

No. 1. — *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. N., Commanding.*

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XVII.

Report on the Crustacea. Part I. DECAPODA. By SIDNEY I. SMITH.

THE part of the following report relating to the *Macrura* was ready for the printer before Alphonse Milne-Edwards's *Description de quelques Crustacés Macroures provenant des grandes profondeurs de la Mer des Antilles* (Annales Sci. Nat., Zool., 6^me série, XI. No. 4, 1881) was received, so that all the references to it have been added subsequently. The new species in this and some other recent papers of Milne-Edwards, and in Bates's recent paper on the *Penæidea*, are so imperfectly characterized that in several cases I have found it impossible to determine, with any approximation to certainty, whether or not they are identical with species described in the following pages. I have endeavored, however, to make the descriptions and figures of the species here described so complete, that subsequent investigators will not labor under a similar difficulty in regard to them.

BRACHYURA.

MAIOIDEA.

Amathia Agassizii, sp. nov.

Plate II. Figs. 2, 3.

Resembles *A. Carpenteri* Norman (figured by Wyville Thomson, *Depths of the Sea*, p. 175, 1873), but has shorter rostral horns and more numerous spines upon the carapax.

The carapax is sub-triangular, excluding spines and rostral horns, nearly

four fifths as broad as long, or with the breadth including spines about equal to the length excluding the rostral horns, which are strongly divergent, nearly straight, and in the adult less than half as long as the rest of the carapax. The supra-orbital spines are large, acute, and much more prominent than the obtuse post-orbital processes. The basal segment of the antenna is armed with two large and nearly equal spines beneath the eye, one near the base, the other near the tip. The hepatic region projects above the lateral margin in a prominent spine about a third of the way from the orbit to the great branchial spine. The anterior angles of the buccal area project in angular dentiform processes, back of which the prominent margin of the pleural region is armed with two or three small and unequal spines. There are six spines or spiniform tubercles on the gastric region, two median, and each side two slightly smaller lateral, which are nearer together than the median. There are three median spiniform tubercles on the cardiac region, of which the middle one is much the more prominent, and back of these the posterior margin of the cardiac region projects in a prominent median spine, either side of which the postero-lateral margin is ornamented with a regular series of six or seven minute tubercles. The middle of the branchial region projects in a spine directed straight outward and a little upward, which is the largest upon the carapax, and about half as long as the rostral horns; on a line between this and the postero-lateral gastric spine there are two spines near together; and back of these on the posterior part of the region there is a single spine opposite the large cardiac spine. In addition to these dorsal spines of the branchial region there is a lateral closely set series of three or four small spines just below the pleural suture and above the base of the cheliped, and a similar but isolated spine below and back of the great branchial spine. The entire surface of the carapax and of the sternum, and of the exposed parts of the appendages, except the terminal portions of the chelæ and of the dactyli of the ambulatory legs, is covered with soft scabrous papillæ, and sparsely clothed with short setæ.

The chelipeds are a little longer than the carapax including the rostral horns, and scarcely stouter than the ambulatory legs; the chela is nearly as long as and no stouter than the merus, the basal portion subcylindrical, nearly naked and smooth except for minute, scattered papillæ, like those on the surface generally except that they are smaller and much more scattered; the digits are a little more than half as long as the basal portion, a little curved, slightly compressed, smooth, and with the prehensile edges regularly dentate. The ambulatory legs are all armed with a dentiform spine at the distal end of the merus; the first pair are nearly twice as long as the chelipeds, and the succeeding pairs are successively a little shorter.

The second and third segments of the abdomen of the male are expanded, and the first and second are each armed with a small median tubercle.

Station 319, N. Lat. $32^{\circ} 25'$, W. Long. $77^{\circ} 42' 30''$, 262 fath. ; 1 ♂.

A very much smaller specimen (Plate II. fig. 3) from Station 317 differs so much from the one above described that it might readily be mistaken for a distinct species. It is apparently an immature male, and differs in having a

narrower carapax, with much longer rostral horns and fewer and much longer spines.

The carapax, excluding the rostral horns and lateral spines, is about two thirds as broad as long; the rostral horns are as long as the breadth of the carapax excluding the spines, nearly straight, slender, and very acute. There are two spines upon the basal segment of the antenna, but the proximal is much smaller than the distal. The hepatic spine is slender, and about a fourth as long as the rostral horns. There is only one small spine, or one with the rudiment of a second, on the margin of the pleural region back of the anterior angle of the buccal area. The two median spines of the gastric region are slender and conspicuous, the posterior much the larger, but there are no lateral spines. The middle spine of the cardiac region is as long as the hepatic, and in front of its base there is a rudiment of a second; the posterior cardiac spine is slender and very little shorter than the hepatic, but there are no spines or tubercles either side its base. The middle spine of the branchial region is slender, and more than half as long as the rostral horns; there is a single small spine in place of the two anterior branchial; a small posterior branchial is present; and in place of the series of small spines there are two very minute tubercles.

The chelipeds and ambulatory legs are nearly as in the other specimen, but the chelæ and the dactyli of the ambulatory legs are a little more hairy.

Station 317, N. Lat. $31^{\circ} 57'$, W. Long. $78^{\circ} 18' 35''$, 333 fath.

The two specimens give the following measurements.

Station	319	317
Sex	♂	Young
Length of carapax including rostrum and posterior spine	35.2 mm.	13.1 mm.
Length of carapax from base of rostrum to tip of posterior spine	27.5	8.4
Length of rostral horns	8.5	5.1
Breadth of carapax, including lateral spines	27.0	10.5
“ “ excluding “ “	20.3	5.1
Length of branchial spine	4.5	3.0
“ cheliped	37	8
“ first ambulatory leg	63	16
“ second “	43	13

Since the above was written several specimens of this species have been taken off Martha's Vineyard by the United States Fish Commission. All these specimens are intermediate in size between those above described, and show that they are really, as supposed, stages of growth of a single species.

Hyas coarctatus LEACH.

One young specimen, Station 301, N. Lat. $41^{\circ} 26' 55''$, W. Lon. $66^{\circ} 3'$, 71 fath.

Euprognatha rastellifera STIMPSON.

STIMPSON, Bull. Mus. Comp. Zoöl., II. p. 123, 1870.

A. M.-EDWARDS, Crust. Région Mexicaine, p. 183, Pl. XXXIII. fig. 2, 1878 ; Bull. Mus. Comp. Zoöl., VIII. p. 7, 1880.

SMITH, Proc. National Mus., Washington, III. p. 415, 1881.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
335	38° 22' 25"	73° 33' 40"	89	1 ♂.
345	40° 10' 15"	71° 4' 30"	71	70 ♂ ♀.
346	40° 25' 35"	71° 10' 30"	44	1 ♀.

This is apparently by far the most abundant of all the Brachyura along our whole eastern coast south of Cape Cod in the belt from 50 to 200 fath. depth. In the U. S. Fish Commission dredgings off Martha's Vineyard, many thousands of specimens were often taken at a single haul of the trawl.

CANCROIDA.**Cancer irroratus** SAY.

Cancer irroratus SAY, Jour. Acad. Nat. Sci. Philadelphia, I. p. 59 (♂ only, ♀ being *C. borealis*), Pl. IV. fig. 2, 1817.

STIMPSON, Ann. Lyceum Nat. Hist. New York, VII. p. 50 (4), 1859.

SMITH, Trans. Conn. Acad., V. p. 38, 1879.

KINGSLEY, Proc. Acad. Nat. Sci., 1879, p. 391, 1880.

Platycarcinus irroratus M.-EDWARDS, Hist. Nat. Crust., I. p. 414, 1834.

DEKAY, Nat. Hist. New York, Crust., p. 6 (in part), Pl. II. fig. 2, 1844.

Cancer Sayi GOULD, Invertebrata Massachusetts, 1st ed., p. 323, 1841.

Platycarcinus Sayi DEKAY, *op. cit.*, p. 7, 1844.

Cancer borealis PACKARD, Memoirs Boston Soc. Nat. Hist., I. p. 303, 1867.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
314	32° 24' 0"	78° 44' 0"	142	2 ♀.
327	34° 0' 30"	76° 10' 30"	178	6 ♂, 2 ♀.
333	35° 45' 25"	74° 50' 30"	65	1 ♂.

The occurrence of this abundant shallow-water and littoral northern species in deep water south of Cape Hatteras is very interesting. As a littoral species it is apparently not abundant south of Cape Hatteras, and on the New England coast fully grown individuals are certainly rare below twenty fathoms. The alcoholic specimens from deep water are lighter in color than similar specimens from shallow water, but this may be partially due to the fact that they are entirely devoid of all algaic growths which are common on shallow-water individuals ; and the edges of the carapax appear more acutely dentated, which is easily explained by the fact that they are not subjected to the abrading influence of sand and gravel as the shallow-water specimens are. The following measurements show no appreciable difference from shallow-water specimens in the proportions of the carapax,

Station.	Sex.	Length of Carapax.	Breadth of Carapax.	
333	♂	25.0 mm.	38.7 mm. = 1.55 lgth.	
327	"	36.3	56.0	1.54
"	"	37.2	59.0	1.59
"	"	37.2	59.1	1.59
"	"	40.5	64.8	1.60
"	"	41.0	64.8	1.58
"	"	59.7	94.0	1.59
"	♀	39.0	61.5	1.58
"	"	39.1	62.0	1.56

Cancer borealis STIMPSON.

Cancer irroratus SAV, Jour. Acad. Nat. Sci. Philadelphia, I. p. 57, 1817 (♀ only, ♂ being *C. irroratus*).

GOULD, Invertebrata Massachusetts, 1st ed., p. 322, 1841

STIMPSON, Invertebrata Grand Manan, p. 59, 1853 (*teste* Stimpson).

Platycarcinus irroratus DEKAY, Nat. Hist. New York, Crust., p. 6 (but not the fig.), 1844.

Cancer borealis STIMPSON, Ann. Lyceum Nat. Hist. New York, VII., p. 54(4), 1859.

SMITH, Inverteb. Vineyard Id., Report U. S. Fish Com., I. pp. 546 (252), 745 (451), 1874; Trans. Conn. Acad., V. p. 39, Pl. VIII. 1879; Proc. National Mus., Washington, III. p. 417, 1881.

KINGSLEY, Proc. Acad. Nat. Sci. Philadelphia, 1878, p. 317 (2).

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
314	32° 24' 0"	78° 44' 0"	142	1 ♂, 3 ♀, 3 young.
321	32° 43' 25"	77° 20' 30"	233	6 ♂, 4 ♀.
327	34° 0' 30"	76° 10' 30"	178	3 ♂, 1 ♀, 8 young.

Fifteen of the specimens give the following measurements.

Station.	Sex.	Length of Carapax.	Breadth of Carapax.	
314	Young.	15.2 mm.	21.5 mm. = 1.41 lgth.	
"	"	16.7	24.3	1.45
321	♀	22.3	33.2	1.48
"	"	25.3	38.0	1.50
327	"	47.0	73.0	1.55
314	"	49.3	76.0	1.54
321	♂	32.5	49.0	1.51
"	"	38.0	59.5	1.56
314	"	46.0	72.0	1.56
327	"	47.0	74.5	1.59
321	"	47.6	75.5	1.59
327	"	63.0	101.2	1.60
"	"	76.0	120.0	1.58
314	"	78.0	123.0	1.58
"	"	80.0	129.0	1.61

This species has also been taken in considerable abundance, in 50 to 200 fathoms, off Martha's Vineyard, by the U. S. Fish Commission. The remarks under the last species in regard to coloration, acuteness of the dentation of the edge of the carapax, etc., apply equally well to this species. The fact that this species and *C. irroratus* as well are regular inhabitants of the deep water off our southern coast is sufficient to account for their occasional occurrence in shallow water at the Bermudas, and even in the West Indies.

Cancer Bellianus Johnson (Proc. Zoöl. Soc. London, 1861, p. 240, Pl. XXVIII.) from Madeira, is much like this species, but apparently distinct from it.

Geryon quinquedens SMITH.

Trans. Conn. Acad., V. p. 35, Pl. IX. figs. 1-1 b, 2, 1879; Proc. National Mus. Washington, III. p. 417, 1881.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
325	33° 35' 20''	76° 0' 0''	647	1 ♂
332	35° 45' 30''	74° 48' 0''	263	2 ♂
334	38° 20' 30''	73° 26' 40''	395	2 ♂
337	38° 20' 8''	73° 23' 20''	740	Fragments only.
343	39° 45' 40''	70° 55' 0''	732	3 ♀ with eggs.
309	40° 11' 40''	68° 22' 0''	304	1 ♂, 1 ♀ "
312	39° 50' 45''	70° 11' 0''	466	1 ♂

These specimens and others recently obtained by the U. S. Fish Commission show that this species grows to be one of the largest of the Brachyura. The very large individuals differ considerably from the specimens originally described. In all the large specimens the teeth of the antero-lateral margin of the carapax become reduced to angular tubercles, and in some of the larger ones the fourth tooth becomes entirely obsolete. Thus in specimens No. 2, 3, 5, 7, and 8 of the table of measurements given below, the fourth tooth is distinct; in No. 9, distinct, but very obtuse; in No. 4, distinct, but the right side of the carapax deformed by some injury; in No. 1, nearly obsolete; while in Nos. 6 and 10 it is entirely obsolete.

Ten specimens give the following measurements:—

No.	Station.	Sex.	Length of Carapax.	Breadth including spines.	Breadth excluding spines.
1	312	♂	41.0 mm.	51.6 mm. = 1.26 lgth.	45 mm. = 1.10 lgth.
2	309	"	54.0	65.5 1.21	61 1.13
3	334	"	81.0	97.0 1.20	89 1.10
4	"	"	94.0	113.0 1.20	104 1.11
5	332	"	116.0	136.5 1.18	128 1.10
6	"	"	130.0	152.5 1.17	144 1.11
7	309	♀	47.5	61.0 1.28	55 1.16
8	343	"	82.5	99.5 1.21	92 1.12
9	"	"	84.0	100.0 1.19	91 1.18
10	"	"	92.0	107.5 1.17	101 1.10

In four of the above specimens the greatest expanse of the ambulatory legs, which is at next to the last pair, is as follows. No. 5, 540 mm.; No. 6, 625 mm. (24.6 inches); No. 8, 380 mm.; No. 10, 417 mm. The chelæ are almost exactly alike on the two sides, and in the largest male and largest female give the following measurements:—

No.	RIGHT CHELA.			LEFT CHELA.		
	Length.	Height.	Length of Dactylus.	Length.	Height.	Length of Dactylus.
6	114 mm.	42	62	112	38	62
" 10	68	25	39	68	23	38

OXYSTOMATA.

CALAPPIDÆ.

Acanthocarpus Alexandri STIMPSON.

STIMPSON, Bull. Mus. Comp. Zoöl., II. p. 153, 1870.

A. M.-EDWARDS, Ibid., VIII. p. 19, Pl. I. fig. 2, 1880.

SMITH, Proc. National Mus., Washington, III. p. 418, 1881.

Station 345, N. Lat. 40° 10' 15", W. Long. 71° 4' 30", 71 fathoms. A single male recently moulted and very soft, the carapax about 36.0 mm. long and 36.1 broad. It has also been taken at several stations off Martha's Vineyard by the U. S. Fish Commission in 1880 and 1881, and in living specimens from these stations the dorsal surface of the carapax and chelipeds was pale reddish orange, deepest in color upon the elevations of the carapax and upon the bases of the carpal spines of the chelipeds; while the carapax beneath, the sternum, abdomen, and the under surfaces of the chelipeds and ambulatory legs are white, very slightly tinged with reddish.

DORIPPIDÆ.

Cyclodorippe nitida A. M.-EDWARDS.

Bull. Mus. Comp. Zoöl., VIII. p. 24, 1880.

Plate II. Figs. 1-1^b.

Station 319, N. Lat. 32° 25', W. Long. 77° 42' 30", 262 fath. One specimen, which gives the following measurements:—

Station	319
Sex	♀
Length of carapax to middle of front	6.1 mm.
" " including frontal teeth	6.4
Breadth between tips of lateral teeth	6.9
Greatest breadth back of lateral teeth	6.9
Length of cheliped	10.0

Length of chela	5.0 mm.
Breadth of "	1.7
Length of its dactylus	2.8
" first ambulatory leg	9.0
" dactylus	2.0
" second ambulatory leg	11.6
" dactylus	3.2
" telson	2.5
Breadth of "	4.8

ANOMURA.

LITHODIDEA.

Lithodes Agassizii, sp. nov.

Plate I.

This species is allied to *L. maia* and *L. antarctica* in having no scale and only a single spine at the base of the antenna, and in the general form and armament of the carapax and appendages, but differs from them both conspicuously in the rostrum, which is rather short and tridentate, with the lateral spines nearly as long as the rostral spine itself. The spines upon the carapax and appendages are more numerous and much more acute than in *L. maia*, and the marginal spines of the carapax are not very much larger than the dorsal. There are only two adults, both females, in the collection, and these differ remarkably from each other, and from three very young specimens, in the number and length of the spines upon the carapax and legs.

In the larger specimen the carapax, excluding the rostrum and spines, is about nine tenths as broad as long, with a conspicuous sinus in the middle of the posterior margin. The rostrum is very short, with an acute central spine scarcely as long as the eye-stalks and with a somewhat shorter lateral spine arising either side its base and directed upward and outward. The gastric region is swollen and very high, separated from the cardiac by a very deep depression, and armed with a pair of small spines just back of the lateral spines of the rostrum, and back of these on the highest part of the region with two widely separated pairs of much larger spines, while either side there is a small spine opposite the large hepatic spine, between which and the obtusely spiniform external angle of the orbit there are two spinigerous angular prominences in the antero-lateral margin. There is a distinct notch in the antero-lateral margin at the cervical suture, but back of this the margin is regularly arcuate to the middle of the posterior margin, and is armed with about thirteen stout spines, of which the larger are about as large as the hepatic spines. The branchial region is considerably convex, and armed, in addition to those upon the margin, with about ten large spines, between which there are a consider-

able number of low obtuse spines or tubercles. The cardiac region is separated from the branchial each side by a deep sulcus, is prominent and armed with two pairs of large spines, and back of these with a single one in the middle line.

The eyes, antennulæ, antennæ, and the exposed parts of the oral appendages are very nearly as in *L. maia*. The chelipeds are nearly equal in length, but the right is much stouter than the left, are armed with comparatively few and small spines, and the digits of the chelæ are about two thirds of the entire length of the chela, slender, tapering, and strongly curved. The ambulatory legs are very long, those of the third pair being nearly three times as long as the breadth of the carapax excluding spines. The ischial, meral, and carpal segments are armed with only a very few scattered and very small spines, the meral segments in the first and second pairs are almost entirely unarmed except a few small spines or teeth along the upper edges, but the propodi, which are slender and fully as long as the corresponding meri, are armed along the edges with more numerous and very sharp but small spines. The dactyli are about half to considerably more than half the length of the corresponding propodi, slightly curved, acute, and, except near the tips, armed with small and acute spines.

The plates of the second somite of the abdomen are armed with numerous spines projecting backward and upward, and of which those upon the middle plate are longer than those upon the lateral. The plates of the succeeding somites of the abdomen are very unequally developed, the plates of the left hand side of the third, fourth, and fifth somites being greatly developed at the expense of the corresponding plates of the opposite side, so that the outer edge of the left side of the fifth segment lies beneath the bases of the cheliped and first ambulatory leg of the right side, and the small semicircular telson is beneath, or a very little in front of the base of the second ambulatory leg of the right side.

In the smaller of the adult specimens (Pl. I. fig. 1) the carapax, excluding rostrum and spines, is proportionally narrower than in the larger specimen, being about eight tenths as broad as long, and the spines upon the carapax, abdomen, and appendages are much longer and more numerous, the additional spines appearing between the large ones corresponding to the spines, or in place of the tubercles, on the larger specimen. The rostral spine and the spines at its base are absolutely more than twice as long as in the larger specimen and more slender, and about the same proportion holds for all the principal spines of the carapax. The external angle of the orbit projects in a spine but little shorter than the eye-stalk, and back of it there are two nearly as large spines on the antero-lateral margin in place of the two angular prominences of the larger specimen. The large hepatic spine and the thirteen large marginal spines back of the cervical suture are most of them but little smaller than the rostral spine, are directed more upward than outward, and there are nearly as many more additional smaller spines alternating with the larger. There is a conspicuous additional spine in the middle of the gastric region, and numerous additional small spines on other parts of the carapax.

The chelipeds and ambulatory legs have about the same proportions as in the larger specimen, but are armed with very numerous acute spines, many of which are of large size. The spines upon the second somite of the abdomen are more numerous, and the larger ones much longer and more slender than in the larger specimen.

The small specimens are all immature, with the carapax excluding the rostrum and spines less than 13 mm. in length, and differ so much from the adults that they might readily be mistaken for a distinct species. These small specimens differ considerably in size, but are all essentially alike. The smallest and most perfect one is from the U. S. Fish Commission dredgings off Martha's Vineyard. In this specimen (Pl. I. figs. 2, 2^a) the carapax excluding the rostrum and spines is only 12.6 mm. in length and scarcely more than seven tenths as broad as long, but all three of the rostral spines and several spines of the carapax proper are more than half as long as the carapax. The spines are much fewer in number than in either of the adult specimens, very slender and acute, and those at the base of the rostrum are just about as large as the rostrum itself. The gastric region is proportionally very much larger than in the adults, but is high and separated from the cardiac region by a deep sulcus, as in them, and is armed with six slender spines, — two pairs on the highest part of the region, of which the anterior pair are almost as long as the rostrum, but the posterior considerably shorter, and a still smaller lateral spine each side. There are two pairs of slender spines on the anterior part of the cardiac region, the anterior a little longer and the posterior a little shorter than the posterior gastric spines. The single hepatic spine each side is nearly as long as the rostrum. The external angle of the orbit projects forward in a long and slender spine, back of which are two smaller spines on the antero-lateral margin. There are about twelve slender spines on the lateral and posterior margin back of the cervical suture each side, but they are all small compared with the other spines of the carapax and about half of them are inconspicuous, and above these on either branchial region there are six much larger spines, of which two near the middle of the region are as long as the posterior gastric, but the others considerably shorter.

The eye-stalks and eyes are small and proportionally but little larger than in the adult, but there are two or three sharp spines projecting in front over the eye in place of some inconspicuous tubercles in the adults. The antennæ, antennæ, and the exposed parts of the oral appendages, are nearly as in the adults.

The chelipeds are nearly as unequal as in the adults, and are armed with very much longer and more slender spines, several of those upon the distal part of the merus and upon the carpus being longer than the carpus itself. The ambulatory legs have about the same proportions as in the adults, but the spines with which they are armed are fully as long as those upon the chelipeds, the longer ones, as in the chelipeds, being upon the distal parts of the meri and upon the carpi.

The abdomen is *symmetrical*. The second somite is made up of three calci-

fied and spiny plates, nearly as in the adult female. The third, fourth, and fifth somites are soft, scarcely at all calcified, and show no distinct division into somites. The sixth is small and sunken for its whole length in the proximal somites, while the seventh is still smaller and rounded at the extremity.

Four of the five specimens seen give the following measurements : —

Station	1029	305	329	326
Sex	Young.	Young.	♀	♀
Length of carapax including rostrum and posterior spines	17.5	25+	115	139
Length of carapax excluding rostrum and posterior spines	9.1	12.6	90	123
Breadth of carapax between tips of hepatic spines,	13.5	18+	57	64
“ “ “ “ branchial spines,	13.0	18+	87	117
Greatest breadth of carapax excluding spines	6.6	9.0	77	110
Length of rostrum	7.3	9+	17	8
“ spines at base of rostrum	7.4	11.5	16	7
“ anterior gastric spines	7.0	10.5	12	5
“ “ cardiac	6.3	8.0	10	5
“ right cheliped	15.0	19.0	126	171
“ “ chela	6.1	8.5	55	66
Breadth of “ “	1.9	2.5	18	25
Length of dactylus of right chela	3.5	5.0	35	44
“ left cheliped	15.0	20.0	126	167
“ “ chela	6.0	8.8	50	62
Breadth of “ “	1.5	1.9	14	19
Length of dactylus of left chela	3.8	5.5	36	44+
“ first ambulatory leg	18.5	30.0	220	270
“ second “ “	19.5	31.5	245	310
“ third “ “	19.5	32.0	260	320
Greatest expanse of ambulatory legs	43.0	65.0	560	720

Station.	N. Lat.	W. Long.	Fathoms.
305	41° 33' 15"	65° 51' 25"	810
326	33° 42' 15"	76° 0' 50"	464
329	34° 39' 40"	75° 14' 40"	603

Also taken by the U. S. Fish Commission, off Martha's Vineyard, in 1881, Stations 1028 and 1029, 410 and 458 fathoms; one young specimen in each case.

PAGURIDEA.

PAGURIDÆ.

Eupagurus Krøyeri STIMPSON.

Eupagurus Krøyeri STIMPSON, Ann. Lyceum Nat. Hist. New York, VII. p. 89 (43), 1859.

SMITH, Trans. Conn. Acad., III. p. 28, 1874; Ibid., V. p. 48; Proc. National Mus., Washington, III. p. 428, 1881.

Eupagurus pubescens KRØYER, in Gaimard, Voyages en Scandinavie, Pl. II. fig. 1, 1849 (*non* Krøyer, Naturh. Tidssk., II. p. 251, 1839).

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
303	41° 34' 30"	65° 54' 30"	306	6
306	41° 32' 50"	65° 55' 0"	524	4
311	39° 59' 30"	70° 12' 0"	143	2 in <i>Epizoanthus</i> .

Nearly all the specimens I have seen from deep water off the Southern coast of New England are small, and the great majority of them were inhabiting carcinae overgrown by or composed of *Epizoanthus Americanus* Verrill.

Eupagurus politus, sp. nov.

Plate II. Fig. 5.

The carapax is not suddenly narrowed at the bases of the antennæ, where the breadth is equal to the length in front of the cervical suture, and not rostrated, the median lobe of the front being broadly rounded and not projecting as far forward as the external angles of the orbital sinuses, which are acute and each usually armed with a short spine.

The eye-stalks, including the eyes, are nearly four fifths as long as the breadth of the carapax in front, stout, and expanded at the very large black eyes, which are terminal, not oblique, compressed vertically, and broader than half the length of the stalks. The ophthalmic scales are small, narrow, and spiniform at the tips.

The peduncle of the antenna is about as long as the breadth of the carapax in front, and the ultimate segment about a third longer than the penultimate. The upper flagellum is much longer than the ultimate segment of the peduncle, while the lower is only about half as long as the upper, slender, and composed of ten to twelve segments. The peduncle of the antenna reaches slightly beyond the eye. The acicle is slender, slightly curved, and reaches to the tip of the peduncle, and inside its base there is a minute tooth, while outside there is a straight spine toothed or spined along its inner edge, acute at the tip and half as long as the acicle itself. The flagellum is nearly naked, and about three times as long as the carapax.

The exposed parts of the oral appendages are very nearly as in *E. bernhardus*.

The chelipeds are longer, much narrower, and more nearly equal in size than in *E. bernhardus*, and, as in that species, are almost entirely naked, but beset with numerous tubercles and low spines. The right cheliped is about as long as the body from the front of the carapax to the tip of the abdomen. The merus and carpus are subequal in length, while the chela is about once and a half as long as the carpus. The carpus and chela are rounded above and armed with numerous tubercles, which are smaller and more crowded on the chela than on the carpus, but the surface between the tubercles is smooth and polished. The dorsal surface of the carpus is limited along the inner edge by a sharp angle armed with a double line of tubercles, while the outer edge is rounded. The chela is very little wider than the carpus, and is narrowed from near the base to the tips of the digits, and both edges are rounded. The digits are rather slender, about half as long as the entire chela, slightly gaping, with acute and strongly incurved chitinous tips, and the prehensile edges armed with a very few obtuse tuberculiform teeth. The left chela is much more slender than the right, but reaches to or a little beyond the base of its dactylus. The carpus is slender, higher than broad, only slightly expanded distally, and with the narrow dorsal surface flattened and margined either side with a single line of spiniform tubercles. The chela is about a third longer than the carpus, slender, about two and a half times as long as broad, and the dactylus about two thirds the entire length. The dorsal and outer surface is tuberculose, and a low obtuse ridge extends from near the middle of the base along the propodal digit, which tapers from the base to the tip, while the dactylus is smooth except for a few fascicles of setæ, more slender than the propodal digit, and tapered only near the tip. The chitinous tips of the digits are slender, acute, and strongly incurved, and the prehensile edges are sharp, and armed with a closely set series of slender spines or setæ.

