsky, 1948, 1955). On the contrary, of all the species, found in the northwest part of the Pacific, the hyperiids make up 50% of the pan-oceanic species, the gammarids 26% and the copepods 15.5%.

In spite, however, of their range and wide geographic distribution, the Physosomata hyperiids, as also for other groups of pelagic animals (gammarids, copepods), though perhaps to a lesser degree, are characterized by certain differences in the geographic distribution of the groups of species, having a different vertical distribution. So, as also for the pelagic gammarids and copepods, the species (subspecies) of the Trench zone (group "e") are endemic. Among the species not occurring above 1000-2000 m (group "d"), as also for the gammarids, they predominate in the Atlantic-Pacific zone, which as we already have indicated, undoubtedly to a large degree is due to the insufficient study of the depths of the ocean of the southern hemisphere. Finally, the species occurring in the upper sub-zone of the deep-water zone, but also in the transitional and surface zones (groups "b" and "c"), have fundamentally a pan-oceanic distribution.

These data are given in Table 4.

As seen in this table, among the Physosomata, along with the numerous, widely-distributed species there is also a group of forms with a very limited range, taken only in the northwest Pacific. One of them, represented by 2-3 specimens (Lanceola laticarpa, Chuneola major, Ch. parasitica) in the usual ocean depths, is possibly distributed widely and will be found in other regions of the ocean too. Others, evidently actually have a very limited dispersion. Such, on the one hand, are species (subspecies) coordinated with depths greater than 6000 m (Lanceola clausi var. sphaericus and Scina wagleri var. abyssalis), and, on the other hand, certain species, occurring in the near-surface strata in depths of 100 m or less. So from analysis of the distribution of hyperiids inside the region examined by us, it is apparent that for some of these species the essential zoogeographical boundary appears to be the front of warm [p. 224]

current of Kuroshio which is well defined by the surface isotherm of 18° in August-October. North of this boundary Scina crassicornis and S. curvidactyla and also the mass of surface warm-water species of Curvicornia hyperiids do not occur. On the contrary, south of this Scina curilensis, usual in far-eastern seas and cold water of Oyashio is not found (fig. 19). Such species as Sc. curilensis and Sc. wagleri, associated with the water masses present in the north part of the Pacific, can be considered genuinely endemic in these regions.

Table 4. Percentage relationship of species with different zones of distribution, living at different depths*

Groups of species	No. of species	Atlantic Indian Pacific	Atlantic Pacific	Pacific Indian	Pacific	North-west Pacific
Group "a" - occurring above 500 m	2	50	-	-	-	50
Group "b" - species occurring in thermocline and upper subzone of deep water zone	14	71.4	14.3	-	-	14.3
Group "c" - species not occurring in thermocline	11	54.5	-	18.2	9.1	18.2
Group "d" - species not found above 1000 - 2000 m	11	27.3	45.4	-	9.1	18.2
Group "e" - species in the Trench zone (deeper than 6000 m)	2	-	-	-	-	100
Total	40	50.0	17.5	5.0	5.0	22.5

* In this table, of 4 species, described for the northwest Pacific by A.I. Bulycheva (1955) and absent in our material, only Scina orientalis and Chuneola paradoxa have been examined, so the identification of the two others (Archaeoscina stebbingi and Lanceola aestiva) requires verification.

To what extent the hyperiid fauna of the deep waters of the northern Pacific are uniform is difficult to determine. To us (Bogorov and Vinogradov, 1955) on the basis of the distribution of certain Coelenterates, Decapods and other groups was found the presence of the zoogeographical boundary for the deep-water pelagials of the western part of the Pacific, lying between 35°-45°. One closely coincides with the boundaries, described by K.A. Brodsky (1955a) on the basis of the occurrence of deepwater Copepoda and by N.G. Vinogradov (1955) on the occurrence of the bottom organisms. In the material possessed by us it is impossible with assurance to judge for what deepwater hyperiids there appear to be obstacles since the majority of the species absent north of this boundary and present in the south were discovered there only by single specimens. It is possible only to assume that north of this boundary Lanceola loveni var. grossipes,

Scypholanceola agassizi, Mimonectes diomedae, M. loveni and Proscina magna do not occur. To the south of this boundary Scina wagleri, common in the Okhotsk Sea and very rare in the cold Kurile Island waters, are not found. It, as for Sc. curilensis may be considered endemic of the cold waters of the northwest Pacific. However, this subspecies - Sc. wagleri var. abyssalis, living at depths below 6000 m, occurs in all the deep water of the Kurile-Japan-Idzi-Bonin Trench and is found in it to the south up to 28°N.

