

ISOPODS COLLECTED IN THE NORTHWEST PACIFIC BY
THE U. S. BUREAU OF FISHERIES STEAMER "ALBA-
TROSS" IN 1906.

By HARRIET RICHARDSON,

Collaborator, Division of Marine Invertebrates, U. S. National Museum.

The following report is of the Isopoda collected by the U. S. Bureau of Fisheries steamer *Albatross* during its cruise in 1906, from San Francisco to Alaska, the Aleutian Islands, Bering Sea, Kamchatka, Japan, etc. A large number of specimens were obtained, including known species and twenty-nine new ones. The new forms are herein described and a list of the known species given with their stations. References to the literature are to be found at the end of the paper.

CYMOTHOIDEA or FLABELLIFERA.

Family GNATHIIDÆ.

Genus GNATHIA Leach.

GNATHIA TUBERCULATA, new species.

Body oblong, ovate.

Head large, squarish, with the anterior margin produced in a rounded lobe and the antero-lateral angles acute. The eyes are small, round, composite, and situated at the base of the antero-lateral angles of the head. The surface of the head is granulate and covered with numerous small spines.

The first pair of antennæ have the first two articles short and subequal; the third is twice as long as the second; the flagellum is composed of five articles. The second pair of antennæ have the basal article short, the last two articles elongate; the flagellum is composed of seven articles. The mandibles are large and conspicuous, and project straight in front, with their inner edges contiguous along the middle and the tips crossing. There is a small dentation about the middle of the outer margin.

On the ventral side of the head the anterior margin is provided with four spines on either side close to the antennæ and within them.

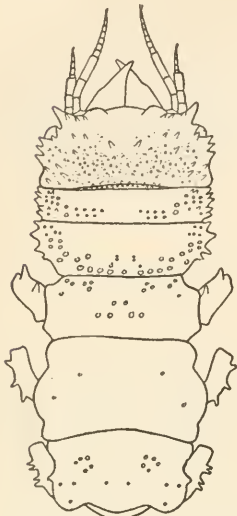


FIG. 1.—GNATHIA TUBERCULATA. HEAD AND THORAX. $\times 14\frac{1}{2}$.

The first segment of the thorax is short and narrow and almost inconspicuous. The second segment is about half as long as the third, but is equally wide. The second is covered with small spines and tubercles, the third at the sides and on the posterior half. The fourth segment is a little longer than the third and a little narrower; it is also furnished with tubercles. The fifth segment is one and a half times longer than the fourth and has only a very few tubercles on the dorsal surface. The sixth segment is a little shorter and a little narrower than the fifth segment and is furnished with but few tubercles, more, however, than on the fifth segment. The seventh segment is short and almost inconspicuous.

The abdomen is abruptly about half as wide as the sixth thoracic segment. The five anterior segments are subequal. The terminal segment is produced to a long, narrow extremity. The inner angle of the peduncle of the uropoda is produced and extends about half the length of the inner branch. The branches are similar in shape and size, the inner one being a little longer than the outer and also a little longer than the tip of the terminal segment of the abdomen. Both are fringed with long hairs.

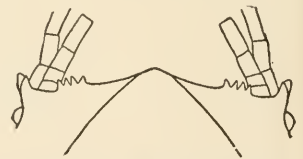


FIG. 2.—GNATHIA TUBERCULATA. ANTERIOR MARGIN OF HEAD (VENTRAL). $\times 27\frac{1}{2}$.

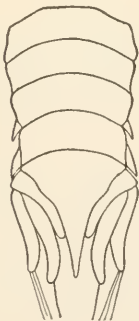


FIG. 3.—GNATHIA TUBERCULATA. ABDOMEN. $\times 27\frac{1}{2}$.

The fourth pair of legs have the basis furnished with two long spines, one being at the distal extremity and the other about the middle; the ischium is furnished with one spine and the merus with one. The fifth pair have the basis furnished with three spines on the exterior margin; the ischium is furnished with one spine and the merus with one. The sixth pair have the basis furnished with four spines. (The rest of the leg is lost in the only specimen.) The first pair of legs are modified into an operculum covering the mouth parts; each appendage is composed of three articles, the last one being minute.

Only one specimen, a male and imperfect, comes from station 4831, on the way from Nanao, Hondo, Japan, to Isuruga, Hondo, Japan,

at Sudzu Misaki Light, N. 68° W., 24 miles (lat. $37^{\circ} 22' 30''$ N.; long. $137^{\circ} 47'$ E.) at a depth of 619 fathoms in green mud.

Type-specimen.—Cat. No. 39496, U.S.N.M.

Family ANTHURIDÆ.

Genus PARANTHURA Bate and Westwood.

PARANTHURA JAPONICA, new species.

Body narrow, elongate. Color, in alcohol, yellow, with irregular markings of black.

Head about as long as wide, 1 mm.: 1 mm. Anterior margin excavate and with a small median point. Eyes rather large, round, composite and placed in the antero-lateral angles. The first pair of antennæ have the first article of the peduncle elongate; the second and third are subequal in length, and both together are not longer than the first article; the flagellum consists of four articles, the last of which is minute. The second pair of antennæ have the second article elongate; the third and fourth short and subequal, and both together not longer than the second; the fifth is about one and a half times longer than the fourth; the flagellum consists of a single, tapering article, furnished with hairs.

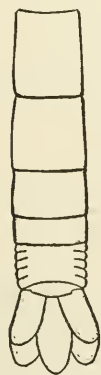
The first five segments of the thorax are subequal in length, each being $1\frac{1}{2}$ mm. long. The sixth segment is shorter, being only 1 mm. long. The seventh is half as long as the sixth, being $\frac{1}{2}$ mm. in length.

The first five segments of the abdomen taken together are equal in length to the sixth thoracic segment. These segments are all fused in the middle of the dorsal region but are distinct at the sides. The sixth segment is almost as long as half the length of the other five segments taken together. The telson is ligniform, with the posterior extremity rounded. The peduncle of the uropoda extends about three-fourths the length of the terminal abdominal segment. The inner branch is short, rounded posteriorly, and does not extend beyond the extremity of the terminal abdominal segment. The outer branch arches over the telson and is as long as the peduncle of the uropoda.

FIG. 5.—PARANTHURA JAPONICA. LAST FOUR SEGMENTS OF THORAX AND ABDOMEN. $\times 9\frac{3}{4}$.



FIG. 4.—PARANTHURA JAPONICA. HEAD AND FIRST THREE SEGMENTS OF THORAX. $\times 9\frac{3}{4}$.



The first three pairs of legs are prehensile, the first pair being stouter and larger than the others. The last four pairs are ambulatory.

Only one specimen, a female, was collected at Mororan, Japan, on the shore.

Type-specimen.—Cat. No. 39497, U.S.N.M.

Family CIROLANIDÆ.

Genus BATHYNOMUS A. Milne Edwards.

BATHYNOMUS DODERLEINI Ortman.

Bathynomus doderleini ORTMANN, Proc. Acad. Nat. Sci. Phila., 1894, pp. 191–193.—BOUVIER, C. R. Acad. Sci., vol. 132, pp. 643–645.—A. MILNE EDWARDS and BOUVIER, Mem. Mus. Comp. Zool. Harvard College, vol. 22, No. 2, 1902, pp. 159–165, pls. 7, 8.

Locality.—Two fine specimens were collected at station 5067, in Suruga Gulf, Japan, at Ose Saki, 50° E., 6.5 miles (lat. 35° 05' 50'' N.; long. 138° 41' 15'' E.).

Depth.—Two hundred and ninety-three fathoms in broken sand and shells.

The type-specimens of this species were collected in Sagami Bay, near Enoshima, Japan. The flagelli of the second pair of antennæ were broken in both specimens, the longest fragment being composed of 25 articles and reaching to the end of the first segment of the thorax. In the two perfect specimens obtained by the Bureau of Fisheries steamer *Albatross*, the flagelli are entire and extend to the posterior margin of the fourth thoracic segment in one specimen and almost to the posterior margin of the fifth thoracic segment in the other specimen. The articles in the flagellum number about 73.

Family CORALLANIDÆ.

Genus ALCIRONA Hansen.

ALCIRONA NIPONIA, new species.

Body narrow, elongate, nearly three times as long as wide (4 mm.: 11 mm.). Surface smooth. Color, in alcohol, pale yellow.

Head twice as wide as long (1 mm.: 2 mm.). Anterior margin widely rounded. Eyes small, round, composite, and situated in the post-lateral angles. The first pair of antennæ have the first two articles of the peduncle short and subequal; the third is about one and a half times longer than the first two combined; the flagellum is composed of about 11 articles and does not quite reach the posterior margin of the first thoracic segment. The second antennæ, with a flagellum of 19 articles, extend to the posterior margin of the third thoracic segment.

The segments of the thorax are about equal in length with the exception of the first, which is a little longer. Epimera are present on all the segments, except the first; those of the second and third

segments do not extend beyond the posterior margin of the segment and are quadrangular; those of the last four segments have the outer post-lateral angle produced so that they extend beyond the posterior margin of the segment, each being increasingly longer. Each epimeron is furnished on the outer post-lateral angle with a bunch of long hairs, a most conspicuous feature.

The first two segments of the abdomen are entirely concealed. The three following are short and subequal. The terminal segment is triangular, with apex rounded. The inner branch of the uropoda is about twice as wide as the outer branch and is a little longer. It is widely rounded posteriorly and extends a little beyond the tip of the abdomen. Both branches, as well as the terminal segment of the abdomen, are furnished with hairs and a few spines.

The first three pairs of legs are prehensile, the other four pairs ambulatory. In the first pair of prehensile legs the merus is armed with four blunt spines, the carpus with one, the propodus with seven rounded teeth, and the dactylus with four low rounded serrations.

Only one specimen, a male, was collected at station 4879, in the eastern channel of Korea Strait, vicinity of Oki Shima, S. 70° W., 7.5 miles (lat. $34^{\circ} 17'$ N.; long. $130^{\circ} 15'$ E.), at a depth of 59 fathoms in fine gray sand and broken shells.

This species is very close to *Alcirona insularis* Hansen^a from Samoa, but differs in the character of the prehensile legs, in having a bunch of hairs on each epimeron at the outer post-lateral angle, and in having the first two segments of the abdomen entirely concealed.

Type-specimen.—Cat. No. 39498, U.S.N.M.

Family ÆGIDÆ.

Genus ÆGA Leach.

ÆGA SYMMETRICA Richardson.

Æga symmetrica RICHARDSON, Bull. U. S. Bureau of Fisheries, vol. 24, 1905, pp. 211-212; Bull. U. S. Nat. Mus., No. 54, 1905, pp. 185-187.

Localities.—Station 4771, on "Bowers Bank," Bering Sea, at lat. $54^{\circ} 30'$ N.; long. $179^{\circ} 17'$ E., and station 4772, at lat. $54^{\circ} 30' 30''$ N.;



FIG. 6.—ALCIRONA NIPONIA. LEG OF FIRST PAIR. $\times 27\frac{1}{2}$.

^a Vidensk. Selsk. Skr. 6te Række, naturvidenskabelig og matematisk Afd., vol. 5, pt. 3, 1890, pp. 393-395, pl. 8, figs. 2-2n.

long. $179^{\circ} 14' E.$; station 4781, on the way from "Petrel Bank," Bering Sea, to McDonald Bay, Agattu Island, Aleutians, by the passage east of Semisopochnoi and Amchitka Islands, at lat. $52^{\circ} 14' 30'' N.$; long. $174^{\circ} 13' E.$

Depth.—Three hundred and forty-four to four hundred and eighty-two fathoms in fine gray sand and pebbles, in green and brown sand, and in broken shells.

ÆGA MAGNOCULIS, new species.

Body ovate, about twice as long as wide (11 mm. : 21 mm.). Surface smooth. Color, in alcohol, yellow.

Head wider than long, $2\frac{1}{2}$ mm. long by $5\frac{1}{2}$ mm. wide. Front produced in a small median point, separating the basal articles of the first antennæ. Eyes large, oval, occupying almost the entire surface of the head, and separated from each other by a distance equal to half a millimeter. The first pair of antennæ have the two basal articles not dilated, and subequal; the third is narrow, elongate, and equal in length to the first two articles taken together; the flagellum is composed of eighteen articles. The first antennæ extend to the posterior margin of the first thoracic segment. The second antennæ, with a flagellum of twenty-one articles, extend to the posterior margin of the third thoracic segment. The frontal lamina is conical, with the distal end flat and ovate, the proximal end produced to a point.



FIG. 7.—*ÆGA MAGNOCULIS*. HEAD AND FIRST TWO SEGMENTS OF THORAX. $\times 3\frac{1}{2}$.

The segments of the thorax are subequal, the last one being slightly shorter than the others.

The epimera are large, subquadrate, with the outer post-lateral angle acute and produced posteriorly in the last three segments beyond the posterior margin of the segments.

The first segment of the abdomen is almost entirely covered by the seventh thoracic segment, especially in the middle dorsal region; the following three segments are subequal; the fifth segment is slightly longer in the middle dorsal region; the sixth or terminal segment is rounded, with the apex produced in a small point, on either side of which the posterior margin is serrulate. The uropoda extend a little beyond the terminal abdominal segment; the inner branch is slightly longer than the outer branch, is also wider and has the posterior margin obliquely truncate, with the outer angle produced acutely; the outer branch is ovate with the posterior extremity acute. Both branches have the margins serrulate.

The first three pairs of legs are prehensile. There is one small spine at the distal extremity of the propodus, and one larger spine on the carpus. A few small spines are also on the merus. The last

four pairs of legs are ambulatory and are furnished with a few spines and hairs.

Nine specimens of this species come from the following localities: Station 4772, on "Bowers Bank," Bering Sea, at lat. $54^{\circ} 30' 30''$ N.; long. $179^{\circ} 14'$ E., and station 4771, at lat. $50^{\circ} 30'$ N.; long. $179^{\circ} 17'$ E.; station 4781, on the way from "Petrel Bank," Bering Sea, to McDonald Bay, Agattu Island, Aleutians, by the passage east of Semisopchnoi and Amchitka Islands, at lat. $52^{\circ} 14' 30''$ N.; long. $174^{\circ} 13'$ E., at a depth of 344–482 fathoms in broken shells, brownish-green sand, and fine gray sand and pebbles.

This species is very close to *Æga symmetrica* Richardson, but differs in the much larger and oval eyes, which are also closer together, in the greater number of articles in the flagellum of both pairs of antennæ, and the longer second antennæ, and in the lesser number of spines on the prehensile legs.

Type-specimen.—Cat. No. 39499, U.S.N.M.

One specimen from station 4906, 10–20 miles southwest of Koshika Islands, Eastern Sea, at Tsurikake Saki Light, S. 85° E., 17.2 miles (lat. $31^{\circ} 39'$ N.; long. $129^{\circ} 20' 30''$ E.), taken at a depth of 369 fathoms, I have doubtfully referred to this species. It differs from the other specimens in the less oval eyes, in the shorter second antennæ, which extend to the posterior margin of the second thoracic segment, and in the narrower and longer body, being $8\frac{1}{2}$ mm. $\times 20$ mm. In color it is reddish brown.



FIG. 8.—ÆGA SYNOPTHALMA. HEAD AND FIRST TWO SEGMENTS OF THORAX. $\times 3\frac{1}{2}$.

ÆGA SYNOPTHALMA, new species.

This species is very similar to the preceding, but differs in having the eyes confluent and not separated from each other; in having the first antennæ, with a flagellum of only 12 articles, extending to the middle of the first thoracic segment; in having the second antennæ, with a flagellum of 16 articles, extending to the middle of the third thoracic segment; in having the outer post-lateral angles of the first three epimera rounded and not acute; and in having the distal end of the frontal lamina rounded and not flat, and more circular in outline instead of oval.

Only one specimen comes from station 5091, in Uraga Strait (entrance Gulf of Tokyo), at Joga Shima Light; N. 15° W., 4.2 miles (lat. $35^{\circ} 04' 10''$ N.; long. $139^{\circ} 38' 12''$ E.), at a depth of 197 fathoms in green mud and coarse, black sand and pebbles.

Type-specimen.—Cat. No. 39500, U.S.N.M.

Genus ROCINELA Leach.

ROCINELA CORNUTA Richardson.

Rocinela cornuta RICHARDSON, Proc. Amer. Philos. Soc., vol. 37, 1898, p. 12, figs. 1-2; Proc. U. S. Nat. Mus., vol. 21, 1899, p. 827; Ann. Mag. Nat. Hist. (7), vol. 4, 1899, p. 169; American Naturalist, vol. 34, 1900, p. 219; Bull. U. S. Nat. Mus., No. 54, 1905, pp. 192-193.

Locality.—Station 4772, on "Bowers Bank," Bering Sea, lat. $54^{\circ} 30' 30''$ N.; long. $179^{\circ} 14'$ E.

Depth.—Three hundred and forty-four fathoms in green and brown sand. Only one specimen found. This is the only one, besides the type-specimen, which has been taken.

ROCINELA BELLICEPS (Stimpson).

Ega belliceps STIMPSON, Proc. Acad. Nat. Sci., Phila., vol. 16, 1864, p. 155.

Ega alasensis LOCKINGTON, Proc. Cal. Acad. Sci., vol. 7, 1877, pt. 1, p. 46.

Rocinela alasensis RICHARDSON, Proc. Amer. Philos. Soc., vol. 37, 1898, p. 11.

Rocinela belliceps RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 827; Ann. Mag. Nat. Hist. (7), vol. 4, 1899, p. 169; American Naturalist, vol. 34, 1900, p. 219; Harriman Alaska Expedition, Crust., vol. 10, 1904, p. 214; Proc. U. S. Nat. Mus., vol. 27, 1904, p. 659; Bull. U. S. Bureau of Fisheries, vol. 24, 1905, p. 213; Bull. U. S. Nat. Mus., No. 54, 1905, pp. 199-201.