The ambulatory legs reach considerably beyond the right cheliped, and the second pair reach to the tips of the first pair. In both pairs the meri and propodi are approximately equal in length and longer than the carpi, while the dactyli are about once and a half as long as the propodi, slender, strongly curved, and distally strongly twisted. The two posterior pairs of thoracic legs and the abdominal appendages are very nearly as in *E. bernhardus*.

In life the general color of the exposed parts is pale orange, the tips of the chelæ and of the ambulatory legs white, the eyes black.

The eggs are very large, and few in number as compared with the ordinary species of the genus, being 1.0 to 1.1 mm. in diameter in alcoholic specimens, while in *E. bernhardus* they are only 0.45 to 0.50 mm. in diameter.

Three specimens give the following measurements :—

Station	306	309	309
Sex	♀	♂	♂
Length from front of carapax to tip of abdomen	25.0 mm.	40.0 mm.	50.0 mm.
“ of carapax along median line	10.0	16.0	21.0

Breadth of carapax in front	5.5 mm.	8.6 mm.	11.0 mm.
Length of eye-stalks	4.7	6.2	7.8
Greatest diameter of eye	2.7	3.5	4.1
Length of right cheliped	30.0	40.0	56.0
" carpus	7.3	11.3	14.5
" chela	12.0	16.0	22.7
Breadth of chela	5.8	8.3	11.0
Length of dactylus	6.1	9.1	11.9
" left cheliped	25.0	37.0	48.0
" carpus	6.1	10.0	12.0
" chela	9.2	13.5	17.5
Breadth of chela	4.0	5.8	7.5
Length of dactylus	5.8	8.8	11.2
" first ambulatory leg, right side	36.0		67.0
" propodus	7.6		14.5
" dactylus	11.5		22.0
" second ambulatory leg, right side	38.0	54.0	73.0
" propodus	8.8	12.0	16.0
" dactylus	13.0	17.0	23.0

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
309	40° 11' 40"	68° 22' 0"	304	3
310	39° 59' 16"	70° 18' 30"	260	2
336	38° 21' 50"	73° 32' 0"	197	5

It has also been taken, and in great abundance, by the U. S. Fish Commission, off Martha's Vineyard and off the Capes of the Delaware, in 65 to 365 fathoms, and is the species which I have referred to, in Proc. National Mus., Washington, III. p. 428, 1881, as "*Eunagurus*, sp."

CATAPAGURUS A. M.-EDWARDS.

Catapagurus A. M.-EDWARDS, Bull. Mus. Comp. Zool., VIII. p. 46, 1880 (Dec. 29).
Hemipagurus SMITH, Ann. Mag. Nat. Hist., 5th ser., VII. p. 143, Feb. 1881; Proc. National Mus., Washington, III. p. 422, 1881.

I have no doubt that my genus is synonymous with that of Milne-Edwards as indicated above, but I am quite unable to tell from the description alone whether one of my species is synonymous with the single species, *C. Sharreri*, described by Milne-Edwards. *C. Sharreri* agrees more nearly in size with *H. socialis* than *H. gracilis*, but will very likely prove to be distinct from either, and until this can be determined satisfactorily, it seems best to refer both my species to *Catapagurus*.

The genus differs from *Spiropagurus* Stimpson in the form and position of the sexual appendage (formed by the permanent extrusion of a portion of the

vas deferens) of the last thoracic somite of the male, which arises from the *right* coxa, and is curved in one plane round the right side of the abdomen; while in *Spiropagurus* the appendage arises from the *left* coxa, and is spirally curved.

The carapax is short and broad, and the anterior margin is obtuse, and does not wholly cover the ophthalmic somite between the eyes. The portion in front of the cervical suture is indurated, but all the rest of the carapax is very soft and membranaceous, without any distinct induration along the cardio-branchial suture. The ophthalmic scales are well developed. The eye-stalks are short and the cornea expanded. The antennulæ, antennæ, and oral appendages are similar to those in *Eupagurus*; the exopods of all the maxillipeds are, however, proportionally much longer than in that genus. There are eleven pairs of phyllobranchiæ, arranged as in *Eupagurus bernhardus*, but the two anterior pairs connected with the external maxillipeds are very small, and composed of a few flattened papillæ. The chelipeds are slender and unequal. The first and second pairs of ambulatory legs are long, and have slender, compressed, and ciliated or setigerous dactyli; the third pair are only imperfectly subcheliform.

In the male, the second, third, and fourth somites of the abdomen bear small appendages upon the left side, as in most of the allied genera, but the fifth somite is destitute of an appendage; in the female, the appendages of the second, third, and fourth somites are biramous and ovigerous, and there is usually a rudimentary uniramous appendage upon the fifth somite, as in the allied genera.* The uropods are very nearly or quite symmetrical, the rami of the right appendage being very nearly or quite as large as that of the left. The telson is bilobed at the extremity.

As might be expected, the unsymmetrical development of the external sexual appendages of the males of the two species here described corresponds to a like unsymmetrical development of the internal sexual organs, and the following incomplete observations, made on ordinary alcoholic specimens in which the abdominal viscera are not sufficiently well preserved for a full anatomical or histological investigation, appear of sufficient importance to notice here, especially as nothing appears to be known of the internal structure of either species of *Spiropagurus*.

The right testis and vas deferens are much larger than the left. The lower part of the right vas deferens, in all the adults examined, is much more dilated than the left, and is filled (as is also the external part of the duct) with very large spermatophores of peculiar form. The left vas deferens is slender, much as in *Eupagurus bernhardus*, terminates in a small opening in the left coxa of the last thoracic somite, as in ordinary Paguroids, and contains spermatophores somewhat similar in form and size to those of *Eupagurus bernhardus*. In alco-

* In many of the best preserved and most perfect females of *C. socialis* examined I can find no trace whatever of this appendage of the fifth somite, while in others it is very easily seen.

holic specimens of *C. socialis* the spermatophores from the left vas deferens are approximately 0.16 mm. long and 0.035 mm. broad, with a slender neck about a third of the entire length, and a very thin and delicate lamella for a base. The spermatophores from the right vas deferens are over 2 mm. in total length; the body itself is oval, approximately 0.40 mm. long and a third as broad; at one end it terminates in a very long and slender process, two or three times as long as the body; at the other end there is a similar but slightly stouter process, a little longer than the body, and expanding at its tip into a broad and very delicate lamella, approximately 0.35 mm. long by 0.20 mm. broad.

Catapagurus socialis.

Hemipagurus socialis SMITH, Proc. National Mus., Washington, III. p. 423, 1881.

Male.—The part of the carapax in front of the cervical suture is about a fifth broader than long, with the sides nearly parallel; the front margin sinuous, curving slightly forward in the middle and each side between the eye-stalks and the peduncles of the antennæ, the middle lobe thus formed being scarcely more prominent than the lateral lobes, each of which is armed with a minute spine, projecting forward just inside of the peduncle of the antenna; between these spines the edge of the front is upturned in a sharp marginal carina, which terminates each side in the spines themselves. The dorsal surface of this part of the carapax is convex in both directions, the protogastric lobes are protuberant and well marked, and nearly the whole surface is roughened and more or less tuberclose, with transverse scabrous elevations, which give rise to numerous hairs. The branchial regions are slightly swollen, so that the breadth of the carapax posteriorly is greater than in front. All the portions back of the cervical suture are smooth and membranaceous.

The eye-stalks are about half as long as the carapax in front of the cervical suture, flattened and expanded distally, where they are about three fourths as broad as long. The eye itself is black, and the cornea extends round either side so as to be crescent-shaped as seen from above. The ophthalmic scales are less than half as long as the eye-stalks, narrow, triangular, and acute.

The first and second segments of the peduncle of the antennula are subequal in length, and the ultimate segment nearly once and a half as long as the penultimate, and almost as long as the eye-stalks. The superior or major flagellum is nearly as long as the ultimate segment of the peduncle; the thick, ciliated basal portion consists of about fourteen segments, and the slender terminal portion, which is nearly once and a half as long as the basal, of about five very slender and subequal segments. The minor flagellum is about two thirds as long as the major, and composed of about eight segments. The peduncle of the antenna reaches by the eye nearly the length of the last segment, which is about as long as the greatest diameter of the eye. The acicle is slender, acute, and slightly longer than the last segment of the peduncle. The flagellum reaches beyond the tips of the ambulatory legs.

The chelipeds are slender and very nearly equal in length, but the right is very much stouter than the left. In the right cheliped the merus and carpus are subequal in length, together nearly twice as long as the carapax, and both are rough and obscurely spinous, the spines being most conspicuous on the edges of the upper surface of the carpus, which is fully three times as long as broad, flattened above, and angular, but not distinctly carinated along either side. The chela is not far from twice as long as the carpus, nearly three times as long as broad, compressed vertically, evenly rounded, smooth and nearly naked above, but clothed with long, soft hair beneath; the digits are longitudinal, not gaping, and the dactylus is about two thirds as long as the basal portion of the propodus, and its prehensile edge is armed with a broad tooth near the middle. In the left cheliped the merus and carpus are similar to those of the right, but much more slender and a little longer; the carpus is about six times as long as broad, and the edges of the upper surface are rather more sharply angular than in the right; the chela is shorter than the right, but very slender, smooth, and nearly naked; the digits are similar, longitudinal, slightly longer than the basal portion of the chela, compressed, slightly curved downward toward the tips, but the prehensile edges straight and very minutely serrate.

The ambulatory legs are very nearly equal in length, and slightly overreach the chelipeds; the merus is about as long as the left chela, and roughened with small spines on the upper and under edges; the propodus is shorter than the merus, compressed, smooth, and ciliated along the edges; the dactylus is a little longer in the second than in the first pair, but in both shorter than the propodus, very strongly compressed, very slightly twisted, about ten times as long as broad, and thickly ciliated along both edges, except for a short distance along the lower edge near the tip.

The *female* is smaller than the male, and has proportionally shorter ambulatory legs, and chelipeds very much shorter and much more alike. The right chela is only about a third longer than the carpus, little more than a third as broad as long, and the digits are slender and nearly as long as the basal portion. The left cheliped is proportionally stouter than in the male, and thus approximates to the right; the chela itself is scarcely more than a third longer than the carpus. The ambulatory legs overreach the chelipeds by nearly or quite the full length of the dactyli, but all the segments have very nearly the same relative proportions as in the male.

The eggs are few in number and very large, being about a millimeter in diameter in alcoholic specimens.

In young males the chelipeds and ambulatory legs are similar to those of the female.

Two specimens from Station 314 give the following measurements:—

Sex	♂	♀
Length from front of carapax to tip of abdomen	18.0 mm.	15.0 mm.
“ of eye-stalks	2.8	2.5

Greatest diameter of eye	2.0 mm.	1.6 mm.
Length of right cheliped	30.0	15.0
" chela	11.5	5.2
Breadth of propodus	4.4	1.9
Length of left cheliped	26.0	14.5
" chela	9.5	5.0
Breadth of propodus	2.0	1.2
Length of first ambulatory leg, right side	32.0	19.5

The carcinœcium is very rarely a naked gastropod shell; in most of the specimens seen it is either built up by a colony of *Epizoanthus Americanus*, or is made up in a somewhat similar way by the single polyp of *Adamsia sociabilis* Verrill, the base secreted by the *Adamsia* being expanded on either side and united below so as to enclose the crab in a broadly conical cavity, with only a slight spiral curvature. The nuclei about which these polypean carcinœcia are formed are of various origins; the majority of the *Adamsia* carcinœcia appear to have been built upon fragments of pteropod shells, in some cases upon bits of worm-tubes, in one case upon the entire shell of a *Cadulus*, the greater part of the shell being left protruding from the base of the polyp. In the carcinœcia formed by *Epizoanthus* the nucleus seems usually to have been absorbed, so that nothing is left distinguishable from the colony of polyps itself. In some cases the *Adamsia* has completely overgrown a small *Epizoanthus* carcinœcium, so that when the *Adamsia* is removed a perfect *Epizoanthus* carcinœcium is found beneath as a nucleus. The carcinœcium of this species, and of *C. gracilis* as well, does not cover the animal to the same extent as is usual in the species of *Eupagurus*, the anterior part of the carapax being apparently constantly exposed, and its induration fitting the animal for such exposure. The *Epizoanthus* carcinœcia are, however, very often disproportionately large for the crabs inhabiting them, having grown out either side until they are several times broader than long. In spite of these often enormous carcinœcia, both species of the genus probably swim about by means of the ciliated dactyli of the ambulatory legs, as *Spiropagurus spiriger* has been observed to do by Stimpson (Proc. Acad. Nat. Sci. Philadelphia, 1858, p. 248 (86), 1859).

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
311	39° 59' 30"	70° 12' 0"	143	6
313	32° 31' 50"	78° 45' 0"	75	2
314	32° 24' 0"	78° 44' 0"	142	1000±
315	32° 18' 20"	78° 43' 0"	225	4
316	32° 7' 0"	78° 37' 30"	229	1
327	34° 0' 30"	76° 10' 30"	178	8
344	40° 1' 0"	70° 58' 0"	129	40±
345	40° 10' 15"	71° 4' 30"	71	5

This species was taken in great abundance, in 51 to 250 fathoms, off Martha's Vineyard, by the U. S. Fish Commission, in 1880 and 1881.

Catapagurus gracilis.

Hemipagurus gracilis SMITH, Proc. National Mus., Washington, III. p. 426, 1881.

This is a smaller and more slender species than the last, and is readily distinguished from it by the smooth carapax, the longer and more slender eye-stalks, the long and acicular ophthalmic scales, and by the narrow dactyli of the ambulatory legs being longer than the corresponding propodi.

Male. — The carapax in front of the cervical suture is flat, smooth, nearly naked, and scarcely at all areolated. The anterior margin is rather more strongly sinuous than in *C. socialis*, and the lateral lobes are slightly angular and each is tipped with a minute spine, as in that species, but the marginal carina between these spines is much less distinct.

The eye-stalks are more than half as long as the carapax in front of the cervical suture, flattened and expanded distally, but only about half as broad as long. The eyes themselves are as in *C. socialis*. The ophthalmic scales are more than half as long as the eye-stalks, and are acicular and regularly acute.

The ultimate segment of the peduncle of the antennula is as long as the eye-stalk and nearly twice as long as the penultimate segment. The major flagellum is as long as the ultimate segment of the peduncle, the basal portion of about eight segments, the terminal portion three times as long and of about five subequal and very slender segments. The minor flagellum is about half as long as the major, and composed of about six segments. The antennæ are very much as in *C. socialis*.

The chelipeds are nearly equal in length and similar to those of *C. socialis*, but in the right cheliped the inner edge of the upper surface of the carpus is angular, and armed with a regular series of twelve to eighteen small spines, while the outer edge is rounded and unarmed; and the prehensile edge of the dactylus is armed with two irregular and indistinct teeth, corresponding with two irregular emarginations in the edge of the digital portion of the propodus. In the left cheliped the outer edge of the upper surface of the carpus is slightly rounded and scarcely at all spinulose, while the inner edge is armed as in the right cheliped. The left chela differs from that of *C. socialis*, in having the digital portion of the propodus considerably stouter than the dactylus, particularly toward the base.

The ambulatory legs are proportionally as long as in *C. socialis*, but more slender; in both pairs the dactylus is longer than the propodus, curved slightly near the tip, about sixteen times as long as broad, sparsely ciliated along the upper edge, and very slightly setigerous along the lower.

The *female* differs from the male as in *C. socialis*, but to a very much less extent, the chelipeds and ambulatory legs being only a little shorter than in the male, and the right cheliped only a little less stout and a little more like the left than in the male.

The eggs are few and nearly as large as in *C. socialis*.

The carcinoecia are similar to those of the last species.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
344	40° 1' 0''	70° 58' 0''	129	1
345	40° 10' 15''	71° 4' 30''	71	3

Also taken by the U. S. Fish Commission, in 51 to 155 fathoms, off Martha's Vineyard, in 1880 and 1881.

Two specimens from Fish Commission Station 874, 85 fathoms, give the following measurements : —

Sex	♂	♀
Length, from front of carapax to tip of abdomen	12.0 mm.	11.2 mm.
Length of eye-stalk	1.6	1.5
Greatest diameter of eye	1.1	0.9
Length of right cheliped	15.2	11.2
“ chela	6.0	4.4
Breadth of chela	2.4	1.8
Length of left cheliped	13.6	10.0
“ chela	5.0	3.6
Breadth of chela	1.1	1.0
Length of first ambulatory leg, right side	16.1	12.8

PARAPAGURIDÆ.

The genus *Parapagurus* differs so widely from all other Paguridea in possessing trichobranchiæ instead of phyllobranchiæ, that it ought, undoubtedly, to be separated as a distinct family on this character alone.

Parapagurus pilosimanus SMITH.*

Trans. Conn. Acad., V. p. 51, 1879 ; Proc. National Mus., Washington, III. p. 428, 1881.

Plate II. Figs. 4 - 4¹.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
306	41° 32' 50''	65° 55' 0''	524	1 young.
309	40° 11' 40''	68° 22' 0''	304	4
322	33° 10' 0''	76° 32' 15''	362	2 ♂

This species has also been taken, and in considerable abundance, by the U. S. Fish Commission, in deep water off Martha's Vineyard. At Station

* A. Milne-Edwards in a recent report on the explorations of the "Travailleur," in the Comptes-Rendus of the Academy of Sciences, Paris, Dec. 1881 (Ann. Mag. Nat. Hist., 5th ser., IX. p. 42, 1882), states that his *Eupagurus Jacobii* from the "Blake" dredgings (Bull. Mus. Comp. Zool., VIII. p. 42, 1880) is identical with this species, of which specimens were sent to him last June.

947, 312 fathoms, three hundred and ninety-three specimens, nearly all adults and many of them very large, were taken at one haul of the trawl.

The carcinœcia of all the specimens seen are formed by colonies of *Epizoanthus paguriphilus* Verrill, which at first invest spiral shells which are finally absorbed by the basal cœnenchyma of the growing polyps.

GALATHEIDÆ.

Galacantha rostrata A. M.-EDWARDS.

Bull. Mus. Comp. Zool., VIII. p. 52, 1880.

Plate IX. Figs. 2, 2*.

Station 340, N. Lat. 39° 25' 30", W. Long. 70° 58' 40", 1394 fathoms ; and Station 341, N. Lat. 39° 38' 20", W. Long. 70° 56', 1241 fathoms ; two males, which give the following measurements : —

Station	341	340
Sex	♂	♂
Length from tip of rostrum to tip of telson	75.0 mm.	62.0 mm.
“ of carapax to bases of rostral spines	34.5	28.8
Greatest breadth excluding spines	27.0	23.2
“ “ including “	31.5	26.7
Length of rostrum above its lateral spines	7.8	8.0
“ gastric spine	7.7	7.8
Greatest breadth of abdomen, third somite	24.2	24.0
“ diameter of eye	3.0	2.4
Length of cheliped	53.5	44.0
“ chela	21.5	16.7
“ dactylus	13.0	10.3
“ first ambulatory leg	65.0	53.0
“ posterior leg	39.0	31.0

MUNIDOPSIS WHITEAVES.

Munidopsis WHITEAVES, Amer. Jour. Sci., 3d ser., VII. p. 212, 1874.

Galathodes A. M.-EDWARDS, Bull. Mus. Comp. Zool., VIII. p. 53, 1880.

Munidopsis curvirostra WHITEAVES.

Amer. Jour. Sci., 3d ser., VII. p. 212, 1874 ; Report on further Deep-sea Dredging Operations in the Gulf of St. Lawrence [in 1873], p. 17, 1874.

Plate VIII. Figs. 2, 3, 3*.

Station 325, N. Lat. 33° 35' 20", W. Long. 76°, 647 fathoms, one small male, which gives the following measurements : —

Length from tip of rostrum to tip of telson	16.0mm.
“ of carapax	10.4
Greatest breadth of carapax	5.2
Diameter of eye	0.8
Length of cheliped	15.0
“ chela	5.9

I have compared this specimen with the original specimens from the Gulf of St. Lawrence described by Whiteaves, and find no differences of any importance whatever. The species is perhaps identical with some one of the ten species of *Galathodes* described by Milne-Edwards, but with which, if with any, it seems impossible to determine from the descriptions alone.

Munida, sp. indet.

Munida Caribæa? SMITH, Proc. National Mus., Washington, III. p. 428, 1881.

Plate X. Fig. 1.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
311	39° 59' 30"	70° 12' 0"	143	1
314	32° 24' 0"	78° 44' 0"	142	50±
315	32° 18' 20"	78° 43' 0"	225	1
333	35° 45' 25"	74° 50' 30"	65	100±
335	38° 22' 25"	73° 33' 40"	89	31
336	38° 21' 50"	73° 32' 0"	197	6
344	40° 1' 0"	70° 58' 0"	129	1

Also taken in great abundance in the U. S. Fish Commission dredgings off Martha's Vineyard, in 1880 and 1881, in 65 to 200 fathoms.

This species will probably prove identical with one of the eleven species enumerated by A. Milne-Edwards in his report on the "Blake" crustacea from the West Indies, but with which one it is not possible to tell from the descriptions alone. Before the publication of Milne-Edwards's report I referred this species doubtfully, as indicated above, to *Munida Caribæa* of Stimpson, described from a single very small specimen, but it is probably not the species referred to the *Caribæa* by Milne-Edwards. It is now impossible to tell with certainty to which of the numerous Caribbean species Stimpson's really belongs, but it is perhaps best to restrict it to the one called *Caribæa* by Milne-Edwards, whatever that may be, although he gives no description whatever.

MACRURA.

ERYONTIDÆ.

Pentacheles sculptus.

Plates III. and IV.

Polycheles sculptus SMITH, Ann. Mag. Nat. Hist., London, 5th ser., V. p. 269, April, 1880; Proc. National Mus., Washington, II., 1879, p. 345, Pl. VII., 1880.

Pentacheles spinosus A. M.-EDWARDS, Bull. Mus. Comp. Zoöl., VIII. p. 66, December, 1880.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
325	33° 35' 20"	76° 0' 0"	647	1 young, 44 mm. long.
326	33° 24' 15"	76° 0' 50"	464	1 ♂, 2 ♀
329	34° 39' 40"	75° 14' 40"	603	2 ♂

This species was first described from a single imperfect specimen taken by a Gloucester fisherman, off the coast of Nova Scotia, N. Lat. 43° 10', W. Long. 61° 20', in 250 fathoms, so that the specimens recorded above, and a large female with eggs, taken, Nov. 16, 1880, off the mouth of Chesapeake Bay, N. Lat. 37° 24', W. Long. 74° 17', 300 fathoms, Station 89S, by Lieut. Tanner, on the U. S. Fish Commission Steamer "Fish-Hawk," afford an opportunity for a more complete description than that originally given.

The sides of the carapax are nearly parallel posteriorly, but arcuately convergent anteriorly, and the greatest breadth is just in front of the cervical suture, and is about three fourths of the length along the median line. As seen from above, the anterior margin is concave in outline, so that the acute and spiniform lateral angles are much in advance of the rostrum, which is armed with two spines close together and projecting obliquely upward and forward. About a third of the space between the median line and the lateral angle each side is occupied by a very deep orbital sinus nearly parallel with the lateral margin, considerably deeper than broad, somewhat narrowed and evenly rounded posteriorly, and completely filled by the large ophthalmic lobe. On the inner side of this sinus the frontal margin projects in a small spiniform tooth, but outside the margin is unarmed and curves regularly to the lateral angle. Just behind the orbital sinus there is a smooth and evenly curved depression in the surface of the carapax exposing a small area on the posterior part of the ophthalmic lobe, more fully described beyond. The cervical suture divides the dorsal surface of the carapax into two pretty nearly equal portions, and is deep and conspicuous, but is indicated in the lateral margin, each side, by a slight emargination only, which is scarcely deeper than the emargination between the anterior and posterior lobes of the hepatic region. The lateral margin is armed, on the anterior lobe of the hepatic region, with (including the anterior angle) six, or rarely only five, small and slender spiniform teeth di-

rected forward, and on the posterior lobe with three more. The lateral margin, behind the cervical suture, is armed with six to eight similar teeth, which become successively more remote posteriorly. There is a slight median carina extending the whole length of the carapax, and armed, behind the two rostral spines, first with a single small spine directed forward, then with two side by side and very close together, then with one, then with two on the posterior edge of the cervical suture, then with two more, and finally with two somewhat larger and more widely separated spines projecting forward from the anterior edge of the broad and prominently raised posterior margin. In front of the cervical suture there is an irregular longitudinal dorso-lateral line of five minute spines each side, and back of these a single spine each side on the posterior edge of the cervical suture. Extending from the posterior margin nearly to the cervical suture, there is a sharp sublateral carina parallel to the lateral margin, about a third of the way from it to the median carina, and armed with five or six small spines.

The ventral regions of the carapax (Pl. IV. fig. 1) are inflected each side at a very acute angle with the dorsal surface, and, the sternum being narrow, the ventral regions are very broad. The ventral region each side is divided longitudinally into three approximately equal parts by two prominent carinæ; the outer carina (marking the pleurotergal suture?) extends from the anterior margin at the base of the antenna, in a slightly sinuous line, toward the postero-lateral margin of the carapax; the anterior half is very prominent, and armed with small spines directed outward, while the posterior half is much less conspicuous, unarmed, and disappears entirely before reaching the posterior angle of the carapax. The inner carina extends along the branchial region from near the base of the first leg quite to the postero-lateral angle of the carapax; the extreme anterior portion is not prominent, but from opposite the third leg posteriorly it is very prominent, acute, and armed with ten to fifteen sharp spines. The outer of the three longitudinal regions thus marked out is divided transversely by the cervical suture, and the anterior portion (subhepatic region) is divided transversely into an anterior and a posterior lobe by a groove nearly or quite as conspicuous as the cervical. In the frontal margin of this anterior lobe, and near its inner side, there is a deep sinus corresponding to the orbital sinus of the dorsal surface, but not quite as wide, and open nearly to the dorsal surface, except where it is crossed by a protuberance from the ventral portion of the ophthalmic lobe.

On the upper surface of the carapax, the orbital sinus, each side, is completely filled by the dorsal part of the ophthalmic lobe, of which the anterior margin is slightly concave in outline and continuous with the anterior margin of the carapax, but has a small tubercle near the middle. The dorsal surface of the lobe is smooth, calcareous, and opaque, and on a level with the adjacent surface of the carapax except posteriorly, where a small oval area of the extremity of the lobe is exposed by a depression in the carapax. This oval area is thin, semitranslucent, and not calcareous, and has every appearance of being a true corneal area, although I am unable to detect any evidence of facets. The

carapax along the margins of the sinus is in close contact with the ophthalmic lobe. From the lower portion of each ophthalmic lobe there is an elongated cylindrical and somewhat conical, but obtuse and pointed protuberance, of which the base rests in a transverse groove in the base of the antenna, while the terminal portion extends well across the open ventral side of the orbital sinus. Upon the obtuse extremity of this protuberance there is a nearly circular area similar to the cornea-like area at the posterior extremity of the dorsal part of the lobe.

The peduncles of the antennulæ are very stout, being stouter even than the peduncles of the antennæ. The basal portion of the proximal segment is longer than the two distal segments, is armed on the distal portion of the outer margin with two spiniform teeth, and the inner side is broadly expanded and prolonged into an acute scalelike appendage upturned and densely ciliated along the inner margin, and extending considerably beyond the distal segment and nearly as far as the tip of the antennal scale. The second and third segments are subcylindrical, and, as seen from above, are each about as broad as long, the second being somewhat larger than the third. The inner or major flagellum is about as long as the carapax. The minor flagellum is about as long as the peduncle of the antenna, about half as thick as the base of the major flagellum, of nearly uniform thickness for three fourths its length, then tapers rapidly to a very slender tip, and is thickly ciliated along the inner margin distally.