[p. 225] Literature

Birstein Ya. A and Vinogradov, M.E. Pelagic gammarids (Amphipoda-Gammaridea) Kurile-Kamchatka Trench. Tr. In-ta Oceanol., T. XII, 1955.

Birstein, Ya. A., Vinogradov, M.E. and Chindonova Iu. G. Vertical zonality of the plankton of the Kurile-Kamchatka Trench. DAN SSSR, T. 95, No. 2, 1954.

Bogorov, V.G. and Vinogradov, M.E. On the zooplankton of the northwest Pacific. DAN SSSR, T. 102, No. 4, 1955.

Bulycheva, A.I. Hyperiids (Amphipoda-Hyperiidea) of the northwest Pacific. DAN SSSR, T. 102, No. 5, 1955.

Brodsky, K.A. On the zoogeography of the deep-water trenches of the northwest part of the Pacific Ocean. DAN SSSR, T. 60, No. 6, 1948.

Brodsky, K.A. Deepwater copepods (Calanoida) of the northwest Pacific. Issl. dalnevost morei SSSR, No. 3, 1952.

Brodsky, K.A. On the Calanoida fauna of the Kurile-Kamchatka Trench. Tr. In-ta Oceanol. Tom XII, 1955.

Brodsky, K.A. Zoogeographic regions of the pelagic forms of the Far Eastern Sea and northern parts of the Pacific (with reference to the Calanoida). DAN SSSR, Tom 102, No. 3, 1955a.

Vinogradov, M.E. Hyperiids (Amphipoda-Hyperiidea) of the western part of the Bering Sea. Zool. zhurn., T. 35: 2, 1956.

Vinogradova, N.G. Geographical dispersion of deepwater bottom fauna. Avtoreff. diss. In-ta Oceanol., M., 1955.

Gurjanov, E.F. On the fauna of the higher crustacea (Crustacea-Malacostraca) of the north Pacific. Issl. dalnevost. morei SSSR, 3, 1952.

Barnard, K.H. Amphipoda. British Antarctic (Terra Nova) expedition 1910. Nat. Hist. Rep. Zool., v. 8, N. 4, Crustacea, pt. XI, Amphipoda, 1930.

Barnard, K.H. Amphipoda. Discov. Rep., v. 5, 1932.

Barnard, K.H. Amphipoda. The John Murray expedition 1933-1934. Sci. Rep., v. 4, N. 6, 1937.

Barnard, K.H. Amphipoda Hyperiidea. Australian Antarctic expedition 1911-1914. Sci. Rep., ser. C, Zool. a. Bot., v. 2, 1937a.

Behning, A.L. Die Amphipoda Hyperiidea der den Fernen Osten der UdSSR umgrenzenden Meere. Intern. Rev. Hydrobiol. u Hydrogr., v. 38, Hft 3/4, 1939.

Bovallius, C. On some forgotten Genera among the Amphipodous Crustacea. K. Svenska Vet. Akad. Handl., Bd. 10, N. 14, 1885.

Bovallius, C. Mimonectes, a remarkable genus of Amphipoda Hyperiidea. Nova Acta Reg. Soc. sci, Upsala, ser. 3, v. 13, 1885a.

Bovallius, C. Contribution to a monograph of the Amphipoda Hyperiidea. K. Svenska. Vet. Akad. Handl., v. 21, N. 5, 1887.

Bovallius, C. Arctic and Antarctic Hyperids. "Vega" Expeditions. Vetensk. Jakttag. v. 4. 1887a.

Bovallius, C. Contribution to a monograph of the Amphipoda hyperiidea. K. Svenska Vet. Akad. Handl., v. 22, N. 7, 1889.

Chevreux, E. Amphipodes provenant des campagnes de "l'Hirondelle". Resultats des campagnes scientifiques accomplies sur son yacht par Albert I-er, Prince Souverain de Monaco, fasc. 16, 1900.

Chevreux, E. Liste des Scinidae "de la Princesse Alice" et description d'une espèce nouvelle. Bull. Mus. Océanogr. de Monaco, N. 37, 1905.

Chevreux, E. Sur quelques amphipodes pelagiques nouveaux ou peuconnur, provenant des campagnes de S.A.S. le Prince de Monaco. Bull. Inst. Océanogr., No. 291, 1914.

Chevreux, E. Revision des Scinidae provenant des campagnes de S.A.S. le Prince de Monaco. Bull. Inst. Océanogr. de Monaco, N. 352, 1919.