Localities.—Unalaska; Nazan Bay, Atka; station 4782, on the way from Agattu Island to Chichagof Harbor, Attu Island, by the Semichi Islands, Aleutians, at East Cape, Attu Island, S. 22° W., 4 miles (lat. $52^{\circ} 55'$ N.; long. $173^{\circ} 27'$ E.); station 4784, on the way from Chichagof Harbor, Attu Island, around eastern end and south of Attu Island to Preobrajleniya Bay, Medni Island, Komandorski Islands, at East Cape, Attu Island, S. 18° W., 4 miles (lat. $52^{\circ} 55' 40''$ N.; long. $173^{\circ} 26'$ E.); station 4803, on the way from Milne Bay, Simushir Island, Kuril Islands, to Hakodate, Hokkaido, Japan, by the Boussole Strait, at Cape Rollin, Simushir Island, N. 59° W., 9 miles (lat. $46^{\circ} 42'$ N.; long. $151^{\circ} 45'$ E.) and station 4804, N. 58° W., 9.7 miles (lat. $46^{\circ} 42'$ N.; long. $151^{\circ} 47'$ E.); station 4812, on the way from Hakodate, Japan, to Ebisu, Sado Island, Sea of Japan (by the Tsugaru Strait), at north point Sado Island, S. 31° W., 15 miles (lat. $38^{\circ} 33'$ N.; long. $138^{\circ} 40'$ E.); station 4860, on the way from Matsu Shima, Sea of Japan, to Nagasaki, Japan, at C. Clonard, S. 23° W., 13 miles (lat. $36^{\circ} 18'$ N.; long. $129^{\circ} 44'$ E.); station 4779, on "Petrel Bank," Bering Sea, at Semisopochnoi Island, r. t. S. $59\frac{1}{2}^{\circ}$ W., l. t. S. 37° W. (lat. $52^{\circ} 11'$ N.; long. $179^{\circ} 57'$ W.).

Depth.—Shore; 54-229 fathoms in green mud, fine brown mud, black sand, coarse pebbles, rocks, gravel, broken shells.

Remarks.—There are four spines on the propodus of the prehensile legs in these specimens.

ROCINELA ANGUSTATA Richardson.

Rocinela laticauda RICHARDSON (not HANSEN), Proc. Amer. Philos. Soc., vol. 37, 1898, pp. 14–15, figs. 5–6; Proc. U. S. Nat. Mus., vol. 21, 1899, p. 828 (part).

Rocinela angustata RICHARDSON, Proc. U. S. Nat. Mus., vol. 27, 1904, p. 33; Bull. U. S. Bureau of Fisheries, vol. 24, 1905, p. 214; Bull. U. S. Nat. Mus., No. 54, 1905, pp. 206–207.

Locality.—Station 5036, south coast of Hokkaido at Urakawa light, N. $44\frac{1}{2}^{\circ}$ E., 16.8 miles (lat. $41^{\circ} 58' N.$; long. $142^{\circ} 30' 30'' E.$); station 5045, at lat. $42^{\circ} 11' 10'' N.$; long. $142^{\circ} 12' E.$

Depth.—359–464 fathoms in brown mud, fine black sand and in coral and sand.

ROCINELA MACULATA Schiödte and Meinert.

Rocinela maculata SCHIÖDTE and MEINERT, Naturhistorisk Tidsskrift (3), vol. 12, 1879–80, p. 393, pl. 12, figs. 10–12; vol. 14, 1883–84, p. 413, pl. 18, fig. 13.—BOVALLIUS, Bilang till Kgl. Sv. Vet. Akad. Handling., vol. 10, No. 11, 1885, p. 10, pl. 2, figs. 18–23.—HANSEN, Vidensk. Meddel. naturh. Foren. i Kjøbenhavn, 1887, p. 187.—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 198–199.

Locality.—Station 4807, on the way from Hakodate, Japan, to Ebisu, Sado Island, Sea of Japan (by the Tsugaru Strait) at Cape Tsiuka, S. $58^{\circ} W.$, 10.3 miles (lat. $41^{\circ} 36' 12'' N.$; long. $140^{\circ} 36' E.$).

Depth.—Forty-four fathoms, in shells and coarse gravel. This species has been recorded from West Greenland, Vladivostok, Kamtchatka, and east Asia.

The specimen taken by the Bureau of Fisheries steamer *Albatross* has a black spot on the fourth and fifth segments of the abdomen on either side as well as on the last segment at the base. The spines on the propodus are not as long as mentioned in the description of the type by Schiödte and Meinert.

ROCINELA NIPONIA, new species.

Body ovate, a little more than twice as long as wide ($8\frac{1}{2}$ mm.: 18 mm.).

Head triangular in shape, 2 mm. long and 3 mm. wide, with the front produced in a broad median triangular process. Eyes large, composite, and separated in front by a distance equal to the length of one eye. The first pair of antennæ extend to the posterior margin of the head and almost to the end of the peduncle of the second antennæ; the flagellum is composed of six articles, the first one of which is twice as long as the second and the two terminal ones minute. The



FIG. 9.—ROCINELA NIPONIA. HEAD AND FIRST TWO SEGMENTS OF THORAX. $\times 3\frac{1}{2}$.

second antennæ extend to the posterior margin of the second thoracic segment; the flagellum is composed of sixteen articles.

The first, second, and seventh segments of the thorax are about equal in length; the third, fourth, fifth, and sixth are slightly longer. The epimera of the second and third segments are posteriorly rounded; those of the four following segments are posteriorly acute, and in the last three segments are produced beyond the posterior margins of the segments.

The first segment of the abdomen is covered in the middle by the last thoracic segment, but is visible at the sides; the three following segments are subequal; the fifth segment is narrower than any of the preceding segments, but is longer in the middle portion of the dorsal surface. The sixth or terminal segment is posteriorly triangulate, with the margin furnished with short spines and hairs.



FIG. 10.—*ROCINELA NIPONIA*. THIRD LEG.
× 14½.

The uropoda do not extend beyond the extremity of the abdomen; the outer branch is slightly shorter and slightly narrower than the inner branch; they are both armed with spines and furnished with hairs. The posterior extremity of the inner branch is more rounded than the outer branch.

The propodus of the first pair of prehensile legs is produced in a palmar process furnished with a marginal row of ten curved spines; the two following pairs of legs have eight spines on the propodus; the carpus is furnished with one long spine; the merus is furnished with five long spines, the most anterior one being very long, almost twice as long as the others. The last four pairs of legs are also furnished with numerous spines.

Only one specimen, a female, was collected at station 4815, on the way from Hakodate, Japan, to Ebisu, Sado Island, Sea of Japan, at Niigata Light, S. 25° E., 21.5 miles (lat. 38° 16' N.; long. 138° 52' E.), at a depth of 70 fathoms, in dark green sand.

This species is very close to *Rocinela propodialis* Richardson, but differs in having 10 spines on the palmar process of the propodus of the first pair of legs and 8 on the next two instead of 6 teeth; in having five long, sharp spines on the merus instead of five low, blunt ones; in having the posterior margin of the abdomen triangulate instead of rounded; and in having the last three epimera produced beyond the posterior margins of the segments instead of only the last.

Type-specimen.—Cat. No. 39501, U.S.N.M.

Genus SYSCENUS Harger.

SYSCENUS INFELIX Harger.

Syscenus infelix HARGER, Report U. S. Commissioner of Fish and Fisheries for 1878, pt. 6, 1880, pp. 387-390; Bull. Mus. Comp. Zool. Harvard College, vol. 11, 1883, No. 4, pp. 100-102, pl. 3, figs. 5-5a; pl. 4, figs. 3-3h.—RICHARDSON, Proc. Amer. Philos. Soc., vol. 37, 1898, p. 8 (footnote); Amer. Naturalist, vol. 34, 1900, p. 219; Proc. U. S. Nat. Mus., vol. 23, 1901, p. 524.—NORMAN, Ann. Mag. Nat. Hist. (7), vol. 14, 1904, p. 437.—RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 212-214.

Harponyx pranzoides SABS, Forhandlungen i Videnskab Selsk. Christiania, No. 18, 1883, p. 60 (young).

Rocinela lilljeborgii BOVALLIUS, Bihang. till Vetensk. Akad. Handl., vol. 10, No. 10, 1885, pp. 3-10, pls. 1-11.

Syscenus lilljeborgii BOVALLIUS, Bihang. till K. Sv. Vet. Akad. Handl., vol. 11, No. 17, 1886-87, pp. 17-18.

Locality.—Station 5066, at Ose Saki, S. 52° E., 7.3 miles (lat. 35° 06' 05'' N.; long. 138° 40' 20'' E.).

Depth.—Two hundred and eleven to two hundred and ninety-three fathoms, in fine black sand.

Remarks.—Only one imperfect specimen was collected.

SYSCENUS LATUS, new species.

Body 41 mm. long and 20 mm. wide at its greatest width. Thorax broad, ovate; abdomen abruptly narrower than thorax, only 8 mm. wide at the base, and becoming gradually a little narrower from the anterior to the posterior extremity. Surface of body smooth. Color, in alcohol, yellow.

Head nearly twice as wide as long, 4 mm. : 7 mm. Front of head triangularly produced in the middle. Eyes entirely wanting, but ocular swellings are present, showing the position of the eyes. Ocular swellings large and occupying the entire lateral margin. The first pair of antennæ have the first two articles about equal in length; the third is twice as long as the second; the flagellum is composed of thirteen articles and extends three articles beyond the peduncle of the second antennæ. The second pair of antennæ have the first two articles short and subequal; the third is a little longer than either the first or second; the fourth and fifth are long and subequal, each being about as

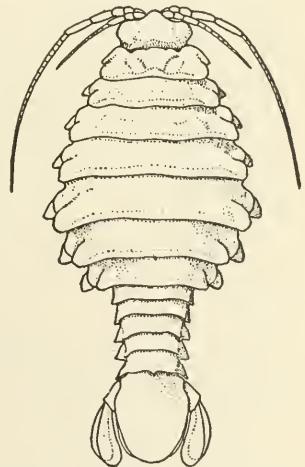


FIG. 11.—SYSCENUS LATUS. × 1.3. (Drawn by Miss V. Dandridge.)

long as the first three taken together; the flagellum is composed of twenty-eight or twenty-nine articles. The second antennæ, when retracted, extend to the middle of the sixth thoracic segment. The frontal lamina is large, triangular in front, wedge-shaped, with the post-lateral angles produced and widely separating the basal articles of the second pair of antennæ. First, fifth, and sixth segments longest, and subequal, each being 4 mm. in length. Second, third, and seventh segments 3 mm. each in length; fourth segment $3\frac{1}{2}$ mm. long. The segments increase gradually in width to the fifth, which is the widest; the sixth and seventh decrease in width gradually, the seventh being $12\frac{1}{2}$ mm. wide. Epimera are distinctly separated on all the segments with the exception of the first; they are broad plates, with the posterior extremities rounded.

The abdomen is abruptly narrower than the thorax, the basal segment being only 8 mm. wide. All six segments are distinct; the first is $1\frac{1}{2}$ mm. long; the four following segments are 2 mm. in length. The post-lateral angles are acute and in the fifth segment are somewhat produced. The fifth segment also has the posterior margin produced backward in a sharp, median point, about 1 mm. long. The sixth or terminal segment is $7\frac{1}{2}$ mm. wide and 10 mm. long; it is widely rounded posteriorly. The uropoda are about as long as the terminal segment; the inner branch is a little longer and a little wider than the outer branch; they are similar in shape and widely rounded posteriorly.

The first three pairs of legs are prehensile, the last four pairs ambulatory. The last four pairs gradually increase in length, the two last pairs being extremely long. The legs are all free from spines.

One large specimen, a female, comes from station 4907, 10-20 miles southwest of Koshika Islands, Eastern Sea, at Tsurikake Saki Light, S. 83° E., 14.7 miles (lat. $31^{\circ} 39' 30''$ N.; long. $129^{\circ} 24'$ E.). Another small specimen, a young female, comes from station 4906, Tsurikake Saki Light, S. 85° E., 17.2 miles (lat. $31^{\circ} 39'$ N.; long. $129^{\circ} 20' 30''$ E.). They were taken at a depth of 406 fathoms in gray globigerina ooze.

This species differs from *Syscenus infelix* Harger in the much broader and more ovate thorax, in the narrower abdomen, the longer antennæ and antennulæ, in the differently shaped head, terminal segment, and uropods, the broader frontal lamina, and the longer legs. The fifth abdominal segment also has a median point on the posterior margin produced backward, not found in *S. infelix*.

Type-specimen.—Cat. No. 39502, U.S.N.M.

Family CYMOTHOIDÆ.

Genus MEINERTIA Stebbing.

MEINERTIA TRIGONOCEPHALA (Leach).

Cymothoa trigonocephala LEACH, Dict. Sci. Nat., vol. 12, 1818, p. 353.—MILNE EDWARDS, Hist. Nat. Crust., vol. 3, p. 272.—DE HAAN, Faun. Japon., vol. 50, 1850, p. 227, fig. 7a-b.

Ceratothoa trigonocephala SCHIEDTE and MEINERT, Naturhist. Tidsskrift, (3), vol. 13, 1883, pp. 358-364, pl. 16, figs. 1-7.

Meinertia trigonocephala STEBBING, Hist. Crust., 1893, p. 354.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 27, 1904, p. 46.

Locality.—Tanegashima, Japan.

Genus LIVONECA Leach.

LIVONECA PROPINQUA Richardson.

Livoneca propinqua RICHARDSON, Proc. U. S. Nat. Mus., vol. 27, 1904, pp. 37-38.

Localities.—Station 5060, at Ose Saki, S. 53° E., 7.3 miles (lat. 35° 06' N.; long. 138° 40' 10'' E.); station 4967, going from Kobe, Japan, to Yokohama, Japan, at Shio Misaki Light, N. 83° E., 6.5 miles (lat. 33° 25' 10'' N.; long. 135° 37' 20'' E.).

Depth.—One hundred and ninety-seven fathoms in coarse black sand; 244 fathoms in brown mud, sand, and foraminifera.

Host.—Mouth cavity of chalinura.

LIVONECA SACCIGER, new species.

Body of adult female, ovate, 20 mm. wide and 34 mm. long. Surface smooth. Color, in alcohol, pale yellow.

Head almost as long as wide, 4 mm.: 5½ mm. Anterior margin rounded and produced in a small median point. Posterior margin rounded. Eyes almost entirely absent, with only a slight trace of them. First pair of antennæ, composed of eight articles, extend to the antero-lateral angle of the first thoracic segment. Second pair of antennæ, composed of twelve articles, extend to the middle of the first thoracic segment.

The first thoracic segment is 3 mm. long, the second 2¾ mm., the third 3½ mm., the fourth and fifth each 3¾ mm., the sixth 3½ mm., the seventh 2 mm.

The first segment has the antero-lateral angles acutely produced. Epimera are present on all the segments, with the exception of the first, in the form of elongated plates, extending the entire length of

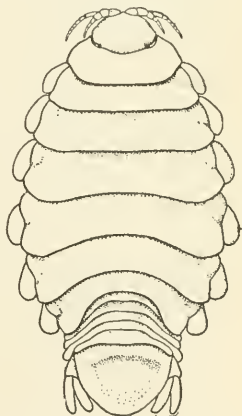


FIG. 12.—LIVONECA SACCIGER. $\times 1.5$. (Drawn by Miss V. Dandridge.)

the segment, gradually becoming wider from the first to the last, and all with the posterior extremity rounded, sac-like.

The abdomen is immersed in the seventh thoracic segment. The first four segments are about equal in length, each being about 1 mm. long; the fifth segment is a little longer, being $1\frac{1}{2}$ mm. in length. The sixth or terminal segment is a little wider than long, 7 mm. : $8\frac{1}{2}$ mm. It is posteriorly rounded. The uropods are equal in length, the inner one being a little wider and both rounded posteriorly. They do not reach the extremity of the terminal segment. The outer branch is 1 mm. wide and a little over 3 mm. long.

All the legs are prehensile; the basis of the last four pairs is furnished with a very low carina.

Only one adult female comes from station 4957, having been collected on the way from Kagoshima, Kagoshima Gulf, Japan, to Kobe, Japan, by way of Bungo Channel and Inland Sea at Mizimoko Shima Light N. 22° W., 29 miles (lat. $32^{\circ} 36'$ N.; long. $132^{\circ} 23'$ E.), at a depth of 437 fathoms, in greenish-brown mud, fine gray sand, and foraminifera.

Three young females and two males were collected at station 5044, on the south coast of Hokkaido, at lat. $42^{\circ} 10' 40''$ N., long. $142^{\circ} 14'$ E. (approximate position), at a depth of 309 fathoms. They are from the mouth cavity of *Synaphobranchus*.

The males differ from the females in the presence of eyes, the longer antennæ of the first and second pairs, the first extending to the middle of the first thoracic segment, the second to the posterior margin of the first thoracic segment, and in the narrower and smaller body. The second antennæ in the young female are also a little longer than in the adult.

Type-specimen.—Cat. No. 39503, U.S.N.M.

LIVONECA EPIMERIAS, new species.

Body of adult female, elongate-ovate, almost twice as long as wide (15 mm. : 29 mm.). Surface smooth. Color, in alcohol, dark yellow.

Head almost as long as wide (3 mm. : 4 mm.). Anterior margin widely rounded. Eyes small, distinct, and placed in the lateral angles. Posterior margin of head also rounded. First pair of antennæ, composed of eight articles, extend to the antero-lateral angles of the first thoracic segment. Second pair of antennæ, composed of seven articles on one side and eight on the other, extend one-third of the lateral margin of the first thoracic segment.

The first segment of the thorax is $3\frac{1}{2}$ mm. long, the second $2\frac{1}{2}$ mm. long, the third $2\frac{3}{4}$ mm., the fourth 3 mm., the fifth and sixth each $2\frac{3}{4}$ mm., the seventh 2 mm. All the segments are furnished with distinct epimera with the exception of the first. They are in the form of narrow plates, except the last, which are very broad. All, except

those of the fourth and fifth segments, extend to the posterior margin of the segment. The posterior extremities are rounded.

The abdomen is deeply immersed in the seventh thoracic segment. The first four segments are about equal in length, each being 1 mm. long. The fifth segment is $1\frac{1}{2}$ mm. long. The sixth, or terminal, segment is wider than long, being 10 mm.: $6\frac{1}{2}$ mm. It is posteriorly rounded. The outer branch of the uropoda is a little wider and a little longer than the inner branch. The outer is oval in shape, the inner more tapering. They are shorter than the abdomen, and do not reach its extremity. The outer branch is 1 mm. wide and $2\frac{1}{2}$ mm. long.

All the legs are prehensile; the last four are furnished with a rather high carina.

Two specimens, both females, were collected at Hakodate, Japan. The second specimen has twelve articles to the second pair of antennæ, but is otherwise similar to the first.

The species is very close to *Livoneca propinqua* Richardson,^a but differs in its larger size, in the shape of the head, the larger seventh epimera, the longer abdomen, and the differently shaped carina on the last four pairs of legs.

It is also similar to *Livoneca raynaudii* Milne Edwards,^b but differs in the shape of the head and the epimera.

This species differs from *Livoneca caudata* Schiødte and Mienert^c in the more rounded head, in the larger and more conspicuous epimera of the seventh segment, in the narrower abdomen as compared with the width of the thorax, in having the outer branch of the uropoda slightly longer instead of shorter than the inner branch, and in having a rather high carina on the basis of the last four pairs of legs.

Type-specimen.—Cat. No. 39504, U.S.N.M.