The first three segments of the peduncle of the antenna are very short, the three together being scarcely longer than the fifth segment. The first segment is loosely articulated with the sternum of the antennal segment, so as to be freely movable upon it; it is very short upon the outside, but expands somewhat on the inner side, which terminates distally in a thin tubular process arising from the oral side of the segment and directed upward to a level with the dorsal side, so that, in the ordinary position of the appendages, its orifice is closed by contact with the first segment of the peduncle of the antennula. This tubular process readily admits a large bristle, which can be pushed through it round into the cavity of the segment itself. It undoubtedly contains the canal of the green gland. The second segment is small, closely united with the third, and bears upon its outer side a slender scale, which reaches nearly to the tip of the peduncle, is about five times as long as broad, and thickly ciliated along both edges. The third segment, as seen from below, is almost wholly internal to the second, and is armed on the distal part of the inner margin with a small spiniform tubercle. The fourth and fifth segments are subcylindrical, the fourth is slightly longer than the fifth, and both are ciliated each side. The flagellum is about as thick at base and nearly as long as the major flagellum of the antennula.

The buccal opening is nearly square. The branchiostergites extend forward quite over the sternum of the antennary somite, and their anterior extremities are applied to the basal segments of the antennæ, which, however, are freely movable upon the antennary somite. The epistome is short, not extending at all in front of the bases of the antennæ, is nearly on a level with the dorsal

wall of the efferent passages from the branchial chambers and on a plane above the bases of the antennæ, so that the efferent passages terminate in the space between the upturned edges of the squamiform processes of the inner sides of the basal segments of the antennulæ and just beneath the short two-spined rostrum. In the middle of the slightly raised and regularly arcuate posterior edge of the epistome there is a slight elevation with a tuft of hairs. The anterior part of the endostome is on a plane somewhat above the plane of the epistome, but the space below is filled by the soft and fleshy labrum which projects considerably below the raised posterior edge of the epistome.

The mandibles (Pl. IV. fig. 2) are wholly without molar areas and with crowns expanded into very broad and thin lamellæ serrated along the cutting edges with about fourteen acutely triangular teeth, of which one at the anterior angle and one in the middle are much larger and more prominent than the others. The palpus (fig. 2^a) is short, but composed of three segments, of which the proximal is very small; the second is fully as long as the terminal, and expanded distally, and the terminal about three and a half times as long as broad, and densely setose along the anterior edge and ventral side.

The lobes of the metastome (fig. 2) are very narrow and widely separated. The two lobes of the first maxilla (fig. 3) are very much as described and figured by Willemoes-Suhn in *Willemoesia leptodactyla*, the two lobes being very slender and strongly incurved, and the anterior the larger and with a slight elevation covered with a dense tuft of hairs on the outside near the base.

The second maxilla (fig. 4) has two small and slender protognathal lobes, of which the anterior is very much the larger. The scaphognath is very large, and with the posterior portion very broad and evenly rounded in outline posteriorly, while the anterior portion is much narrower, and reaches forward nearly to the base of the antenna. The endognath is apparently represented by a short and truncate lobe at the base of the anterior lobe of the protognath.

The first maxillipeds (Pl. IV. figs. 5, 5^a, 5^b) are greatly elongated and peculiarly modified. The exopodal lamella (*f*, fig. 5^a) is long and very broad, projects farther back into the branchial passage than the scaphognath, and terminates anteriorly in a small triangular lobe (*g*); while the exopod reaches forward considerably in front of the epistome, where its terminal lobes are somewhat upturned and help to enclose the efferent branchial passage. The proximal lobe of the protopod (*a*, figs. 5, 5^a) is triangular and densely setigerous along the edges, while the distal lobe (*a'*) is elongated, and bears the endopod and the peculiarly modified exopod, which lie together, and at nearly a right angle with the protopod. The endopod (*b*, figs. 5, 5^b) is slender, somewhat triquetral, reaches nearly to the bases of the terminal lobes of the exopod, is densely hairy along the edges, is divided near the middle by an imperfect articulation, and lies above and close along the inner edge of the exopod. The exopod (*c*, figs. 5, 5^b) is lamellar, very broad, concave dorsally, divided by several sutures, as shown in the figure, curved inward almost to the mesial line, and encloses the broad efferent passage ventrally and anteriorly. The terminal portion of the exopod is divided into two lobes (*d*, *e*, figs. 5, 5^b), which

are stiff and more calcareous than the rest of the appendage. The outer and anterior of these lobes (*d*) is the larger, and is alone exposed as seen from below in the natural position of the appendages, while the inner (*e*) is somewhat triangular, with a narrow base of attachment, and is curved round above the other lobe, and serves to prolong the dorsal wall of the efferent passage, or, perhaps, as a valve for closing its orifice.

The second maxillipeds (fig. 6) are apparently wholly without exopodal or epipodal branches, and are so short that they reach but little beyond the ischia of the third pair. The ischium and merus are very short, together little more than half as long as the carpus, and both are setigerous along the inner edge, while the ischium has in addition a series of dentiform tubercles. The carpus is about two thirds of the whole length, nearly twice as long as broad, compressed vertically, and much broader in the middle than at either end, and setigerous, but not dentate or tuberculous along the inner edge. The propodus is less than half as long and less than half as wide as the carpus, while the dactylus is still smaller, tapered distally, and terminated in a slender curved and spiniform tip, and both propodus and dactylus are thickly armed with setæ and small spines.

The external maxillipeds (fig. 7) are long and slender, reach, when extended, nearly to the bases of the peduncles of the antennulæ, and are well clothed with hairs and setæ, but unarmed either with teeth or spines. There is a very small and rudimentary appendage (*a*), apparently representing the epipod, upon the outer side of the protopod. The ischium is a little longer than the merus and carpus combined, and a very little stouter than the merus. The merus is about two thirds as long as the ischium, while the three distal segments are subequal in length and together a little longer than the merus, the carpus and propodus tapering slightly distally, while the dactylus is slightly curved and tapers regularly to an acute tip.

The great chelipeds are smooth and naked throughout, except the prehensile edges of the digits of the chelæ, and differ somewhat in size in different individuals, varying in length from about two and a half to nearly three times the length of the carapax, but the differences are apparently entirely independent of sex. The coxa is very stout and broad, far stouter than any of the succeeding segments, and much broader than the coxæ of the other legs. The basis is completely ankylosed with the ischium, which is expanded distally but at the same time strongly compressed vertically, strongly curved upward so as to fit the side of the carapax when turned out at right angles to it, and reaches, in this position, a little above the edge of the carapax, or, when turned forward, to the base or beyond the middle of the antennal scales. The merus is two thirds to four fifths as long as the carapax, compressed like the merus, but considerably expanded proximally, contracted in the middle and distally to near the tip where it is again expanded and thickened at the articulation with the carpus; the posterior edge is armed with an acute spine at the distal extremity, and with either one or two similar ones on the proximal half, while the anterior edge, except near the base, is armed with a scattered series of minute

spines. The carpus is more than half as long as the merus, compressed and very slender to near the distal end where it is expanded and thickened for the articulation of the chela and armed above with a single acute spine and below with one or two small teeth, and along the whole length of the dorsal edge there is a distinct but narrow sulcus. The chela (Pl. IV. fig. 8) is about as long as the merus, and the digits themselves considerably longer than the basal portion, which is about as broad as but much thicker than the proximal part of the merus, though still strongly compressed; the dorsal edge is evenly rounded, and projects in a small tooth and an acute spine above the articulation of the dactylus; the inferior edge projects slightly proximally and then retreats at the base of the propodal digit, and except near the proximal end is occupied with a shallow sulcus, the edges of which are armed with several minute spines directed distally. Both digits are compressed, very slender, and regularly tapered to acute and very strongly curved extremities; the dorsal edge of the dactylus is flattened, but scarcely sulcated, and the inferior edge of the propodal digit is flattened and slightly sulcated near the base, but rounded distally; the prehensile edges of both digits are armed throughout with a close-set series of very short and very stiff setæ.

The legs of the second pair are slender, densely ciliated along the edges, and reach to the tips of the peduncles of the antennæ. The basis is ankylosed with the rather short ischium. The merus is considerably longer than the ischio-basis and reaches to the edge of the carapax. The carpus is a little shorter than the merus. The basal part of the chela (fig. 9) is a very little longer than the carpus, and is flattened and somewhat expanded distally, where it is a third as broad as long; the propodal digit is very slender, nearly as long as the basal portion of the chela, nearly straight to the slender, acute, and chitinous tip, which is strongly curved, and the prehensile edge is thin and armed as in the first pair. The dactylus is almost exactly of the same form as the propodal digit, and its prehensile edge is armed in the same way, but the cilia upon the outer edge are much longer than on the corresponding part of the propodus.

The third and fourth pairs of legs are successively a very little shorter than the second, and have very nearly the same form. From the coxal to the meral segment they are very nearly as stout as in the second pair, but the three distal segments are much more slender. The basal part of the chela (fig. 10) is subcylindrical and only very slightly expanded and flattened distally, while the propodal digit and the dactylus are nearly equal in length, very slender and weak, straight throughout, without incurved or chitinous tips, and densely ciliated along the prehensile edges.

The fifth pair of legs (figs. 11 and 12) are considerably shorter and more slender than the fourth, and all the segments except the propodus and dactylus have very nearly the same relative proportions as in that pair. The basal portion of the propodus is alike in the two sexes, a little longer than the carpus, subcylindrical and slightly tapered distally. The digits differ in the sexes. In the male (fig. 11) the propodal digit is about as long as the proximal

thickness of the propodus, or a little longer, slender, and tapers to a rounded tip, while the dactylus is nearly or fully twice as long, considerably stouter, straight, and nearly cylindrical. In the female (fig. 12) the propodal digit is scarcely as long as in the male, is more slender, and tapers to an acute and incurved tip, which is somewhat flattened and excavated on the anterior and inner side, leaving an edge on the posterior side; the dactylus reaches very nearly to the tip of the propodal digit, and is like it in form, but a little more sharply incurved at tip.

The branchiæ resemble the branchiæ of the Astacida, being slender, very soft, and composed of slender filaments, which are not closely crowded together. There are no branchiæ connected with the first and second maxillipeds, but above the base of the third maxilliped and between the lamellar epipod of the first maxilliped and the coxa of the first leg there is a slight lamellar elevation bearing a few filaments which are apparently branchial and may represent a very rudimentary epipodal branchia. The legs of the first four pairs bear each a well-developed podobranchia and a small epipodal plate, lying just at the edge of the carapax but not projecting into the branchial chamber, and above the bases of each of these legs there are two arthrobranchiæ and one pleurobranchia. There is also a pleurobranchia above the base of the fifth leg, so that there are in all sixteen well-developed branchiæ, — four podobranchiæ, eight arthrobranchiæ, and four pleurobranchiæ each side, as indicated in the following formula: —

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	0	0	1	1	1	1	1	0	(5)
Podobranchiæ,	0	0	?	1	1	1	1	0	4
Arthrobranchiæ,	0	0	0	2	2	2	2	0	8
Pleurobranchiæ,	0	0	0	0	1	1	1	1	4
									<hr/> 16+(5)

As seen from above, the sides of the abdomen are nearly straight, and form, with the telson, a regular acute triangle. The first five somites are carinated dorsally, and the carina projects forward from each somite in an acute tooth, but the carina and tooth are small and low on the first somite, increase rapidly to the fourth, while on the fifth they are scarcely as prominent as on the fourth, and on the sixth the carina is inconspicuous and there is no tooth, but the top of the carina is traversed by a narrow longitudinal sulcus. On the first somite there are, in addition, two slender spines each side projecting forward above the articulations with the carapax. The dorsal surface of the abdomen, either side of the median carina, is smooth and scarcely at all sculptured; but along the lateral margin, where the pleura bend abruptly and nearly perpendicularly downward, there is a series of deep longitudinal sulci, except upon the narrow first somite, which is unsculptured, and upon the sixth, where the sulcus is replaced by a simple carina. Of the pleura themselves, the first is nearly obsolete, the second is broader than deep, projecting back over the third with a broadly rounded margin, and forward in a prominent but rounded angle, and

has a central circular depressed area ; the succeeding pleura decrease regularly in size posteriorly, scarcely overlap when the abdomen is extended, are convex in outline posteriorly but straight or slightly concave anteriorly, and the third, fourth, and fifth are ornamented with a median curved carina extending two thirds of the length, but not well marked upon the fifth.

The telson is pretty regularly triangular, about twice as long as broad, is convex and slightly grooved longitudinally above, and terminates in an acutely rounded tip unarmed with spines. The lamellæ of the uropods scarcely reach the tip of the telson : the outer is nearly as broad as long, regularly rounded in outline except for a short distance on the outer edge near the tip, where the margin is more or less conspicuously truncated, but varying considerably in different individuals, and stiffened by two slightly diverging ribs in addition to the thickening of the outer margin ; the inner lamella is stiffened by a single median rib, is nearly twice as long as broad, the lateral margins are approximately straight and parallel, and the tip is regularly rounded in outline.

In the male the first pair of abdominal appendages (Pl. IV. fig. 14) are much longer than the protopods of the second pair, reach slightly beyond the bases of the fourth thoracic legs, and have an imperfect articulation at about a third of the way from the base to the tip ; the basal portion is somewhat triquetral, while the terminal expands into a smooth, naked, and thin lanceolate lamella slightly concave posteriorly. The second pair reach slightly farther forward than the first, and the protopod and lamellæ are about equal in length. The lamellæ are narrow, lanceolate, and thickly ciliated along the edges ; the inner is about as long as the outer, and bears the two styliform processes usually characteristic of males in the *Macrura*. These styliform processes are a little less than a third as long as the lamella itself, and arise together at about a third of the way from the base to the tip of the lamella ; the inner, like that upon the three succeeding pairs of appendages, arises from the slightly thickened inner edge of the lamella, is ridged, of nearly equal width to the rounded tip, and nearly naked except a line of cilia along the posterior margin. The outer process arises just in front of the inner, and its base is at a right angle to that of the outer ; it is more slender than the outer, tapers distally, and is ciliated on both edges and on the anterior surface. The three succeeding pairs of appendages are similar to the second pair, but the fourth and fifth pairs are successively a little shorter, and, as usual among *Macrura*, they all want the outer of the two styliform processes of the inner margin of the inner lamella.

In the female the first pair of abdominal appendages (Pl. IV. fig. 13) are about as long as in the male ; the basal portion, or protopod, is scarcely more than half as long as the terminal lamella, is narrow, compressed, turned inward toward the mesial line, and clothed thickly along the outer and the distal part of the inner edge with long ovigerous hairs ; the terminal lamella is multi-articulate, like the lamellæ of succeeding appendages, but a little narrower than they, and is clothed with numerous ovigerous hairs. The four succeeding pairs of appendages are very nearly like the three last pairs in the male, but the styliform process of the inner lamella is a little larger and more compressed.

The only specimen carrying eggs is the one above referred to as taken off the mouth of Chesapeake Bay. In this specimen the eggs are in an early stage of development, are nearly spherical and .65 to .70 mm. in diameter, and are carried in a mass behind the first pair of abdominal appendages, and between the appendages of the second and third pairs, the mass being principally supported by the first pair, very slightly by the third, and not at all by the fourth and fifth.

Five specimens give the following measurements in millimeters : —

Station	326	898	326	329	326
Sex	♀	♀	♀	♂	♂
Length from front of carapax to tip of telson	60.0	124.0	126.0	83.0	107.0
Length of carapax along median line	26.0	53.2	55.2	36.0	45.3
Breadth of carapax between spines of anterior margin	12.9	25.5	27.3	16.5	23.0
Greatest breadth (in front of cervical suture)	19.3	40.5	41.3	26.7	35.0
Length of first pair of legs*	67.0	140.0	161.0	100.0	125.0
“ merus	21.5	42.0	50.0	31.7	39.0
“ carpus	12.5	26.0	32.0	17.8	25.0
“ chela	21.0	46.0	49.0	30.0	38.5
“ dactylus	12.6	27.0	29.0	18.0	22.0
“ second pair of legs	22.3	50.0	51.0	32.0	41.5
“ merus	6.1	13.3	13.2	8.5	11.0
“ carpus	4.0	9.3	9.4	5.2	6.6
“ propodus	7.7	17.9	18.5	11.1	14.5
“ dactylus	3.9	8.5	8.8	5.2	7.0
“ fifth pair of legs	12.5	32.0	32.5	19.0	28.0
“ propodus	3.6	10.7	10.5	5.4	7.4
“ dactylus	0.9	2.0	2.1	1.4	1.8
“ abdomen	34.0	70.0	71.0	47.0	62.0
Greatest breadth at second somite	14.0	34.5	35.0	21.0	30.0
“ “ sixth somite	7.5	17.3	18.0	11.1	15.0
Length of telson	11.0	23.0	23.0	14.8	20.0
Breadth of telson	5.7	12.2	12.2	7.9	10.5

* In the second, third, and fourth columns the measurements of the first pair of legs are taken from the right leg; in the first and last columns, from the left. In the specimen of which the measurements are given in the fourth column, both legs of the first pair are present and the left one is a little shorter than the right and gives the following measurements: length, 153 mm.; merus, 47; carpus, 31; chela, 48; dactylus, 23.

CRANGONIDÆ.

Ceraphilus Agassizii, sp. nov.

Plate VII. Figs. 4-5*.

The carapax is short and broad, and in the female rounded and swollen above and somewhat convex longitudinally. The rostrum (*b*, in figs. 4* and 5) is hidden from above by the anterior spine (*a*) of the dorsal carina, and is slender, spiniform, and scarcely if at all more prominent than the slender spine forming the outer angle of the orbit each side, and very much less prominent than the slender and acute antero-lateral angles (*d*), which are slightly divergent and reach a little by the bases of the antennal scales in the female, while they are much more divergent and much longer in the male, so that the distance between their tips is considerably greater than the greatest breadth of the middle portion of the carapax. A narrow dorsal carina extends the whole length of the carapax, and is armed with two laterally compressed and spiniform teeth directed forward, and of which the anterior is much the larger, projects immediately above the rostrum, and reaches considerably beyond its tip, while the posterior one is smaller and arises just in front of the cardiac region. There is occasionally a very minute additional tooth in the dorsal carina about midway between these two. On the gastric region either side of the dorsal carina there is a large spine directed forward; below this is a stout hepatic spine from the upper side of which a prominent carinal ridge extends to near the posterior border, while from its lower edge a similar ridge extends downward and backward a short distance to the branchial region, where it meets a much less distinct carina extending from the antero-lateral angle nearly to the posterior border. There is also a well-marked carina extending backward from the orbital spine (*c*, figs. 4*, 5, 5*) along either side of the gastric region and following a distinct suture terminating anteriorly just outside the orbital spine. The lateral margin of the carapax is strongly incurved, and projects inward in a prominent rounded lobe below the base of the first thoracic leg. All the spines of the carapax are proportionally longer in the male than in the female.

The eyes are small and black, and scarcely reach beyond the tip of the rostrum.

The first segment of the peduncle of the antennula is more than twice as long as the second, and the lateral process from its base is very long, and reaches as far forward as the segment itself, which is armed with a tuberculiform prominence at the outer edge of the distal extremity and with a much smaller one on the inner edge; the second segment is short and has the outer distal angle considerably produced; the ultimate segment is much broader than long. The flagella are subequal in length and in the female about as long as the peduncle, but in the male about twice as long as the peduncle and the outer longer and very much stouter than the inner or than the outer flagellum of the female.

The antennal scale is about as long as the sixth segment of the abdomen and about twice and a half as long as broad, and the ultimate segment of the peduncle reaches very nearly to the tip of the scale.

The external maxillipeds are much more slender than in *C. boreas* and reach by the tips of the antennal scales about half the length of the ultimate segment, which is no broader than the penultimate but fully twice as long and about six times as long as broad ; the antepenultimate segment is longer than the ultimate.

The thoracic legs are nearly as in *C. boreas*, but are all rather more slender and less hairy. In the first pair the carpal spines are smaller and the chelæ are nearly naked and less swollen than in *C. boreas*. The second pair are nearly as long as the first : the carpus and merus are subequal in length, and each is a little longer than the ischium ; the chela is very slender, about half as long as the carpus, with the digits scarcely a third as long as the basal portion of the chela. The third pair are about as long as the second, the carpus a little longer than the merus, the propodus two thirds as long as the carpus, and the very slender dactylus but little less than half as long as the propodus. The fourth pair do not quite reach the tips of the third, and the fifth reach slightly by the carpi of the fourth.

The abdomen is broad, slightly depressed and rounded above anteriorly, and tapers rapidly to the sixth somite, which is only a little longer than the fifth. The five anterior somites are armed with a median dorsal carina which is conspicuous and flattened above on the fourth and fifth. The epimeron of the first somite is broadly expanded anteriorly and projects in an obtuse tooth below ; the second is broad and evenly rounded in front and behind, and has a slight tooth below, but the inferior edges of the remaining epimera are straight and unarmed. The sixth somite, excluding spines, is about a fourth longer than the fifth, is armed above with four prominent and approximately equidistant carinæ, and the posterior edge projects in a large tooth either side of the base of the telson and in an acute angle at the lateral margin. The carinæ and the teeth on the edges of the epimera are more prominent in the male than in the female.

The lamellæ of the uropods are much shorter than the telson : the outer are from a little more than twice to about three times as long as broad ; the inner are about as long as the outer, and three to four times as long as broad.

The telson is about once and two thirds as long as the sixth somite of the abdomen, flattened and broadly channelled above, tapers regularly to an acute point unarmed with spines but furnished with two pairs of plumose setæ arising from the under side, and the margins are ciliated beneath.

In the male there is a very long median spine on the sternum of each of the four anterior somites of the abdomen, but no similar spines in the female.

The surface of the carapax and abdomen is sparsely clothed with minute pubescence, which is very easily removed with the coating of soft mud with which all the specimens are covered.

The number and arrangement of the branchiæ is the same as in *C. boreas*, and as indicated by the following formula :—

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	0	0	0	0	0	0	(2)
Podobranchiæ,	0	0	0	0	0	0	0	0	0
Arthrobranchiæ,	0	0	0	0	0	0	0	0	0
Pleurobranchiæ,	0	0	0	1	1	1	1	1	5
									5+(2)

Five specimens give the following measurements in millimeters:—

Station		317	332	326	326	329
Sex		♂	♂	♀	♀	♀
Length from tip of rostrum to tip of telson	42.0	49.0	51.0	70.0	72.0	
Length of carapax including rostrum . . .	11.2	12.5	14.7	19.1	19.5	
Greatest breadth of carapax anteriorly . .	7.7	9.4	11.4	15.2	15.3	
Breadth between tips of antero-lateral spines	10.3	11.8	11.0	14.0	14.8	
Length of anterior dorsal spine	3.5	4.5	3.5	3.7	3.6	
“ antennal scale	5.6	6.0	6.4	8.1	8.2	
“ sixth somite of abdomen excluding spines	5.3	5.7	6.3	8.2	8.3	
“ telson	9.1	10.2	10.3	13.6	14.0	

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
317	31° 57' 0"	78° 18' 35"	333	2 ♂
326	33° 42' 15"	76° 0' 50"	464	1 ♂, 2 ♀
329	34° 39' 40"	75° 14' 40"	603	1 ♀
332	35° 45' 30"	74° 48' 0"	263	1 ♂, 4 ♀

A young specimen was taken in the U. S. Fish Commission dredgings off Block Island, in 1880, Station 891, N. Lat. 39° 46', W. Long. 71° 10', 500 fath.

Pontophilus Norvegicus M. Sars.

- Crangon Norvegicus* M. Sars, *Nyt Magazin Naturv.*, Christiania, XI. p. 248, 1861.
 GOES, *Öfversigt Vetenskaps-Akad. Förhandlingar*, Stockholm, 1863, p. 173 (13).
Pontophilus Norvegicus M. Sars, *Christiania Videnskabs-Selskabs Forhandlingar*, 1861, p. 183; *Nyt Magazin Naturv.*, Christiania, XII. p. 290 (38), 1863; XV. p. 242 (2), Pl. I. figs. 1–25, Pl. II. figs. 17–37, 1868.
 G. O. Sars, *Nyt Magazin Naturv.*, Christiania, XV. p. 95 (14), 1866; *Christiania Videnskabs-Selskabs Forhandlingar*, 1871, p. 261 (18), 1872; *Archiv. Mathem. Naturvidensk.*, Kristiania, II. p. 340, 1877.
 METZGER, *Jahresber. Comm. wissenschaft. Untersuchung deutschen Meere*, 1872–73, Nordsee, p. 291, 1875.
 S. I. SMITH, *Trans. Conn. Acad.*, New Haven, V. p. 61, 1879; *Proc. National Mus.*, Washington, III. p. 435, 1881.
 ?? *Hippolyte costata* LEUCKART, *Wirbelloser Thiere mit Fauna norddeutsch. Meeres*, p. 159, 1847.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
306	41° 32' 50"	65° 55' 0"	524	5
309	40° 11' 40"	68° 22' 0"	304	7

Pontophilus brevisrostris SMITH.

Proc. National Mus., Washington, III. p. 435, 1881.

Plate VII. Figs. 1-1^b.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
314	32° 24' 0''	78° 44' 0''	142	15
315	32° 18' 20''	78° 43' 0''	225	2
321	32° 43' 25''	77° 20' 30''	233	1
327	34° 0' 30''	76° 10' 30''	178	25
333	35° 45' 25''	74° 50' 30''	65	2
344	40° 1' 0''	70° 58' 0''	129	6
345	40° 10' 15''	71° 4' 30''	71	20

This species is very closely allied to *P. spinosus* and *P. Norvegicus*, but is readily distinguished from them by the very short rostrum, which is tridentate, with the median tooth scarcely broader and very little longer than the lateral, about reaching to the cornea of the inner side of the eye and not projecting beyond the line of the spiniform outer angles of the orbits. The proportions of the body are more like *spinosus* than *Norvegicus*, but the carination and armature of the carapax are more like *Norvegicus*, while the sculpture of the distal somites of the abdomen is more like *spinosus*.

The dorsal carina of the carapax is armed with three spines, and frequently a smaller fourth one in front of the others and just back of the base of the rostrum; the subdorsal carina is armed with two spines, as in *Norvegicus*, and often with a rudiment of a third behind these; the lateral carina does not extend back of the middle of the carapax, and is armed with a single spine, as in *Norvegicus*. There are no distinct carinæ on the first four somites of the abdomen, but the fifth somite is flattened above and has subdorsal carinæ slightly diverging posteriorly, and below these, each side, another carina, nearly parallel with the subdorsal; and the sixth somite is flattened above and subdorsally carinated, as in *spinosus*, though the carinæ are not quite as conspicuous on either somite as in that species.

The eyes, antennulæ, and antennæ are very nearly as in *P. spinosus*. The external maxillipeds reach a little beyond the tips of the chelipeds, the penultimate segment reaches nearly to the tip of the antennal scale, and the ultimate segment is a little less than twice as long as the penultimate, while in *P. Norvegicus* it is about once and a half as long, and in *P. spinosus* much more than twice as long, as the penultimate segment. The thoracic legs differ scarcely at all from those of *P. spinosus*.

The lamellæ of the uropods are very nearly as in *P. spinosus*. The inner lamella reaches nearly or quite to the tip of the telson, is lanceolate, and six or seven times as long as broad; the outer lamella is about a tenth shorter than the inner, and about four times as long as broad. The telson is once and a fourth to once and two fifths as long as the sixth somite of the abdomen, is very narrow, slightly acuminate, and has a very narrow and acutely triangular tip,

armed with only two very long, slender, and plumose setæ, which arise near together from the under side.

It appears to be a much smaller species than either *Norvegicus* or *spinus*, the largest males being scarcely 25 mm. in length and the largest females about 36 mm.

This species was taken in great abundance, in 51 to 155 fathoms, off Block Island, in 1880 and 1881, by the U. S. Fish Commission. The specimen figured is from the Fish Commission collection, Station 873, 100 fathoms.