Chevreux, E. Revision des Lanceolidae provenant des campagnes de S.A.S. le Prince de Monaco. Bull. Inst. Océanogr. de Monaco, N. 363, 1920.

Chevreux, E. Amphipodes provenant des campagnes scientifiques du Prince Albert I-er de Monaco. Resultats des campagnes scientifiques accomplies sur son yacht par Albert I-er, Prince de Monaco, fasc. 91, 1935.

Fabricius, J.C. Systema Entimologiae sistens Insectorum Classes, Ordines, Genera, Species, adjectis synonymis, locis descriptionibus observationibus. Flensburgi et Lipzial, 1775.

Hurley, D.E. Bathypelagic and other Hyperiidea from Californian waters. Allan Hancock Foundation publications, N. 18, 1956.

Garbowski, T. Zoologishe Ergebnisse. IX. Hyperienartige Amphipoden des Mittelmeeres. Monographie, bearbeitet auf Grund des während der 5. Exped. S.M. Schiffes "Pola" gesammelten Materiales (1890-94). I. Theil. Die

Sciniden (Bericht. Komm. Tiefsee-Forschung XX). Denkschr. K. Acad. Wiss. Wien, Math.-Naturwiss. Cl., Bd. 63, 1896.

Pirlot, J.M. Les Amphipodes Hyperides. Resultats zoologiques de la Croisière at lantique de l'"Armauer-Hansen". Mém. soc. roy. sci. de Liège, t. XV, fasc. 2, 1929.

Pirlot, J.M. Les Amphipodes Hyperides. Siboga-expedit., v. 33a, pt. I, 1930.

Pirlot, J.M. Sur des Amphipodes Hyperides provenant des Croisières du Prince Albert I-er de Monaco. Resultats du campagnes scientifiques accomplies sur son yacht par I-er Prince Souverain de Monaco, fasc. CII, 1939.

Sars, G.O. Oversigt af Norges Crustaceer etc. Vidensk. Selsk. Forhandl., N. 18, Christiania, 1882.

Sars, G.O. An account of the Crustacea of Norway. Hyperiidae, v. I, Christiania, 1890-1895.

Sars, G.O. Crustacea V. The Norwegian North-Polar expedition 1893-1896. Sci. Res., v. 1, 1900.

Say, T. Account of the Crustacea of the United States. J. Acad. Nat. Sci., Phil., v. I, pt. 2, 1818.

Shoemaker, C.R. The Amphipoda of the Bermuda oceanographic expeditions 1929-1931. Zool., v. XXX, pt. 4, N. 17, 1945.

Stebbing, T.R. Report on the Amphipoda collected by H.M.S. "Challenger" during the years 1873-1876. Report on the Scientific results of the voyage of H.M.S. "Challenger", Zool., XXIX, 1888.

Stebbing, T.R. Biscayan plankton. Pt. 2. The Amphipoda and Cladocera. Trans. Linn. Soc. Lond., ser. 2, v. 10, pt. 2, 1904.

Stephensen, K. Hyperiidea-Amphipoda (Lanceolidae, Scinidae, Vibilidae, Thaumatopsidae). Rep. on the Dan. Oceanogr. Exp. 1908-1910 to the Mediterranean and adjacent seas, v. II, Biol. D_2, 1918.

Stephensen, K. Amphipoda, The Godthaab Expedition 1928. Meddel. om Grönland, v. 79, N. 7, 1933.

Stephensen K. and Pirlot, J.M. Les amphipodes hyperides du genre Mimonectes Bovallius (inclus. Sphaeromimonectes Woltereck et Parascina Stebbing) et de quelques genres voisins (Archaeoscina Stebbing, Micromimonectes Woltereck, Microphasma Woltereck et Proscina n.g.). Arch. Zool. exper. et génér., v. 71, fasc. 4, 1931.

Tattersall, W.M. Pelagic Amphipoda of the Irish Atlantic slope Fisheries. Ireland Sci. Investig., 1905; N. 4, pt. 8, 1906.

Thorsteinson, E.D. New or noteworthy amphipods from the North Pacific coast. Univ. Wash. Publ. Oceanogr., v. 4, N. 3, 1941.

Vosseler, J. Die Amphipoden der Plankton-Expedition. I Theil. Hyperiidea I. Mt.-Nat. Kab. Stuttgart, N. 17, 1901.

Wagler, E. Amphipoda 2. Scinidae der Deutschen Tiefsee-Expedition. Wiss. Ergebn. Deutsch. Tiefsee-Expedition, Bd. XX, H. 6, 1926.