Family SPHÆROMIDÆ.

Genus TECTICEPS Richardson.

TECTICEPS RENOCULIS, new species.

Body oblong-ovate, very broad, $20\frac{1}{2}$ mm. in length and 13 mm. in width. Surface minutely granulate. Color pink, with the lateral margins becoming white.

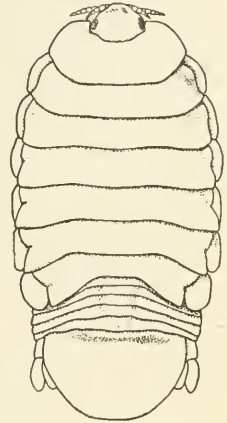


FIG. 13.—LIVONECA EPIMERIAS. $\times 1.86$. (Drawn by Miss V. Dandridge.)

^a Proc. U. S. Nat. Museum, vol. 27, 1904, pp. 37-38.

^b Hist. Nat. Crust., vol. 3, p. 262.—Schiødte and Meinert, (3), vol. 14, 1883-84, pp. 367-372, pl. 15, figs. 9-10.

^c Naturhistorisk Tidsskrift, (3), vol. 14, 1883-84, pp. 360-362, pl. 15, figs. 1-2.

Head wider than long, 7 mm. : 4 mm., wider anteriorly than posteriorly, with the eyes, which are large, composite and kidney shaped, situated in the posterior half, at the post-lateral angles. Front of head roundly produced. In a dorsal view both pairs of antennæ are entirely concealed. The first pair have the basal article large and dilated; the second article is about half as large as the first; the third is slender and elongate; the flagellum is composed of about 11 articles and extends to the posterior margin of the first thoracic segment. The second antennæ, with a flagellum of 11 articles, extend to the posterior margin of the third thoracic segment.

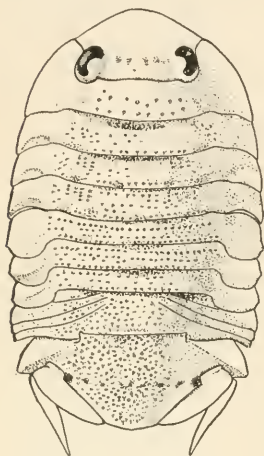


FIG. 14.—TECTICEPS RENOCULIS. $\times 2.6$. (Drawn by Miss V. Dandridge.)

The first segment of the thorax has the antero-lateral angles produced so as to surround the posterior half of the head. All the segments are about equal in length. The epimera are not distinctly separated from the segments; they are produced posteriorly in a quadrilateral process, with rounded angles. The abdomen consists of two segments, the first of which has three suture lines, indicating partly coalesced segments. The second, or terminal, segment is about twice as broad as long, $5\frac{1}{2}$ mm. : 11 mm. The posterior extremity is roundly truncate. A carina crosses the basal portion of the segment on either side. The inner branch of the uropoda is fixed, immovable, and does not extend beyond the posterior margin of the terminal abdominal segment. The outer, movable branch is much narrower than the inner branch, is a little longer, and is produced to a pointed extremity. In the female the outer branch is equal in length to the inner branch.

The first two pairs of legs in the male are subchelate. In the first pair the propodus is large and oval in shape, and is armed on the inferior margin with stiff bristles and hairs. In the second pair of legs the propodus is long and narrow, and has a rudimentary pollex at the base. The following five pairs of legs are ambulatory and increase gradually in length. In the female only the first pair of legs are subchelate and are similar to those of the male.

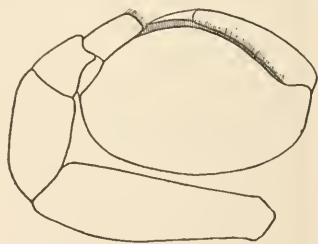


FIG. 15.—TECTICEPS RENOCULIS. FIRST LEG OF MALE. $\times 14\frac{1}{2}$.

Twenty-three specimens, both males and females, were collected by the U. S. Bureau of Fisheries steamer *Albatross* at stations 5023 and 5024, off eastern coast, Saghalin Island, vicinity of Cape Patience, in Okhotsk Sea, at Flat Hill, N. 53° W., Cape Patience, S. 77° W. (lat. $48^{\circ} 43' 30''$ N.; long. $145^{\circ} 3'$ E.), and N. 48° W.; Cape Patience, S. 74° W. (lat. $48^{\circ} 43' 10''$ N.; long. $144^{\circ} 53' 30''$ E.).

This species differs from *T. alascensis* Richardson^a in the shape of the terminal segment of the abdomen, which is truncate and not acutely triangular, in the shorter outer branch of the uropoda, in the broader body, and in the tuberculate character of the surface of the body. It differs from *T. convexus* Richardson^b in the position of the eyes, which are placed in the posterior half of the head, and not in the middle as in *T. convexus*, in the shorter antennæ, in the differently shaped abdomen, the broader body and the tuberculate character of the surface of the body. It differs from both species in the shape of the eyes, which are semi-lunate or kidney-shaped.

Type-specimen.—Cat. No. 39505, U.S.N.M.

Genus SPHÆROMA Latreille.

SPHÆROMA SIEBOLDI Dollfus.

Spharoma sieboldi DOLLFUS, Notes from the Leyden Museum, vol. 11, pp. 93-94, pl. 5, fig. 3a-3b.

Locality.—Hakodate, Japan.

Depth.—Surface.

The type species came from Japan.

The specimen, collected by the Bureau of Fisheries steamer *Albatross*, differs from the type as described by Dollfus in the longer first pair of antennæ, which have a flagellum of eleven articles instead of eight, and the longer second pair of antennæ, which have a flagellum of fifteen articles instead of ten. The tubercles on the abdomen form two longitudinal parallel rows, one on either side of the median line, not divergent rows. The other tubercles on the abdomen do not appear to be arranged in rows. The tubercles on the anterior part of the body are very small, hardly perceptible, and not numerous.

Hansen^c does not mention this species in his list of those belonging to the genus *Spharoma*, but it belongs without question to this genus.

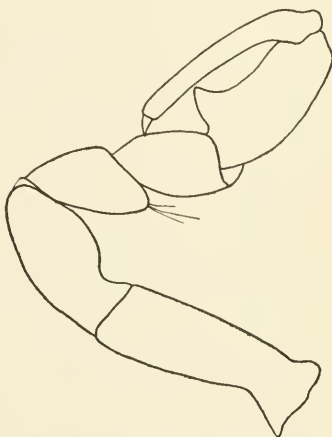


FIG. 16.—TECTICEPS RENOCULIS.
SECOND LEG OF MALE. $\times 14\frac{1}{2}$.

^a Bull. U. S. Nat. Museum, No. 54, 1905, pp. 276-278.

^b Idem, pp. 278-280.

^c Quart. Journ. Microscopical Science, vol. 49, 1906, pp. 115-117.

Genus EXOSPHEROMA Stebbing.

EXOSPHEROMA OREGONENSIS (Dana).

Exospharoma oregonensis DANA, Proc. Acad. Nat. Sci. Phila., vol. 7, 1854-55, p. 177; U. S. Expl. Exp. Crust., vol. 14, 1853, p. 778, pl. 52, fig. 4.—STIMPSON, Bost. Jouru. Nat. Hist., vol. 6, 1857, p. 509.—RICHARDSON, Bull. U. S. Nat. Museum No. 54, 1905, pp. 296-298.

Spharoma olivacca LOCKINGTON, Proc. Cal. Acad. Sci., vol. 7, 1877, pt. 1, p. 45.

Spharoma oregonensis RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 836; Ann. Mag. Nat. Hist. (7), vol. 4, 1899, p. 180; American Naturalist, vol. 34, 1900, p. 223; Harriman Alaska Exp. Crust., vol. 10, 1904, p. 214; Proc. U. S. Nat. Mus., vol. 27, 1904, p. 659.

Localities.—Nazan Bay, Atka; Unalaska; Attu.

Depth.—Shore.

Genus CYMODOCE Leach.

CYMODOCE JAPONICA Richardson.

Cymodoce japonica RICHARDSON, Proc. U. S. Nat. Mus., vol. 31, 1906, pp. 7-8 (male).

Cymodoce affinis RICHARDSON, Proc. U. S. Nat. Mus., vol. 31, 1906, pp. 11-12 (female).

Localities.—Hakodate Bay, Japan; Otaru, Hokkaido; Nanao; Mororan, Japan; station 4879, at Oki Shimi, S. 70° W., 7.5 miles (lat. 34° 17' N.; long. 130° 15' E.) and station 4877, S. 37° W., 6.3 miles (lat. 34° 20' 30'' N.; long. 130° 11' E.); station 4849, on the way from Saigo, Dogo Island, Oki Group, to Matsu Shima, Sea of Japan (off coast of Korea) at lat. 36° 46' N.; long. 132° 15' E.

Depth.—Collected around surface light; shore; 59 fathoms in fine gray sand, broken shells; 846 fathoms, in green mud and globigerina.

Remarks.—*Cymodoce affinis* is probably the female of *Cymodoce japonica*, and I therefore unite these two species. A large number of specimens of both sexes were collected in the same locality, which has convinced me that the two species heretofore recognized are the same.

Cymodoce acuta Richardson^a is the female of an unknown male, which is probably quite similar to *Cymodoce japonica*. The female of *Cymodoce acuta* is very much like the female of *Cymodoce japonica*.

One specimen, a male, which I have doubtfully referred to this species, was collected at station 4876 in eastern channel of Korea Strait, vicinity of Oki Shima, at S. 29° W., 5.3 miles (lat. 34° 20' N.; long. 130° 10' E.), at a depth of 59 fathoms, in fine gray sand and broken shells. It differs from the type in having longer uropoda and in having the body covered with thick hairs. It is a small specimen and probably younger than the others in the collection.

^a Proc. U. S. Nat. Mus., vol. 27, 1904, pp. 38-39.

HOLOTELSON, new genus.

Head of normal size. Basal article of first pair of antennæ with the distal posterior angle not produced in an acute process.

Seventh thoracic segment in male produced backward in two small processes, one on either side of the median line. These processes are much smaller in the female, but are indicated.

First segment of abdomen produced in the median line on the posterior margin in a small tubercle, represented in both sexes.

Terminal segment of abdomen, with the posterior margin produced backward in one long median process, at the base of which on either side is a small rounded process. The median process is shorter in the female, and the lateral processes are also reduced.

The branches of the uropoda are similar in size in the male, the exopod of the female being somewhat smaller than the endopod.

The second pleopod of the male is furnished with a stylet.

The exopod of the third pleopod is jointed near the extremity.

Both branches of the fourth and fifth pairs of pleopods are fleshy, with transverse folds, and are without marginal setæ. The exopod of the fifth pleopod is jointed.

This genus belongs in the section *cubbranchiata* of Hansen, but differs from the other genera in that section in not having the terminal segment of the abdomen emarginate.

The type of the genus is *Holotelson tuberculatus*, the description of which follows:

HOLOTELSON TUBERCULATUS, new species.

Body oblong-ovate, about twice as long as wide, $5\frac{1}{2}$ mm.: 11 mm.

Head wider than long, rounded in front, and with a small median point. Eyes round, composite, and placed at the post-lateral angles. The first pair of antennæ have the basal article large and dilated, about twice as long as wide; the second article is short, about as wide as long, and nearly as wide as the basal article; the third article is narrow and elongate, being only half as wide as the second article and twice as long; the flagellum is composed of fourteen articles and extends to the middle of the first thoracic segment. The second antennæ have a flagellum of fifteen articles and extend to the middle of the second thoracic segment.

The first segment of the thorax is about one and a half times longer than any of the following five segments which are of nearly equal length. The lateral parts of these segments are short and broad and produced at the post-lateral angles in rounded triangular processes.



FIG. 17.—HOLOTELSON TUBERCULATUS. FIRST ANTENNA OF FEMALE. $\times 15\frac{1}{3}$.

The seventh segment is a little longer in the middle portion than any of the five preceding segments and is produced backward in two short rounded processes, one on either side of the median line, which extend over the first abdominal segment, covering its anterior portion.



FIG. 18.—HOLOTELSON TUBERCULATUS. ABDOMEN OF MALE. $\times 3\frac{1}{2}$.

The first segment of the abdomen is longer in the middle portion than at the sides, and is produced in the median line in a triangular process which ends in a small tubercle. There are two suture lines on either side, indicating partly coalesced segments. The terminal segment has a transverse row of three tubercles about the middle of the segment, one in the median line and one on either side. Posteriorly it is produced in a long median process, about twice as long as wide and rounded at the extremity. At the base of this process on either side is a small, rounded tooth. The branches of the uropoda are about equal in size and similar in shape; they are oar-like and do not extend beyond the lateral teeth at the base of the median process.

The female differs from the male in the shorter terminal abdominal process, in the less pronounced teeth at the base of this process, in the shorter processes on the posterior margin of the seventh abdominal segment, which are only slightly indicated, and in not having the first abdominal segment triangularly produced in the middle and terminating in a tubercle.



FIG. 19.—HOLOTELSON TUBERCULATUS. ABDOMEN OF FEMALE. $\times 3\frac{1}{2}$.

Five specimens, two females and three males, were collected by the U. S. Bureau of Fisheries steamer *Albatross* at Mororan, Japan, on the shore.

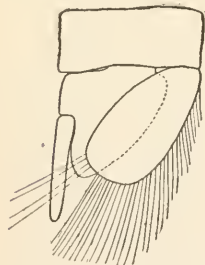


FIG. 20.—HOLOTELSON TUBERCULATUS. SECOND PLEPOD OF MALE. $\times 15\frac{1}{2}$.

The female of this species is similar to *Sphaeroma aspera* Haswell^a from Port Jackson, Australia, but differs in having three tubercles in a transverse line about the middle of the terminal segment, in lacking the "prominent tubercle on the posterior margin on either side of the middle line" of the first segment of the abdomen, and in not having the last abdominal segment "ornamented with two slightly convergent irregular rows of minute tubercles."

Type-specimen.—Cat. No. 39506, U.S.N.M.

^aProc. Linn. Soc. New South Wales, vol. 5, 1881, p. 472, pl. 16, fig. 3. The species described by Haswell is probably a *Cymodoce*, the specimen obtained being the female.

Family LIMNORIIDÆ.

Genus LIMNORIA Leach.

LIMNORIA JAPONICA, new species.

Body oblong-ovate, 2 mm. : 5 mm. Color of body, in alcohol, yellow, with the fifth, sixth and seventh segments of the thorax reddish brown.

Head three times wider than long ($\frac{1}{2}$ mm. : $1\frac{1}{2}$ mm.). Front with a rounded excavation. Eyes large, round, composite, and situated close to the lateral margin. The head is very bulbous, and from the anterior margin projects upward to form a large rounded prominence. The first pair of antennæ are composed of four articles; the first two are subequal; the third is a little longer than either of the preceding; the fourth is minute and terminates in a bunch of long hairs. The second antennæ have a peduncle of five articles, the first two of which are short, the last three longer and subequal; the flagellum is composed of about five articles, and is furnished with a few hairs.

The first segment of the thorax is twice as long as the head or any of the six following segments, which are subequal. Epimera are distinctly separated on all the segments with the exception of the first and are in the form of wide plates, gradually becoming wider from the first to the last.

The first four segments of the abdomen are subequal in length, and each is a little shorter than any of the preceding six thoracic segments. The fifth segment is twice as long as any of the four preceding segments and has two low median tubercles in longitudinal series. The sixth

or terminal segment is large, almost circular in outline, and concave on the dorsal surface. It has a large prominent tubercle in the median line near the base, and two prominent tubercles, close together, one on either side of the median line, about one-third the distance between the anterior and the posterior margin. These tubercles are continued in two low parallel ridges. The uropoda are about as long as the abdomen; the inner branch is shorter than the peduncle; the outer is minute.

Thirty-one specimens of this species were collected at station 4828, on the way from Nanao, Hondo, Japan, to Isuruga, Hondo, Japan, at Sudzu Misaki Light, N. 57° W., 16 miles (lat. $37^{\circ} 23' N.$; long. $137^{\circ} 36' E.$) at a depth of 163 fathoms. They were taken "from crevices in water-logged fragment of bamboo." (H. Heath.)

This species differs from *Limnoria lignorum* Rathke in having the fifth abdominal segment armed with two low tubercles: in having the terminal abdominal segment armed with three tubercles and two

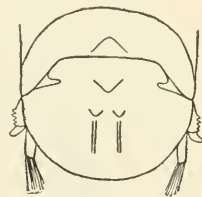


FIG. 21.—LIMNORIA JAPONICA. ABDOMEN. $\times 15\frac{1}{2}$.

parallel ridges, and in the lack of markings on the body, with the last three thoracic segments reddish brown in contrast to the yellow color of the rest of the body.

Type-specimen.—Cat. No. 39507, U.S.N.M.

IDOTHEOIDEA or VALVIFERA.

Family ARCTURIDÆ.

Genus *ASTACILLA* Cordiner.

ASTACILLA DILATATA, new species.

Body narrow, elongate, $2\frac{1}{2}$ mm. wide and $9\frac{1}{2}$ mm. long. Surface of body thickly tuberculate.

Head with the front deeply excavate, the antero-lateral angles produced and bifid; the lateral margin is also produced in an acute triangular process. The eyes are large, round, composite, and situated close to the lateral margin. About the middle of the head on the dorsal surface are two prominent tubercles, one on either side of the median line. The first pair of antennæ have the basal article large and dilated; the second and third are short and slender and subequal, each being only half the length of the basal article; the fourth article is about twice as long as the third. The first antennæ extend a little beyond the second article of the second pair of antennæ. The first two articles of the second antennæ are short, the first being shorter than the second; the third article is nearly twice as long as the first two taken together; the fourth and fifth are about equal in length and each is twice as long as the third; the flagellum consists of three articles, the first of which is nearly three times as long as the second, and the last is minute, less than half as long as the second. The second antennæ are as long as the body.

The head is coalesced with the first thoracic segment. The antero-lateral angles of the first segment are acutely produced. The first, second, and third segments are about equal in length; close to the posterior margin of the second and third segments are two tubercles, one on either side of the median line, those of the third segment being long and conspicuous. The fourth segment is twice as long as the third and is much broader anteriorly than posteriorly. The antero-lateral

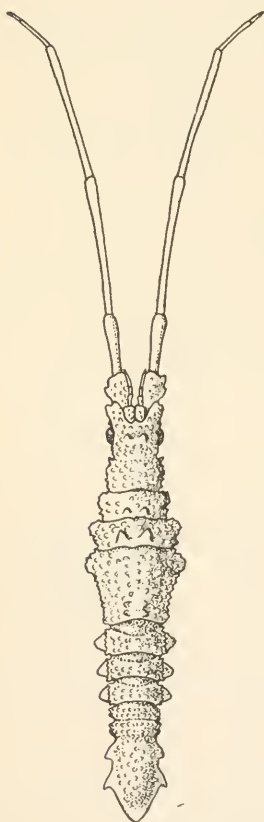


FIG. 22.—*ASTACILLA DILATATA*, ♀. (Drawn by Miss V. Dandridge.)

margins of the second, third, and fourth segments are produced on each side in a small lobe, beneath which the epimera are conspicuous each in the form of two small triangular processes. On the dorsal surface of the fourth segment, close to the posterior margin, are four small tubercles, two on either side of the median line, in longitudinal series. The last three segments gradually decrease a little in length, with the tubercles arranged, two on either side of the median line, in longitudinal series on each segment. The epimera project at the sides in the form of large triangular processes, one on each side of the segment.