Pontophilus gracilis, sp. nov.

Plate VII. Figs. 2 - 3^a.

This species is very much more slender and has much larger eyes than any other species of the genus known to me. It is represented in the collection by a single specimen, which is possibly immature, but, judging from the structure of the appendages of the first and second somites of the abdomen, is a female.

The carapax is nearly twice as long, along the dorsal line, as broad, slightly carinated, and so thin that the branchiæ are readily seen through it. The rostrum is about two sevenths as long as the rest of the carapax along the dorsal line, very slender, and the lateral teeth scarcely a third of the way from the base to the tip. The dorsal carina is not distinct except where it rises into two acute teeth directed forward, one on the gastric region and one on the anterior part of the cardiac. There is a slight lateral carina in the middle portion of the carapax, terminating anteriorly in a spine like those in the dorsal carina. A little farther down upon the carapax and a little in front of the anterior spine of the dorsal carina there is a small hepatic spine, making in all six spines exclusive of those of the anterior margin. The orbit is very broad and its outer border extends far forward and terminates in a slender spine, while the similarly slender spine of the antero-lateral angle extends still farther forward nearly or quite to a line with the tip of the rostrum.

The eyes are very large and reach to about the tip of the rostrum; the cornea is oblique, somewhat compressed vertically, and its greatest breadth considerably more than the breadth of the antennal scale. The peduncle of the antennula scarcely reaches the middle of the antennal scale, and the lateral process from the base of the first segment reaches to the distal extremity of the segment itself; the outer flagellum is slender and reaches to the tip of the antennal scale; the inner is about a third longer, but scarcely stouter, than the outer. The antennal scale is about three fourths as long as the carapax exclusive of the rostrum, about four times as long as broad, only very slightly narrowed distally, and the tip evenly rounded. The distal segment of the peduncle is a little more than half as long as the scale, and the flagellum is slender and about twice as long as the carapax exclusive of the rostrum.

The first and second maxillipeds are nearly as in *P. Norvegicus*. The external maxillipeds reach by the tips of the antennal scales by fully half the

length of the distal segment, which is a little longer than the penultimate, but only a little more than two thirds as long as the antepenultimate, while the two distal segments together are about as long as the antennal scale.

The anterior thoracic legs are very slender, reach a little beyond the tips of the antennal scales, and the chela itself is smooth, naked, strongly compressed distally, a little shorter than the antennal scale, about as long as the diameter of the carapax, and, excluding the very prominent distal spine of the inner margin, about a fourth as wide as long. The second legs are very small, as in the other species of the genus, slender, and scarcely reach the middle of the meri of the anterior pair. The third are very slender, about twice as long as the carapax, reach by the tips of the antennal scales the full length of the propodi and dactyli, which taken together are very nearly as long as the carpi, the dactyli being very slender and acute and about half as long as the propodi. The fourth and fifth legs are about as long as the first pair, and sparsely clothed with long hairs except upon the dactyli, which are strongly compressed vertically, about two thirds as long, and toward the base as broad, as the propodi.

The abdomen to the tip of the telson is about three times as long as, and slightly narrower than, the carapax. The sixth somite is more than a fifth of the entire length, compressed laterally so that the breadth is less than a fourth while the height is fully two fifths of the length, and flattened or obscurely channelled longitudinally in the middle of its length above. The telson is about as long as the sixth somite, very slender, flattened but scarcely channelled above, and the narrow tip armed with four very slender spines of which the median are twice as long as the lateral. The inner lamella of the uropod is as long as the sixth somite, projects considerably by the tip of the telson, is lanceolate, and more than five times as long as broad. The outer lamella is considerably shorter and slightly broader than the inner.

The inner lamella of the appendage of the first abdominal somite (Pl. VII. fig. 2^b) is about as long as the protopod, linear, and the margins not ciliated; the outer lamella is narrow-ovate, considerably longer than the inner, and of the usual structure. The inner lamella of the appendage of the second somite (fig. 2^c) is a little shorter and much narrower than the outer, and has a single stylet two fifths as long as itself arising from the inner margin near the base.

Length from tip of rostrum to tip of telson	30.0 mm.
Length of carapax including rostrum	7.8
Length of rostrum	1.7
Greatest breadth of carapax	4.1
Length of antennal scale	4.5
Breadth of antennal scale	1.1
Greatest diameter of eye	1.4
Length of sixth somite of abdomen	4.9
Length of telson	5.0

Station 315, N. Lat. 32° 18' 20", W. Long. 78° 43'; 225 fathoms.

Since the above description was written a specimen of this species has been taken in 458 fathoms, by the U. S. Fish Commission, Station 1029, off Martha's Vineyard. This specimen, an adult male 28 mm. long, agrees perfectly with the female except in the usual sexual characters, and proves beyond question that the specimens are adult, though the female is probably not fully grown. The eyes in the male are fully as large as in the female. The inner flagellum of the antennula reaches nearly half its length by the antennal scale, while the outer is only a little shorter than the inner, but very stout, fusiform, with the diameter at the thickest point equalling nearly half the breadth of the antennal scale. The inner lamella in the first pair of abdominal appendages (Pl. VII. fig. 3) is only half as long and less than half as broad as the outer, and almost entirely naked. In the second pair (fig. 3^r) the inner lamella is nearly as long as the outer, but only about two thirds as broad, lanceolate in outline, furnished with plumose marginal setæ like the outer, and bears the two stylets characteristic of the male at about a fourth of the way from the base to the tip of the inner margin. The marginal or major stylet is like the single stylet of the female and of the succeeding appendages of the male, about two fifths as long as the lamella itself, very narrow, and almost entirely naked except the usual hooklike setæ near the tip, while the minor stylet is a little stouter than the other, but only about a fourth as long as the lamella, and naked except a few minute hairs near the tip.

Sabinea princeps, sp. nov.

Plate VIII. Figs. 1-1^b.

Carapax with seven carinæ as in the other species of the genus, but with an acute rostrum as long as the antennal scales or longer, and armed above with a spine either side near the base and below with a single spine. The dorsal carina is very high, sharp, slightly arched longitudinally, and armed, from a little back of the orbit to the posterior margin, with seven or eight somewhat irregular teeth directed forward. The rostrum varies very much in length, in the male being often only a little shorter than the length of the carapax from the orbit to the middle of the posterior margin, but in large females often only half as long; dorsally it is flattened and the margins slightly carinated, but beneath the edge is angular; the basal portion is nearly horizontal, but the terminal portion is upturned and acute; below the margin is armed with a slender spiniform tooth directed forward from the point where the terminal portion is upturned, and above with a similar tooth arising from the dorsal margin over either eye and directed outward and upward. The three carinæ each side of the carapax have about the same position as in the other species of the genus. The subdorsal is continuous almost to the orbit, and is armed with six or seven spiniform teeth directed forward. The next carina below is broadly interrupted on the anterior region, but back of this is armed with five or six teeth like those of the subdorsal carina, and in front, at the outer margin

of the orbit, with a prominent slender and acute spine. The lower lateral carina is very prominent anteriorly and is armed with nine to twelve spiniform teeth, of which the three or four most anterior increase in size very rapidly, the anterior one forming a great and somewhat laterally expanded spine nearly or quite half as long as the rostrum, and reaching nearly to, or in the male often considerably beyond, the middle of the antennal scale.

The eyes are black, very large, pyriform, and including the peduncles much longer than the greatest diameter, which is about two thirds the breadth of the antennal scale.

The peduncle of the antennula reaches to about the middle of the antennal scale; the flagella are subequal in length, in the female a little longer than the antennal scale, but in the male much longer and the outer very much stouter than in the female, and considerably thickened vertically.

The antennal scale is about a third as long as the carapax including the rostrum, and is itself of nearly the same form as in the allied species, but there is a prominent and acute spine near its base upon the outer edge of the second segment. The distal segment of the peduncle is very long, reaching nearly to the tip of the antennal scale, and the flagellum in the male is about as long as the abdomen, but considerably shorter in the female.

The external maxillipeds are slender, reach considerably beyond the tips of the antennal scales, and the proportions of the segments and of the exopods are almost exactly the same as in the other species of the genus.

The anterior legs reach to the tips of the antennal scales: the outer distal margin of the merus is prolonged into a slender spine, and there is a similar one upon each of the two outer distal angles of the carpus; the chela is about as long as the merus, very stout, somewhat swollen, and nearly cylindrical at base, but compressed and expanded on the inner side distally, the prehensile edge nearly transverse, slightly arcuate, and armed with a very large spiniform tooth at the inner margin. The rudimentary second legs are small, very slender, and reach to the distal end of the ischia of the first: the ischium and merus are subequal in length and each much longer than the three distal segments, of which the carpus and propodus are subequal, while the dactylus is very small, only a little longer than the diameter of the propodus. The third legs reach slightly beyond the first, and the dactylus is very slender and acute, but only about one sixth as long as the propodus. The fourth and fifth are nearly equal in length, and the fourth reach to the tips of the third: the dactyli are about half as long as the propodi, very slender, with the upper surfaces densely ciliated.

The carinae of the abdomen have the same arrangement as in *S. Sarsii*, but are much more conspicuous, and each of the epimera of the first two somites projects below into an acuminate spine, while the epimera of the third, fourth, and fifth somites are each armed with two similar spines. The dorsal carina upon the posterior half of the second somite is double, or rather V-shaped with the apex directed forward. The dorsal carina upon the third and fourth somites is very conspicuous, and upon each is prolonged in a tooth at the

posterior margin, the tooth upon the fourth being prominent and horizontal and occasionally having a secondary tooth above its base. The two dorsal carinæ of the fifth somite are high and sharp, and each armed with a sharp tooth near the middle and with a similar one projecting over the posterior margin. The sixth somite is about once and a half as long as the fifth, its dorsal carinæ are very high and sharp and each armed with five to seven acute teeth of which the posterior project over the margin as in the fifth somite; the posterior margin is in addition armed with two spines each side, one at the inferior angle and another above the base of the telson.

The outer lamella of the uropod is a little longer than the sixth somite, about twice and a half as long as broad, and obtusely rounded at the tip; the inner is longer than the outer, ovate-lanceolate, and not quite a third as broad as long.

The telson is about once and a half as long as the sixth somite, tapers regularly throughout, and is ornamented above with two carinæ converging to the tip, which is acute, unarmed, and naked.

All the exposed surfaces of the carapax and abdomen except the spines and carinæ, and a considerable part of the surface of the appendages, are clothed with a very short and dense pubescence, which readily brushes off with the soft mud with which most of the specimens are covered.

Six specimens give the following measurements in millimeters:—

Station	326	326	337	326	326	312
Sex		♂	♂	♂	♀	♀
Length from tip of rostrum to tip of telson	56.0	65.0	89.0	98.0	77.0	125.0
Length of carapax including rostrum	21.0	23.2	33.5	35.0	28.5	49.5
Length of rostrum	9.2	9.6	15.5	13.5	12.0	21.0
Length of antennal scale	7.0	8.1	11.5	12.5	9.2	15.0

The eggs are very large, being, even in alcoholic specimens, about 2.5 and 3.0 mm. in least and greatest diameter, while in *S. septemcarinata* they are about 1.0 by 1.4 mm. in alcoholic specimens.

The number and arrangement of the branchiæ are the same as in *S. septemcarinata*, and may be indicated by the following formula:—

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	0	0	0	0	0	0	(2)
Podobranchiæ,	0	0	0	0	0	0	0	0	0
Arthrobranchiæ,	0	0	2	0	0	0	0	0	2
Pleurobranchiæ,	0	0	0	1	1	1	1	1	5
									<u>7+(-)</u>

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
312	39° 50' 45"	76° 11' 0"	466	1 ♀
326	33° 42' 15"	76° 0' 50"	464	10 ♂, 9 ♀, 3 young.
337	35° 20' 8"	73° 23' 20"	740	1 ♂

Also obtained in the U. S. Fish Commission dredgings off Block Island in 1880, Station 892, N. Lat. 39° 46', W. Long. 71° 5', 487 fathoms; and Station 893, N. Lat. 39° 52' 20'', W. Long. 70° 58', 372 fathoms.

The long and spined rostrum and the long spines and teeth of the carapax and abdomen give this gigantic species a very different aspect from the other species of the genus; but the oral appendages, the number and arrangement of the branchiæ, and other structural details, agree perfectly with *S. septemcarinata*, the type species of the genus. The present species is, however, much more closely allied to *S. Sarsi* Smith (Trans. Conn. Acad., V. p. 59, Pl. II. figs. 6-8, 1879) than to *septemcarinata*; the elongated and acute rostrum, the prominent dentation of the carapax and abdomen, and the structure of the telson in *Sarsi* show a marked approach toward the *princeps*, although the two species are very different in general appearance.

Sabinea hystrix (*Paracrangon hystrix* A. Milne-Edwards, Ann. Sci. Nat., 6^{me} série, XI. No. 4, p. 6, 1881), from 730 fath., near Guadaloupe, is very closely allied and probably identical with this species, which, though externally somewhat like *Paracrangon echinatus* Dana, differs essentially in several structural features in which, as pointed out above, it agrees with the typical species of *Sabinea*. In *Paracrangon echinatus*, not only are the second pair of legs completely obsolete, but there are no arthrobranchiæ, the branchial formula being the same as for *Ceraphilus boreas* and *Agassizii*.

RHACHOCARINÆ, subfam. nov.

Anterior thoracic legs stout, non-chelate; second pair slender, chelate, and with multiarticulate carpi; coxæ of the external maxillipeds articulated with the adjacent edge of the carapax.

These characters sufficiently distinguish this subfamily from all other Crangonidæ. The broad, ovate antennal scales with both margins ciliated are probably also characteristic of the subfamily, which, as far as known to me, contains but one genus.

RHACHOCARIS,* gen. nov.

Plates V. and VI.

The carapax is subcylindrical, carinated longitudinally, rostrated, with prominent antero-lateral and antennal spines, and the margins of the branchiostegites are strongly incurved opposite the bases of the second pair of legs and are connected each side with the coxæ of the external maxillipeds by two processes from the coxa interlocking between their converging tips a projection in the margin of the carapax so as to form therewith an articulation admitting slight motion.

The eyes are large and pyriform, with the cornea expanded and very large. The antennulæ are very nearly as in *Crangon*. The antennal scale is broad,

* 'Ράχis and καρπs.

ovate, the entire margin ciliated, and with the tooth of the outer margin small and far back from the tip. The other parts of the antenna are nearly as in *Crangon*. The oral appendages are very similar to those of *Crangon* and the closely allied genera, and the labrum, metastoma, mandibles, maxillæ, and second pair of maxillipeds are very nearly as in *Crangon vulgaris*. In the first maxilliped the proximal lobe of the endopod projects inward much more prominently and the distal lobe is longer than in *Crangon*. There are two arthrobranchiæ at the base of the external maxilliped, as in *Sabinea*, and the stout endopod is composed of three segments as in *Crangonina*, but the two distal segments are very short and the terminal one acute and spined.

The legs of the first pair are symmetrical and about as large as the external maxillipeds; the propodus is short and tapers distally, and the dactylus is small, slender, and capable of flexion against the inner side of the propodus. The legs of the second pair are elongated, slender throughout, and, in all the specimens examined, slightly unsymmetrical in length; the carpi are long and multartienlate; and the chelæ small. The last three pairs of legs are slender and nearly alike.

The number and arrangement of the branchiæ differ from all the *Crangonidæ* known to me. In *R. sculpta*, the second species here described, there are epipods on the bases of the first and second maxillipeds and two arthrobranchiæ at the base of each external maxilliped, one arthrobranchia for each of the thoracic legs except the last pair, and a pleurobranchia for each side of the last five thoracic somites, — making two epipods, six arthrobranchiæ, and five pleurobranchiæ each side, as indicated in the following formula: —

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	0	0	0	0	0	0	(2)
Podobranchiæ,	0	0	0	0	0	0	0	0	0
Arthrobranchiæ,	0	0	2	1	1	1	1	0	6
Pleurobranchiæ,	0	0	0	1	1	1	1	1	5
									<hr/> 11+(2)

The abdomen is sculptured and spined to correspond with the carapax, and the exoskeleton is throughout very thick and massive.

In the three species here described, the hinges at the last three articulations of the abdominal somites — that is, at the articulation of the fifth with the fourth, the sixth with the fifth, and of the telson with the sixth — present a peculiar modification by which the hinge is very much strengthened and is at the same time apparently made capable of being clamped or locked so as to hold the terminal somites firmly extended. In addition to the ordinary hinge, at each of these articulations, there is a process arising from the anterior somite just below the hinge and curved backward and upward concentrically with the hinge, and this process fits accurately and is slightly overlapped along its edges by a similarly curved groove in the posterior somite. When the abdomen is completely flexed the ends of these curved processes project dorsally consider-

ably beyond the grooves, but when the abdomen is fully extended the processes are withdrawn so as to expose the dorsal part of the groove, and in this position in the contracted alcoholic specimens the somites are firmly clamped, apparently by the pressure of the ends of the processes upon the concave posterior walls of the grooves, and held rigidly extended, so that it is very difficult to flex the somites, unless the tip of the abdomen is pulled backward with considerable force, when the processes slide easily through the grooves and the somites are readily flexed. It is probable that in life, while the extensor muscles of the abdomen are relaxed, the processes move easily through the grooves; but when the extensor muscles are strongly contracted the hinges are clamped as in the alcoholic specimens, so that the animal can voluntarily hold the telson and the spiny terminal somites of the abdomen rigidly extended as a means of self-defence.

In all three of the species, when the abdomen is fully flexed, the tip of the telson is brought directly below and very near to the mouth.

A. Milne-Edwards, in the paper already referred to, which has been published since the part of this report relating to the Crangonidæ was ready for the printer, has described three new species belonging to a new genus, *Glyphocrangon*, which is apparently very closely allied to the genus here described and possibly identical with it. In Milne-Edwards's genus the telson is described as consolidated with the sixth somite of the abdomen.* It is scarcely to be supposed that Milne-Edwards could mistake the peculiar articulation of the telson with the sixth somite of the abdomen, which is described above and which is equally characteristic of the articulation of the sixth somite with the fifth and of the fifth with the fourth, for actual consolidation, or overlook the remarkable character of the articulation of the external maxillipeds with the carapax; and as neither of the species here described and figured agrees fully with the description of either of the species of *Glyphocrangon* in the spines of the carapax and abdomen, I am forced to the conclusion that Milne-Edwards's genus is different from mine, though possessed of quite as remarkable characters.

Rhachocaris Agassizii, sp. nov.

Plate V. Fig. 2. Plate VI. Fig. 2.

Female. — The carapax has eight conspicuous longitudinal carinæ which are interrupted by a very deep cervical and a broad and deep gastro-orbital sulcus, but, aside from the carinæ, sulci, and spines, is nearly cylindrical. The rostrum is about two thirds as long as the rest of the carapax along the dorsal line, flat-

* In characterizing the genus he says, "Le septième article abdominal est presque entièrement soudé au sixième"; and in the description of *G. spinicauda*, the first species, "Le septième article est immobile sur le précédent, il est triangulaire, bicaréné en dessus, très pointu, et au lieu d'avoir la même direction que les autres articles, il se relève et son extrémité est dirigée en haut."

tened above, triangular but with the edge flattened and distally slightly grooved below, and tapers regularly to an acute and gently upturned tip; above there is a narrow but distinct median carina extending the whole length, and the margins are carinated and each armed just above the front of the eye with a prominent and acute spine directed forward and upward; below the rostrum is unarmed. Just back of the base of the rostrum there is a pair of spines like those upon the rostrum, but slightly larger and with the bases elongated and laterally compressed. From these teeth two parallel dorsal carinæ extend to the posterior margin, but each one is broken into ten or eleven elongated teeth turned slightly forward, truncated above, and all except the first and last with flattened and conspicuously punctate tops. The space between these carinæ is concave with a deep transverse depression at the cervical suture, but smooth except a few small tubercles along the carinæ and one on the median line in front. The frontal margin is transverse and nearly straight, but the lateral angle is armed with three very large and acute spines: a very slender antennal spine directed upward and forward from just above the base of the antenna; directly below this a somewhat larger one (the lateral angle itself) slightly compressed laterally and curved downward and then directed forward below the antennal scale; and, arising outside and a little back of these, a very broad, dentiform, vertically compressed spine directed outward and forward, terminating in an acute tip as far forward as the tip of the antennal spine, and apparently representing the anterior part of the lower of the three lateral carinæ, but separated from it by the broad and very deep depression of the cervical suture. The broad triangular space between this carinal tooth and the gastric region is depressed and smooth. The posterior part of the middle lateral carina is prominent and terminates at the cervical suture in a long tooth directed forward; posteriorly it extends to the posterior margin and has the edge thick, flattened and punctate. The upper of the lateral carinæ is not evident in front of the cervical suture, is less conspicuous than the dorsal, and is obscurely divided into about four truncated teeth flattened and punctate above. On the gastric region in front of this carina there is an irregular group of elongated tubercles extending to the gastro-orbital suture, but with this exception the sides of the gastric region are unarmed, as are the remaining spaces between the carinæ of the dorsal part of the carapax, except a few very small tubercles either side of the cardiac region, and a few still smaller ones below the upper lateral carina and near the posterior margin. The lower of the lateral carinæ is broad, punctate along its edge, and extends from near the base of the spine of the antero-lateral angle almost to the posterior margin, with a broad and deep interruption at the cervical suture. On the branchial region below this carina there are about three irregular elongated and punctate ridges, and near the posterior margin there are a few small tubercles, but with these exceptions the branchial regions are unarmed. There is, however, a narrow but well-marked carina the whole length of the lateral margin.

The eyestalks are slender and very small in proportion to the eyes themselves, which are approximately spherical, slightly compressed vertically, and

with the horizontal diameter about three fourths as great as the breadth of the antennal scale and only a little less than the length of the eye to the base of the stalk. In the alcoholic specimen, the pigment is deep purplish and is probably not black in life.

The peduncle of the antennula reaches to the tip of the antennal scale and nearly to the tip of the rostrum, and is clothed along the sides and below with very fine hairs, but is nearly naked above; the first segment is a little longer than the second and third together, the second nearly as long as the last, which is less than twice as long as broad. The flagella are both nearly naked: the outer is about as long as the peduncle, the proximal two thirds of its length vertically compressed and broad, but the terminal portion suddenly contracted; the inner is a little longer than the outer, very slender and regularly tapered.

The antennal scale is regularly ovate, with the greatest breadth about two thirds of the way from the tip to the base, where it is very much contracted at the articulation; both margins are thickly ciliated, and the tooth of the outer margin is represented by an obscure angular projection at less than a third of the way from the base to the tip. The narrowness of the articulation permits great lateral motion in the scale, so that it may be turned outward at nearly a right angle to the body. The segments of the peduncle are without spines or tubercles; the last segment is about as long as the breadth of the scale and reaches three fourths of the way from its base to its tip, and the inner edge is compressed and ciliated. The flagellum is a little longer than the carapax including the rostrum, slender, compressed vertically, and almost naked.

The tips of the external maxillipeds reach to about the tips of the antennal scales. The proximal of the three segments of the endopod is about as long as the antennal scale and five or six times as long as broad; the second segment is about two fifths as long as, and slightly broader than, the first, vertically compressed, thickly ciliated along the inner edge, and armed beneath with a single movably articulated spine near the distal end, and with two or three similar spines along each edge; the last segment is a little longer than the second, flat and smooth above, tapers from the base to a slender curved and acute tip, and the under surface and lateral margins are armed with thirteen or fourteen movably articulated spines among which there are a few fascicles of setæ. The exopod is very slender, the basal portion slightly longer than the flagelliform portion, and the whole considerably shorter than the proximal segment of the endopod.

The legs of the first pair are just about as long as and scarcely stouter than the external maxillipeds, and reach a little beyond the bases of their dactyli, or nearly to the tips of the peduncles of the antennæ: the ischium is about as long as the propodus, the inner and outer margins nearly parallel, the outer articulating with the merus, while the inner is thin, nearly straight, closely approximated, and armed with a few setæ, and each projects forward beyond the articulation with the merus in a narrow dentiform prominence; the merus is as long as the three distal segments together, about a fourth as long as broad, slightly compressed vertically and with a few setæ along the inner edge, but

otherwise unarmed; the carpus is short, about as broad as long, and unarmed, and is so articulated with the merus as to be capable of flexion backward and beneath it; the propodus is slightly more than half as long as the merus, rounded, slightly swollen, tapers to a very narrow distal extremity, and is smooth and unarmed except upon the upper and inner side where it is furnished with three longitudinal series of fascicles of soft setæ; the dactylus is about half as long as the propodus, very slender, curved and acute, smooth and naked, and capable of nearly complete flexion on the setigerous side of the propodus. The manner in which the distal segments of these limbs are articulated brings the setigerous sides of the propodi and the points of the dactyli in direct opposition to the spinous sides of the two distal segments of each of the external maxillipeds, and these two pairs of appendages are probably used together as prehensile organs.

The legs of the second pair are unarmed and naked, very slender, the distal portion but little stouter than the proximal part of the flagellum of the antenna, and a little unsymmetrical, the left being slightly stouter than the right and reaching nearly to the tip of the rostrum, while the right reaches a little beyond: the coxa is short and nearly cylindrical; the ischium is a little longer than the propodus in the first pair, much broader than the coxa, very much compressed vertically and the inner edge slightly expanded proximally, so that the breadth is about a fourth of the length; the merus is about a fourth longer than the ischium, the right a little longer than the left, little more than half as broad as the ischium, nearly uniform in breadth, and compressed vertically but much less so than the ischium; the carpus is more than twice as long as the merus and more slender, strongly compressed, very slightly tapering at the distal end, composed of thirty-one segments on the right side and twenty-three on the left, and the most distal segment in each about as long as the three next taken together; the left chela is slightly larger than the right, but neither is larger than the distal segment of the carpus, the digits are both short, the prehensile edge of the propodal one considerably oblique and shorter than the dactylus, which is itself scarcely longer than the breadth of the propodus.

The legs of the third pair are nearly naked, slender, and reach to the tip of the rostrum: the merus is about twice as long as the ischium, and these two segments taken together are longer than the three distal segments and are of nearly uniform diameter throughout and very slightly compressed; the carpus is a little shorter and more slender than the ischium; the propodus is nearly twice as long as the carpus, cylindrical, and slightly tapered distally; the dactylus is narrower than the distal end of the propodus, nearly a fourth as long as the propodus, nearly straight, a little compressed vertically, and tapered from the base to the tip. The fourth and fifth pairs of legs are alike and very similar to the third pair, but are slightly stouter throughout, the propodus is furnished with a dense fascicle of setæ outside the base of the dactylus, and the dactylus itself is considerably longer than in the third pair, strongly compressed vertically, concave above and convex below, and lanceolate, being broader in the middle than the distal end of the propodus, but narrowed toward the base and tapered to an acute tip.

The sternum is flat, triangular, and wholly unarmed.