Wagler, E. Die Sciniden. Deutsche Südpolar-Expedition 1901-1903, Bd. XIX, Zool. 11, 1927.

Woltereck, R. Dritte Mitteilung über die Hyperiden der Deutschen Tiefsee-Expedition, und erste Notiz über die Amphipoden der Deutschen Südpolar-Expedition: Sphaeromimonectes Valdiviae nov. gen., nov. spec. etc. Zool. Anz., Bd. XXVII, N. 20/21, 1904.

Woltereck, R. Mitteilungen über Hyperiden der "Valdivia" (N. 4), der "Gauss" (N. 2) und der Schwedischen Südpolar-expedition. Scypholanceola, eine neue Hyperidengattung mit Reflektororganen. Zool. Anz. Bd. XXIX, 1905.

Woltereck, R. Fünfte Mitteilung über die Hyperiden der "Valdivia"-Expedition: Micromimonectes, nov. gen. Zool. Anz. Bd. XXX, 1906.

Woltereck, R. Siebente Mitteilung über die "Valdivia"-Hyperiden: Prolanceola vibiliformis nov. gen. nov. sp. Zool. Anz. Bd. XXXI, No. 5/6, 1907.

Woltereck, R. Amphipoda. Reports on the scientific results of the expedition to the Eastern Tropical Pacific, in charge of Alexander Agassiz, by the U.S. fish commission steamer "Albatross", from October 1904 to March 1905. Bull. Mus. Comp. Zool., v. 52, N. 9, 1909.

Woltereck, R. Die Lanceoliden und Mimonectiden. Deutsche Südpolar-Expedition 1901-1903, Bd. XIX, Zool., 11, 1927.

Figure Legends

Fig. 1 (p. 187). Region of operations (shaded area).

Fig. 2 (p. 191). Terminal sections of I antennae. (a) Lanceola sayana Bov.; (b) L. pacifica Steb. (♀, 21 mm).

Fig. 3 (p. 192). Lanceola laticarpa sp. n. (♂, 21 mm). A_I, A_{II} - antennae; l - upper lip; Md - mandible; Mx_I - first maxilla; Mx_{II} - second maxilla; Mxp - maxilliped.

Fig. 4 (p. 193). Lanceola laticarpa sp. n. (♂, 21 mm). P_I-P_{VII} - I-VII pereiopods; U_I-U_{III} - I-III uropods; T - telson.

Fig. 5 (p. 195). Lanceola clausi var. gracilis M. Vinogr. Designations as for figs. 3 and 4.

Fig. 6 (p. 196). Lanceola clausi var. sphaerica n. var. Designations as for figs. 3 and 4.

Fig. 7 (p. 198). Prolanceola vibiliformis Wolt. (♀, 13 mm). Designations as for fig. 3.

Fig. 8 (p. 199). Prolanceola vibiliformis Wolt. (♀, 13 mm). Designations as for fig. 4.

Fig. 9 (p. 202). Chuneola major n. sp. (21 mm).

Fig. 10 (p. 203). Chuneola major n. sp. (21 mm). U_I U_{III} - uropods; T - telson. Other designations the same as in figs. 3 and 4.

Fig. 11 (p. 204). Mimonecteola beebi Shoemaker (♀). pMx_I - tentacle or feeler on first maxilla. Other designations the same as in figs. 3 and 4.

Fig. 12 (p. 207). Mimonectes diomedae (Wolt.) (♂, 11 mm). Designations as in figs. 3 and 4.

Fig. 13 (p. 209). Proscina stephenseni (Pirlot). Designations as in figs. 3 and 4.

Fig. 14 (p. 211). Proscina magna Stephensen et Pirlot (♀, 18 mm). Designations as in figs. 3 and 4.

Fig. 15 (p. 215). Maxillipeds. (a) Scina stebbingi Chevre.; (b) Scina spinosa Vos.; (c) Scina typhlops Wagler.

Fig. 16 (p. 217). Scina wagleri var. abyssalis n. var. Designations the same as in figs. 3 and 4. P_{III} typ - 3rd pereiopod of typical specimen of S. wagleri Behning.

Fig. 17 (p. 218). Fifth pereiopod on Ctenoscina brevicaudata Wagler.

Fig. 18 (p. 220). Ctenoscina spinosa Chevreux (♀, 8.5 mm).

Fig. 19 (p. 225). Occurrence of Scina curilensis and Scina crassicornis in the northwest Pacific. 1 - S. curilensis; 2 - S. crassicornis.