The abdomen is composed of two short segments anterior to the large terminal segment, all of which appear to be coalesced. The first two segments have each two transverse rows of small tubercles on the dorsal surface. In both segments the lateral margins are produced on either side in a small triangular process. The terminal segment is produced to an acute triangular point and has two triangular processes on either side of the lateral margin, a pair at the base, and a pair about the middle of the segment. The first four pairs of legs are furnished with long hairs; the last three pairs are ambulatory.

The marsupium consists of two pairs of plates, as is also true of *A. cæca* and *A. granulata*, the anterior pair having been overlooked in previous examinations of these two species.

Only one specimen comes from station 4815, on the way from Hakodate, Japan, to Ebisu, Sado Island, Sea of Japan, at Niigata Light, S. 25° E., 21.5 miles (lat. 38° 16' N.; long. 138° 52' E.) at a depth of 70 fathoms in dark green sand.

Type-specimen.—Cat. No. 39508, U.S.N.M.

Genus ARCTURUS Latreille.

ARCTURUS HIRSUTUS Richardson.

Arcturus hirsutus RICHARDSON, Proc. U. S. Nat. Museum, vol. 27, 1904, pp. 41-43.

Localities.—Station 4769, on "Bowers Bank," Bering Sea, at lat. 54° 30' 40'' N.; 179° 14' E.; station 4770, at lat. 54° 31' N.; long. 179° 15' E.; station 4771, at lat. 54° 30' N.; long. 179° 17' E.; and station 4772, at lat. 54° 30' 30'' N.; long. 179° 14' E.; station 4780, on the way from "Petrel Bank," Bering Sea, to McDonald Bay, Agattu Island, Aleutians, by the passage east of Semisopchnoi and Amchitka Islands, at lat. 52° 01' N.; long. 174° 39' E.; station 4781, at lat. 52° 14' 30'' N.; long. 174° 13' E.; station 4784, on the way from Chichagof Harbor, Attu Island, around eastern end and south of Attu Island, to Preobrajaniya Bay, Medni Island, Komandorski Islands at East Cape, Attu Island, S. 18° W., 4 miles (lat. 52° 55' 40'' N.; long. 173° 26' E.); station 4786, on the way from Preobrajaniya Bay, Medni Island, to Nikolski Bay, Bering Island, by the passage

between islands, at North Point Copper Island, N. 84° E., 8.2 miles (lat. $54^{\circ} 51' 30''$ N.; long. $167^{\circ} 14'$ E.). A large specimen, mutilated, comes from station 5084, off Omai Saki Light (20 to 40 miles distant), N. $29\frac{1}{2}^{\circ}$ E., 41 miles (lat. 34° N.; long. $137^{\circ} 49' 40''$ E.), at a depth of 918 fathoms, which I have doubtfully referred to this species.

Depth.—344 fathoms; 244 fathoms; 482 fathoms; 135 fathoms; 247 fathoms; 426 fathoms; 1,046 fathoms; in gray sand and green mud; in broken shells; in green and brown sand; in gray mud, sand, and pebbles; in fine gray sand; in coarse pebbles.

ARCTURUS GRANULATUS, new species.

Body narrow, elongate, about four times as long as broad, 4 mm.: $15\frac{1}{2}$ mm. Surface of body rugose, with the anterior and posterior margins of all the segments furnished with a row of tubercles. Abdomen covered with low tubercles.

Head a little wider than long, $1\frac{1}{2}$ mm.: 2 mm. Front deeply excavate, with the antero-lateral angles produced. There is a small median point. The eyes are large, round, composite, and paced close to the lateral margin, about halfway between the anterior and the posterior margins. The rugosities on the posterior half of the head form two low elevations, one on either side of the median line. The first pair of antennæ have the basal article large and dilated; the next two articles are slender and subequal; the fourth article is about twice as long as the preceding

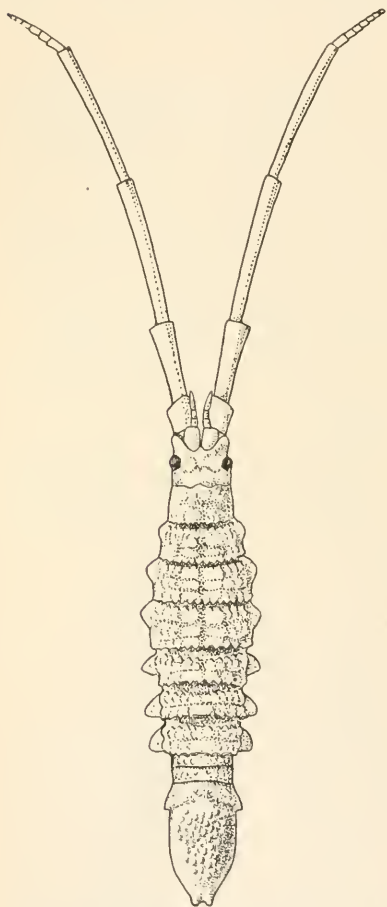


FIG. 23.—ARCTURUS GRANULATUS. $\times 4\frac{1}{2}$.
(Drawn by Miss V. Dandridge.)

ing article and extends to the end of the second article of the second pair of antennæ. The second pair of antennæ have the first article very short; the second is longer and is about $1\frac{1}{2}$ mm. long; the third is $2\frac{1}{2}$ mm. in length; the fourth is twice as long as the third, being 5 mm. long; the fifth is almost as long as the fourth, being $4\frac{1}{2}$ mm.; the flagellum is 2 mm. long and is composed of seven articles.

The first three segments of the thorax are subequal in length, being each about $1\frac{1}{2}$ mm. long; the fourth segment is but little longer than these, being only $1\frac{3}{4}$ mm. in length; the last three segments are subequal and each is 1 mm. long. The anterior part of the lateral margin of the second, third, and fourth segments is produced on either side in a small lobe; lateral to this lobe is the epimeron, which is in the form of a narrow plate, gradually increasing in size. On the last three segments the epimera are in the form of large, angular processes extending laterally on either side of the segment and occupying one-half the lateral margin in the fifth segment, two-thirds of the lateral margin in the sixth segment, and nearly all of the lateral margin in the seventh segment.

The abdomen is composed of three segments, two short ones anterior to the terminal segment. At the base of the terminal segment are two lateral projections, one on either side, which, together with the depression which extends across the segment, mark the place of coalescence of another segment. The terminal segment is produced to a bifid extremity; it is $2\frac{1}{2}$ mm. wide and 4 mm. long.

There are four pairs of incubatory plates.^a

The first four pairs of legs are directed forward and are furnished with long hairs; the last three pairs are ambulatory.

Five specimens, males and females (the female is described and figured) were collected at station 4803, on the way from Milne Bay, Simushir Island, Kuril Islands, to Hakodate, Hokkaido, Japan, by the Boussole Strait at Cape Rollin, Simushir Island, N. 59° W., 9 miles (lat. $46^{\circ} 42'$ N.; long. $151^{\circ} 45'$ E.), and at station 4804, at N. 58° W., 9.7 miles (lat. $46^{\circ} 42'$ N.; long. $151^{\circ} 47'$ E.), at a depth of 229 fathoms in coarse pebbles and black sand.

This species is close to *Arcturus beringanus* Benedict,^b but differs in the rugose and tuberculate character of the body, in the shorter fourth thoracic segment and in the shorter abdomen, the apex of the terminal segment not being produced as in *A. beringanus*.

Type-specimen.—Cat. no. 39509, U.S.N.M.

ARCTURUS HASTIGER, new species.

Body narrow, elongate, $8\frac{1}{2}$ mm.: 52 mm. Surface minutely granulate. Head deeply excavate in the middle, with a small median point. Antero-lateral angles acutely produced. Eyes very large, composite, about twice as wide as long, transversely oval. Two tubercles, one on either side of the median line, are situated about the middle of the head between the eyes. The first pair of antennæ

^a In the genus *Arcturus* there are four pairs of incubatory plates and not three, as I have heretofore stated. The first pair are small and somewhat obscured by the overlapping second pair.

^b Proc. Biol. Soc., Washington, vol. 12, 1898, pp. 46-47.

have the basal article large and dilated; the second and third articles are narrow, elongate, about equal in length, and shorter than the

basal article; the fourth article is one and a half times longer than the third, and is about as long as the basal article. Second antennæ with the first article short, not reaching beyond the first article of the first pair of antennæ; second article reaching to the end of the flagellum of the first pair of antennæ, being 4 mm. long; third article elongate, about three times longer than the second article, being 13 mm. long; fourth article more than one and a fourth times longer than the third, being 23 mm. long; fifth article about equal to the fourth in length, being 24 mm. long; the flagellum is composed of 10 articles, the first one of which is almost as long as all the others taken together.

All seven thoracic segments are furnished with two tubercles each, close to the posterior margin, one on either side of the median line. The fourth segment is about one and a fourth times longer than the third. The epimera are distinct on all the segments with the exception of the first; on the second, third, and fourth segments they are small and anteriorly placed; on the three last segments they are large and conspicuous and situated about the middle of the lateral margin.

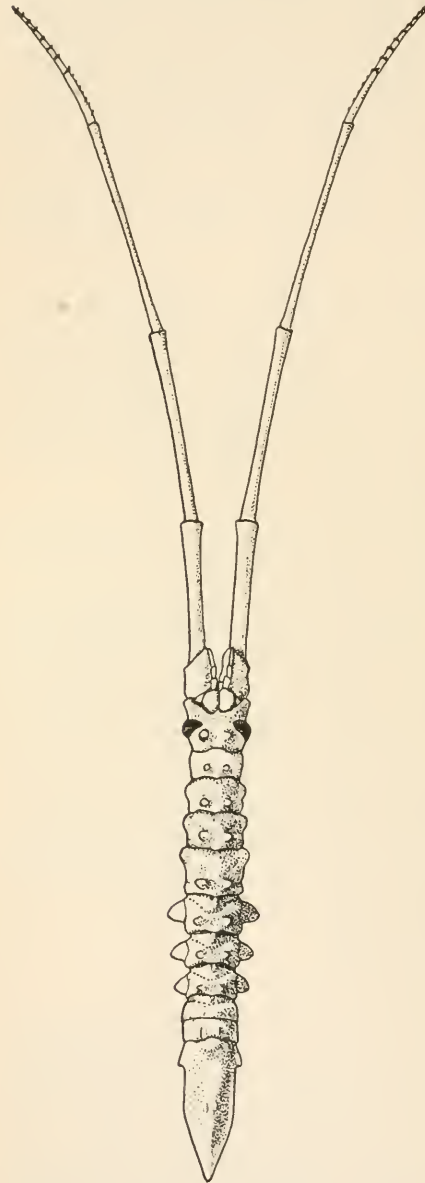


FIG. 24.—ARCTURUS HASTIGER. $\times 1\frac{1}{2}$.
(Drawn by Miss V. Dandridge.)

The abdomen is composed of three segments, two short ones and the terminal segment, which ends in a pointed extremity, and has two

small tubercles on the middle of the dorsal surface, one on either side of the median line. At the base of the segment there is a prominent lateral tooth or projection on either side.

The first four pairs of legs are furnished with long hairs and are anteriorly directed; the last three pairs are ambulatory. There are four pairs of marsupial plates. (The female is described and figured.)

A large number of specimens come from station 4982, on the way from Hakodate, Hokkaido, Japan, to Otaru, Hokkaido, Japan, by the Tsugaru Strait, at Benkei Mizaki Light, S. 3° E., 10.5 miles (lat. 43° N.; long. 140° 10' 30'' E.), and station 4983 (lat. 43° 01' 35'' N.; long. 140° 10' 40'' E.).

Depth.—Three hundred and ninety to four hundred and twenty-eight fathoms in green mud.

Young specimens differ from the adults in having the tubercles on the head replaced by spines, which are, however, not very long.

This species is very close to *Arcturus baffini* var. *tuberosus* Sars, but differs in the much larger eyes, in having two large and well developed tubercles on the head, and in having two distinct, though small, tubercles on each one of the segments of the thorax, and no tubercles on the first two segments of the abdomen. This species is also distinct from *Arcturus baffini* var. *intermedia* Norman.^a

Type-specimen.—Cat. No. 39510, U.S.N.M.

ARCTURUS GLABER Benedict.

Arcturus glabrus BENEDICT, Proc. Biol. Soc. Wash., vol. 12, 1898, p. 46.

Arcturus glaber RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 855; Ann. Mag. Nat. Hist. (7), vol. 14, 1899, p. 277; American Naturalist, vol. 34, 1900, p. 230; Bull. U. S. Nat. Mus., No. 54, 1905, pp. 330-331.

Localities.—Station 4782 on the way from Agattu Island to Chichagof Harbor, Attu Island, by the Semichi Islands, Aleutians, at East Cape, Attu Island, S. 22° W., 4 miles (lat. 52° 55' N.; long. 173° 27' E.); station 3253, between Bristol Bay and Pribilof Islands, Alaska.

Depth.—Thirty-six to fifty-seven fathoms.

ARCTURUS TRITÆNIATUS, new species.

Body narrow, elongate, a little more than four times as long as wide (4½ mm. : 19 mm.). Surface perfectly smooth. Color, in alcohol, yellow, with numerous brown spots close together, covering the entire surface of the body, with the exception of three longitudinal bands of yellow, one median, and a lateral band on either side, which extend the entire length of the body to about the middle of the terminal segment. The median longitudinal band stops at the base of the terminal segment.

^a Ann. Mag. Nat. Hist. (7), vol. 14, 1904, p. 445.

Head wider than long (2 mm.:3 mm.) and with the anterior margin deeply excavate between the produced antero-lateral angles; there is also a small median point separating the basal articles of the first pair of antennæ. The eyes are large, composite, wider than long, and placed close to the lateral margin half way between the anterior and the posterior margins. The first pair of antennæ have the basal article large and dilated; it extends to the end of the first article

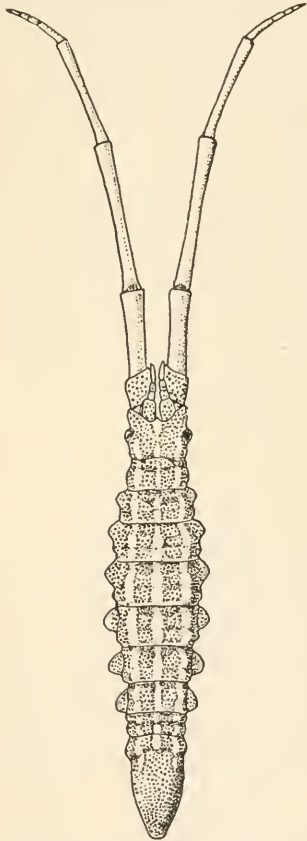


FIG. 25.—ARCTURUS TRITENIATUS. $\times 3$. (Drawn by Miss V. Dandridge.)

of the second antennæ; the second and third articles are narrow and subequal in length; the fourth article is equal in length to the second and third articles taken together and extends to the end of the second article of the peduncle of the second pair of antennæ. The second antennæ have the first article very short; the second is 2 mm. long; the third is twice as long as the second, being 4 mm. in length; the fourth is 7 mm. and the fifth is 5 mm.; the flagellum is 3 mm. long and is composed of five articles, the first of which is twice as long as the second.

The segments of the thorax are about equal in length, with the exception of the fourth, which is one and a half times longer than any of the others. The anterior part of the lateral margin in the second, third, and fourth segments is produced in a lobe on either side; lateral to these lobes the epimera are placed and are in the form of narrow plates, gradually becoming wider; on the last three segments the epimera are large and conspicuous, projecting laterally and occupying half the margin of the fifth segment, two-thirds of the margin of the

sixth segment, and nearly all of the margin of the seventh segment.

The abdomen is composed of three segments, two short ones anterior to the terminal segment, which is produced posteriorly to a narrow rounded extremity. At the base on either side the terminal segment is produced in a rounded lobe; the incision between the lobe and the rest of the segment marks a depression extending across the segment, which is the indication of another coalesced segment.

There are four pairs of marsupial plates.

The first four pairs of legs extend forward and are furnished with long hairs; the last three pairs are ambulatory.

Two specimens, a male and a female (the female is described and figured) were collected at station 4778, on the way from "Bowers Bank" to "Petrel Bank," Bering Sea, at Semisopochnoi Island, r. t. S. 45° W., l. t. S. 12° W., about 12 miles (lat. $52^{\circ} 12'$ N.; long. $179^{\circ} 52'$ E.), at a depth of 43 fathoms in fine black gravel.

This species is very close to *Arcturus glaber* Benedict^a from Bering Sea, but differs in the shorter and more thickset body; in the shorter second antennæ; in the shorter abdomen, with the apex less pointed; in the shorter fourth segment of the thorax; and in having the three longitudinal bands of yellow on the body.

This species is also similar to *Arcturus myops* Beddard^b from New Zealand.

Type - specimen.—Cat. No. 39511, U.S.N.M.

ARCTURUS MAGNISPINIS, new species.

This species is very close to *Arcturus longispinus* Benedict,^c so that a complete description does not seem necessary. It differs from that form in having the tubercles of the first thoracic segment replaced by small spines; in having the third, fourth, and fifth articles of the peduncle of

^a Proc. Biol. Soc. Washington, vol. 12, 1898, p. 46.

^b Challenger Report, vol. 17, 1886, p. 100, pl. 22, figs. 5-8.

^c Proc. Biol. Soc. Washington, vol. 12, 1898, pp. 44-45; Richardson, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 329-330.