The abdomen is about once and a half as long as the carapax including the rostrum, is narrower than the carapax, and as seen from above tapers regularly from the base to the tip of the telson. There is a sharp medio-dorsal carina from the base to the telson, but interrupted on all the somites but the first; a single lateral carina each side is indistinctly indicated on the first two or three somites; and the dorsal surface generally is studded with prominent tubercles, many of which are elongated and all the larger ones with flattened and punctate tops. Upon the first somite, the median carina is thin and very high and projects forward in an acute tooth; either side, in line with the upper lateral carina of the carapax, there is a very prominent acute and spiniform tooth directed obliquely forward. On the second and third somites, the dorsal carina is divided into two nearly equal parts by a smooth and very conspicuous sulcus, which passes slightly backward either side across the whole dorsum of the segment and down parallel with and near to the posterior margin of the epimeron; the anterior part of the carina on the second somite is nearly as high as on the first and projects slightly forward, but the posterior part on the second and both parts on the third are much lower and do not project in front or behind. On the fourth somite, the carina is divided into two unequal parts by a less conspicuous sulcus, the anterior part being like that upon the third somite, while the posterior part is twice as long, thickened and flat above anteriorly, but posteriorly higher, more acute, and projecting slightly over the fifth somite. On the fifth somite the carina is unequally divided by a similar sulcus, but the anterior portion is more prominent than on the fourth, and the posterior part is very prominent, its anterior half being formed of two longitudinally elongated tubercles slightly diverging posteriorly, and between and back of them a single very high sharp and triangular tooth. The carina upon the sixth somite is broken anteriorly by a small notch, and posteriorly rises in an acute edge and projects far back over the base of the telson in an acute tooth. The epimeron of the first somite is narrow, does not project below the margin of the carapax, is rounded below and almost wholly covered by the anterior expansion of the epimeron of the second somite when the abdomen is fully flexed. The epimeron of the second somite projects much below the epimeron of the first, the anterior margin is nearly as convex in outline as the posterior, the inferior margin projects in the middle in a very long, slender, and outcurved spine, in a much smaller spine at the posterior angle, and in a small tooth anteriorly; on the outer surface a sulcus, like and nearly parallel with the sulcus of the posterior border, passes from near the anterior hinge to the base of the large spine of the inferior margin, but between and outside of the sulci the surface is sparsely tuberculous. The epimera of the third, fourth, and fifth somites have a smooth depressed area along the anterior margin, and are each armed below with two slender acute and out-curved spines, of which the anterior one on each epimeron is about as long as the large spine of the second epimeron, while the posterior spines increase in length from the second to the fifth somite, that upon the fifth epimeron being longer than the anterior spine of the same

epimeron and directed backward as well as outward; the middle portion of the outer surface of each of these epimera is raised and sparsely tuberculous, and there is also a line of small tubercles between the sulcus and the posterior margin on the third, but on the following epimera the transverse sulcus of the dorsum does not extend down the epimera. Most of the tubercles on the side of the sixth somite are arranged in two longitudinal lines, an irregular but prominent one between the two hinges and a less prominent one below. The lateral angles of the sixth somite project downward, outward, and backward in a very large and acute spine outside the base of the uropod.

The telson is a little longer than the rostrum, slightly expanded toward the base, but the distal two-thirds is narrow, and terminates in a slender spiniform and slightly upturned tip unarmed with spines or setæ. On the dorsal side there is a sharp median tooth beneath the projecting carinal tooth of the sixth somite; either side there is a sharp carina extending from the base nearly to the tip, leaving, except at the base, a smooth and deep groove between them; the lateral edges are strongly carinate, leaving a smooth groove either side, and a wide and shallow groove the full width of the under surface.

The lamellæ of the uropods are about three fourths as long as the telson; the inner lamella is obtusely lanceolate and nearly four times as long as broad; the outer is much broader, the tip ovately rounded, and the very prominent lateral tooth about a fourth of the way from the tip to the base.

The inner lamella of the appendage of the first abdominal somite is very short, about a third as long as the outer, obtuse, and about half as broad as long.

The sterna of all the abdominal somites are unarmed.

The eggs are very large, being, in alcohol, about 2.6 and 3 mm. in least and greatest diameter, and are proportionally few in number, there being not far from one hundred carried by the specimen examined.

The single specimen seen, a female, gives the following measurements:—

Length from tip of rostrum to tip of telson	111.0mm.
Length of carapax, including rostrum	46.0
Length of rostrum	18.0
Breadth of carapax in front, including spines	30.0
“ “ at cervical suture	17.0
“ “ at middle, including spines	21.0
Diameter of eye	5.0
Length of antennal scale	13.1
Breadth of antennal scale	7.1
Length of external maxillipeds	27.4
“ first pair of legs	27.2
“ carpus	2.3
“ propodus	6.2
“ dactylus	3.4
“ second pair of legs	right, 42.0 mm.; left, 39.0

Length of merus	right, 8.4 mm. ; left, 8.7 mm.
“ carpus	“ 19.9 “ 17.5
“ chela	“ 1.2 “ 1.1
“ third pair of legs	41.0
“ fifth pair of legs	46.0
“ telson	20.0

Station 326, N. Lat. 33° 42' 15", W. Long. 76° 0' 50", 464 fathoms.

Rhachocaris sculpta, sp. nov.

Plate V. Fig. 3. Plate VI. Figs. 3-3¹.

Female.—This species, though closely resembling the last in structure and general appearance, differs very conspicuously in the ornamentation of the carapax and abdomen, and in the form of the dactyli of the fourth and fifth pairs of thoracic legs. It is distinguished from *R. Agassizii* at a glance by having the dorsal and upper lateral carinæ of the carapax only obscurely indicated by lines of acute tubercles and the spaces between the carinæ tuberculous, by having two short spines each side in place of the great lateral spine of the antennal region and a small bidentate tooth in place of the sharp branchial spine of *R. Agassizii*, and in having three instead of two lateral spines on the epimeron of the fifth somite of the abdomen.

The postero-lateral angle of the carapax is more prominent and angular than in *R. Agassizii*, but in other respects the form is very nearly the same. The lateral carinæ on the posterior part of the rostrum are not so high, and the two teeth at the base of the rostrum are even smaller than the rostral teeth and are nearly erect. All the carinæ of the carapax are much less prominent, so that the carapax is more regularly rounded. The space between the two dorsal carinæ is scarcely at all depressed, the transverse sulcus at the cervical suture is not as deep, and there are two lines of small spiniform tubercles extending the whole length of the space, and the dorsal carinæ themselves are represented by two similar lines of larger spiniform tubercles with about twelve tubercles in each line, and with an obscure line of minute tubercles just outside of them. Below the dorsal carina and just back of the eye either side, at the extreme anterior end of the lateral lobe of the gastric region, there is a very large vertically compressed and acute tooth or spine connected with the lateral carina of the rostrum by a low but conspicuous ridge, just back of the base of this tooth there are one or two small spines, and on the rest of the triangular lateral lobe of the gastric region between these and the cervical suture there are approximately twelve spines or tubercles, of which those in the middle of the lobe are larger than the others. Of the three spines of the antennal region, the antennal itself is longer than in *R. Agassizii*, much stouter, considerably expanded at the base and directed strongly outward as well as forward and upward; the spine of the antero-lateral margin is stouter and directed more outward; while back of and between these spines there are two relatively small acute teeth directed

forward, one behind the other, and of which the anterior is considerably the larger, and in the space between these teeth and the gastric region there are two or three irregular lines of minute acute tubercles. Back of the cervical suture, the upper lateral carina is high, conspicuous, and marked by a line of about six acute teeth directed slightly forward, and the depression between these and the lateral carina is armed with minute spiniform tubercles obscurely arranged in longitudinal lines. The middle lateral carina is distinct, armed in front with a small bidentate tooth and back of this by a very few small and irregular teeth. The lower lateral carina is distinct, with the edge slightly crenulated but not dentate. Below the carina of the antennal region there is a longitudinal rugose ridge, and below and back of this a similar ridge on the lower part of the branchial region. The surface of the branchial region between the carinæ is roughened by many minute tubercles, the inferior margin is bordered by a conspicuous carina as in the last species, and just above this at the postero-lateral angle there is a conspicuous elongated tubercle.

The eyes are a little larger than in the last species, but do not differ in other respects. The peduncles of the antennulæ are clothed with coarser hairs than in the last species, and the distal segments are hairy above as well as on the sides, but in other respects they do not differ. The antennal scale is a little broader than in the last species and the tooth of the outer margin is more prominent and nearly half-way from the base to the tip, but the peduncle and flagellum do not differ. The distal segment of the external maxilliped is no longer than the penultimate, and the spines upon these two segments are a little more slender and the whole appendage a little shorter than in *R. Agassizii*. The legs of the first pair are a little shorter as a whole, and the propodi and dactyli are relatively shorter. The legs of the second pair are exactly as in *R. Agassizii* except that they are shorter and have fewer segments in the carpi, the right leg scarcely reaching the tip of the peduncle of the antenna, the left a little shorter, while the right carpus has twenty-three segments and the left twenty. The legs of the third pair are stouter than in *R. Agassizii* and only reach to tips of the antennal scales, but the relative lengths of the segments are about the same. The fourth and fifth pairs are proportionally short and stout, and the dactyli very different from those of *R. Agassizii*. These are alike in both pairs, about a fifth as long as the propodi, shorter than in the third pair, not at all compressed but nearly cylindrical, even slightly swollen distally, and very abruptly contracted into a bifid tip, the inner tooth of which is the longer, more acute, and curved.

The form and sculpture of the abdomen is very similar to that of the last species, but the dorsal carina on the first somite is interrupted posteriorly and on the second is not so high; the teeth of the lateral carinæ on the first somite are not quite as acute; the tubercles over the surface generally are more irregularly arranged, and none of them are much elongated; the marginal spines of the epimera are shorter and less curved, but the anterior tooth on the second epimeron is much larger though obtuse; the fifth is armed with three spiniform teeth, a median tooth, and two smaller nearly equal lateral teeth; and the

lateral spine of the sixth somite is smaller and not directed so much backward. There are no differences of importance in the form of the telson, uropods, or other abdominal appendages.

The eggs are slightly larger than in *R. Agassizii*, and of about the same number.

The specimen above described gives the following measurements:—

Length from tip of rostrum to tip of telson	108.0 mm.
Length of carapax, including rostrum	44.0
Length of rostrum	18.5
Breadth of carapax in front, including spines	19.3
“ “ at cervical suture	15.4
“ “ at middle, including spines	21.5
Length of antennal scale	12.7
Breadth of antennal scale	6.8
Diameter of eye	5.5
Length of external maxillipeds	22.5
“ first pair of legs	22.2
“ second pair of legs	right, 29.0; left, 27.5
“ merus	“ 6.2 “ 6.2
“ carpus	“ 12.7 “ 11.0
“ chela	“ 1.1 “ 1.1
“ third pair of legs	34.0
“ fifth pair of legs	27.5
“ telson	18.5

Station 339, N. Lat. 38° 16' 45", W. Long. 73° 10' 30", 1186 fathoms.

Rhachocaris longirostris, sp. nov.

Plate V. Fig. 1. Plate VI. Fig. 1.

Female.—This species agrees with *R. Agassizii* in having the dactyli of the fourth and fifth pairs of thoracic legs slender, but in the sculpturing of the carapax and abdomen it is more like *R. sculpta*, though the tubercles are fewer in number and are all obtuse; it differs very conspicuously from both these species in having a much longer rostrum, longer telson, much shorter antennal scales, and the eyes on shorter peduncles, and, in the alcoholic specimen, devoid of colored pigment.

The rostrum is slightly longer than the rest of the carapax along the dorsal line; the basal two-thirds is horizontal, but the tip strongly upturned; the upper side is flat and the horizontal portion of uniform breadth, but the tip regularly tapered and acute; there is a slight median carina the whole length; there are lateral spines and the corresponding pair of spines at the base of the

rostrum as in *R. sculpta*, though a little less prominent; and between the lateral spines and the curved tip the surface is irregularly corrugated. The inferior edge of the rostrum is grooved, the groove being broadest at the beginning of the curved portion, and toward the tip there is in addition a slight median carina. The carinæ of the carapax have nearly the same arrangement as in *R. sculpta*. The tubercles of the indistinct dorsal carinæ are all very low, obtuse, and punctate, and the space between the carinæ unarmed except by a few small tubercles in front. On the lateral lobes of the gastric region the tubercles are all low and obtuse, the anterior being no more prominent than the others. The antennal spine is nearly as in *R. sculpta*, but the spine of the anterior angle is shorter and stouter than in that species, and directed straight forward as in *R. Agassizii*. The lateral carina of the antennal region is continuous and terminates anteriorly in a distinct tooth back of which the edge is obtuse and punctate. Back of the cervical suture, the upper lateral carina is prominent, but the tubercles with which it is surmounted, though more prominent than the others on the carapax, are all obtuse and punctate. The middle lateral carina is continuous, broad, and punctate, and the lower carina is very low but well marked by being punctate. The inferior margin of the carapax is carinated as in the other species.

The eyestalks are very short so as to be almost entirely concealed, and the eyes themselves relatively about as broad as in the other species, but somewhat flattened anteriorly so that they appear much less prominent, and in the alcoholic specimen are perfectly white.

The peduncles of the antennulæ reach only to about the middle of the rostrum and the flagella fall short of its tip, but the proportions of both peduncles and flagella are very nearly as in the other species. The antennal scales scarcely reach to the tips of the peduncles of the antennulæ, are ovate, about three fifths as broad as long, broadest distally, and have a very indistinct tooth about the middle of the outer margin which is only obscurely ciliated back of the tooth.

The external maxillipeds and the first pair of thoracic legs are slightly shorter, reaching scarcely to the tips of the antennal scales, but otherwise as in *R. sculpta*. The thoracic legs of the second pair are similar to those of *R. sculpta*, but the right reaches a little beyond the tip of the antennal scale and its carpus has about twenty-one segments; the left is a little shorter than the right and its carpus has about eighteen segments. The third legs are nearly as in the other species, reach a little beyond the tips of the antennal scales, and their dactyli are about a third as long as the propodi and very slender. The fourth and fifth pairs of legs are but very little if at all stouter than the third, the fascicles of setæ at the tips of the propodi are nearly as long as the propodi themselves, and the propodi are slightly shorter than in the third pair, strongly compressed as in *R. Agassizii*, but slender and not expanded at all in the middle.

The sculpturing of the abdomen resembles that of *R. sculpta*, but the dorsal carina is less prominent and more obtuse, and the tubercles are fewer in num-

ber, obtuse, and punctate. The marginal spines of the epimera of the second to the fifth somite are all short, dentiform, and the posterior spine of the fifth epimeron is merely represented by an obtuse angle. The lateral spines of the sixth somite are about as prominent and fully as stout as in *R. sculpta*.

The telson is longer than the carapax along the median line, exclusive of the rostrum, and has nearly the same form and sculpturing as in *R. sculpta*, though the tip is slightly more upturned. The outer lamella of the uropod is only about two thirds as long as the telson, fully a third as broad as long, with the lateral spine farther from the tip than in the other species and the margin between the spine and the tip obliquely truncated rather than rounded. The inner lamella is narrow and considerably longer than the outer.

The specimen on which the above description is based is not carrying eggs, and the genital orifices at the bases of the third pair of thoracic legs are not easily discoverable; but the appendages of the first and second somites of the abdomen are like those of *R. sculpta*, and leave no doubt in regard to the sex.

Length from tip of rostrum to tip of telson	54.0mm.
“ of carapax including rostrum	23.0
“ of rostrum	12.3
Breadth of carapax in front, including spines	8.7
“ “ at cervical suture	7.0
“ “ in middle	8.5
Length of antennal scale	4.9
Breadth of antennal scale	3.0
Diameter of eye	2.5
Length of telson	11.0

Station 330, N. Lat. 31° 41', W. Long. 74° 35', 1047 fathoms.

From Station 315, N. Lat. 32° 18' 20", W. Long. 78° 43', 252 fathoms, there is a single small and imperfect specimen, evidently the young of this species. This specimen is about 25 mm. long and differs from the one above described in having the carinae of the carapax a little sharper; the lateral carina of the antennal region interrupted in the middle; the marginal teeth of the abdominal epimera smaller in proportion and the posterior tooth of the fifth epimeron wholly wanting, leaving it bidentate like the third and fourth; and the right and left carpi in the second pair of thoracic legs of about eighteen and fifteen segments respectively.

PALÆMONIDÆ.

ALPHEINÆ.

Hippolyte Liljeborgii DANIELSSEN.

Hippolyte Liljeborgii DANIELSSEN, *Nyt Magazin Naturv.*, Christiania, XI. p. 5, 1861.

METZGER, *Jahresber. Comm. wissenschaft. Untersuchung deutschen Meere, 1872-73, Nordsee*, p. 290, 1865 (*Liljeborgii*).

DANIELSSEN and BOECK, *Nyt Magazin Naturv.*, Christiania, XIX. p. 196, Pl., figs. 15-20, 1872.

Hippolyte securifrons NORMAN, *Trans. Tyneside Naturalists' Field Club*, V. p. 267, 1863 (teste Danielssen and Boeck, Metzger).

SMITH, *Trans. Conn. Acad.*, V. p. 69, Pl. X. fig. 3, 1879; *Proc. National Mus.*, Washington, III. p. 437, 1881.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
303	41° 34' 30''	65° 54' 30''	306	8 ♀
306	41° 32' 50''	65° 55' 0''	524	2 ♀
309	40° 11' 40''	68° 22' 0''	304	2 ♀

This species appears to be abundant in deep water off the whole New England coast. It has also been taken off the Capes of the Delaware by Capt. Z. L. Tanner, of the U. S. Fish Commission Steamer "Fish-Hawk," Station 1045, N. L. 38° 35', W. Long. 73° 13', 312 fathoms, and at neighboring stations.

Hippolyte Phippsii KRÖYER.

Hippolyte Phippsii KRÖYER, *Naturh. Tidssk.*, III. p. 575, 1841 (♂).

Hippolyte turgida KRÖYER, *Ibid.*, p. 575, 1841 (♀).

Hippolyte vibrans STIMPSON, *Ann. Lyceum Nat. Hist. New York*, X. p. 125 (♂, var.).

Hippolyte Ochotensis BRANDT, *Middendorff's Sibirische Reise*, II. p. 120, Pl. V. fig. 17, 1849 (♀).

Station 302, N. Lat. 41° 30', W. Long. 66° 3', 73 fathoms: one male.

Hippolyte polaris Ross.

Alpheus polaris SABINE, *Suppl. to Appendix of Parry's First Voyage*, p. cccxxxviii. Pl. II. figs. 5-8, 1824.

Hippolyte polaris J. C. Ross, in *John Ross, Appendix to Second Voyage*, p. lxxxv., 1835 (♀).

Hippolyte borealis J. C. Ross, in *John Ross, op. cit.*, p. lxxxiv. Pl. B, fig. 3, 1835 (♂).

Station 303, N. Lat. 41° 34' 30'', W. Long. 65° 54' 30'', 306 fathoms; one male.

Caridion Gordoni Goës.

Hippolyte Gordoni BATE, Nat. Hist. Review, V., Proc., p. 51, figs., 1858. [No specific name is given in the article, though the species is said to be named after its discoverer, the Rev. G. Gordon, but *Hippolyte Gordoni* is given in the "Index to the Proceedings," p. iv.]

Doryphorus Gordoni NORMAN, Ann. Mag. Nat. Hist., 3d Series, VIII. p. 277, Pl. XIII. figs. 6, 7, 1861. [The generic name preoccupied.]

Caridion Gordoni Goës, Öfversigt Vetenskaps-Akad. Förhandlingar, Stockholm, 1863, p. 170 (10).

Station 311, N. Lat. 39° 59' 30", W. Long. 70° 12', 143 fathoms, sand ; two specimens, male and female.

Bythocaris, sp. indet.

A few specimens from Station 314, N. Lat. 32° 24', W. Long. 78° 44', 142 fathoms ; and Station 327, N. Lat. 34° 0' 30", W. Lon. 76° 10' 30", 178 fathoms.

The species is the same as the one I have referred to as taken off Block Island by the U. S. Fish Commission (Proc. National Mus., Washington, III. p. 437, 1881). It is apparently closely allied to *B. Payeri* G. O. Sars (Archiv Mathem. Naturvid. Kristiania, II. p. 340, 1877, *Hippolyte Payeri* Heller), but the specimens are all much smaller than the one described by Heller, none of them being over 30 mm. in length, and probably belong to a distinct species.

Anchistia tenella, sp. nov.**Plate IX. Figs. 1 - 1^b.**

This species is represented by a single specimen, an egg-carrying female. The integument is very thin and soft, so that it is difficult to make out accurately the proportions of the carapax, which is apparently slightly compressed laterally. The rostrum is slender, falls slightly short of the tips of the antennal scales, is fully three fourths as long as the rest of the carapax along the dorsal line ; the dorsal crest extends back a short distance upon the carapax, is directed slightly downward through its whole length, and is armed with nine teeth, crowded posteriorly but more widely separated anteriorly, and of which three are back of the orbit and the small anterior one near the acute tip ; the lower edge is armed with three teeth. The anterior margin projects in an acute angle below the orbit, and there are well-developed antennal and hepatic spines. Just back of the dorsal crest there is a slight notch in the dorsum with a distinct but short transverse sulcus turned forward either side.

The eyes are small, black, and fall considerably short of the middle of the rostrum. The peduncle of the antennula (Pl. IX. fig. 1^a) reaches to the tip of

the rostrum: the first segment is squamiform, about once and two thirds as long as the two distal segments together, about three sevenths as broad as long, and the outer margin is armed with an acute tooth near the middle and projects distally in a similar tooth half as long as the second segment; the second and third segments are subequal in length, the second less than half as wide as the first but with a slight carina-like expansion on the outer side, while the third is still narrower and nearly cylindrical. The outer flagellum is divided for nearly half the length of the outer portion, which is as long as the peduncle, rather stout and somewhat hairy, while the inner ramus is more slender, nearly naked, and extends more than half the length of the whole flagellum beyond the tip of the outer ramus. The inner flagellum is very slender and apparently a little shorter than the outer, but is imperfect at the tip. The antennal scale (Fig. 1^b) is about as long as the rostrum, more than a third as broad as long, only very slightly narrowed distally, and the broad obliquely truncated and rounded tip extends considerably beyond the large and acute spine in which the outer margin terminates. The terminal segment of the peduncle is slender and about two fifths as long as the scale. The flagellum is nearly as long as the whole body of the animal.

The external maxillipeds reach to the middle of the antennal scales and are very slender; the first of the three segments of the endopod reaches to the front edge of the carapax, and the second and third are successively a little shorter. The exopod is slender and reaches a little by the first segment of the endopod. The two pairs of chelate legs are unsymmetrical, the legs of the left side being larger than those of the right. This is very likely accidental, however, for the right antennal scale is short and misshapen, evidently reproduced after injury, and the right chelate legs have very likely been reproduced also, although they are as well formed as the left ones. The left leg of the first pair is about as long as the carapax including the rostrum; the merus and carpus slender and subequal in length; the chela nearly as long as the carpus, and slender, six or seven times as long as broad and with slender and slightly curved digits nearly half the whole length. The right leg is slightly smaller than the left, but the proportion of the parts the same. The left leg of the second pair is once and a half as long as that of the first pair; the ischium and merus are subequal in length, the latter reaching as far forward as the tip of the rostrum; the carpus is a little more than half as long as the merus, and shorter than in the first pair; the chela is nearly as long as the carpus and merus together, slender, though slightly swollen in the middle, and with slender digits about two fifths the whole length. The right leg is about a fourth shorter than the left, and slender in proportion. The third and fourth pairs of legs are alike, slender, about a third longer than the carapax including the rostrum, the carpi about two thirds as long as the meri, the propodi considerably longer than the carpi, and the dactyli slender, slightly curved, acute, and only a sixth or seventh as long as the propodi.

The epimeron of the first somite of the abdomen is very broad, but little narrower than that of the second, and extends far forward by the posterior edge

of the carapax ; the second epimeron is orbicular, broader than high and nearly as broad as the whole height of the somite ; the third epimeron is broad and rounded posteriorly ; the fourth epimeron is prolonged backward nearly the full length of the fifth somite and is evenly rounded posteriorly ; the fifth is rounded and projects very slightly posteriorly. The sixth somite is nearly twice as long as the fifth, and about half as high as long. The telson is nearly a third longer than the sixth somite, thin and lamellar, tapers regularly to a rounded tip unsymmetrically armed with five spines and perhaps not quite perfect, and above is evenly rounded and armed with two pairs of aculei. The lamellæ of the uropods reach a little by the tip of the telson : the inner is narrowly ovate and nearly four times as long as broad ; the outer is less than three times as long as broad, and broadly rounded at the tip, which projects much beyond the tooth in which the thickened outer margin terminates.

The eggs, which are well advanced toward maturity, are approximately 0.60 and 0.45 mm. in greater and less diameter in the alcoholic specimen.

All the oral appendages agree very closely with those of *Palæmonetes varians* (Leach sp.) and the number and arrangement of the branchiæ are apparently the same as in that species, though I am not certain that there is more than one arthrobranchia at the base of the external maxilliped. [*Palæmonetes varians* and *Leander natator* have the same branchial formula as *Palæmon squilla*.]

The single specimen is from Station 316, N. Lat. 32° 7', W. Long. 78° 37' 30", 229 fathoms, bottom of pebbles, and gives the following measurements :—

Sex	♀
Length from tip of rostrum to tip of telson	25.0 mm.
“ of carapax including rostrum	9.3
“ of rostrum	3.8
“ of antennal scale	3.7
Breadth of “ “	1.4
Length of first pair of legs	right, 8.9 ; left, 9.5
“ chela	“ 1.8 “ 2.0
“ second pair of legs	“ 11.5 “ 15.0
“ ischium	“ 2.4 “ 3.1
“ merus	“ 2.5 “ 3.3
“ carpus	“ 1.5 “ 1.8
“ chela	“ 3.7 “ 5.0
“ dactylus	“ 1.5 “ 2.0
“ third pair of legs	12.5
“ propodus	3.5
“ dactylus	0.5
“ sixth somite of abdomen	3.0
Height of “ “ “	1.5
Length of telson	4.3

PANDALINÆ.

Pandalus propinquus G. O. SARS.

G. O. SARS, Vidensk.-Selsk. Forhandl. Christiania, 1869, p. 148 (4); Ibid., 1871, p. 259 (16).

SMITH, Proc. National Mus., Washington, III. p. 437, 1881.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
306	41° 32' 50"	65° 55' 0"	524	2
309	40° 11' 40"	68° 22' 0"	304	12

This species is not uncommon in deep water off the New England coast, and is found at least as far south as off the Capes of the Delaware, where it has been taken in abundance by Capt. Z. L. Tanner, of the U. S. Fish Commission steamer "Fish-Hawk," Station 1045, N. Lat. 38° 35', W. Long. 73° 13', 312 fathoms.

Pandalus leptocerus SMITH.

Proc. National Mus., Washington, III. p. 437, 1881.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
301	41° 26' 55"	66° 3' 0"	71	2
302	41° 30' 0"	66° 0' 0"	73	7
303	41° 34' 30"	65° 54' 30"	306	25±
304	41° 35' 0"	65° 57' 30"	139	1
311	39° 59' 30"	70° 12' 0"	143	14
344	40° 1' 0"	70° 58' 0"	129	2
346	40° 25' 35"	71° 10' 30"	44	1

This species almost entirely replaces *P. Montagu* south of Cape Cod, and appears to be everywhere exceedingly abundant in from 30 to 200 fathoms, but below 300 fathoms it seems to give place to *P. propinquus*.

In size and general appearance it is much like *P. Montagu* but more slender and readily distinguished from it, and from *P. propinquus* and *borealis* as well, by the minutely roughened surface and the presence of exopods upon the external maxillipeds.

The rostrum is from about once and a third to nearly twice as long as the rest of the carapax, and curved very slightly upward, but usually not as much so as in *P. Montagu*. Above, it is armed with eleven to thirteen teeth, of which one is near the tip, as in *P. Montagu*, and usually only two back of the orbit on the carapax proper, while a considerable space back of the terminal spine is unarmed, though this space is usually shorter than in *P. Montagu*. Beneath, there are six to eight teeth, as in *P. Montagu*. The entire surface of the carapax and abdomen is slightly roughened with short and irregular, trans-

verse punctate ridges, which give rise to very short bristle-like hairs, while in *P. Montaguï*, *propinquus*, and *borealis* the surface is naked and very smooth. The carapax is considerably more slender than in *P. Montaguï*, and the posterior tooth of the dorsal carina is farther forward, being much in front of the middle. The abdomen is more slender than in *P. Montaguï*; but, except for the greater slenderness, there is scarcely any difference in the form or proportions of the somites, or the form and armature of the telson and uropods. There are slender exopods, about a third as long as the ischia, at the bases of the external maxillipeds, but the endopods themselves are as in *P. Montaguï*; the merus reaches to the base of the flagellum of the antenna, and the tip falls considerably short of the tip of the antennal scale.