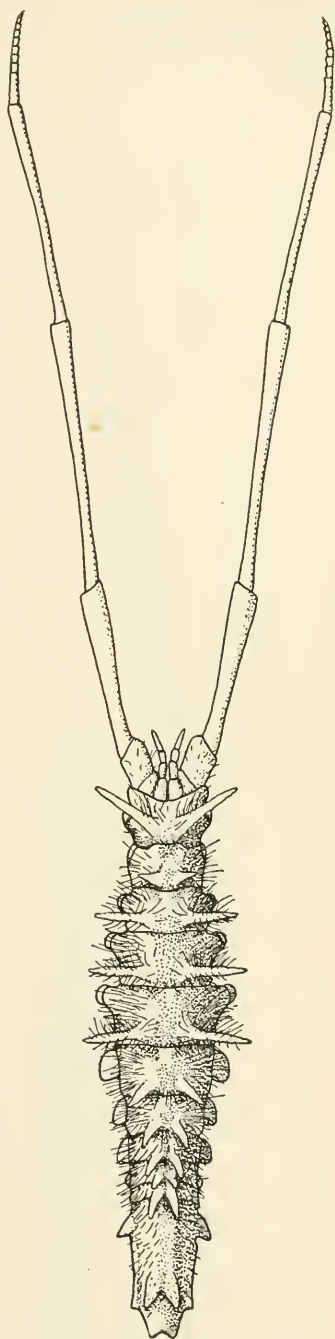


FIG. 26.—ARCTURUS MAGNISPINIS.
× 2.4. FEMALE. (Drawn by
Miss V. Dandridge.)

the second antennae shorter (the second article is 3 mm. long, the third is 9 mm., the fourth is 14 mm., the fifth is 13 mm.); in having the spines of the head and of the second, third, and fourth segments of the thorax stouter and longer; in having the body shorter and more thickset (8 mm.:30 mm.), and densely covered with hairs; and in having the abdomen below the median dorsal spines shorter. The first antennae do not extend beyond the second article of the second antennae.

The young are similar to the adults.

A number of specimens (about twelve) were collected at station 4777, on "Petrel Bank," Bering Sea, at Semisopchnoi Island, r. t. S. 44° W., l. t. S. 4° W., about 12 miles (lat. 52° 11' N.; long. 179° 49' E.), and station 4778, r. t. S. 45° W., l. t. S. 12° W., about 12 miles (lat. 52° 12' N.; long. 179° 52' E.), at a depth of 43-52 fathoms.

One small specimen from station 4779 agrees in every respect with the other specimens, except that the terminal segment, instead of terminating in two points, is rounded posteriorly. This is probably an abnormal condition.

Type-specimen.—Cat. No. 39327, U.S.N.M.

ARCTURUS DIVERSISPINIS, new species.

This species is also close to *Arcturus longispinus* Benedict, but differs in having the tubercles of the first thoracic segment replaced by well-developed spines, which are almost as long as those of the three following segments, and in having the spines of the seventh thoracic segment rudimentary. The first antennae extend the length of the last article beyond the second article of the second antennae; the last article of the first antennae is about twice as long as the preceding article. There is a small, blunt spine on the outer distal end of the second article of the second antennae, and one on either side of the



FIG. 27.—ARCTURUS DIVERSISPINIS. \times 1.2. FEMALE.
(Drawn by Miss V. Dandridge.)

head at the antero-lateral angles. The surface of the body is smooth and covered with long hairs. More than fifteen specimens of this species were collected at station 4784, on the way from Chichagof Harbor, Attu Island, around eastern end and south of Attu Island to Preobrajleniya Bay, Medni Island, Komandorskii Islands at East Cape, Attu Island, S. 18° W., 4 miles (lat. $52^{\circ} 55' 40''$ N.; long. $173^{\circ} 26'$ E.), at a depth of 135 fathoms.

Type-specimen.—Cat. No. 39432, U.S.N.M.

ARCTURUS BREVISPINIS, new species.

This species differs from *Arcturus longispinus* Benedict in having all the spines quite short, those of the last three thoracic segments and the first two abdominal segments being almost rudimentary. The terminal abdominal segment in all these specimens is longer than in *A. longispinus*. The body is covered with small, pointed tubercles. The first antennae extend the length of the last article beyond the second article of the second antennae. The last article of the first antennae is about three times longer than the third article.

About nine specimens were collected at station 4784, on the way from Chichagof Harbor, Attu Island, around eastern end and south of Attu Island to Preobrajleniya Bay, Medni Island, Komandorskii

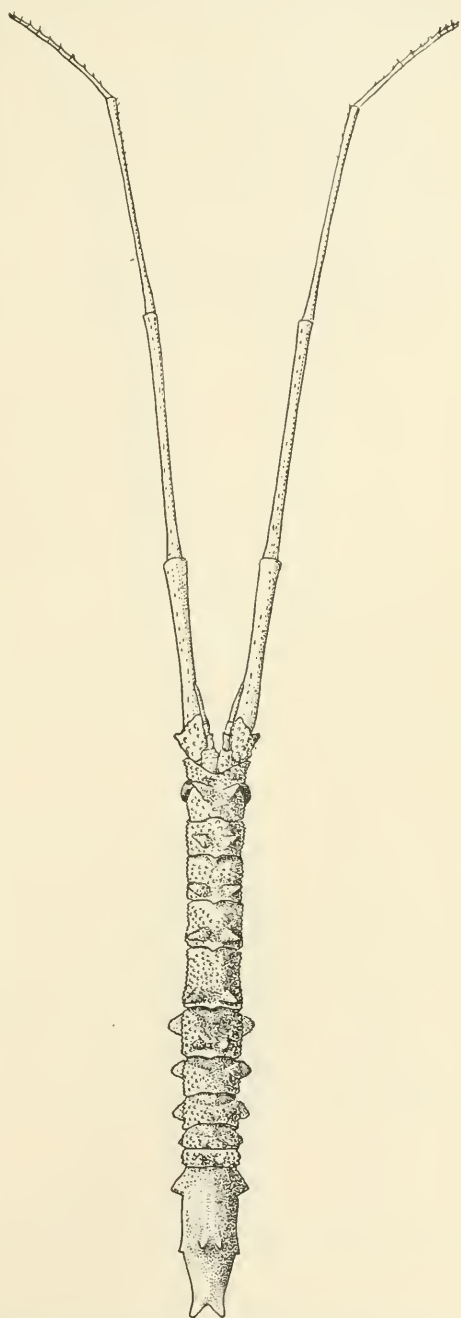


FIG. 28.—ARCTURUS BREVISPINIS. $\times 2.2$.
MALE. (Drawn by Miss V. Dandridge.)

Bay, Medni Island, Komandorskii

Islands, at East Cape, Attu Island, S. 18° W., 4 miles (lat. $52^{\circ} 55' 40''$ N.; long. $173^{\circ} 26'$ E.) at a depth of 135 fathoms.

Type - specimen.—Cat. No. 39313, U.S.N.M.

ARCTURUS CRASSISPINIS, new species.

This species is likewise close to *Arcturus longispinus* Benedict, but differs in having spines present on all the segments of the thorax and abdomen, only they are all of the same length and short, none being rudimentary. The terminal segment of the abdomen is also longer than in *A. longispinus*. This species is very large, measuring 44 mm. in length and $8\frac{1}{2}$ mm. in width.

The spines on the body are short and stout. The surface of the body is covered with short hairs. The first pair of antennae do not extend much beyond the second article of the second pair of antennae. The second antennae have the second article 4 mm. long; the third 13 mm.; the fourth 20 mm.; and the fifth, 17 mm. in length.

About 45 specimens come from the following localities: Station 5005, in Aniwa Bay, approaching Korsokov, Saghalin Island, at lat. $46^{\circ} 4' 40''$ N.; long. $142^{\circ} 27' 30''$ E.; station 5006, at lat. $46^{\circ} 4'$ N.; long. $142^{\circ} 29'$ E.; station 5007, at lat. $46^{\circ} 3'$ N.; long. $142^{\circ} 31'$ E.;

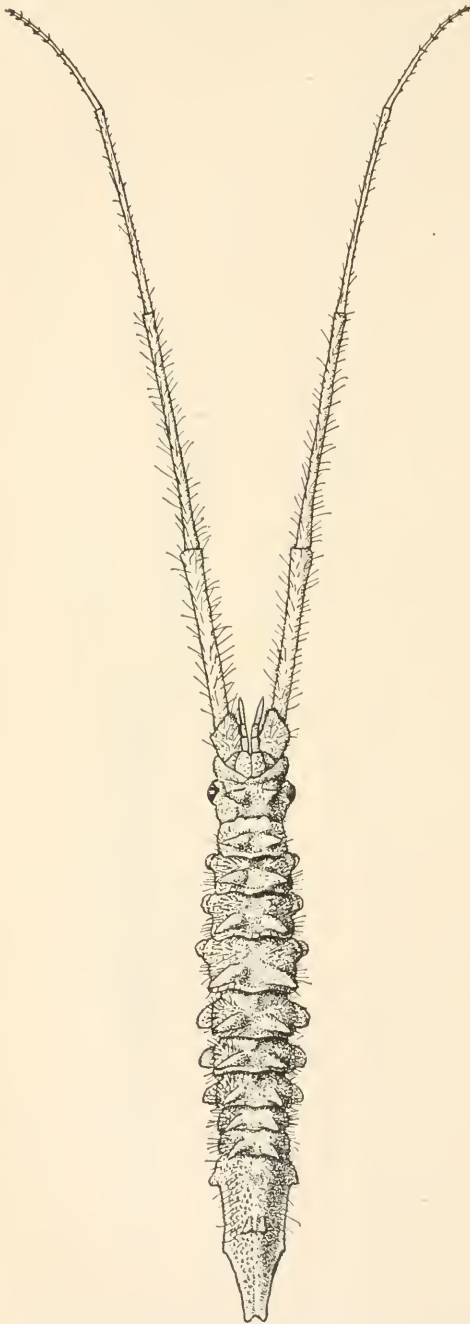


FIG. 29.—ARCTURUS CRASSISPINIS. $\times 1.5$. FEMALE.
(Drawn by Miss V. Dandridge.)

142° 29' E.; station 5007, at lat. $46^{\circ} 3'$ N.; long. $142^{\circ} 31'$ E.;

station 5008, at lat. $46^{\circ} 7' 50''$ N.; long. $142^{\circ} 37' 20''$ E.; station 5009, at lat. $46^{\circ} 21' 10''$ N.; long. $142^{\circ} 40'$ E.; station 5010, at Korsokov Light, N. 5° E., 9.5 miles (lat. $46^{\circ} 30' 30''$ N.; long. $142^{\circ} 43' 30''$ E.); station 5020, off eastern coast, Saghalin Island, vicinity of Cape Patience, in Okhotsk Sea, at lat. $48^{\circ} 32' 45''$ N.; long. $145^{\circ} 7' 30''$ E.; station 5021, at lat. $48^{\circ} 32' 30''$ N.; long. $145^{\circ} 08' 45''$ E.; station 5022, at lat. $48^{\circ} 35' 30''$ N.; long. $145^{\circ} 20'$ E.; station 5024, Flat Hill, N. 48° W.; Cape Patience, S. 74° W. (lat. $48^{\circ} 43' 10''$ N.; long. $144^{\circ} 59' 30''$ E.); station 4854, on the way from Matsu Shima, Sea of Japan (off coast of Korea), to Nagasaki, Japan, at Cape Clonard, N. 31° W., 13.3 miles (lat. $35^{\circ} 54'$ N.; long. $129^{\circ} 46'$ E.); and station 4861, S. 27° W., 16.5 miles (lat. $36^{\circ} 19'$ N.; long. $129^{\circ} 47'$ E.).

Depth.—21–73 fathoms.

Type-specimen.—Cat. No. 39309, U.S.N.M.

Family IDOTHEIDÆ.

Genus MESIDOTEA Richardson.

MESIDOTEA ENTOMON (Linnaeus).

Oniscus entomon LINNÆUS, Syst. Nat., 12th ed., vol. 1, pt. 2, 1767, p. 1060.

Idotea entomon Bosc, Hist. Nat. des Crust., vol. 2, 1802, p. 178.

Idotega entomon LOCKINGTON, Proc. Cal. Acad. Sci., vol. 7, 1877, pt. 1, p. 45.

Glyptonotus entomon MIERS, Trans. Linn. Soc. London, vol. 16, 1883, pp. 12–13, pl. 1, figs. 1–2. (See Miers for further synonymy.)

Mesidotca entomou RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 348–350.

Locality.—Petropaulovsk.

Genus IDOTHEA Fabricius.

IDOTHEA OCHOTENSIS (Brandt).

Idotea ochotensis BRANDT, Middendorff's Sibirische Reise, vol. 2, 1851, Crust., p. 145, pl. 6, fig. 33.—MIERS, Jour. Linn. Soc. London, vol. 16, 1883, p. 32, pl. 1, figs. 8–10.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 846; Ann. Mag. Nat. Hist. (7), vol. 4, 1899, p. 265; American Naturalist, vol. 34, 1900, p. 227; Harriman Alaska Expedition, Crust., vol. 10, 1904, p. 219; Proc. U. S. Nat. Mus., vol. 27, 1904, p. 663; Bull. U. S. Bureau of Fisheries, 1905, p. 216.

Idothea ochotensis RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 366–367.

Localities.—Milne Bay, Simushir Islands; Nikolski, Bering Island; Petropaulovsk.

Depth.—Shore.

IDOTHEA METALLICA (Bosc).

Idotea metallica Bosc, Hist. Nat. Crust., vol. 2, 1802, p. 179, pl. 15, fig. 6.—MIERS, Jour. Linn. Soc. London, vol. 16, 1883, pp. 35–38 (see Miers for further synonymy).

Idotea robusta KRØYER, Naturh. Tidsskr., (2), 1846–49, p. 108.—STIMPSON, Proc. Acad. Nat. Sci. Phila., vol. 14, 1863, p. 133.—HARGER, Report U. S. Fish Com., pt. 6, 1880, p. 349, pl. 6, figs. 30–32.

Idothea metallica RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 362–363.

Localities.—Station 4883, on the way from Nagasaki, Japan, to Kagoshima, Kagoshima Gulf, Japan, at Nomo Zaki, N. 83° E., 10.25 miles (lat. $32^{\circ} 33' 30''$ N.; long. $129^{\circ} 32'$ E.); station 4849, on the way from Saigo, Dogo Island, Oki Group, to Matsu Shima, Sea of Japan (off coast of Korea) at lat. $36^{\circ} 46'$ N.; long. $132^{\circ} 15'$ E.; station 4850, at Liancourt Rocks, NW. (mag.), 13.8 miles (lat. $36^{\circ} 56'$ N.; long. 132° E.); station 3766, Shioya Saki Light, N. 78° , W. 108 miles.

Depth.—Surface; 800–846 fathoms in green mud and globigerina. In dip net with *Porpita*.

Genus *PENTIAS* Richardson.

PENTIAS HAYI Richardson.

Pentias hayi RICHARDSON, Proc. U. S. Nat. Mus., vol. 27, 1904, pp. 47–49.

Locality.—Hakodate, Japan.

A single small specimen, a male, of this species was collected, which differs from the type in the narrower body and narrower epimera. The lateral margins of the segments are not incised as deeply for the reception of the epimera as in the type. Owing to the difference in size, the difference in sex and the insufficient material, I have referred the two specimens to the same species. The small specimen has the first segment of the thorax marked with ten parallel longitudinal lines of dark brown, close together. There is a small spot of dark brown on each one of the six following segments in the median line, close to the anterior margin, as well as one at the base of the abdomen. On the seventh thoracic segment is a large spot on either side on the lateral margin, and there is a large brown spot on either side of the abdomen close to the lateral margin about the middle of the segment.

Genus *PENTIDOTEA* Richardson.

PENTIDOTEA JAPONICA Richardson.

Idotea japonica RICHARDSON, Proc. U. S. Nat. Mus., vol. 22, 1900, pp. 131–134; Idem, vol. 27, 1904, p. 47.

Localities.—Mororan, Japan; Hakodate, Japan; Same, Rikuoku, Japan; Tomakomai, Japan.

Depth.—Shore.

Inasmuch as the palp of the maxillipeds is composed of five articles, this species must be referred to the genus *Pentidotea*.

PENTIDOTEA WOSNESENSKII (Brandt).

Idotea wosnesenskii BRANDT, in Middendorff's Sibirische Reise, vol. 2, 1851, Crust., p. 146.—STIMPSON, Bost. Jour. Nat. Hist., vol. 6, 1857, p. 504.—SPENCE BATE, Lord's Naturalist in British Columbia, vol. 2, 1866, p. 281.—MIERS, Journ. Linn. Soc. London, vol. 16, 1883, p. 40.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 846; Ann. Mag. Nat. Hist. (7), vol. 4, 1899, p. 265; American Naturalist, vol. 34, 1900, p. 227; Harriman Alaska Expedition, Crust., vol. 10, 1904, p. 218; Proc. U. S. Nat. Mus., vol. 27, 1904, p. 663; Bull. U. S. Bureau of Fisheries, 1905, p. 216.

Idotea hirtipes DANA, U. S. Expl. Exp., Crust., vol. 14, 1853, p. 704, pl. 46, fig. 6.

Idotea oregonensis DANA, Proc. Acad. Nat. Sci. Phila., vol. 7, 1854, p. 175.

Idotea media (DANA?) SPENCE BATE, Lord's Naturalist in British Columbia, vol. 2, 1866, p. 282.

Pentidotea wosnesenskii RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 370-373.

Localities.—Agattu Island; Union Bay, Bayne Sound, British Columbia; Unalaska; Attu Islands; Nazan Bay, Atka.

Depth.—Shore.

PENTIDOTEA WHITEI (Stimpson).

Idotea whitei STIMPSON, Proc. Acad. Nat. Sci. Phila., 1864, p. 155.—MIERS, Journ. Linn. Soc. London, vol. 16, 1883, pp. 42-43.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, pp. 846-847; Ann. Mag. Nat. Hist. (7), vol. 4, 1899, p. 266; American Naturalist, vol. 34, 1900, p. 227.

Pentidotea whitei RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 373-374.

Locality.—Nazan Bay, Atka.

PENTIDOTEA ROTUNDATA, new species.

Body narrow, elongate, about five and a half times longer than wide ($6\frac{1}{2}$ mm.: $35\frac{1}{2}$ mm.). Surface smooth, color light green, with markings and dots of a darker green.

Head a little wider than long (4 mm.: 5 mm.). Front excavate, and the antero-lateral angles rounded. Eyes small, round, situated on the lateral margins, close to the posterior margin, and scarcely visible in a dorsal view. The first pair of antennae have the basal article large and dilated, quadrate; the three following articles are short and subequal. The first antennae extend to the end of the second article of the peduncle of the second antennae. The first article of the second antennae is extremely short and is scarcely visible in a dorsal view; the second and third articles are about equal in length, being each $1\frac{1}{2}$ mm. long; the fourth article is a little longer than the

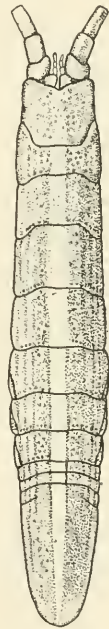


FIG. 30.—PENTIDOTEA ROTUNDATA. $\times 2$. (Drawn by Miss V. Dandridge.)

two preceding, being $2\frac{1}{2}$ mm. long. The second antennæ are broken at the fourth article. The maxilliped has a palp of five articles.

The first segment of the thorax is not wider than the head, and has the antero-lateral angles produced, surrounding the posterior portion of the head. In the median line this segment is only 2 mm. long and is the shortest segment with the exception of the seventh, which is also but 2 mm. in length. The second segment is $3\frac{1}{2}$ mm. long; the third and fourth 4 mm. each; the fifth 3 mm.; and the sixth $2\frac{1}{2}$ mm. long. Epimera are distinct on all the segments with the exception of the first. They are in the form of extremely narrow, elongated plates, which in the second segment extend a little more

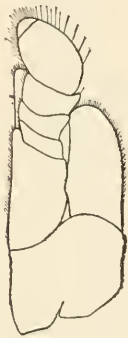


FIG. 31.—PENDIDOTEA ROTUNDATA. MAXILLIPED. $\times 15\frac{1}{2}$.

than half the length of the lateral margin, in the third and fourth segments about two-thirds of the lateral margin, and in the last three segments the entire length of the lateral margin. In a dorsal view the first three epimera are not visible.

The abdomen is composed of three segments, two short ones anterior to the long terminal segment. At the base of the terminal segment is a suture line on either side, indicating another partly coalesced segment. The terminal segment is $9\frac{1}{2}$ mm. long and 5 mm. wide at the base; it tapers gradually to a rounded extremity.

The first four pairs of legs are directed forward, the last three pairs backward. All the legs are very small and short.

Only one specimen, a female, was collected at Same, Rikuoku, Japan.

Type-specimen.—Cat. No. 39516, U.S.N.M.

Genus SYNIDOTEA Harger.

SYNIDOTEA BICUSPIDA (Owen).

Idotea bicuspida OWEN, Crustacea of the Blossom, 1839, p. 92, pl. 27, fig. 6.

Idotea pulchra LOCKINGTON, Proc. Cal. Acad. Sci., vol. 7, 1877, p. 44.

Edotea bicuspida MIERS, Journ. Linn. Soc. London, vol. 16, 1883, p. 66.

Synidotea bicuspida SARS, Crust. Norwegian North Atlantic Exp., 1885, p. 116, pl. 10, figs. 24-26.—BENEDICT, Proc. Acad. Nat. Sci. Phila., 1897, pp. 391-392.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 848; Ann. Mag. Nat. Hist. (7), 1899, p. 268; American Naturalist, vol. 34, 1900, p. 228; Bull. U. S. Nat. Mus., No. 54, 1905, pp. 385-386.

Localities.—Station 3253, between Bristol Bay and Pribilof Islands; station 3255, N. and N. W. of Unimak Island.

Depth.—Thirty-six to forty-nine fathoms, in green mud, broken shells, and gray sand and gravel.

SYNIDOTEA ACUTA, new species.

Body oblong-ovate, about twice as long as wide, 5 mm.:12 mm. Color yellow, with the exception of the third and fourth segments, which are red.

Head with the front produced in a wide border on either side of a median cleft. The frontal excavation is slight. The lateral portions of the frontal border form an angle with the dorsal portion. Just behind the median cleft is a prominent median tubercle. The eyes are small, round, composite, and placed close to the lateral margins. The first pair of antennæ extend to the middle of the fourth article of the peduncle of the second pair of antennæ; the first two articles are about equal in length; the third and fourth are about equal in length and each is a little longer than the second article. The second pair of antennæ have the first two articles about equal in length; the third and fourth are also equal in length and each is twice as long as either of the two preceding articles; the fifth article is about one and a half times longer than the fourth; the flagellum consists of ten articles. When retracted the second antennæ extend to the posterior margin of the first thoracic segment.

The lateral margins of the first and second thoracic segments are angulate; those of the following five segments are straight. All the epimera are coalesced with the segments. The first four segments are about equal in length; the last three gradually decrease a little in length.

The abdomen is composed of a single segment, with a suture line on either side at the base, indicating another partly coalesced segment. This segment is triangular, with the apex very slightly excavate.

Only one specimen was collected by the U. S. Bureau of Fisheries Steamer *Albatross* at station 4778, on "Petrel Bank," Bering Sea, at Semisopochnoi Island, r. t. S. 45° W., l. t. S. 12° W., about 12 miles (lat. 52° 12' N.; long. 179° 52' E.) at a depth of 43 fathoms, in fine black gravel.

Type-specimen.—Cat. No. 39517, U.S.N.M.

This species is very close to *Synidotea bicuspida* (Owen), but differs in having the first two segments of the thorax with lateral margins angulate, in having a prominent median tubercle on the head, and in the shape of the frontal border. The abdomen is also different, in being as long as wide, while in *S. bicuspida* it is wider than long, and in having a more shallow excavation at the extremity. The second antennæ are also shorter, with fewer articles in the flagellum.



FIG. 32.—SYNIDOTEA ACUTA. $\times 3\frac{1}{2}$.

SYNIDOTEA EPIMERATA, new species.

Body oblong-ovate, a little more than twice as long as wide (6 mm.; 13 mm.).

Head with the front excavate, the antero-lateral angles being very acutely produced. In the middle of the frontal excavation is another small excavation. The eyes are large, composite, and situated close to the lateral margin, about half way between the anterior and the posterior margins. In front of each eye, close to the anterior margin, is a prominent tubercle. Just posterior to the median excavation of the anterior margin is a single prominent median tubercle. A series of small tubercles in a transverse row lies just back of the median tubercle. The transverse ridge at the posterior extremity of the head has a single median tubercle. The first pair of antennæ have the first two articles about equal in length; the two following are also about equal in length and each is a little longer than either of the preceding articles. The first antennæ extend to the middle of the fourth article of the second pair of antennæ.

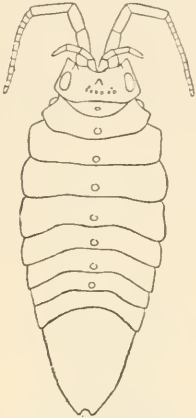


FIG. 33.—SYNIDOTEA EPIMERATA. $\times 3\frac{1}{2}$.

The first two articles of the second antennæ are short and subequal in length; the third and fourth articles are also subequal, and each is twice as long as either of the preceding articles; the fifth article is about one and a half times as long as the fourth; the flagellum consists of twelve articles. The second antennæ, when retracted, extend to the posterior margin of the third thoracic segment.

The first thoracic segment is shorter and narrower than the three following segments and has the lateral margins angulate. There are distinct epimera on the anterior part of this segment which are not present on any of the following segments. The epimera arise from the underside of the lateral margin and project anteriorly beyond the place where they are visible in a dorsal view. The lateral margins of the second segment are also angulate; those of the following segments are straight. The last three segments gradually decrease a little in length. The second, third, and fourth segments are about equal in length. On each one of the segments is a small median tubercle situated close to the posterior margin.



FIG. 34.—SYNIDOTEA EPIMERATA. MAXILLIPED. $\times 23$.

The abdomen is composed of a single segment with a suture line distinct at the sides, but less distinct in the middle, indicating another

partly coalesced segment at the base. The abdomen tapers to the extremity, which has a deep rounded notch or excavation.

Only one specimen comes from station 4987, on the way from Hakodate, Hokkaido, Japan, to Otaru, Hokkaido, Japan, by way of Tsugaru Strait, at Kamoi Mizaki Light, N. 76° E., 3.2 miles (lat. 43° 19' 20'' N.; long. 140° 17' E.), at a depth of 59 fathoms in a rocky bottom.

This species differs from all the other species of *Synidotea* in the presence of distinct epimera on the first thoracic segment.

Type-specimen.—Cat. No. 39518. U.S.N.M.

SYNIDOTEA TUBERCULATA, new species.

Body oblong-ovate, about twice as long as wide (8½ mm.; 16½ mm.). Head with the front excavate in the middle, on either side of which the frontal border is wide and forms an angle with the lateral portion. This angle is elevated in the form of an arched tubercle. Just back of the median excavation are two large, prominent tubercles, one on either side of the median line. Posterior to these two tubercles is a transverse row of six low tubercles, three on either side of the median line. Posterior to these six tubercles is a ridge which is elevated to form three low tubercles, one median and one on either side of it. The eyes are large, round, composite, and situated close to the lateral margin on the posterior half of the head; they are somewhat elevated on rounded lobes. The first pair of antennæ have the first two articles subequal; the third and fourth are also about equal in length and each is a little longer than either of the first two. The first antennæ extend to the end of the fourth article of the peduncle of the second antennæ. The first two articles of the second pair of antennæ are short and subequal; the third is as long as the first two taken together; the fourth is a little longer than the third; the fifth is a little longer than the fourth; the flagellum consists of thirteen articles. When retracted, the second antennæ extend to the posterior margin of the second thoracic segment. All the epimera are firmly united with the segments.

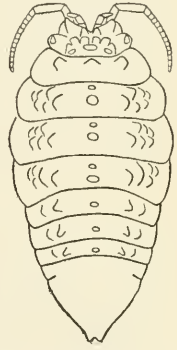


FIG. 35.—SYNIDOTEA TUBERCULATA. $\times 2\frac{1}{2}$.

The first four segments of the thorax are longer than the last three, which gradually decrease a little in length. The first segment has a prominent median tubercle, and a prominent arched, hornlike tubercle on either side of the median tubercle. The second, third, and fourth segments have each a median tubercle, and on either side of it a group of five or six tubercles, two of the group being larger and more cou-

spicuous than the others. The fifth, sixth, and seventh have each a median tubercle, and on either side of it a group of two large tubercles surrounded by low areolations.

The abdomen consists of a single segment, with a suture line on either side at the base, indicating another partly coalesced segment. The abdomen tapers to a narrow extremity, which posteriorly is notched.

The first pair of legs are shorter than the following six pairs, and are prehensile. All the others are similar, and have the basis produced on the upper side in a ridge which is bilobate.

Eight specimens of this species come from the following localities: Station 5020, station 5021, station 5023, and station 5024, off the eastern coast of Saghalin Island, vicinity of Cape Patience, in Okhotsk Sea, at lat. $48^{\circ} 32' 45''$ N.; long. $145^{\circ} 07' 30''$ E.; lat. $48^{\circ} 32' 30''$ N.; long. $145^{\circ} 08' 45''$ E.; Flat Hill, N. 53° W.; Cape Patience, S. 77° W. (lat. $48^{\circ} 43' 30''$ N.; long. $145^{\circ} 03'$ E.); Flat Hill, N. 48° W.; Cape Patience, S. 74° W. (lat. $48^{\circ} 43' 10''$ N.; long. $144^{\circ} 59' 30''$ E.), at a depth of 67–75 fathoms, in sand, pebbles, and green mud.

This species is perhaps closer to *Synidotea consolidata* (Stimpson), from Pacific Grove, than to any other species.

Type-specimen.—Cat. No. 39519, U.S.N.M.

Genus CLEANTIS Dana.

CLEANTIS ISOPUS Miers.

Cleantis isopus MIERS, Journ. Linn. Soc. London, vol. 16, 1883, pp. 80–81, pl. 3, figs. 9–11.—GRUBE (MS. in Brit. Mus.).

Locality.—Two specimens from Hakodate Bay, Japan; four specimens from Mororan, Japan. Miers's specimens were from Ojica, Goto Island, lat. $33^{\circ} 12' 30''$ N.; long. $129^{\circ} 5'$ E. Grube's specimens were from Chefoo.

Depth.—Taken on the shore.

The palp of the maxilliped is composed of five articles as in *Cleantis planicauda* Benedict.

ASELLOIDEA or ASELLOTA.

Family JANIRIDÆ.

Genus JANIRA Leach.

JANIRA JAPONICA, new species.

Body oblong-ovate. Color, in alcohol, yellow. Surface smooth and free from spines.

Head wider than long, with the front between the antero-lateral angles, triangularly produced. Antero-lateral angles narrow and but little produced; their extremities are rounded. Eyes large, oval, composite, and placed halfway between the anterior and the posterior margins, and a distance from the lateral margin equal to the width of one eye. The first pair of antennæ have a peduncle of

three articles and a flagellum of about ten articles. The second pair of antennæ are broken at the end of the third article; there is a scale articulated to the third article.

The first three segments of the thorax are about equal in length; the fourth and fifth are shorter; the last two are subequal and are the longest. The lateral margin of the first segment has the posterior half produced in a slight rounded lobe; the epimeron is situated on the anterior half of the lateral margin and is in the form of an angular lobe, projecting as far as the posterior lobe of the lateral margin. The lateral margin of the second segment is straight, with the anterior and posterior angles slightly produced in a lobe; the epimeron is small, bilobed, and placed between the anterior and the posterior lobes. The third segment has the lateral margin nearly straight, with the anterior and posterior angles also slightly produced in a lobe; the epimeron consists of two rounded lobes placed between the anterior and the posterior lobes. The fourth segment

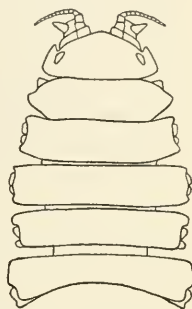


FIG. 36.—JANIRA JAPONICA. HEAD AND FIRST FIVE SEGMENTS OF THORAX. $\times 93$.

has the antero-lateral margin produced in a rounded lobe; the epimeron consists of a double lobe placed below this. The fifth segment has the anterior angle of the lateral margin, slightly produced in a lobe; the epimeron consists of a double lobe just posterior to the posterior lobe of the segment. The sixth and seventh segments have the anterior part of the lateral margins produced in a large lobe, with the epimeron double and placed on the posterior half of the lateral margin.



FIG. 37.—JANIRA JAPONICA. LAST TWO SEGMENTS OF THORAX AND ABDOMEN. $\times 93$.

The abdomen has the posterior margin broadly triangular, the median angle and the lateral angles rounded. The uropoda are about as long as the abdomen. The branches are almost equal in length, the outer one being but slightly shorter than the inner. They are about one and a half times longer than the peduncle. The first pair of legs are prehensile; the following six pairs are ambulatory and furnished with biunguiculate dactyli.

Only one specimen, a female, was collected at station 4915, 10 to 20 miles southwest of Koshika Islands, Eastern Sea, at Tsurikake Saki Light, N. 62° E., 14.8 miles (lat. $31^{\circ} 31' N.$; long. $129^{\circ} 25' 30'' E.$), at a depth of 427 fathoms in gray globigerina ooze and broken shells.

Type-specimen.—Cat. No. 39520, U.S.N.M.

MICROPROTUS, new genus.

Head with short truncated rostrum and without eyes. First pair of antennæ with the first article of the first pair of antennæ produced at the outer anterior angle; flagellum multi-articulate. Second antennæ with the flagellum multi-articulate.

Molar expansion of mandibles well developed. Palp three jointed. First four segments of thorax provided each with three long dorsal spines, one in the median line, and one on either side, at the antero-lateral angle; the last three segments provided with three long spines, one median and one on either side, all close together, and the antero-lateral angles produced in a long spine on either side.

The epimera of the second, third, and fourth segments of the thorax produced in two spines, the anterior one being longer. The epimera of the last three segments, in the form of small rounded lobes, situated on the posterior half of the segment.

Abdomen with the lateral margins produced in two spines on either side, and the posterior margin produced in two spines.

Uropoda consisting of a peduncle and two branches.

The first pleopoda of the male have the distal extremity of the peduncle produced.

First pair of legs small, short, and feeble; the following six pairs robust and similar in character. The second, third, and fourth pairs gradually increase in length. Daetylus bi-unguiculate.

This genus has affinities with the *Munnopsidæ*. The short, truncated rostrum, the absence of eyes, the small and short first pair of legs as compared with the three following pairs and the form of the first article of the first pair of antennæ are characters similar to those found in that family. The absence of natatory legs, the general form of the body and the style of uropods, however, are characters referable to the *Janiridæ*.

The type of the genus is *Microprotus cæcus*, the description of which follows:

MICROPROTUS CÆCUS, new species.

Head, with the anterior margin almost straight, and produced in the middle in a small, truncated rostrum. Eyes wanting. First pair of antennæ, with the first article large and produced at the outer anterior angle; second article about half as long as the first and only half as wide; third article more slender than the second and a little longer. Second antennæ with the second article of the peduncle provided with a long spine; the third article is provided with a long spine on the underside; the fourth article is provided with two long spines, one above and one on the underside; the fifth and sixth articles are long and slender and are not armed. The flagellum is elongate and multiarticulate.

The first segment of the thorax is provided with three spines, one in the middle on the anterior margin and one at the antero-lateral angle on either side. The median spine is about twice as long as the lateral spines. The second, third, and fourth segments are each provided with three spines, one median spine on the anterior margin and a spine on either side on the anterior margin close to the lateral margin; these spines are all of nearly equal length; the epimera of these segments are drawn out in two spines, an anterior spine and a posterior spine, the anterior one being twice as long as the posterior one. The three following segments are each furnished with three spines in a transverse row near the posterior margin, a median small spine and one on either side, some distance from the lateral margin; the lateral spines are longer than the median spines and decrease gradually in length from the fifth to the seventh segments; the antero-lateral angles of these last three segments are produced in an extremely

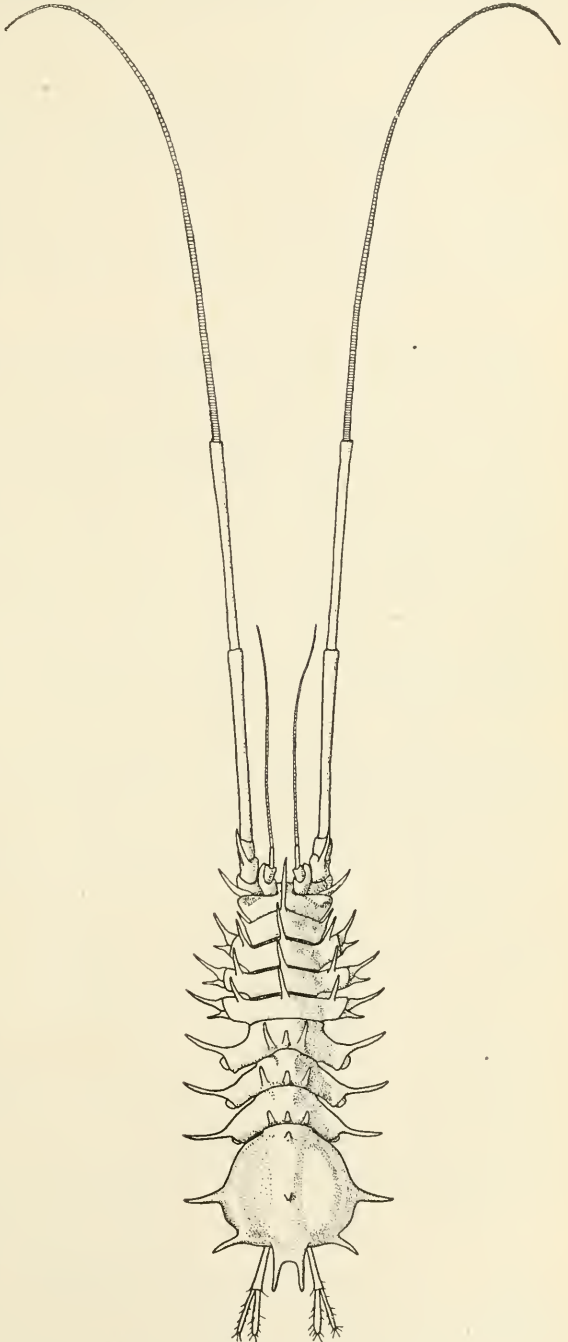


FIG. 38.—MICROPROTUS CÆCUS. \times 3.8. (Drawn by Miss V. Dandridge.)

long spine, one on other side; the epimera are in the form of small rounded lobes at the post-lateral angles and are unarmed.