The legs of the first pair are nearly as in *P. Montaguï*. The right chelate leg of the second pair is shorter and stouter than in *P. Montaguï*, and scarcely reaches the tip of the corresponding leg of the first pair; the ischium is about a fourth the entire length; the merus is only a little shorter than the ischium; the carpus increases in thickness distally, is a little longer than the ischium, not more than about once and a half as long as the merus, and usually composed of only five segments, the proximal half being wholly unsegmented or annulated, then three subequal and very distinct segments, about as broad as long, and these followed by the terminal segment, which is about as long as the three next preceding; the chela is about half as long as the carpus, and a little stouter than its distal end. The left chelate leg is a little shorter and stouter than in *P. Montaguï*, but has about the same number of segments in the merus and carpus, and does not differ in other respects. The third, fourth, and fifth pairs of legs differ from those of *P. Montaguï* in being a little more slender, and in having much longer, much more slender, and nearly cylindrical dactyli, which are wholly unarmed, except a few small spinules beneath near the base.

The branchial formula is the same as in *P. Montaguï*.

Pandalus tenuipes SMITH.

Proc. National Mus., Washington, III. p. 441, 1881.

Plate XIII. Fig. 12.

Station 314, N. Lat. $32^{\circ} 24'$, W. Long. $78^{\circ} 44'$, 142 fathoms; one male and one young specimen, both imperfect.

This species is smaller but has a proportionally thicker body than *P. Montaguï*, and the surface of the carapax and abdomen is very minutely roughened, somewhat as in *P. leptocerus*, but the punctate ridges are much less conspicuous and much more thickly crowded than in that species.

The carapax, including the rostrum, is about two fifths of the entire length, and the carapax proper is nearly as long as the rostrum, slightly swollen in the middle, somewhat contracted in front, as seen from above, and with the rostral carina extending back to about the middle, and armed, at about a third of the

way from the orbit to the posterior margin, with two to four slender spines crowded close together, rapidly decreasing in size posteriorly and *movably articulated* with the carapax; but between these teeth and the posterior teeth of the rostrum the carina is wholly unarmed. The rostrum is curved upward a little more than in *P. Montagu*, is not expanded below, and is armed the whole length above with eight to ten teeth, which are usually more widely separated distally, though in some specimens the terminal two or three are crowded together near the tip; beneath there are six to ten small teeth.

The eyes are black and as broad as long, but shorter than in *P. Montagu*. The peduncle of the antennula reaches to near the middle of the antennal scale, and the two distal segments are subequal in length and each about as broad as long. The antennular flagella are subequal in length and much longer than the carapax, including the rostrum; the proximal half of the outer flagellum is very much thickened, the terminal portion very slender, as is the inner flagellum throughout. The antennal scale is approximately four fifths as long as the rostrum, and of very nearly the same form as in *P. Montagu*. The oral appendages differ from those of *P. Montagu* in the following particulars: the proximal segment of the mandibular palpus is dilated, though not quite as conspicuously as in *P. Montagu*; the posterior lobe of the scaphognath of the second maxilla is very short, broad, obtusely rounded at the extremity, and projects very little back of the base of the endognath, while in *P. Montagu* and the allied species it is very much prolonged and acutely triangular posteriorly; in the second maxilliped the dactylus is about as long as broad, and articulated with the oblique distal end of the propodus (Pl. XIII. fig. 12), while in *P. Montagu* and its allies the dactylus is a narrow plate, articulated by one edge to the distal part of the mesial edge of the propodus. The external maxillipeds are very slender, reach to about the tip of the rostrum, and have well-developed exopods, fully half as long as the ischium; the ischium is a little longer than the rest of the endopod, which is composed, as in *P. Montagu*, of only two distinct segments beyond the ischium, and in this case these two segments are subequal in length.

The legs of the first pair are very slender, and reach to the tips of the external maxillipeds. The second (chelate) legs are exactly alike, and reach to or considerably beyond the tips of the antennal scales. The ischium is a little longer than the merus; the carpus is a little less than twice as long as the merus, slightly shorter than the antennal scale, and composed of about fifteen segments, of which the proximal are separated by indistinct, but the four or five distal by conspicuous articulations, while the ultimate is about twice as long as broad, and the next three or four, each, only about half as long as broad. The chela is slender, only a very little stouter than the distal end of the carpus, nearly a third as long as the carpus, and about half as long as the merus, and the digits are alike, about as long as the basal portion, slightly gaping, and with a very few long, setiform hairs. The third, fourth, and fifth pairs of legs are exceedingly slender, sparsely armed with minute spinules and slender setæ; and the dactyli are very long and slender, slightly and regularly bent, and

flattened a little vertically (or in the direction of the plane of the curvature), and wholly unarmed; those of the fifth pair reach beyond the tip of the rostrum, and the fourth and third pairs are successively a little longer; the dactylus in the fifth pair is a third or a little more than a third as long as the propodus, in the fourth pair a little longer than in the fifth, and in the third pair not far from half as long as the propodus.

The abdomen is evenly rounded and not at all compressed above, and less geniculated at the third segment than in *P. Montaguï*. The sixth segment is about once and two thirds as long as the fifth. The telson is about once and a half as long as the sixth segment, and terminates in an acutely triangular tip, armed each side with two long spines, of which the proximal is very much the longer, and at the extreme tip with a few long, plumose setæ.

The branchial formula is the same as in *P. Montaguï*.

Pandalus acanthonotus, sp. nov.

Plate XIII. Figs. 10, 11.

This species, of which there is but one specimen in the collection, is closely allied to *P. tenuipes*, but is at once distinguished from it by the deeper and nearly horizontal rostrum with the dorsal teeth forming a continuous series with the spines on the dorsal crest of the carapax; and by the much longer sixth somite of the abdomen, which is more than twice as long as the fifth somite, and longer even than the telson.

Female. — The carapax including the rostrum is only about a third of the entire length, somewhat contracted in front as seen from above, and with the rostral carina extending back to about the middle, but not sharp except in front, where it is armed with five slender spines *movably articulated* with the carapax and closely crowded together. The rostrum is considerably shorter than the carapax proper, nearly horizontal, expanded below, tapers to an acute tip, is armed above with seven teeth, of which the anterior is very minute and a little way from the tip while posteriorly the teeth become slender and at last spiniform, almost like the spines of the carapax, with which they form a continuous series; below, the edge is armed with six teeth, of which the anterior one is minute and situated a little back of the tip.

The eyes are large, pyriform, and black, and, as well as the antennulæ and antennæ, are nearly as in *P. tenuipes*.

The oral appendages are all very nearly as in *P. tenuipes*; the propodus in the second maxilliped (Pl. XIII. fig. 11) is, however, a little larger proportionally, and the very narrow dactylus articulated along nearly half the length of the mesial edge of the propodus very much as in *P. Montaguï*, while in *P. tenuipes* the dactylus is about half as long as broad and articulated with the oblique distal end of the propodus. The external maxillipeds reach a little by the tips of the antennal scales, are almost exactly as in *P. tenuipes*, and, as in that species, have well developed exopods half as long as the ischia. The oral

appendages do not differ very much from those of *P. carinatus* figured on Plates X. and XI.: the first maxillæ and second maxillipeds are almost exactly as in *P. carinatus*; the distal segment of the mandibular palpus is broader and more obtuse at the tip, but in other respects the mandibles do not differ; the second maxillæ differ only in having the posterior division of the distal lobe of the protognath proportionally a little smaller; the first maxillipeds are similar to those of *P. carinatus*, but the lamellar portion of the exopod is a little broader and more abruptly narrowed into a more slender flagelliform portion; the external maxillipeds are more slender than in *P. carinatus*, and the two distal segments are subequal in length.

The legs of the first pair reach to the tips of the external maxillipeds and are as in *P. tenuipes*. The second (chelate) legs are very nearly alike, but the left is a little longer than the right and reaches to about the tip of the antennal scale; both are about equally slender; the carpi are more than a third of the entire length, segmented throughout but more conspicuously distally, and composed of about twenty segments, of which the most distal one is considerably longer than broad, but all the others shorter than this and approximately equal in length; the chelæ are alike, scarcely stouter than the carpus and only a little more than twice as long as its distal segment. The third, fourth, and fifth pairs of legs are nearly as in *P. tenuipes*: those of the posterior pair reach considerably by the tip of the rostrum, and the fourth and third are successively a little longer; the meri are sparsely armed with small spines, but the distal segments unarmed excepting a few setæ or hairs; the dactylus in the third pair is about a third as long as the propodus, and in the fourth pair about a fourth as long as the propodus.

The abdomen is rounded above, but is rather strongly geniculated and slightly compressed at the third somite. The sixth somite is more than twice as long as the fifth, longer even than the antennal scale or rostrum, and strongly compressed.

The telson is much shorter than the sixth somite, slender, and terminates, as in *P. tenuipes*, in a triangular tip armed each side with two long and slender spines of which the proximal is much the longer.

The surface of the carapax and abdomen is minutely roughened, as in *P. tenuipes*, by thickly crowded irregular transverse punctate ridges.

The branchial formula is apparently just as in *P. tenuipes*, *P. Montagu*, etc., and as in the following species, *P. carinatus*.

MEASUREMENTS.

Station	321
Sex	♀
Length from tip of rostrum to tip of telson	42.0 mm.
" of carapax including rostrum	14.2
" of rostrum	6.3
Breadth of carapax	4.9
Length of antennal scale	5.6

Breadth of antennal scale	1.3 mm.
Length of right chelate leg	11.5
“ carpus	4.2
“ chela	1.0
“ left chelate leg	13.5
“ carpus	5.4
“ chela	1.0
“ third leg	19.0
“ fifth leg	18.5
“ fifth somite of abdomen	3.0
“ sixth somite of abdomen	7.0
Height of “ “ “	2.7
Length of telson	5.2

Station 321, N. Lat. 32° 43' 25'', W. Long. 77° 20' 30'', 233 fathoms.

Pandalus carinatus, sp. nov.

Plate X. Figs. 2-2'. Plate XI. Figs. 1-3.

Female. — The surface of the carapax and abdomen is microscopically punctate for the insertion of very minute hairs. The carapax including the rostrum is about as long as the entire abdomen, but the carapax proper much shorter than the rostrum and armed with a high dorsal crest nearly the whole length and with four sharp and very conspicuous longitudinal carinæ each side. The rostrum is very slender, nearly horizontal toward the base and slightly upturned from a little back of the middle, and armed above, from near the slender and acute tip, with thirteen conspicuous teeth in front of the orbit and four more on the anterior half of the carapax, and beneath from near the tip to the front of the eye with nine similar teeth. The uppermost of the four lateral carinæ is in a line straight back from the middle of the orbit, but is interrupted by a slight depression and terminates in a small tooth just back of the middle, and is not conspicuous on the anterior half of the carapax; the second and third carinæ are continuous the whole length of the carapax, nearly parallel and slightly curved, the upper terminating anteriorly in a conspicuous antennal spine just over the base of the antenna, the lower in a similar but laterally more prominent spine below the base of the antenna; the lowest carina is a marginal carina of the inferior edge of the carapax, which is more strongly incurved than in the typical species of *Pandalus*.

The eyes are rather small for the genus, pyriform, and black. The first segment of the peduncle of the antennula is broad, squamiform, excavated for the reception of the eye, and furnished externally with a large lamellar process terminating anteriorly in an acute angle in front of the eye. The second and third segments are very short, taken together being scarcely longer than their diameter. The outer flagellum is a little more than twice as long as the peduncle, the basal half considerably thickened and hairy, but the terminal

portion exceedingly slender. The inner flagellum is considerably longer than the outer, reaches nearly to the tip of the rostrum, and is slender throughout. The antennal scale is about three fourths as long as the carapax excluding the rostrum, and near the base about a fourth as broad as long, but tapers distally to an acute tip. The second segment of the peduncle of the antenna is armed with a triangular tooth above the base of the scale and with a long spine below. The flagellum is slender, and considerably longer than the carapax including the rostrum.

The mandibles (Pl. XI. fig. 1) are nearly as in *P. Montagu*, though the proximal segment of the palpus is much less dilated, and all the segments are only sparsely armed with setæ; the mandibles are in fact more nearly as in *P. tenuipes*. The first maxillæ (Fig. 2) are essentially as in *P. Montagu*. The lobes of the protognath and the endognath of the second maxilla (Fig. 3) are nearly as in *P. Montagu*, but the scapognath is very different; its posterior lobe is short, broad, and evenly rounded, much as in *P. tenuipes*, while the anterior lobe is much longer than the posterior, fully as broad, and with a broad and truncated extremity; both extremities of the scapognath are margined with very long plumose setæ, while those upon the edges between are short. The first and second maxillipeds (Pl. X. figs. 2^a, 2^b) do not differ essentially from those of *P. Montagu*. The external maxillipeds have well-developed exopods about two thirds as long as the ischium, which is more than half the entire length of the endopod; the terminal segment of the endopod is considerably longer than the penultimate, and tapers to an acute point.

The legs of the first pair are more slender than the external maxillipeds, and do not quite reach to their tips. The right chelate leg (Pl. X. fig. 2^c) reaches a little by the base of the antennal scale, and is rather stouter than usual in the genus; the merus and carpus are subequal in length, and the carpus is rather obscurely divided into about eight segments, of which the proximal and distal are much longer than the others; the chela is very little shorter than the carpus and much stouter, and somewhat swollen so that it is between a third and a fourth as broad as long; the digits are rather stout, slightly curved, and more than a third of the entire length.

The three last pairs of legs are slender, subequal in length, reach to about the tips of the first pair, are armed with numerous setæ and slender spines, and the dactyli are slender, very slightly curved, and about a third as long as the propodi.

The first, second, fifth, and sixth somites of the abdomen are evenly rounded above, but the third and fourth are armed with a sharp dorsal carina, most conspicuous on the third somite, and in both somites projecting backward over the succeeding somite in a prominent horizontal and acute tooth. The first epimeron projects downward even below the second, which is orbicular and about as broad as high; the third and fourth epimera project backward in evenly rounded lobes, but the fifth in an acute angle.

The telson is about as long as the fifth and sixth somites together, narrow, armed with four pairs of dorsal aculei, and the triangular tip (Pl. X. fig. 2^d)

with three pairs of spines, of which the terminal are small and slender, the next very long, and the anterior short and stout. The lamellæ of the uropods are about as long as the telson: the inner is lanceolate and between four and five times as long as broad; the outer is between three and four times as long as broad, with the tip broad, somewhat obliquely rounded, and projecting considerably beyond the acute tooth in which the outer margin terminates, and just inside the base of which there is a spine much longer than the tooth itself.

The outer lamella of the appendage of the first somite of the abdomen is a little longer than the protopod, about a sixth as broad as long, and margined with multiarticulate plumose setæ as usual, while the inner lamella is a little less than half as long as the outer, expanded externally near the base, where the breadth is equal to about a fourth the length, but tapering and slender distally, and margined with plumose setæ like the outer. The inner lamella of the appendage of the second somite is a little longer than the outer lamella of the appendage of the first somite, between six and seven times as long as broad, and bears, a little way from the base, the usual stylet, which is about a fifth as long as the lamella itself.

The single specimen is from Station 327, N. Lat. $34^{\circ} 0' 30''$, W. Lon. $76^{\circ} 10' 30''$, 178 fathoms, and gives the following measurements:—

Sex	♀
Length from tip of rostrum to tip of telson	48.0mm.
“ of carapax including rostrum	24.0
“ of rostrum	15.2
Breadth of carapax	5.2
Length of antennal scale	7.1
Breadth of “ “	1.8
Length of right chelate leg	9.2
“ carpus	2.2
“ chela	1.9
“ left chelate leg	12.3
“ carpus	4.8
“ chela	1.2
“ sixth somite of abdomen	4.3
Height of “ “ “	2.2
Length of telson	6.1

The genus *Pandalus*, as at present recognized, apparently contains species representing several genera, and this species is probably not strictly congeneric with *P. Montagu*, the type species. The carinated carapax gives the species a very different aspect from the typical *Pandali*, but the appendages throughout, excepting the scaphognath of the second maxilla, are very nearly as in *P. Montagu*, and the number and arrangement of the branchiæ are the same as in that species, *P. propinquus*, *borealis*, *leptocerus*, and *tenuipes*, or as indicated in the following formula.

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	1	1	1	1	1	0	(7)
Podobranchiæ,	0	1	0	0	0	0	0	0	1
Arthrobranchiæ,	0	0	2	1	1	1	1	0	6
Pleurobranchiæ,	0	0	0	1	1	1	1	1	5

12+(7)

This species will evidently fall in Milne-Edwards's genus *Heterocarpus* (Ann. Sci. Nat., 6^{me} series, XI. No. 4, p. 8, 1881), of which the description has been published since the above was written, and it appears to be closely allied to, but distinct from, his *H. ensifer*, from 218 fathoms near Barbadoes. Milne-Edwards has however misapprehended the affinities of the genus, of which he says: "Les crustacés du genre *Heterocarpus* offrent certaines analogies avec les *Oplophorus* et, par d'autres caractères, ils se rapprochent des *Lysmates*, des *Hippolytes* et des autres crustacés de la même famille." The genus is very near *Pandalus*, certainly far nearer than to *Oplophorus* (of which, however, I have never examined specimens), or any other described genus. *Heterocarpus* should be placed with the two or three genera into which the genus *Pandalus* as it now stands must sooner or later be divided, and the species which I have here described should then stand as *Heterocarpus carinatus*.

EPHYRINÆ.

MIERSIA KINGSLEY.

Ephyra ROUX (nom. præoc.).

As far as I know, the only described species properly referred to this genus are *M. pelagica* and *punctulata* (Risso sp.), both apparently unknown to modern carcinologists, and *M. Hæckelii* (*Ephyra Hæckelii* Von Martens), all from the Mediterranean. *Ephyra compressa* De Haan, placed in *Miersia* by Kingsley, had already been referred to *Atyephyra* by Von Martens (Archiv für Naturgesch., XXXIV., 1868, p. 51, Pl. I. fig. 4^a to 4^c), and is certainly not closely allied to the species here described nor to *M. Hæckelii*.

A new genus, *Meningodora*, described beyond, and *Hymenodora* G. O. Sars, are in most characters closely allied to *Miersia*, and are here referred to the same subfamily, which has little affinity with the *Atyidæ*, but is in many respects much like *Pandalus*, and has, perhaps, still closer affinity with *Oplophorus* or some of its allies.

Eumiersia, a new genus described beyond, is in some respects intermediate between the genera just mentioned and *Pandalus*, and is only provisionally placed in this subfamily.

Miersia Agassizii, sp. nov.

Plate XI. Figs. 5-7. Plate XII. Figs. 1-4.

Male. — The carapax is nearly as broad as high, but is a little compressed above so as to make the dorsum somewhat obtusely angular, though rounded and not at all carinate even anteriorly. The rostrum is imperfect in all the specimens seen, but in the most perfect specimen it was evidently much longer than the carapax proper; it is very slender, slightly upturned toward the tip, and back of the tip of the antennal scale is armed with seven teeth above and four beneath. The anterior margin projects in an acute, but scarcely spiniform, angle above the base of the antenna, and opposite the base in an acute and laterally prominent branchiostegial spine, below which the branchiostergite is rather suddenly incurved in the anterior part of the carapax. The surface of the carapax and abdomen is naked and smooth to the unaided eye, but is microscopically punctate.

The eyestalks are very short, and terminated by small hemispherical black eyes. The peduncle of the antennula is short, much less than half as long as the antennal scale: the first segment is fully as long as the second and third taken together, is deeply excavated above for the reception of the eye, and its outer edge is armed distally with a small tooth; the second and third segments are broader than long and subcylindrical. The outer or major flagellum is nearly twice as long as the antennal scale, with the proximal portion for about half the length of the antennal scale compressed vertically, broadly expanded, and thickly clothed beneath with fine hairs, but the distal portion is very slender and somewhat compressed vertically. The antennal scale is about three fourths as long as the carapax excluding the rostrum, and near the base about a fourth as broad as long, but narrowed regularly to a very slender tip. The second segment of the peduncle is armed with an acute dentiform spine below, and a triangular tooth above the base of the scale. The distal segment of the peduncle reaches only about a third of the way from the base to the tip of the antennal scale. The flagellum is wanting in all the specimens examined.

The labrum is fleshy, prominent as seen in front, and the inferior edge is thickened and slightly indurated and applied to the concave dorsal surfaces of the mandibles. The lobes of the metastome are very broad distally and somewhat truncated. The mandibles (Pl. XII. figs. 1, 1^a) are expanded into thin, dorsally concave and strongly dentate ventral processes, above and closely connected with which are small and narrow molar areas. The opposing edges of the ventral processes differ somewhat on the two sides: on the right side, as shown in the figures, the mesial edge is slightly convex as seen from above or below, and armed with about eight acutely triangular teeth, beyond which there are several small teeth on the anterior edge; on the left side the mesial edge as seen from above or below is straight or slightly concave, terminates anteriorly in a sharp angle beyond which there are no teeth on the anterior edge, and the

teeth on the anterior part of the mesial edge are very small, though back of these small teeth there are about as many and as large teeth as on the mesial edge of the right mandible. The protognathal lobes of the first maxilla (Pl. XII. fig. 2) are approximately equal in size, broad at the ends, and armed as usual with slender spines upon the distal, and numerous setæ upon the proximal lobe. The endognath is small, obtusely pointed, and armed with a very few marginal setæ and with two slender spines upon a small fold on the ventral side near the tip. The protognathal lobes of the second maxilla (Pl. XII. fig. 3) are very unequal, the proximal lobe is broad but very short, while the distal is long and deeply divided into two narrow and obtuse lobes. The endognath is unsegmented, short, and narrowed to a slender tip. The scaphognath projects anteriorly slightly beyond the endognath, and both ends are broad and evenly rounded.

The protopod of the first maxilliped (Pl. XII. fig. 4) projects very little anteriorly, and is obscurely divided into a very small proximal and a large distal lobe. The endopod is well developed, and composed of three segments, of which the proximal is very short, broader than long, the second nearly three times as long as broad, the terminal a little smaller than the second and lanceolately pointed, and all the segments margined with setæ. The exopod is a very large lamelliform lobe longer than the endopod, about a third as broad as long, expanded and broadly rounded in outline distally, and edged with plumose setæ which gradually increase in size distally along the margin. The epipod is small, branchial, with the anterior and posterior parts nearly equal. The ischium in the second maxilliped (Pl. XI. fig. 5*) is much shorter than broad; the merus between two and three times as long as broad; the carpus a little narrower than the merus and about as long as broad; the propodus bent back upon the merus as in most Palæmonidæ, a little longer than the merus, nearly half as broad as long, and obliquely truncated along the mesial edge for the articulation of the dactylus, which is more than twice as broad as long and armed with setæ and slender spines as is the mesial and anterior edge of the dactylus. The exopod is nearly as long as the endopod, slender, and multiarticulate and flagelliform for more than half its length. The epipod is broad at base, somewhat triangular, and bears a large phyllobranchia. The endopod of the external maxilliped reaches a little beyond the middle of the antennal scale, and is slender and composed of three segments, of which the proximal is the longest, reaches as far forward as the antero-lateral angle of the carapax, and is strongly curved and dorsally compressed in the middle opposite the mouth; the middle and the distal segments are straight, the middle about half as long, and the distal nearly as long, as the proximal; all the segments are more or less setigerous. The exopod is slender, multiarticulate, flagelliform, and about as long as the proximal segment of the endopod. The epipod is narrow, lamellar, nearly as long as the middle segment of the endopod, and lies between the branchiæ of the ninth and tenth somites.

All the thoracic legs are furnished with exopods like those of the external maxillipeds, and the first, second, and third pairs are furnished also with epi-

pods like those of the external maxillipeds. The first and second pairs of legs are slender, do not reach the tips of the external maxillipeds, and are very nearly alike, but the carpus and chela are a little longer and more slender in the second than in the first pair. In both pairs the merus is a little longer than the ischium, and reaches to or a little by the antero-lateral angle of the carapax. In the first pair the carpus is scarcely more than half as long and about as stout as the merus, and the chela is somewhat longer and a little stouter than the carpus, and with slender slightly compressed and nearly straight digits about a third of the whole length. In the second pair the carpus is scarcely as stout as the merus and about two thirds as long, and the chela is scarcely stouter than the carpus, but considerably longer. The third and fourth pairs of legs are nearly alike and reach by the tips of the external maxillipeds, the lower edges of the meri are spinulose, the propodi considerably longer than the carpi, and the dactyli are slender, nearly straight, unarmed, and nearly a third as long as the propodi. The posterior legs are slightly shorter than the third and fourth, and like them except the distal extremity, which is peculiarly modified. The propodus is slender, about as long as in the third and fourth pairs, is furnished with a few very long plumose setæ near the middle, is thickly armed distally along the lower edge with serrately armed and simple setæ, and so densely clothed at the tip with long setæ as to very nearly hide the dactylus, which is very short, curved at the tip, and armed with several slender spines.

The abdomen is large relatively to the cephalo-thorax, strongly compressed, and dorsally carinated except upon the first somite, the carina being most conspicuous on the third somite, where it projects posteriorly in a very long and slender tooth. There is a similar but much smaller tooth on the three succeeding somites, though in two of the three specimens examined it is nearly or quite obsolete on the fourth somite. The epimera of the four anterior somites are broad and very deep, the height of the abdomen at these somites being as great as or greater than that of the carapax. The first epimeron is as deep as the second, and its anterior edge is slightly concave in outline and projects a little below; the second is about as broad as high, and approximately orbicular; the third and fourth project posteriorly in broadly rounded lobes; the fifth projects posteriorly in an angular lobe obtusely rounded at the tip. The sixth somite is nearly twice as long as the fifth, and about twice as long as high.

The telson is considerably longer than the sixth somite, very slender toward the tip, rounded and slightly sulcated above, and armed with four or five pairs of stout dorsal aculei on the distal half. The outer lamella of the uropod scarcely reaches the tip of the telson, is about four times as long as broad, tapers very slightly except near the tip, which is ovate and projects nearly the width of the lamella beyond the angle in which the thickened outer margin ends; the inner lamella is obtusely lanceolate, and considerably shorter and a little narrower than the outer.

The outer ramus of the appendage of the first somite of the abdomen is long and slender, and like that of the succeeding appendages, but the inner ramus is

developed into a broad oval lamella about a third as long as the outer ramus, with both margins setigerous and the inner thickened and bearing a slender stylet armed as usual with minute hooks. The inner ramus of the appendage of the second somite bears the two stylets usually characteristic of the male.

A small and imperfect female specimen appears not to differ from the males as above described except in the usual sexual characters. The inner ramus of the first abdominal appendage is a very small lamella nearly four times as long as broad and furnished with very long and slender setæ.

The surface of the carapax and abdomen is very nearly naked, but is roughened by minute granular projections.

The number and structure of the branchiæ seem to be essentially the same as in the typical species of *Pandalus*, but there is apparently no epipod at the base of the fourth leg, so that the branchial formula is as follows:—

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	1	1	1	1	0	0	(6)
Podobranchiæ,	0	1	0	0	0	0	0	0	1
Arthrobranchiæ,	0	0	2	1	1	1	1	0	6
Pleurobranchiæ,	0	0	0	1	1	1	1	1	5
									<hr/> 12+(6)

The most perfect of the three specimens in the collection affords the following measurements:—

Station	330
Sex	♂
Length from tip of rostrum to tip of telson	80+ mm.
“ of carapax excluding rostrum	16.0
“ of rostrum	16+
“ of antennal scale	11.7
Breadth of “ “	3.0
Length of sixth somite of abdomen	10.0
Height “ “ “	5.0
Length of telson	13.0

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
305	41° 23' 15"	65° 51' 25"	810	1 ♂.
323	33° 19' 0"	76° 12' 30"	457	1 ♀.
330	31° 41' 0"	74° 35' 0"	1047	1 ♂.

Miersia gracilis, sp. nov.

Plate XI. Figs. 4-4¹.

Young male.—The carapax is slightly compressed, and including the rostrum only a little shorter than the abdomen; the dorsum is rounded posteriorly, but carinated in front of the middle, and rises anteriorly into a high and sharp crest

which extends to the base of the rostrum ; and the anterior margin is armed as in *M. Agassizii*. The rostrum is considerably longer than the carapax proper, very slender, directed slightly downward for a short distance from the base, and is then nearly horizontal to the very slender and acute tip ; is armed above for its whole length with fourteen teeth, of which the four or five posterior are nearer together than the others, and the two posterior very small and back of the orbit on the carapax proper ; and is armed below with nine teeth from in front of the eye to the tip.