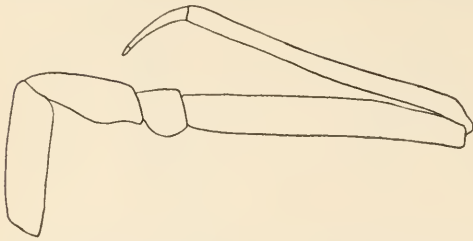


FIG. 39.—MICROPROTUS CECUS. SECOND THORACIC LEG. $\times 14\frac{1}{2}$.

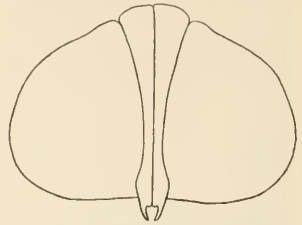


FIG. 40.—MICROPROTUS CECUS. FIRST AND SECOND PLEOPODS OF MALE. $\times 9\frac{3}{4}$.

The abdomen consists of a single large segment, which is produced on either side about the middle in a single long spine, directed outward, and at the post-lateral angle in another long spine, also directed outward. The abdomen is posteriorly produced in a process terminating in two long spines, one on either side of the median line. At the base of the abdomen in the median line is a single small tubercle. There is also a single small tubercle in the middle of the segment on the dorsal surface. The peduncle of the uropoda is long and slender, and reaches almost to the extremity of the terminal spines of the abdomen. The branches are about equal in length and also about as long as the peduncle.

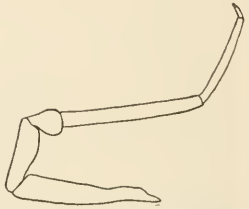


FIG. 41.—MICROPROTUS CECUS. FIRST THORACIC LEG. $\times 14\frac{1}{2}$.

The first pair of legs are very small, short, and feeble. The following six pairs are robust and similar in character. The second, third, and fourth pairs gradually increase in length. All the articles are long and slender, especially the merus and propodus. The legs terminate in bi-unguiculate dactyli.

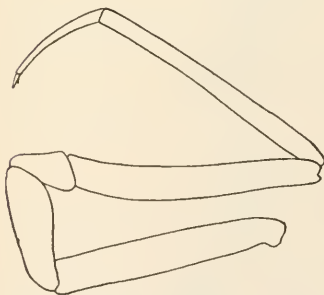


FIG. 42.—MICROPROTUS CECUS. SIXTH LEG. $\times 14\frac{1}{2}$.

Only a single specimen, a male, was collected at station 4781, on the way from "Petrel Bank," Bering Sea, to McDonald Bay, Agattu Island, Aleutians, by the passage east of Semisopchnoi and Amchitka Islands at lat. $52^{\circ} 14' 30''$ N.; long. $174^{\circ} 13'$ E. at a depth of 300 fathoms in fine gray sand and

pebbles. An imperfect specimen, a male, also comes from the same locality.

Type-specimen.—Cat. No. 39521, U.S.N.M.

Family MUNNOPSISIDÆ.

Genus MUNNOPSIS M. Sars.

MUNNOPSIS LATIFRONS Beddard.

Munnopsis latifrons BEDDARD, Proc. Zool. Soc. London, 1885, pt. 4, p. 917; Challenger Report, vol. 17, 1886, p. 56, pl. 10, figs. 1-4.

Localities.—Station 5082, off Omai Saki Light (20 to 40 miles distant), N. 22° E., 33 miles (lat. 34° 5' N.; long. 137° 59' E.); station 4919, about 90 miles WSW. of Kagoshima Gulf, Eastern Sea, at Kusakaki Jima, N. 18° E., 17.6 miles (lat. 30° 34' N.; long. 129° 19' 30'' E.).

Beddard's specimen was from off Ino Sima Island, Japan.

Depth.—Six hundred and sixty-two fathoms in green mud, fine sand, and globigerina; 440 fathoms in globigerina ooze.

Beddard's specimen came from a depth of 345 fathoms in green mud.

Four specimens of this species were collected by the United States Bureau of Fisheries steamer *Albatross*. In his description of the form Beddard says: "The abdominal shield was, unfortunately, considerably damaged, so that its shape can not be described with great accuracy; it appears to be more or less oval in form and truncated at its free extremity; laterally and just in front of the articulation of the long styliform uropoda is a spiny process directed backward nearly in the same straight line with the longitudinal axis of the abdominal shield."



FIG. 44.—MUNNOPSIS LATIFRONS. SEVENTH LEG. $\times 4\frac{2}{3}$.

Beddard's specimen was imperfect. I have made a drawing of the abdomen as it appears in the *Albatross* specimen. I have also made a drawing of one of the natatory legs.

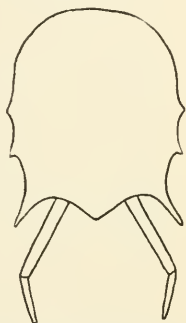


FIG. 43.—MUNNOPSIS LATIFRONS. ABDOMEN. $\times 4\frac{2}{3}$.

In the specimens found by the *Albatross* the abdomen is posteriorly triangular between the two post-lateral spines, and not truncate, as described by Beddard. There are also two small spines on the lateral margin on either side. Because

MUNNOPSIS, new species.

About twelve specimens of a new species of *Munnopsis* were collected from stations 4765, 4766, 4793, and 4800. All the specimens were mutilated, so that a complete description is not possible.

Genus EURYCOPE G. O. Sars.

EURYCOPE LÆVIS, new species.

Body oblong-ovate, about two and a half times longer than wide, 4 mm.: 10 mm.

Surface perfectly smooth; color, in alcohol, yellow.

Head much wider than long, with the anterior margin produced in the middle in a wide truncated process. Eyes absent. First pair of antennae with the first article large and dilated; the second and third are very short and about equal in length. The flagellum is composed of numerous articles. The second antennae are broken at the end of the third article.

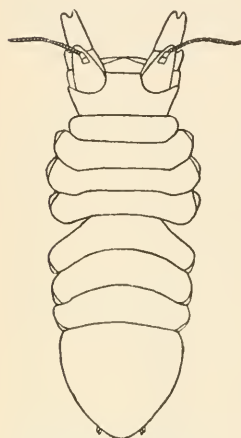


FIG. 45.—EURYCOPE LÆVIS.
× 51.

The first four segments of the thorax are about equal in length and they are also about as long as the head. The first segment is as wide as the head; the three following are equal in width and a little wider than the first. Epimera are present on the second, third, and fourth segments in the form of narrow plates occupying the entire lateral margin. The last three segments of the thorax gradually increase in length; the fifth is about one and a half times longer than the fourth, but is of equal width; the sixth is twice as long as the fourth; the seventh is about two and a half times longer than the fourth. Epimera are present on the last three segments in the form of narrow plates occupying the posterior two-thirds of the lateral margin.

The abdomen consists of a single, large segment, tapering posteriorly to a rounded extremity. The uropoda are double-branched, both branches being very small and short, the inner slightly longer than the outer.

The first pair of legs are shorter than the three following pairs, which are greatly elongated and gradually increase in length. The last three pairs are natatory.

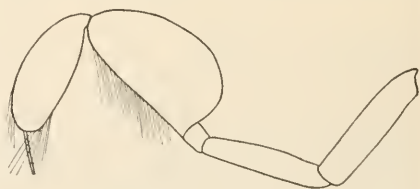


FIG. 46.—EURYCOPE LÆVIS. ONE OF THE NATATORY LEGS. × 142.

Only three specimens, all mutilated, come from station 4907, 10–20 miles southwest of Koshika Islands, Eastern Sea, at Tsurikake Saki Light, S. 83° E., 14.7 miles (lat. 31° 39' 30'' N.; long. 129° 24' E.) at a depth of 406 fathoms in gray globigerina ooze; from station 4774,

on "Bowers Bank," Bering Sea, at lat. $54^{\circ} 33' N.$; long. $178^{\circ} 45' E.$, at a depth of 557 fathoms; and station 5037, off Otechishi Saki, eastern end of Hokkaido, Pacific Ocean, at Urakawa Light, N. $52\frac{1}{2}^{\circ} E.$, 11.9 miles (lat. $42^{\circ} 02' 40'' N.$; long. $142^{\circ} 33' 20'' E.$, at a depth of 349 fathoms.

The only species of *Eurycope* recorded from Japan is *E. fragilis* Beddard^a from off Yokohama, which is entirely different from the species described here.

Type-specimen.—Cat. No. 39522, U.S.N.M.

BOPYROIDEA or EPICARIDEA.

Family BOPYRIDÆ.

Genus PHRYXUS Rathke.

PHRYXUS ABDOMINALIS Krøyer.

Bopyrus abdominalis KROYER. Nat. Tidsskr., vol. 3, 1840–1841, pp. 102–112, 289–299, pls. 1, 2.

Phryxus abdominalis LILLJEBORG. Öfvers, Kongl. Vet. Akad. Forh., vol. 9, 1852, p. 11.—HARGER, Report U. S. Fish Comm., 1880, pt. 6, p. 312. (See Harger for further synonymy).—RICHARDSON, Bull. U. S. Nat. Mus. No. 54, 1905, pp. 500–503.

Localities.—Station 4814, on the way from Hakodate, Japan, to Ebisu, Sado Island, Sea of Japan, at north point Sado Island, S. $42^{\circ} W.$, 15.7 miles (lat. $38^{\circ} 32' N.$; long. $138^{\circ} 43' E.$) on *Spirontocaris*, species (?) at a depth of 429 fathoms; station 4782, on the way from Agattu Island to Chichagof Harbor, Attu Island, by the Semichi Islands, Aleutians, at East Cape, Attu Island, S. $22^{\circ} W.$, 4 miles (lat. $52^{\circ} 55' N.$; long. $173^{\circ} 27' E.$) at a depth of 57 fathoms; station 4992, on the way from Otaru, Hokkaido, Japan, to Korsakov, Aniwa Bay, Saghalin Island (by the Gulf of Tartary and La Perouse Strait) at Bomasiri Shima (off N. end of Rebun To), N. $52^{\circ} E.$, 8 miles (lat. $45^{\circ} 24' N.$; long. $140^{\circ} 49' 10'' E.$), on *Spirontocaris*, species (?) at a depth of 325 fathoms; station 4853, on the way from Matsu Shima, Sea of Japan (off coast of Korea), to Nagasaki, Japan, at C. Clonard, S. $80^{\circ} W.$, 9.8 miles (lat. $36^{\circ} 08' N.$; long. $129^{\circ} 49' E.$) on *Spirontocaris* species (?) at a depth of 335 fathoms; station 5020, off eastern coast Saghalin Island, vicinity of Cape Patience, in Okhotsk Sea, at lat. $48^{\circ} 32' 45'' N.$; long. $145^{\circ} 07' 30'' E.$ on *Spirontocaris* species (?) at a depth of 73 fathoms, and station 5021, at lat. $48^{\circ} 32' 30'' N.$; long. $145^{\circ} 08' 45'' E.$ on *Spirontocaris* species (?); station 5045, south coast of Hokkaido, at lat. $42^{\circ} 11' 10'' N.$; long. $142^{\circ} 12' E.$ on *Spirontocaris* species (?) at a depth of 359 fathoms.

Character of bottom.—Found in rocks and gravel and in brown mud.

^a Challenger Report, vol. 17, 1886, pp. 63–66, pl. 9, figs. 8–12.

Genus PARAPENÆON Richardson.

PARAPENÆON CONSOLIDATA Richardson.

Parapenæon consolidata RICHARDSON, Proc. U. S. Nat. Mus., vol. 27, 1904, pp. 43-44.

Localities.—At Tsuruga on a Penæid; station 4942, in Kagoshima Gulf at Chirin Jima Δ , S. $12\frac{1}{2}^{\circ}$ E., 6.6 miles (lat. $31^{\circ} 23' 10''$ N.; long. $130^{\circ} 39' 10''$ E.), from branchial cavity of a Penæid.

Depth.—One specimen was collected on the shore; the other comes from a depth of 118 fathoms.

The type-specimen is from Mogi, Japan.

Genus ARGEIA Dana.

ARGEIA PUGETTENSIS Dana.

Argeia pugettensis DANA, U. S. Expl. Exp., Crust., vol. 14, 1853, p. 804, pl. 53, fig. 7.—STIMPSON, Bost. Journ. Nat. Hist., vol. 6, 1857, p. 511.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 868; Ann. Mag. Nat. Hist. (7), vol. 4, 1899, p. 337; American Naturalist, vol. 34, 1900, p. 308.—BONNIER, Travaux de la Station Zool. de Wimereux, vol. 8, 1900, pp. 327-328.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 27, 1904, pp. 60-64; Bull. U. S. Bureau of Fisheries, vol. 24, 1905, p. 220; Bull. U. S. Nat. Mus., No. 54, 1905, pp. 544-550.

Argeia, species (?) CALMAN, Ann. N. Y. Acad. Sci., vol. 11, 1898, p. 281.

Argeia calmani BONNIER, Travaux de la Station Zool. de Wimereux, vol. 8, 1900, p. 329.

Localities.—Hakodate, Japan; station 5000, in the Gulf of Tartary, off southwestern coast of Saghalin, at lat. $47^{\circ} 35' N.$; long. $141^{\circ} 43' E.$, and station 5003, lat. $47^{\circ} 32' 30'' N.$; long. $141^{\circ} 45' E.$; station 4870, on the way from Matsu Shima, Sea of Japan (off coast of Korea) to Nagasaki, Japan, at lat. $36^{\circ} 30' 30'' N.$; long. $129^{\circ} 43' E.$

Depth.—Surface light; 31-94 fathoms in green mud and gray sand.

Parasitic on *Nectocrangon*, species (?)

Genus BOPYROIDES Stimpson.

BOPYROIDES HIPPOLYTES (Krøyer).

Bopyrus hippolytes KRØYER, Kongelige Danske Videnskabenes Selskabs naturvidenskabelige og mathematiske Afhandlinger, vol. 7, 1838, p. 306 (78), pl. 4, fig. 22.

Bopyroides acutimarginatus STIMPSON, Proc. Acad. Nat. Sci. Phila., vol. 16, 1864, p. 156.

Gyge hippolytes HARGER, Report U. S. Fish Comm., 1880, pt. 6, p. 311.

Bopyroides hippolytes RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 567-572. (See Richardson for further synonymy.)

Localities.—Unalaska on *Spirontocaris*, species (?); station 4778, on "Petrel Bank," Bering Sea, at Semisopchnoi Island, r. t. S. $45^{\circ} W.$, l. t. S. $12^{\circ} W.$ about 12 miles (lat. $52^{\circ} 12' N.$; long. $179^{\circ} 52' E.$) on

Spirontocaris, species (?); station 4788, on the way from Preobrajaniya Bay, Mendi Island, to Nikolski Bay, Bering Island, by the passage between islands at North point Copper Island, N. 76° E., 8.8 miles (lat. $54^{\circ} 50' 24''$ N.; long. $167^{\circ} 13'$ E.); station 4819, on the way from Ebisu, Sado Island, to Nanao, Noto Peninsula, Hondo, Japan, at Hime Saki Light, S. 16° E., 3.8 miles (lat. $38^{\circ} 09'$ N.; long. $138^{\circ} 32' 12''$ E.).

Depth.—Forty-three to two hundred and forty-five fathoms in green sand and fine brown mud.

Remarks.—The specimen from station 4778 has five pairs of small, rounded tubercles on the fleshy ridges or modified appendages of the abdomen (the pleopoda).

Family DAJIDÆ.

Genus HOLOPHRYXUS Richardson.

HOLOPHRYXUS GIARDI Richardson.

Holophryxus giardi RICHARDSON, Proc. U. S. Nat. Mus., vol. 33, 1908, pp. 690–692.

Locality.—Station 4793, on the way from Nikolski Bay, Bering Island, Komandorski Islands, to Petropaulovsk, Avatcha Bay, Kamchatka, at Toporkov Island, harbor of Nikolski, Bering Island, N. 58° E., 44 miles (lat. $54^{\circ} 48'$ N.; long. $164^{\circ} 54'$ E.).

Depth.—Two thousand seven hundred fathoms.

Parasitic on *Gennadas borealis* Rathbun.

HOLOPHRYXUS CALIFORNIENSIS Richardson.

Holophryxus californiensis RICHARDSON, Proc. U. S. Nat. Mus., vol. 33, 1908, pp. 692–694.

Locality.—On the way from Yes Bay to Seattle, at Bushby Point.

Depth.—One hundred and fifty to two hundred and eighty fathoms.

Parasitic on *Pasiphaea pacifica* Rathbun.

Genus ARTHROPHRYXUS Richardson.

ARTHROPHRYXUS BERINGANUS Richardson.

Arthropryxus beringanus RICHARDSON, Proc. U. S. Nat. Mus., vol. 33, 1908, pp. 695–696.

Locality.—One female, with Schizopoda but not attached, from station 4760, on the way from Union Bay, British Columbia, to Dutch Harbor, Alaska, by the Goletas Channel and Unalga Pass, at lat. $53^{\circ} 53'$ N.; long. $144^{\circ} 53'$ W.

Depth.—Two thousand two hundred fathoms.

The type-specimen came from station 4793, on the way from Nikolski Bay, Bering Island, Komandorski Islands, to Petropaulovsk,

Avatcha Bay, Kamchatka, at Toporkov Island, harbor of Nikolski, Bering Island, at a depth of 2,700 fathoms; it was parasitic on *Eucopia australis*.

PROPHRYXUS, new genus.

Body of adult female irregular in outline. Head and first three segments of thorax defined. Last four thoracic segments indicated only in the dorsal region. Lateral parts of thorax swollen and extending backward in a small rounded lobe on either side.

Five abdominal segments defined. Pleopods rudimentary.

Five pairs of legs surround the oral area. Male unknown.

Type of genus.—*Prophryxus alascensis*.

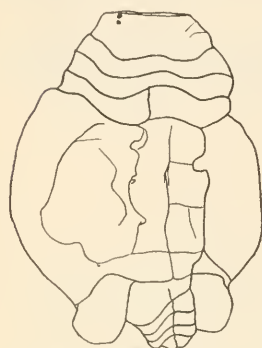


FIG. 47.—PROPHRYXUS ALASCENSIS. DORSAL VIEW OF ADULT FEMALE. $\times 19\frac{1}{2}$.

PROPHRYXUS ALASCENSIS, new species

Body of adult female oval in outline, with the front somewhat quadrangular, more or less depressed. Lateral parts of body swollen, but not projecting anteriorly. Head extending straight in front, with the anterior margin straight. Two little black spots on one side may represent one eye. Head indistinctly defined from thorax.

The first three segments of the thorax are indistinctly indicated; they extend from one side of the body to the other. The following four segments are only indicated in the middle of the dorsal region. The lateral parts of the thorax are expanded and unsegmented, and extend backward in a small posterior lobe on either side of the abdomen, reaching almost to its extremity.

The abdomen consists of five indistinctly defined segments, indicated more on one side of the body than on the other. The fifth or terminal segment is bilobate.

In a ventral view of the body there are five pairs of legs surrounding the oral area. There seem to be rudimentary pleopods.

Only one specimen was obtained at station 4759, on the way from Union Bay, British Columbia, to Dutch Harbor, Alaska, by the Goletas Channel and Unalga Pass, at lat. $53^{\circ} 05' N.$; long. $138^{\circ} 31' W.$ It was taken at a depth of 2,000 fathoms with a schizopod, but unattached.

Type-specimen.—Cat. No. 39523, U.S.N.M.



FIG. 48.—PROPHRYXUS ALASCENSIS. VENTRAL VIEW. $\times 19\frac{1}{2}$.

Attached to one of the legs of *Ega symmetrica* Richardson was a parasite, the outline of which was more or less irregularly transversely oval, with no traces of segmentation on the dorsal surface. The body seems to be converted into a sac for carrying the eggs,

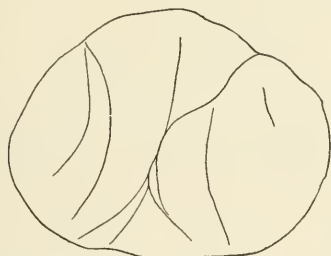


FIG. 49.—ISOPOD PARASITE. DORSAL VIEW. $\times 14\frac{1}{2}$.

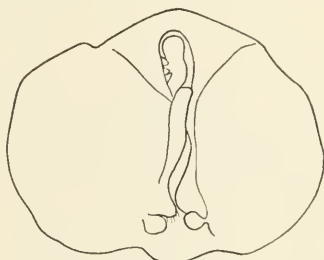


FIG. 50.—ISOPOD PARASITE. VENTRAL VIEW. $\times 14\frac{1}{2}$.

which fill the lateral portions and can be seen through the thin, almost transparent integument. On the ventral side at the anterior end is the oral opening, below which are the lamellæ which bound the opening into the marsupial cavity. Below these lamellæ are two small oval lamellæ, one on either side.

The specimen shown in figs. 49 and 50 is Cat. No. 39524, U.S.N.M.

ONISCOIDEA.

Family LIGYDIDÆ.

Genus LIGYDA Rafinesque.

LIGYDA PALLASII (Brandt).

Ligia pallasii BRANDT, Bul. Soc. Impér. des Natur. de Moscou, vol. 6, 1833, p. 172.

Ligia dilatata STIMPSON, Bost. Jour. Nat. Hist., vol. 6, 1857, p. 507, pl. 22, fig. 8.—SMITH, Report Progress Geol. Survey of Canada, 1880, p. 218.—UNDERWOOD, Bull. Ill. State Lab. Nat. Hist., vol. 2, 1886, p. 361.

Ligia septentrionalis LOCKINGTON, Proc. Cal. Acad. Sci., vol. 7, 1877, pt. 1, p. 46.

Ligia stimpsoni MIERS, Proc. Zool. Soc. London, 1877, p. 671 (footnote).

Ligia pallasii BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 261–262.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 866; Ann Mag. Nat. Hist. (7), vol. 4, 1899, p. 334; American Naturalist, vol. 34, 1900, p. 306; Harriman Alaska Expedition, Crust., vol. 10, 1904, p. 226; Proc. U. S. Nat. Mus., vol. 27, 1904, p. 670.

Ligyda pallasii RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 682–684.

Localities.—Attu Island; Nazan Bay, Atka.

Depth.—Shore.

LIGYDA EXOTICA (Roux).

Ligia exotica ROUX, Crust. Medit., 1828, p. 3, pl. 13, fig. 9.—BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 266–268.—RICHARDSON, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 866; Ann Mag. Nat. Hist. (7), vol. 4, 1899, p. 335; American Naturalist, vol. 34, 1900, p. 306; Proc. U. S. Nat. Mus., vol. 23, 1901, p. 575.

Ligia gaudichaudii DANA, U. S. Expl. Exp., Crust., vol. 14, 1853, p. 741, pl. 49, figs. 6a-h.

Ligyda exotica RICHARDSON, Bull. U. S. Nat. Mus., No. 54, 1905, pp. 676-677.

Localities.—Matsushima; Same, Rikuoku, Japan.

Depth.—Shore.

LIGYDA CINERASCENS (Budde-Lund).

Ligia cinerascens BUDDE-LUND, Crust. Isop. Terrestria, 1885, p. 265.

Locality.—Hakodate, Japan. Budde-Lund says of the type that it is uncertain whether it comes from Manila or Chile, or was taken in Japan, but he thinks it very likely to have come from Japan.

About six specimens, which I hesitatingly refer to this species, were taken at Hakodate, Japan. They differ from *Ligyda exotica* in having shorter antennæ which do not reach beyond the last thoracic segment and in the much shorter uropoda, which do not quite equal half the length of the body. The body is also more thickly granulated than that of *L. exotica*, and the color is uniformly dark gray.

LIST OF REFERENCES.

- BATE, C. SPENCE. Lord's Naturalist in British Columbia, vol. 2, 1866. London.
- BEDDARD, FRANK E. Report on the Isopoda. Report of the scientific results of the voyage of H. M. S. *Challenger* during the years 1873-1876. Vol. 17, 1886, pp. 1-175. London.
- BENEDICT, JAMES E. A revision of the genus *Synidotea*. Proc. Acad. Nat. Sci. Phila., 1897, pp. 389-404. Philadelphia.
- . The Arcturidæ in the U. S. National Museum. Proc. Biol. Soc. Washington, vol. 12, 1898, pp. 41-51. Washington.
- BONNIER, JULES. Contribution à l'étude des Épicarides—les Bopyridæ. Travaux de la Station Zoologique de Wimereux, vol. 8, 1900, pp. 1-396, pls. 1-41. Paris.
- BOSC, LOUIS A. G. Histoire Naturelle des Crustacés, vol. 2, 1802. Paris.
- BOUVIER, E. L. Observations nouvelles sur les Bathynomus, isopodes gigantesques des grands fonds. Compt. Rend. Acad. Sci., vol. 132, 1901, No. 10, pp. 643-645. Paris, 1901.
- BOUVIER, E. L., and EDWARDS, A. MILNE. Reports on the results of dredging under the supervision of Alexander Agassiz in the Gulf of Mexico (1877-1878), in the Caribbean (1878-1879), and along the Atlantic coast of the United States (1880), by the U. S. Coast Survey steamer *Blake*, Lieut. Commander C. D. Sigsbee, U. S. Navy, and Commander J. R. Bartlett, U. S. Navy, commanding. XL. Les Bathynomes. Memoirs, Museum Comparative Zoology at Harvard College, vol. 27, No. 2, 1902, pp. 159-165, pls. 7-8. Cambridge.
- BOVALLIUS, CARL. A new Isopod from the coast of Sweden. Bihang till K. Svenska Vetensk. Akad. Handlingar, vol. 10, No. 10, pp. 3-10, pls. 1-2. Stockholm, 1885.
- . New or imperfectly known Isopoda. Pt. II. Bihang till K. Svenska Vet.-Akad. Handlingar, vol. 11, No. 17, pp. 1-18, 1886, pls. 1-2. Stockholm.
- BRANDT, F. Middendorff's Reise in den aussersten Norden und Osten Sibiriens, vol. 2, Zool., pt. 1, 1851, pp. 145-147. St. Petersburg.

- BRANDT, J. F. *Conspectus Monographiæ Crustaceorum Oniscodorum Latreillii*. Bull. Soc. Impér. des Natur. de Moscou, vol. 6, 1833, pp. 171–193. Moscou.
- BUDE-LUND, G. *Crustacea Isopoda Terrestria per familias et genera et species descripta*, 1885. Hauniæ.
- CALMAN, W. T. On a collection of Crustacea from Puget Sound. Ann. N. Y. Acad. Sci., vol. 11, 1898, pp. 259–292. New York.
- DANA, JAMES D. *Crustacea*. U. S. Expl. Exped., vol. 14, 1853, pp. 696–805, atlas, pls. 46–53. Philadelphia.
- Catalogue and descriptions of Crustacea by Dr. John L. LeConte. Proc. Acad. Nat. Sci. Phila., vol. 7, 1854–55, pp. 175–177. Philadelphia.
- DOLLFUS, ADRIEN. Sur quelques isopodes du Musée de Leyde. Notes Leyd. Museum, vol. 11, 1889, note 21, pp. 91–94. Leyden.
- EDWARDS, H. MILNE. *Histoire Naturelle des Crustacés*, vol. 3, 1840, pp. 115–284, pls. 31–33. Paris.
- HAAAN, WILLEM DE. *Fauna Japon., Crust.*, vol. 50, 1850, p. 227, fig. 7*a*—*b*. Lugduni-Batavorum.
- HANSEN, H. J. *Cirolanidæ et familiæ nonnullæ propinquæ Musei Hauniensis*. Vidensk. Selsk. Skr., 6 te Række, naturvidenskabelig og mathematisk Afd., vol. 5, pt. 3, 1890. Kjobenhavn.
- HARGER, OSCAR. Report on the marine Isopoda of New England and adjacent waters. Report of the U. S. Commissioner of Fish and Fisheries, 1878, pt. 6, pp. 297–462, pls. 1–13. Washington, 1880.
- Reports on the results of dredging, under the supervision of Alexander Agassiz, on the east coast of the United States during the summer of 1880, by the U. S. Coast Survey steamer *Blake*, Commander J. R. Bartlett, U. S. Navy, commanding. XXIII. Report on the Isopoda. Bull. Museum Comparative Zool., Harvard College, vol. 11, No. 4, 1883, pp. 91–104, pls. 1–4. Cambridge.
- HILGENDORF, F. Ueber eine neue Isopoden-Gattung *Leptospharroma* aus Japan. SB. Nat. Fr., 1885, pp. 185–187. Berlin.
- Bemerkungen über zwei Isopoden, die Japanische Susswasser-Assel (*Asellus hilgendorfi*, Bov.) und eine neue Munna-Art. SB. Ges. naturf. Berlin, 1893, pp. 1–3. Berlin.
- KÆLBEL, CARL. Ueber einige neue Cymothoiden. SB. Akad. Wien, vol. 78, pt. 1, 1878, pp. 401–415, pls. 1–2. Wien.
- KRØYER, HENRIK. Grønlands Amphipoder. Kongelige Danske Videnskabenes Selskabs naturvidenskabelige og mathematiske Afhandlinger, vol. 7, 1838, pp. 229–326 (1–98), pls. 1–4. Copenhagen.
- *Bopyrus abdominalis* Krøyer. Nat. Tidsskr., vol. 3, 1840–41, pp. 102–112, 289–299. Copenhagen.
- Karcinologiske Bidrag. Naturh. Tidsskr. (2), 1846–49, pp. 1–123, 366–446. Copenhagen, 1846–49.
- LEACH, W. E. *Cymothoadées*. Dict. des Sci. Nat., vol. 12, 1818, pp. 338–354. Paris.
- LILLJEBORG, WILHELM. Hafs-Crustaceer vid Kullaberg. Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, vol. 9, 1852, pp. 1–13. Stockholm.
- LINNÆUS, CARL VON. *Systema naturæ*. 12th ed., vol. 1, pt. 2, 1767. Holmiæ.
- LOCKINGTON, W. N. Description of Seventeen New Species of Crustacea. Proc. Cal. Acad. Sciences, vol. 7, 1876, pt. 1, pp. 44–46. San Francisco, 1877.
- MIERS, E. J. On a collection of Crustacea, Decapoda and Isopoda, chiefly from South America, with descriptions of New Genera and Species. Proc. Zool. Soc. London, 1877, pp. 653–679, pls. 66–69. London.
- Revision of the Idoteidæ, a family of Sessile-eyed Crustacea. Journ. Linn. Soc. London, vol. 16, 1883, pp. 1–88, pls. 1–3. London.

- NORMAN, ALFRED MERLE. British Isopoda of the families Egidæ, Cirolanidæ, Idoteidæ, and Arcturidæ. *Ann. Mag. Nat. Hist.* (7), vol. 14, 1904, pp. 430-450, pls. 12-13. London.
- ORTMANN, A. E. A new species of the Isopod genus *Bathynomus*. *Proc. Acad. Nat. Sci. Phila.*, 1894, pp. 191-193. Philadelphia, 1895.
- OWEN, RICHARD. The zoology of Captain Beechey's Voyage to the Pacific Ocean and Bering's Straits, performed in H. M. S. *Blossom* in the years 1825-1828. London, 1839.
- RICHARDSON, HARRIET. Description of four new species of *Rocinela*, with a synopsis of the genus. *Proc. Amer. Philos. Soc.*, vol. 37, 1898, pp. 8-17. Philadelphia.
- Key to the Isopods of the Pacific Coast of North America, with descriptions of twenty-two new species. *Proc. U. S. Nat. Mus.*, vol. 21, 1899, pp. 815-869. Washington. (Reprinted in *Ann. Mag. Nat. Hist.* (7), vol. 4, 1899, pp. 157-187, 260-277, 321-338. London.)
- Description of a new species of *Idotea* from Hakodate Bay, Japan. *Proc. U. S. Nat. Mus.*, vol. 22, 1900, pp. 131-134. Washington.
- Synopses of North American Invertebrates. VIII. The Isopoda. *American Naturalist*, vol. 34, 1900, pp. 207-230, 295-309. Boston.
- Key to the Isopods of the Atlantic Coast of North America, with descriptions of new and little-known species. *Proc. U. S. Nat. Mus.*, vol. 23, 1901, pp. 493-579. Washington.
- Contributions to the Natural History of the Isopoda. II. Isopoda collected in Japan by Jordan and Snyder. *Proc. U. S. Nat. Mus.*, vol. 27, 1904, pp. 46-51. Washington.
- Contributions to the Natural History of the Isopoda. I. Isopoda collected in Japan in the year 1900 by the U. S. Fish Commission steamer *Albatross*, and in the year 1881 by the U. S. S. *Palos*. *Proc. U. S. Nat. Mus.*, vol. 27, 1904, pp. 32-46. Washington.
- Isopod Crustaceans of the Northwest Coast of North America. Harri- man Alaska Expedition. *Crust.*, vol. 10, 1904, pp. 213-230. New York. (Reprinted in *Proc. U. S. Nat. Mus.*, vol. 27, 1904, pp. 657-671. Washington.)
- Isopods of the Alaska Salmon Investigation. *Bull. U. S. Bureau of Fisheries*, vol. 24, 1904, pp. 209-221. Washington, 1905.
- A Monograph on the Isopods of North America. *Bull. U. S. Nat. Mus.*, No. 54, 1905, pp. 1-727. Washington.
- Description of new Isopod Crustaceans of the Family Spheromidæ. *Proc. U. S. Nat. Mus.*, vol. 31, 1906, pp. 1-22. Washington.
- On some Isopods of the Family *Dajidæ* from the northwest Pacific Ocean, with descriptions of a new genus and two new species. *Proc. U. S. Nat. Mus.*, vol. 33, 1908, pp. 689-696. Washington.
- ROUX, JEAN L. F. P. *Crustacés de la Méditerranée et de son littoral*. 1828. Paris and Marseilles.
- SARS, GEORGE O. Crustacea of the Norwegian North Atlantic Expedition, 1876-1878. Christiania, 1885.
- Oversigt af Norges Crustaceer med foreløbige Bemærkninger over de nye eller mindre bekendte Arter. 1. Forhandlinger i Videnskab Selskabet i Christiania, Nr. 18, pp. 1-124, 1882. Christiania, 1883.
- SCHIODTE, J. C., and MEINERT, FR. *Symbolæ ad Monographiam Cymothoarum, Crustaceorum Isopodum Familie*. II. *Anilocridæ*. *Naturhistorisk Tidsskrift* (3), vol. 13, 1881-83, pp. 1-167, pls. 1-10. Kjøbenhavn.
- *Symbolæ ad Monographiam Cymothoarum, Crustaceorum Iso- podum Familie*. (Continuato.) *Addimenta*. *Index Systematicus*. *Index Alphabeticus*. *Naturhistorisk Tidsskrift* (3), vol. 14, 1883-84, pp. 360-362, 413-414, pl. 15, figs. 1-2; pl. 18, fig. 13. Kjøbenhavn, 1884.

SMITH, S. I. Notes on Crustacea collected by Dr. G. M. Dawson at Vancouver and the Queen Charlotte Islands. Report of Progress of the Geological Survey of Canada, 1878-79, p. 218. Montreal, 1880.

STEBBING, T. R. R. History of Crustacea, 1893. New York.

STIMPSON, WILLIAM. The Crustacea and Echinodermata of the Pacific shores of North America. Boston Journ. Nat. Hist., vol. 6, 1857, pp. 503-513. Boston.

——— On an oceanic Isopod found near the southeastern shores of Massachusetts. Proc. Acad. Nat. Sci. Phila., vol. 14, 1863, pp. 133-134. Philadelphia.

——— Descriptions of new marine invertebrates from Pugets Sound, collected by naturalists of the Northwest Boundary Commission. Proc. Acad. Nat. Sci. Phila., vol. 16, 1864, pp. 155-156. Philadelphia.

UNDERWOOD, LUCIEN. List of the described species of fresh-water Crustacea from America north of Mexico. Bull. Ill. State Lab. Nat. Hist., vol. 2, 1886, pp. 358-364. Champaign, Illinois.