The eyes are very much larger than in *M. Agassizii*, pyriform, and black. The antennulæ are very nearly as in *M. Agassizii*, but the thickened proximal part of the outer or major flagellum is relatively a little shorter. The antennal scale is about half as long as the rostrum, about three fourths as long as the carapax excluding the rostrum, and of nearly the same form as in *M. Agassizii*.

The labrum and metastome are nearly as in *M. Agassizii*. The mandibles differ from those of *M. Agassizii* in the molar areas being very small, nearly obsolete, and not distinctly separated from the ventral process, which is armed with teeth more uniform in size and not becoming rudimentary anteriorly. The terminal segment of the mandibular palpus is slightly shorter than in *M. Agassizii*, but in other respects the palpus does not differ. The distal lobe of the protognath of the first maxilla is very broad at the prehensile edge, and the lobe is much larger than the proximal lobe ; the endopod is more slender than in *M. Agassizii*, is armed with one in place of two spines on the fold near the distal extremity, and is without marginal setæ. The divisions of the distal lobe of the protognath of the second maxilla are much broader distally, presenting much longer prehensile edges, and the scaphognath is narrower than in *M. Agassizii*. The protopod of the first maxilliped is as in *M. Agassizii*, but the exopod and endopod (Pl. XII. fig. 10) differ conspicuously. The endopod is more slender and the distal segment is very much shorter, while the lamellicorn exopod has the inner angle of the distal extremity prolonged and indistinctly segmented, thus approximating to the early stages, in which it is doubtless flagelliform. The second maxilliped is as in *M. Agassizii*, except the terminal portion of the endopod (Pl. XI. fig. 4^a) which differs in the same way as that of *Pandalus tenuipes* differs from that of *P. acanthonotus* (Pl. XIII. figs. 11, 12), but to a greater extent, the dactylus being narrow, longer than broad, and transversely articulated with the propodus.

The external maxillipeds and chelate legs are almost exactly as in *M. Agassizii*. The third and fourth pairs of legs are alike, and differ from those of *M. Agassizii* in having shorter carpi scarcely half as long as the meri, propodi about twice as long as the carpi, and dactyli only a very little shorter than the propodi, slender, slightly curved, and armed with a few minute spines. The posterior legs are scarcely three fourths as long as the fourth, but the segments have nearly the same relative proportions except the dactylus (Pl. XI. fig. 4^a), which is about a third as long as the propodus, obtuse at the tip, and armed along the lower edge and at the tip with serrate setæ, of which the terminal

ones are much the longer, while the proximal are like those upon the propodus, which is armed with serrate setæ somewhat as in *M. Agassizii*.

The abdomen is a little more slender than in *M. Agassizii*, and the third, fourth, and fifth somites are more conspicuously toothed, but none of the somites are distinctly carinated except the third, which is strongly carinate, or crested, and projects over the fourth somite in a very strong tooth, and the fourth and fifth, which are anteriorly rounded above, and have a short carina-like elevation at the base of the tooth. All the epimera are somewhat smaller than in *M. Agassizii*, but similar in form to those of that species except that the fifth has a distinct tooth in the postero-dorsal edge. The sixth somite is fully twice as long as the fifth, twice as long as high, and strongly compressed laterally.

The telson is a little longer than the sixth somite, about as long as the antennal scale, slender, and tapers to a long and slender tip armed either side with six to eight spines, besides five or six pairs of dorsal aculei above the tip. The lamellæ of the uropods are almost exactly as in *M. Agassizii*.

The inner ramus of the appendage of the first somite of the abdomen (Pl. XI. fig. 4^b) is a little more than a third as long as the slender normal outer ramus, fully three times as long as broad, ciliated along the outer edge, the inner edge straight, and projecting slightly distally, where it is armed with the usual hooklike spines for holding together the appendages of the two sides of the animal. The inner ramus of the appendage of the second somite bears the usual two stylets (Pl. XI. fig. 4^c), but the secondary stylet, specially characteristic of the male, is rudimentary, only about a fifth as long as the other, is terminated with a single long seta, and undoubtedly indicates that the specimen is immature.

The surface of the carapax and abdomen is naked, but thickly and conspicuously punctated.

The branchial formula is apparently the same as in *M. Agassizii*.

The single specimen is from Station 328, N. Lat. 34° 28' 25", W. Long. 75° 22' 50", 1632 fath., and gives the following measurements:—

Sex	♂
Length from tip of rostrum to tip of telson	44.0mm.
“ of carapax including rostrum	20.0
“ of rostrum	12.0
“ of antennal scale	6.0
Breadth of “ “	1.6
Length of sixth somite of abdomen	5.5
Height of “ “ “	2.7
Length of telson	6.0

This species is perhaps not congeneric, or consubgeneric, with *M. Agassizii*, but it seems best to refer them both to the present genus until their relations to the typical Mediterranean species of *Miersia* can be better determined.

The form and dentition of the rostrum of *Miersia gracilis* appear to be much

like *Acanthephyra debilis* A. Milne-Edwards (Ann. Sci. Nat., 6^{me} series, XI. No. 4, p. 13, 1881), and it is possible that the species may be identical, — or, on the other hand, that they may belong to very different genera. Milne-Edwards says: “Le genre *Acanthephyra* semble rattacher les *Penæus*, les *Regulus*, les *Oplophorus* et les *Ephyra*,” but gives no characters which enable me to tell how the genus differs from *Miersia* (*Ephyra*), though the species of *Miersia* appear to be very little known, as I have already remarked, and Milne-Edwards may have had opportunities of examining typical specimens, to which, however, he does not allude. *Miersia Agassizii* is evidently very distinct from any of the species of *Acanthephyra* described by Milne-Edwards.

MENINGODORA,* gen. nov.

Integument throughout very thin and membranaceous. Body compressed laterally and the carapax dorsally carinate anteriorly, with a short triangular rostrum, a well-developed branchiostegial spine as in *Miersia*, and with an antennal and hepatic sulcus, above which there is a carina which is continued back along the dorsal limit of the branchial region, — a form of areolation strongly recalling the Penæidæ. Antennal scales broad and foliaceous, but all the other articular appendages essentially as in *Miersia*. The branchiæ (phyllobranchiæ) have the same structure and arrangement as in *Miersia*, except that there is apparently but one arthrobranchia at the base of the external maxilliped, making in all eleven branchiæ and six epipods each side.

Although differing very conspicuously in general appearance from the species of *Miersia* here described, this genus is very closely allied to them, as a comparison of the figures of the appendages will show, but it is sufficiently distinguished by the characters above given. Its relation to *Hymenodora* † is more obscure, though perhaps equally close. In *Hymenodora* the body is not compressed, and according to Buchholz's figure the epimera of the second somite of the abdomen do not overlap the epimera of the first segment, but are of the same form as the succeeding epimera, and this seems to be confirmed by the clause in Sars's generic diagnosis, “epimeris æqualiter rotundatis.” Moreover, the endopod of the first maxilliped, according to Sars, is not segmented (“parte terminali (propria) angusta, inarticulata”). On the other hand, the number of the branchiæ is apparently the same, though Sars's statement (“branchiæ utriusque 6, antica et postica simplex, ceteræ bipartitæ; præterea adsunt branchiæ supplementariæ, indivisæ, laminacæ, basi maxillipedum 1^{um} et 2^{um} paris affixæ”) does not make this perfectly clear.

* Μήρυξι, a membrane; δόρα, skin.

† *Hymenodora glacialis* G. O. Sars, Archiv Mathem. Naturvid., Kristiania, II. p. 341, 1877 (*Pasiphaë glacialis* Buchholz, Zweite deutsche Nordpolfahrt, II. p. 279, Pl. I. fig. 2, 1874).

Meningodora mollis, sp. nov.**Plate XI. Figs. 8-9. Plate XII. Figs. 5-9.**

Female.—The carapax including the rostrum is about two thirds as long as the abdomen to the tip of the telson, about half as high as long, and considerably compressed; the dorsal carina is high and very sharp in front, gradually diminishes posteriorly, scarcely reaches the posterior margin, and anteriorly extends to the tip of the acutely triangular rostrum, which is about half as long as the antennal scale and only about a seventh as long as the carapax. On the dorsal carina just back of the base of the rostrum there are five or six very indistinct rudimentary teeth scarcely perceptible to the naked eye and too minute to be indicated in the figure. The anterior margin projects in a triangular lobe above the base of the antenna, and is armed below with an acute and laterally prominent branchiostegial spine very much as in *Miersia Agassizii*. From just back of the eye a distinct gastro-antennal and gastro-hepatic carina extends backward and downward and divides, the upper branch continuing back in a gastro- and cardiaco-branchial carina, and the lower turning down in front of the branchial region and limiting a wide antennal and hepatic sulcus behind. The inferior and posterior edges are broadly and evenly curved.

The eyestalks (Pl. XI. fig. 8*) scarcely reach the tip of the rostrum, are nearly cylindrical, slightly swollen near the base and tapered distally, with a papilla-like tubercle just back of the cornea on the inner side and very small terminal black eyes no thicker than the adjacent stalk.

The first segment of the peduncle of the antennula is about as long as the eye and rather longer than the other two taken together, flattened and somewhat excavated above and with a rather broad lateral lobe terminating in a tooth nearly as far forward as the extremity of the body of the segment itself; the second and third segments are subcylindrical and approximately equal, but the third projects below in a process for the articulation of the lower flagellum far beyond the base of the upper flagellum. The proximal part of the upper flagellum is much stouter than the lower, somewhat compressed, not conspicuously swollen at the base, and hairy along the lower edge. The lower flagellum is very slender, cylindrical, and nearly naked. The antennal scale is rather more than twice as long as the eye, nearly half as broad as long, very thin, foliaceous, slightly narrowed distally, and obliquely truncated at the tip, which extends a little beyond the small tooth in which the slightly curved outer margin terminates. There are no acute teeth or spines on the second segment of the peduncle at the base of the scale.

The oral appendages are all very nearly as in *Miersia Agassizii*, the differences being no greater in fact than might be expected between species belonging to the same genus. The labrum is nearly the same, but the lobes of the metastome are much narrower. The mandibles (Pl. XII. figs. 5, 5*) are much the same, but the mesial edge of the ventral process is short and armed with

only five or six teeth, while the anterior edge is entirely unarmed ; the molar area is considerably larger, and is rounded above instead of angular ; the palpus is a very little larger and the second segment proportionally a little longer. The proximal lobe of the protognath of the first maxilla (Pl. XII. fig. 6) is more angular anteriorly and its mesial edge a little longer, and the endognath has but a single spine on the fold near the tip. The protognath and endognath of the second maxilla (Pl. XII. fig. 7) are almost exactly the same, but the scaphognath is larger, more prolonged and ovate in outline at the tip, and the posterior portion projects inward less prominently. The endopod of the first maxilliped (Pl. XII. fig. 8) is much stouter and the two distal segments much more nearly equal in length, and the exopod is more expanded anteriorly and more prolonged at the outer than at the inner edge. The endopod of the second maxilliped (Pl. XI. fig. 9) is a very little stouter proximally and has a rather shorter carpus, but differs very slightly ; the exopod is a very little longer ; and the epipod is narrower at base, more ovate in outline, and bears a branchia composed of only a few pairs of lamella.

The endopods of the external maxillipeds reach considerably beyond the tips of the antennal scales, and are composed of three segments each, as in *Miersia Agassizii*, but are considerably stouter than in that species ; the proximal segment is distally stouter than any part of the other segments and nearly as long as the other two together ; the middle segment is scarcely more than a fourth as long as the proximal, and the distal is triquetral, tapers to an acute point, and is nearly naked but armed with a few minute spines near the tip. The exopod is multiarticulate, flagelliform, as in *Miersia Agassizii*, and about as long as the proximal segment of the endopod. The epipod is nearly as in *Miersia*.

All the thoracic legs are furnished with exopods like the external maxillipeds, and the first, second, and third pairs are furnished also with epipods as in the external maxillipeds. The legs of the first pair are not stouter than the external maxillipeds and fall considerably short of their tips : the merus is compressed and nearly as long as the proximal segment of the endopod of the external maxilliped ; the carpus is scarcely half as long as the merus, subcylindrical, and slightly enlarged distally ; the chela is about twice as long as the carpus, very slightly swollen proximally, and the digits nearly a third the whole length, strongly curved at the tips, and the propodal one considerably stouter at base than the dactylus. The legs of the second pair are very slender, and reach a little by the tips of the external maxillipeds : the ischium and merus are strongly compressed, and the latter is longer than in the first pair and reaches to the distal extremity of the proximal segment of the endopod of the external maxilliped ; the carpus is slender, cylindrical, and about half as long as the merus ; the chela is slightly longer than the carpus, scarcely as long as in the first pair, cylindrical, scarcely as stout as the carpus, not at all swollen, and with very slender and slightly compressed digits about two sevenths the entire length. The third and fourth pairs of legs are nearly alike : the ischia and meri are compressed, and nearly as in the second pair, but a little longer ; the carpi are a little shorter and broader than in the second pair ; the propodi and

dactyli are wanting on both sides. The ischium, merus, and carpus in the posterior legs are nearly as in the third and fourth pairs, but the merus is a little shorter and narrower, while the terminal portion (Pl. XI. fig. 6) is very nearly as in *Miersia Agassizii*: the propodus is longer than the merus, nearly three times as long as the carpus, slender, nearly cylindrical, and is armed near the middle with several very long and slender setæ, toward the distal end with numerous short serrate setæ, and about the base of the dactylus with numerous long serrate, plumose and simple setæ; the dactylus is very short and stout, scarcely as long as the diameter of the propodus, strongly curved at the tip and armed along the lower side with several spines.

The abdomen is considerably compressed, and has a sharp, but not very high, dorsal carina on the third, fourth, fifth, and sixth somites, and is prolonged posteriorly into a small tooth on the fourth and fifth somites. The outlines of the epimera are very nearly as in *Miersia Agassizii*, but the posterior margins of the third, fourth, and fifth are perhaps a little fuller and more broadly rounded. The sixth somite is scarcely once and a half as long as the fifth, and about twice as long as high.

The telson is nearly twice as long as the sixth somite, very slender distally, the dorsum is without aculei but with a broad sulcus within the broadest part of which there is a median longitudinal elevation, and the tip is armed with a pair of lateral and a pair of very slender median spines.

The outer lamella of the uropod reaches slightly by the tip of the telson, is about three times as long as broad, and with the tip rather broad and extending a little by the tooth in which the outer margin terminates, and within which there is a small spine. The inner lamella is a little shorter than the outer, about four times as long as broad, and lanceolate at tip.

The outer ramus of the appendage of the first somite is longer than the propod and like that of the succeeding pairs, while the inner is a minute lamella about twice as long as broad. The inner rami of the four succeeding pairs of appendages are each furnished with the usual stylet for attaching together the two appendages of each pair.

There is but a single specimen in the collection, a female, wanting the left leg of the second pair and the terminal portions of both legs of the third and fourth pairs, from Station 328, N. Lat. 34° 28' 25", W. Long. 75° 22' 50", 1632 fathoms. This specimen gives the following measurements:—

Sex	♀
Length from tip of rostrum to tip of telson	75.0mm.
“ of carapax including rostrum	30.3
“ of rostrum	4.5
“ of antennal scale	9.5
Breadth “ “	4.5
Length of sixth somite of abdomen	8.0
Height “ “ “	4.0
Length of telson	15.5

EUMIERSIA, gen. nov. ♀.

Resembles *Pandalus* in the external form of the carapax and abdomen, and agrees with it essentially in the structure of the oral appendages, and the two species known to me have the same number and arrangement of branchiæ and epipods as in the typical species of *Pandalus*; but the genus is more like *Miersia* in the structure of the thoracic legs, which, however, are greatly more elongated than in the species of that genus here described, and have only very small epipods at the bases of the fourth pair and none at all upon the fifth. The mandibles, though essentially as in *Pandalus*, are stouter and have larger molar processes, while the ventral processes are very thin, more expanded, and with broader serrate tips, thus approaching somewhat to the structure in *Miersia*. The mandibular palpi are much stouter than in the typical species of *Pandalus*, and have broad terminal segments.

Eumiersia ensifera, sp. nov.**Plate XIII. Figs. 1-9.**

The carapax is as broad as high, with the cervical suture indicated by a distinct sulcus from the dorsum to the upper part of the hepatic region either side, where the sulcus terminates in a small but deep depression, and with a very short and inconspicuous gastro-antennal sulcus; the anterior margin is armed with a small antennal and a distinct pterygostomial spine, though the latter is wanting on one side in two of the specimens seen; back of the cervical suture the dorsum is very broad and evenly rounded, but there is usually a very small dentiform tubercle in the middle line on the posterior part of the cardiac region; the rostrum in the smaller specimens is often not more than half as long as the carapax proper, but in the larger specimens much longer and in one specimen nearly as long as the carapax, nearly straight and horizontal, or curved considerably upward as in the specimen figured, narrow, with a strong ridge either side, tapering to a more or less acute tip, and with the dorsal carina extending back upon the carapax nearly to the cervical suture and armed with twenty-five to thirty spines directed forward, movably articulated with the carapax, thickly crowded posteriorly but more and more remote anteriorly, and of which six to eight are crowded upon the carapax in about half the space between the orbit and the cervical suture; beneath, the rostrum is ciliated and in most of the specimens entirely unarmed, but in two or three cases there are one or two teeth near the tip.

The eyestalks are short and terminated by small hemispherical black eyes very nearly as in *Miersia Agassizii*. The peduncle of the antennula is about half as long as the antennal scale: the first segment is about as long as the two others taken together, excavated above for the reception of the eye, which, however, does not reach by a considerable distance the extremity of the segment, with a prominent lateral process terminating in an acute spine, and the body

of the segment itself produced in a spiniform process outside the articulation with the second segment; the second and third segments are subequal in length and nearly cylindrical. The flagella are imperfect in all the specimens seen, but both were very long and slender: the upper or major flagellum is slightly compressed near the base but not suddenly expanded, and was at least as long as the carapax and apparently very much longer; the inferior flagellum was a little smaller at the base than the superior, cylindrical, and apparently about as long as the superior. The antennal scale is thick and strong, seven or eight tenths as long as the carapax excluding the rostrum, about a fourth as broad as long, only slightly narrowed toward the tip, which is truncated and does not extend beyond the strong tooth in which the thickened outer margin terminates; the second segment is armed with a small spiniform tooth below the articulation of the scale; the third segment projects scarcely beyond the second; the fourth and fifth are very short, and the fifth does not project more than its diameter in front of the second. The flagellum is wanting in all the specimens seen.

The labrum is very large, the ventral surface flattened, broader than long, and approximately rectangular, the antero-lateral angles being expanded below so as to reach nearly as far forward as the middle portion, which projects in a tuberculiform lobe, a little above the plane of the ventral surface. The lobes of the metastome are broad and rather fleshy, as in *Pandalus*. The molar process of the mandible (Pl. XIII. figs. 2, 2^a) is stout, the mesial surface somewhat convex, and broken by several semicircular and concentric ridges, of which the one nearest the base of the ventral process is armed with a closely-set series of setæ. The ventral process is thin, distally broad and somewhat concave above, and armed with about eight rather slender teeth. The palpus is a little longer than the ventral process, the first and second segments subequal in length, and the third longer and much broader than the second, lamellar, and armed with numerous setæ. The proximal lobe of the protognath of the first maxilla (Fig. 3) is large, somewhat triangular, with the mesial edge two or three times as long as that of the narrow distal lobe; the endognath is much shorter than the distal lobe of the protognath and truncated at the extremity, which is armed with a stout seta either side and a third one just below the tip. The second maxilla (Fig. 4) is very nearly as in the typical species of *Pandalus*: the proximal lobe of the protognath is very much shorter than the distal, and its small anterior division is more conspicuous than in the typical species of *Pandalus*, while the two divisions of the distal lobe are nearly equal in size; the endognath is scarcely half as long as the distal lobe of the protognath; the anterior portion of the scaphognath is a little longer than the posterior, which, as in the typical species of *Pandalus*, is narrowed to an acute point, and the mesial edge furnished with exceedingly long setæ, many times longer than those upon the outer edge.

The distal lobe of the protopod of the first maxilliped (Fig. 5) is somewhat triangular in outline; the two proximal of the three segments of the endopod are subequal in length, while the distal segment is very short, but little longer

than broad; the lamellar portion of the exopod reaches slightly beyond the endopod, and the flagelliform is a little longer than the lamellar portion. The ischium and merus in the second maxilliped (Fig. 6) are subequal in length; the propodus is about as long as the ischium and merus taken together, and about half as broad as long; the dactylus is articulated obliquely along the distal end of the propodus, and is five or six times as broad as long; the flagelliform exopod is slender, nearly twice as long as the endopod, and multiarticulate for half its length; the epipod bears a well-developed branchia composed of two series of numerous lamellæ. The endopods of the external maxillipeds reach nearly to the tips of the antennal scales: the proximal segment is nearly as long as the two distal, vertically compressed, with a knifelike mesial edge; the middle segment is very slender, cylindrical, and nearly naked; the distal segment is about two thirds as long as the middle, somewhat triquetral, very slightly expanded near the middle, tapered to a point distally, and armed with numerous short setæ. The exopod is very slender and about three fourths as long as the proximal segment of the endopod. The epipod is rudimentary, scarcely longer than the breadth of the protopod, in a transverse sulcus on the outer side of which it lies.

The first four pairs of thoracic legs have exopods and epipods like the external maxillipeds, but the exopods diminish in size very rapidly posteriorly, and are minute upon the fourth pair. The legs of the first pair (Fig. 7) are about as long as the carapax including the rostrum and reach to or a little by the tips of the antennal scales: the ischium is slightly longer than the merus, and both are very slender and armed with a few small spines; the carpus is very much more slender than the merus, and about twice or considerably more than twice as long, slightly enlarged at the distal extremity, and entirely naked and unarmed; the chela in the larger specimens seen is a fourth or fifth as long as the carpus, considerably stouter, slightly flattened, and the digits about a third of the entire length, slightly curved, and rather sparsely clothed with slender setæ. The second (Fig. 8) are similar to the first, but very much longer and more slender: the chela is just about as long as in the first pair, but not quite as stout, while the ischium, merus, and carpus are very much longer than in the first pair. The third, fourth, and fifth pairs of legs are more or less broken in all the specimens seen, but are very long and slender, and are all apparently longer than the second pair. The only one of these legs which is complete belongs to a female 108 mm. long, and is apparently one of the posterior pair, but is, unfortunately, detached. This leg (Fig. 9) is nearly twice as long as the first pair in the same specimen, and much more slender than the second even: the ischium and merus make a little more than half the entire length; the carpus is much longer than the merus, exceedingly slender, somewhat enlarged at the distal extremity, and entirely naked; the propodus is fully as stout as the adjacent part of the carpus, scarcely more than a tenth as long, and armed with a few short setæ on the dorsal side, a fascicle of longer setæ beneath, and a circle of very long ones about the base of the dactylus, which is slightly longer than the carpus, slender, and very slightly curved.

The first and second somites of the abdomen are broadly rounded above and not at all compressed, but the succeeding somites are considerably compressed, particularly near the dorsum, which is not really carinated on any of the somites, however, though the third somite is prolonged in a very prominent tooth over the fourth. The first epimeron is broad and evenly rounded below, the second much longer than high and elliptical, the third and fourth with the posterior edges rounded, but the fifth produced posteriorly in an acute point. The sixth somite is about twice as long as the fifth, less than half as high as long, and very strongly compressed.

The telson is about as long as the sixth somite, narrow distally, rounded above, and armed with five to ten pairs of dorsal aculei and two pairs of long spines at the tip. The outer lamella of the uropod reaches to about the tip of the telson, is nearly four times as long as broad, with the rounded tip extending much beyond the tooth in which the stout outer margin terminates and just within which there is a spine as in most species of *Pandalus*. The inner lamella is considerably shorter and much narrower than the outer, and lanceolate in outline.

In the female, the inner ramus of the appendage of the first somite of the abdomen is lamellar, about two thirds as long as the outer, four times as long as broad, and tapered to an acute point. In the male, this ramus is lamelliform, but shorter and very much broader, being ovate and about twice as long as broad. In the male the sexual appendage at the side of the stylet of the inner ramus of the appendage of the second somite is as long as the stylet, and expanded distally into a broad lamelliform and obtusely rounded tip.

The surface of the carapax and abdomen is naked, but thickly punctate.

All the specimens are imperfect and many of them fragmentary, and the accompanying measurements are consequently very incomplete.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
305	41° 33' 15"	65° 51' 25"	810	2 ♀ young.
308	41° 24' 45"	65° 35' 30"	1242	3 ♀
330	31° 41' 0"	74° 35' 0"	1047	2 ♂ young.
339	38° 16' 45"	73° 10' 30"	1186	2 ♂ small.
340	39° 25' 30"	70° 58' 40"	1394	2 ♀
341	39° 38' 20"	70° 56' 0"	1241	2 ♂

The following measurements are in millimeters :—

Station	330	339	308	340	340
Sex	♂	♂	♀	♀	♀
Length from tip of rostrum to tip of telson	44.0		108.0	122.0	125.0
“ of carapax including rostrum	15.1	25.5	42.0	48.0	51.0
Breadth of carapax	4.8	7.5	11.0	13.0	13.5
Length of rostrum	4.8	9.5	17.0	21.3	23.3
“ of antennal scale	6.8	11.3	16.2	19.0	19.5
Breadth “ “	1.5	3.0	4.4	4.7	5.0

Station	330	339	308	340	340
Sex	♂	♂	♀	♀	♀
Length of first leg	16.0	26.0	40.0		
“ ischium	3.7	6.0	9.0		
“ merus	3.3	5.8	7.8		
“ carpus	6.5	9.5	17.0		
“ chela	2.5	3.1	4.1		
“ dactylus	0.9	1.1	1.4		
“ second leg	25.0				
“ ischium	6.0				
“ merus	6.5				
“ carpus	9.0				
“ chela	2.5				
“ dactylus	0.8				
“ fifth (?) leg			77.0		
“ ischium			18.0		
“ merus			23.0		
“ carpus			28.0		
“ propodus			3.0		
“ dactylus			3.3		
“ sixth somite of abdomen	8.0		16.0	17.0	17.2
Height of “ “ “	2.7		7.0	7.3	7.5
Length of telson	6.7		15.0	18.0	17.8

PENÆIDÆ.

? BENTHESICYMUS BATE.

A single mutilated male specimen is referred very doubtfully to this genus, recently and only very imperfectly characterized by Bate. This specimen wants the larger part of the external maxillipeds, of the flagella of the antennæ and antennulæ, and of the three last pairs of thoracic legs, but the branchial formula is the same as given by Bate for his genus, and as far as the diagnosis goes the specimen agrees with it. There is nothing in the branchial formulæ given by Bate in regard to the seventh somite (the first maxillipedal), but in the specimen before me there is an epipod and a single arthrobranchia at the base of the first maxilliped. The eighth somite bears two arthrobranchiæ, a podobranchia, and an epipod; the ninth to the twelfth inclusive bear each a pleurobranchia, two arthrobranchiæ, a podobranchia, and an epipod; the thirteenth bears a pleurobranchia, two arthrobranchiæ, and an epipod; and the fourteenth bears a pleurobranchia only: making in all twenty-four branchiæ and seven epipods, and of the true branchiæ six are pleuro-, thirteen arthro-, and eight podobranchiæ. The species here described has no exopods at the bases of the thoracic legs, and the maxillæ and first and second maxillipeds are much less

like *Penæus* than like *Stenopus hispidus* as figured by Boas ; and the species is not so closely allied to *Penæus* as might be inferred from the description of *Benthesicymus* and its place in Bate's arrangement.

***Benthesicymus Bartletti*, sp. nov.**

Plate XIV. Figs. 1 - 7.

Male. — The carapax is only slightly compressed laterally, and its surface, as well as that of the abdomen, is naked and polished, but is very conspicuously and peculiarly areolated. There is only one spine each side, a prominent and acute branchiostegial, and from this a sharp carina extends back parallel with the inferior margin to near the middle of the carapax, where it is interrupted by a well-marked sulcus which, beginning as the antennal, turns slightly downward, runs back above and contiguous to the carina just described, and then turns down and nearly reaches the inferior margin ; back of this carina a somewhat similar but much less conspicuous cardiaco-branchial carina accompanied by a slight sulcus extends to near the posterior margin of the carapax ; there is a slight gastro-frontal sulcus at the base of the rostrum ; a very deep and conspicuous transverse gastric sulcus, which slightly notches the dorsum at about the middle of the carapax, extends in an even curve downward and forward, as the gastro-hepatic, and joins the hepatic sulcus a little way back of the branchiostegial spine ; and back of this sulcus there is a distinct but much less conspicuous cervical, extending from very near the middle line, at about a third of the way from the transverse gastric sulcus to the posterior margin, downward to the cardiaco-branchial suture. In front of the transverse gastric sulcus there is a sharp dorsal carina which rises into a lamellar crest and terminates in a short and laterally compressed rostrum armed above with two sharp teeth of which the posterior is slightly back of the orbit and the anterior apparently about half-way between it and the tip, which is slightly broken but appears to have terminated in an acute point about two thirds of the way from the base to the tip of the eyestalk. Both edges of the rostrum are ciliated. Back of the gastric sulcus the dorsum is broad and evenly rounded transversely.

The eyestalks (Pl. XIV. figs. 1, 1*) are less than half as long as the antennal scales, slender, strongly compressed vertically, with a small obtuse dentiform prominence at the middle of the inner side, and just in front of and outside of this a small spot of black pigment showing faintly on the upper but conspicuously on the lower side. The eyes themselves are scarcely wider than the stalks, but are less compressed vertically, though still much broader than high, distinctly faceted, and dark brown in the alcoholic specimen.

The peduncles of the antennulæ (Figs. 1, 1*) are more than half as long as the antennal scales, and essentially as in the species of *Penæus*. The first segment is considerably longer than the two others taken together, is expanded laterally and deeply excavated above to fit the eye, and the outer margin is armed with an acute tooth opposite the extremity of the eye and another at the

distal end ; the second and third segments are subequal in length, and the terminal is considerably prolonged beneath at the origin of the lower flagellum ; the inner and distal margins of the first segment, and nearly the whole exposed surface of the second and third, are thickly clothed with hair. The proximal part of the lower flagellum is about as stout as the flagellum of the antenna, nearly cylindrical, and naked ; while the upper is considerably stouter and ciliated along the inner side.

The segments of the peduncles of the antennæ are all smooth, nearly naked, and externally unarmed, but the second segment bears, on the upper and inner edge, a slender spine curved forward and outward above the base of the scale, and there is a papilla-like prominence just above the opening of the green gland at the distal extremity of the first segment ; the consolidated fourth and fifth segment is about as long as the three others taken together, is sub-cylindrical, and the distal segment prolonged in a thin triangular process inside the origin of the flagellum ; the scale (Fig. 1*) is about two thirds as long as the carapax, and about three times as long as broad, the greatest breadth being near the base, but the margins only slightly converging distally except near the tip, which is obliquely rounded and extends considerably beyond the acute spine in which the very slightly arcuate outer margin terminates. The proximal part of the flagellum is very slender, naked, and slightly compressed vertically.

The labrum projects far below the epistome and is broadly caudate as seen in front, but this form is perhaps a result of contraction due to preservation in alcohol. The lobes of the metastome are narrow at the base, but expand into very broad and obtuse tips.

The mandibles (Fig. 2) are almost exactly alike, and nearly as in *Pencæus*. They are somewhat contracted at the crowns, which are small, with the opposing surfaces somewhat semicircular in outline and each divided longitudinally by a narrow and shallow depression into two portions, of which the ventral is obtusely triangular and obscurely bidentate, while the dorsal portion is long and narrow anteriorly, but expanded at the posterior angle into a small and somewhat oval molar area with a raised and obscurely dentate margin. The mandibular palpus is composed of two lamellar segments, of which the proximal is considerably the longer and broader, while the distal is narrowly ovate with the tip rounded ; both segments are margined with soft hairs and plumose setæ.

The proximal lobe of the protognath of the first maxilla (Fig. 3) is small and ovate, the distal lobe obliquely truncated and armed as in the allied genera. The endognath is narrow, curved, unsegmented, and shorter than the distal lobe of the protognath.

The four lobes of the protognath of the second maxilla (Fig. 4) increase successively in size distally, the distal being twice as wide as the next. The endognath is much shorter than the distal lobe of the protognath, and tapers regularly to the tip. The anterior part of the scaphognath is much longer than the posterior and projects beyond the protognath, while the posterior part is short, broadly expanded, and strongly incurved at the extremity.

The protopod of the first maxilliped (Fig. 5) projects anteriorly in a straight

lobe twice and a half as long as broad and rounded at the tip. The endopod is composed of three very distinct segments: a narrow basal one reaching a little by the protopod and with a slight expansion of the inner edge armed with slender spines, while the rest of the inner margin and the distal part of the outer are clothed with hairs; a second segment about half as long as the first, but expanded in the middle so as to be somewhat elliptical and nearly half as broad as long, with very long plumose setæ on the outer edge and smaller and more numerous ones on the inner; and a small terminal segment about a third as long as the second, half as broad as long, and edged with small setæ or hairs. The exopod is longer even than the endopod, the proximal two-thirds or three-fourths of its length wider than the first segment of the endopod, but the distal portion rather suddenly narrowed, multiarticulate, and flagelliform. The lamelliform branchial epipod is as large as the endopod and the anterior portion a little smaller than the posterior.

The endopod of the second maxilliped (Fig. 6) is approximately uniform in breadth throughout, except the dactylus: the ischium is broader than long; the merus is about as long as the three distal segments taken together, and about three and a half times as long as broad; the carpus and propodus are subequal in length and each a little longer than wide; the dactylus is a little shorter than the propodus, only half as wide as long, and narrowed to a somewhat triangular tip, which is armed with one or more curved spines; the edges of all the segments are more or less hairy or setigerous. The exopod is slender, regularly tapered, considerably longer than the endopod, and its distal half multiarticulate, flagelliform, and furnished with long plumose setæ, while the proximal part is unsegmented and furnished with short hairs or setæ. The epipod is short, nearly orbicular, and bears a short and dense dendrobranchia.

The endopod of the external maxillipeds is unfortunately wanting. The exopod is like that of the second except that it is a little smaller; the epipod is about as long as in the second, but narrow, ovate, and bears a dendrobranchia nearly as long as itself.

The first thoracic legs are slender and reach scarcely by the bases of the antennal scales: the merus is slightly longer than the ischium, and both these segments are strongly compressed vertically and ciliated along the inner edges; the carpus is slightly compressed, about as wide as the merus, and ciliated like it; the chela is scarcely as long as the carpus, and no stouter, and the digits are about as long as the basal portion, slender, very slightly curved at the tips, and the prehensile edges ciliated.

The second legs are much like the first, but a little more slender and considerably longer, reaching to the tips of the peduncles of the antennæ; the merus and carpus are subequal in length, and the chela is considerably shorter than the carpus.

The most of the endopods of the third, fourth, and fifth pairs of legs are wanting except a detached portion of, apparently, one of the fourth pair. This fragment is longer than the carapax and consists of a slender ischium and

merus, the latter twice as long as the former, a still more slender carpus nearly as long as the merus, and a portion of an exceedingly slender and filiform propodus.

The abdomen (Pl. XIV. fig. 1) to the tip of the telson is nearly twice as long as the carapax, anteriorly about as broad as high, but much compressed posteriorly, so that the sixth somite is fully twice as high as broad. The dorsum is evenly rounded on the first four somites, but there is a narrow and sharp carina on the fifth and sixth, which rises abruptly into a crest on the anterior part of the fifth. The posterior prolongations of the first and second epimera are broadly rounded; those of the third and fourth less broad and more angular, but still obtuse and rounded at the posterior angle; while the fifth is acutely angular, but with the tip itself obtuse. The sixth somite is twice as long as the fifth, and more than half as high as long. The telson wants the tip, but is apparently shorter than the sixth somite; it is narrowly triangular, thickened and transversely very strongly convex above at base, but not carinated, and posteriorly flattened above.

The lamellæ of the uropods are thin and lanceolate in outline. The inner is only a little shorter than the sixth somite, less than a third as broad as long, and stiffened in the middle by two slender riblike thickenings, separated, on the dorsal surface, by a narrow sulcus. The outer is fully once and a half as long as the inner, scarcely a fourth as broad as long, and the narrow tip is prolonged far beyond the sharp spine in which the thickened outer margin terminates, and from this spine a slender riblike thickening, with a narrow sulcus along its inner edge on the dorsal surface, runs nearly parallel with the outer edge to the base of the lamella.

The abdominal appendages of the first pair are as large as those of the second, about as long as the uropods, and the distal multiarticulate portion is nearly twice as long as the protopod, slender and subcylindrical. The peculiar male appendage (petasma of Bate) is a thin, squarish plate (Pl. XIV. fig. 7) attached by a constricted base, below which there is a small oblong process (*a*) standing out at nearly right angles to the plane of the rest of the plate. The plate itself, which is apparently carried in a nearly horizontal position in front of the protopod to which it is attached, is obliquely divided vertically or longitudinally by imperfect articulations into three parts, of which the middle one is much the largest and projects at the inner inferior angle in a large ovately pointed process, while the inner or distal of the three parts is narrow and has the lower or posterior part of its free edge armed with minute hooked spines for the attachment of the appendages of the opposite sides of the animal. The outer rami of the second to the fifth pairs of abdominal appendages are similar to the single rami of the first pair, but are all considerably compressed distally. The inner ramus in the second pair is very much more slender and considerably shorter than the outer, and is furnished on the anterior side at base with two small and obtusely terminated, hard, lamelliform processes. The inner rami of the third, fourth, and fifth pairs of appendages are as in the first pair except that they are without the lamelliform process at base.

Length of carapax including rostrum	24.8+ mm.
" rostrum	3.5+
" antennal scale	17.1
Breadth of " "	5.2
Length of abdomen	53.0
" sixth somite	12.4
Height of "	7.5
Length of telson	10+
" inner lamella of uropod	11.0
Breadth of " " "	3.2
Length of outer " " "	17.0
Breadth of " " " "	4.0

Station 343, N. Lat. 39° 45' 40", W. Long. 70° 55', 732 fathoms; one male.

AMALOPENÆUS, gen. nov.

Like the last species in general appearance, but readily distinguished from it by the second maxillipeds, in which the meri expand into broad opercular plates, and in having no podobranchiæ on any of the thoracic legs. The integument of the whole animal is membranaceous, and very soft and thin. The carapax, eyes, antennulæ, antennæ, mandibles, and maxillæ are nearly as in the species last described. The endopod of the first maxilliped is divided into three segments as in that species, but the terminal segment is larger than the penultimate, and the exopod is broad and lamelliform throughout. The merus of the second maxilliped is expanded in a thin lamelliform plate along the inside and beyond the articulation of the carpus, so that when the three distal segments are flexed they are concealed beneath it. In the external maxillipeds the ischium is longer than the merus, and both these segments are very much broader than the slender carpus and propodus, or than the short flattened and pointed dactylus. The first three pairs of thoracic legs are approximately equal and their chelæ are slender and subequal in size, but in the first pair the ischium and merus are compressed and considerably expanded. The fourth and fifth pairs of legs are about as long as the third, and very slender. There are no exopods at the bases of any of the thoracic legs. The branchiæ are arranged as in the last species except that there are no podobranchiæ at the bases of any of the thoracic legs, so that there are only twenty branchiæ and seven épipods on each side, as indicated in the following table.

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	1	1	1	1	1	0	(7)
Podobranchiæ,	0	1	0	0	0	0	0	0	1
Arthrobranchiæ,	1	2	2	2	2	2	2	0	13
Pleurobranchiæ,	0	0	1	1	1	1	1	1	6

20+(7)

Amalopenæus elegans, sp. nov.

Plate XIV. Figs. 8-14. Plate XV. Figs. 1-5.

The carapax is not at all compressed laterally, but about as high, exceedingly thin and membranaceous, and its surface naked and polished. The branchiostegial spine is very minute and the carina which extends back from it is less conspicuous than the sharp gastro-antennal and gastro-hepatic carina which is continuous posteriorly with a distinct cardiaco-branchial one; between the gastro-antennal and the branchiostegial carinæ there is a wide antennal and hepatic sulcus, which posteriorly turns down in front of the branchial region; there is a slight gastro-frontal and a very conspicuous transverse gastric and gastro-hepatic sulcus, as in the last species, while the cervical itself is equally deep and conspicuous, notches the dorsum like the gastric and only a very little way back of it, is directed downward and backward and then in a regular curve forward round the hepatic region to join the hepatic sulcus. A sharp dorsal carina extends the whole length of the carapax, but is most conspicuous in front of the gastric sulcus, rises in front into a sharp lamellar crest armed with a single sharp tooth over the posterior margin of the orbit, and projects forward in a short but acute and laterally compressed rostrum, which scarcely reaches the middle of the eyestalks.

The eyes and eyestalks are very nearly as in the last species, but the dentiform prominence is very much more prominent and conspicuous; the color of the eye and position of the pigment spot are the same, though the latter is more conspicuous above than below.

The ultimate segment of the peduncle of the antennula is much longer than the penultimate, and these two taken together are nearly as long as the first segment, but in other respects the peduncle is as in the last species. In the male the flagella are proximally subequal in diameter, but the superior is expanded somewhat along the inner side for a short distance from the base.

The antennal scale (Pl. XIV. fig. 12) is much less than half as long as the carapax, nearly three times as long as the greatest breadth, which is near the base, from where the margins arcuately converge to a narrow but obtusely rounded tip, which is scarcely in advance of the small terminal spine of the outer margin. The rest of the antennal peduncle is nearly as in the last species, and is armed with a curved spine above the base of the scale in the same way, but the terminal segment is shorter to correspond with the shorter scale. The flagellum is nearly naked, very slender, and at least much longer than the rest of the animal.

The labrum, metastome, and crowns of the mandibles are nearly as in the last species, but the labrum is full and rounded below. The mandibular palpi (Pl. XIV. fig. 9) are very large, and reach nearly to the middle of the antennal scales: the proximal segment is more than half as broad as long, nearly twice as long as the distal segment, with the distal part of the mesial edge straight and the outer edge curved and directed inward distally so as to narrow the

segment very much at the articulation of the terminal segment, which is about twice and a half as long as broad, and ovate with the tip rounded.

The first maxilla is as in the last species except that the endognath (Pl. XIV. fig. 10) is expanded somewhat a little way from the base.

The proximal of the four lobes of the protognath of the second maxilla (Pl. XIV. fig. 11) is larger than the next, while the three others increase successively in size distally, though the distal is not more than a third broader than the one next it. The endognath is nearly as long as the distal lobe of the protognath, broadly expanded near the middle, where it is more than a third as broad as long and has a rounded prominence edged with slender setæ on the inner margin, but suddenly contracted to a very slender tip armed distally with four long setæ on the inner edge and with two or three stouter and curved setæ on the outer edge just below these. The scaphognath is nearly as in the last species except that the posterior part is a little narrower and not so strongly incurved.

The protopod and the branchial epipod of the first maxilliped (Pl. XV. fig. 3) are nearly as in the last species, but the endopod and exopod are very different. The proximal segment of the endopod does not reach the tip of the protopod, though it is between three and four times as long as broad, the inner edge is armed distally with three or four slender spines and the rest of the way with long setæ or hairs; the second segment is a little narrower than the first, between a third and a half as long, about twice as long as broad, and margined with hairs; the terminal segment is considerably wider than the second segment, and about once and a half as long, approximately elliptical, and margined all round with long setæ or hairs. The exopod is a little longer than the endopod, unsegmented, lamellar, very thin and of nearly uniform breadth throughout, rounded at the tip, and with both edges setigerous, the setæ upon the outer edge being long and plumose.

The ischium of the second maxilliped (Pl. XV. fig. 4) is very short; the merus is considerably longer than the carpus and propodus combined, half as broad as long, and projects distally in a thin and broadly rounded lobe beyond the articulation of the carpus; the carpus is as long as the breadth of the merus, less than half as broad as long, and somewhat narrowed proximally; the propodus is a little shorter than the carpus, but as broad, and is slightly produced at the inner distal angle; the dactylus is about two thirds as long as the propodus, nearly half as broad as long, obtusely pointed, and armed with a strong curved spine at the tip. The exopod is slender, reaches about to the extremity of the carpus, and is distinctly multiarticulate from near the base to the tip. The epipod is small, ovate, and bears a relatively large dendrobranchia.

The external maxillipeds (Pl. XV. fig. 5) reach nearly to the tips of the antennal scales and are longer than either the first or second pair of legs: the ischium is about a third of the entire length of the endopod, fully a third as broad as long, and very slightly narrowed proximally; the merus is as broad and about two thirds as long as the ischium, and narrowed distally to the breadth of the

carpus ; the carpus is slightly shorter than the merus, and only about a third as wide ; the propodus is very nearly as long as the carpus, but a little narrower ; the dactylus itself is a little broader than the propodus, but less than half as long, broadest at the middle and with the tip triangular and armed with a slender spine not much shorter than the segment itself ; both edges of the dactylus, the extremity and inner edge of the propodus, and the inner edge of the carpus, are armed with exceedingly long and slender setiform spines, and the inner sides of the proximal segments are, as usual, armed with setæ. The exopod is slender, reaches a little beyond the ischium, and is distinctly multiarticulate to near the base. The epipod is narrow, and not longer than the breadth of the ischium.

The first and second pairs of legs (Pl. XV. figs. 1, 2) are very nearly equal in length, the first pair reaching about to the extremities of the peduncles of the antennæ, and the second pair scarcely falling short of the same point. In both pairs the corresponding segments are of very nearly equal lengths, except the carpi which are a very little longer in the second pair, but the ischia, meri, and carpi are narrower in the second than in the first : the ischium is about two thirds as long as the merus, half as broad as long in the first pair, and scarcely more than a third as broad as long in the second ; the merus is nearly a third of the entire length of the endopod, slightly narrowed distally, and in the first pair more than a third as broad as long, but in the second pair scarcely more than a fifth as broad as long ; the carpus in the first pair is about two thirds as long and half as wide as the merus, while in the second pair it is absolutely a little narrower than in the first ; the chelæ are very nearly alike in both pairs, about as long and broad as the carpus in the second pair, with the fingers slender, curved at the tips, and scarcely more than two thirds as long as the basal portion ; the edges of the chelæ are furnished with fascicles of short setæ, the tips of the fingers densely clothed with much longer setæ and hairs, the inner edges of the other segments thickly clothed with plumose hairs and long setæ, and the outer edges sparsely clothed with short hairs, except on the carpus in the second pair where the outer edge is thickly hairy. The legs of the third pair are considerably longer and much more slender than those of the second, beyond which they reach by the length of their chelæ ; the ischium is about as long as in the second pair, but narrower ; the merus is twice as long as the carpus, very slender, and of nearly equal diameter throughout ; the carpus is a little shorter and scarcely stouter than the merus, and very slightly thickened distally ; the chela is very near the same size as in the first and second pairs, but the fingers are apparently a little longer in proportion.

The third and fourth pairs of legs are nearly alike, a little longer than the third pair and very slender, the fifth being a little more slender than the fourth, and both sparsely armed with long setiform spines, except upon the dactyli, which are nearly naked, long, very slightly curved, and acute.

The abdomen to the tip of the telson is about twice as long as the carapax, anteriorly about as broad as the carapax and with the dorsum broadly rounded, but much compressed posteriorly, so that the sixth somite is twice as high as

broad. None of the anterior somites are dorsally carinated or toothed, but the sixth, which is nearly twice as long as the fifth and half as high as long, has a thin dorsal carina nearly the whole length. The epimera of all somites are rather small, and the posterior angle is more or less rounded in all.

The telson is about two thirds as long as the sixth somite, narrowly triangular, thickened at base, with a longitudinal sulcus the whole length above and with a shorter one either side near the base, and with the tip truncated, narrow, and armed with a spine either side and a series of long plumose hairs between.

The inner lamella of the uropod is a little longer than the sixth somite, lanceolate, and about six times as long as broad. The outer lamella is about a fifth longer than the inner, scarcely wider proportionally, and with the ovate tip prolonged far beyond the sharp spine in which the outer margin terminates.

In both sexes the protopods of the appendages of the first to the fifth somite are stout and all nearly alike, the outer rami are all very long and slender, and the inner rami of the four posterior pairs are shorter and more slender than the outer. The peculiar sexual appendage of the first pair of appendages in the male is carried as in the last species, and, as in that species, consists of a thin, squarish plate (Pl. XIV. figs. 13, 14) divided by imperfect articulations into three parts and attached by a constricted base, below which there is a small, broad, oval process (*a*); but the middle of the three parts is as large as the two others combined, inferiorly projects beyond the other parts, and at either side there is an obtuse tooth, above the outer of which there is an obtuse lobe in the margin and then a deep and narrow notch separating the middle from the inner or distal part, while above the notch on the anterior side there is an oblong process (*b*) which may be turned either in over the distal part of the plate or out over the middle part; the distal part is thin, membranous, curls easily over upon the middle part, and is armed along the free edge with minute hooked spines as in the last species. There are two small, lamelliform plates at the base of the inner ramus in the second pair of appendages of the male, as in the last species.

All the specimens are more or less imperfect, and most of them in very bad condition on account of the softness of the integument and the exceeding fragility of the appendages, so that it is nearly impossible to present a general figure of the whole animal or give accurate measurements. Three specimens, however, give the following approximate measurements in millimeters:—

Station	330	328	893
Sex	♂	♀	♀
Length of carapax including rostrum	9.7	13.5	12.5
“ antennal scale		6.4	6.8
Breadth of “ “		2.5	2.7
Length of abdomen	20.0	27.0	27.0
“ sixth somite of abdomen	5.0	6.2	6.7
Height of “ “ “	2.5	3.5	3.2
Length of telson			5.0

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
323	33° 19' 0''	76° 12' 30''	457	2 ♀, fragmentary.
324	33° 27' 20''	75° 53' 30''	1386	1 ♂
325	33° 35' 20''	76° 0' 0''	647	1 ♀, fragmentary.
328	34° 28' 25''	75° 22' 50''	1632	2 ♀, 1 fragmentary.
330	31° 41' 0''	74° 35' 0''	1047	2 ♂
343	39° 45' 40''	70° 55' 0''	732	Fragments only.

From Station 325, there is the crushed and fragmentary cephalothoracic portion of another specimen, apparently of this species, but having two teeth on the crest of the rostrum, the second tooth being about half-way between the one above the posterior margin of the orbit and the tip of the rostrum.

This species has also been taken by the U. S. Fish Commission at the following stations off Block Island, in 1880 and 1881 : —

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
893	39° 52' 20''	70° 58' 0''	372	1 ♀
935	39° 45' 0''	69° 44' 45''	770	1 ♂
952	39° 55' 0''	70° 28' 0''	388	1 ♂

Among these were the only specimens which had either of the fourth and fifth pairs of legs, the telson, or the uropodal lamellæ perfect.

The specimens in alcohol retain for a considerable time bright purple markings about the oral appendages, and give out a peculiar, bright red, oil-like fluid, after the manner of the species of *Sergestes* and some of the deep-water Schizopoda.

Hymenopenæus debilis, gen. et sp. nov.

Plate XV. Figs. 6-11. Plate XVI. Figs. 1-3.

The whole integument is membranaceous and exceedingly thin and soft. The carapax is smooth, naked, slightly compressed laterally, and dorsally carinated the whole length but not conspicuously on the posterior part ; there are four large and acute lateral spines either side, — an antennal, an hepatic, one a little way back of the antennal, and another (branchiostegial ?) below and in front of the hepatic and near the lower edge of the carapax ; the gastro-hepatic sulcus is conspicuous and deep, and continues upward to the dorsal line considerably back of the middle of the carapax and terminates below in front of the hepatic spine in a depression from which a narrow sulcus extends backward and divides, sending a short branch downward in front of the branchial region and a long one back to become the cardiaco-branchial. The rostrum is nearly straight, a little less than half as long as the rest of the carapax along the dorsum, compressed but not high, terminates in an acute point, is armed above with six or seven teeth besides three more widely separated and nearly equidistant ones upon the anterior half of the carapax proper, and near the tip below with a closely set series of hairs.

The eyes are large, reniform, and black, as in the typical species of *Penæus*.

The peduncle of the antennula is much longer than the rostrum: the first segment is more than half the entire length, excavated above for the reception of the eye, but the lamelliform appendage is small, narrow, and concealed between the eyestalks; the second segment is about half as long as the first, and somewhat triquetral; the body of the ultimate segment is not quite half as long as the second, but is prolonged in a narrow process beneath the bases of the flagella; the upper flagellum is slender, cylindrical and longer than the carapax and rostrum; the proximal portion of the lower flagellum is slender and cylindrical, like the upper, but the terminal portion is wanting in all the specimens seen.

The antennal scale is about half as long as the carapax including the rostrum, nearly four times as long as broad, and contracted distally to a rather narrow but evenly rounded tip, which projects scarcely beyond the terminal spine of the outer margin. The second segment of the peduncle of the antenna is armed with a slender spine just outside the articulation of the scale, and the consolidated fourth and fifth segments reach nearly to the middle of the scale and are subcylindrical. The flagellum is slender, cylindrical, and three or more times as long as the rest of the animal.

The labrum, metastome, and crowns of the mandibles are nearly as in *Penæus*. The mandibular palpi (Pl. XVI. fig. 1) are very much as in the *Amalopenæus* just described, and reach to about the middle of the antennal scales: the proximal segment is about half as broad as long and once and two thirds as long as the distal segment, which is three times as long as broad, and ovate with the tip obtuse.

The proximal lobe of the first maxilla (Pl. XVI. fig. 2) is large, broadly rounded at the extremity, and armed with very long setiform spines and setæ; the distal lobe is broad and truncated at the extremity, and armed with slender spines and setæ rather shorter than on the proximal lobe; the endognath is shorter than the distal lobe of the protognath, has a slight expansion margined with hairs on the outer edge near the base, and tapers to an obtuse tip (Fig. 2^a) armed on the inner edge with three very long and distally plumose setæ, and on the anterior surface with very delicate hairs.

The second maxilla (Pl. XVI. fig. 3) is very much as in many species of *Penæus*. The three proximal lobes of the protognath are subequal and narrow, and the distal lobe about twice as wide as they, but still rather narrow and ovate. The endognath is much shorter than the distal lobe of the protognath, and terminates in a narrow thickened fold (Fig. 3^a) on the posterior side armed along either edge and on the anterior side with a longitudinal series of slender spines or spiniform setæ, of which the distal one on the inner edge, the anterior series, and the distal ones of the outer series are very long. The anterior lobe of the scaphognath is long and very narrow, and projects considerably beyond the protognath, while the posterior lobe is large, broad, and curved strongly inward and anteriorly as in the allied genera.

The first maxillipeds (Pl. XV. fig. 7) resemble those of the typical species of *Penæus*. The distal lobe of the protopod is large, rounded in outline distally and about two and a half times as long as broad. The endopod is composed of three segments: the proximal segment is a little more than half the whole length, broad at base but narrow distally and with the inner margin abruptly contracted near the middle, leaving an angular projection which is armed with long setæ, while beyond this projection it is narrowed to near the extremity and is regularly curved inward round, and extends considerably beyond, the end of the protopod; the two distal segments are nearly straight, approximately equal in length, very narrow, and with a regular series of slender plumose setæ along either edge, those on the outer edge being much the larger. The exopod reaches to about the base of the distal segment of the endopod, is narrow, twelve to fifteen times as long as broad, but lamellar, and edged with a regular series of long plumose setæ. The epipod is small, but with a distinct anterior lobe, has a few hairs or setæ along the edges, and is apparently not branchial.

The endopod in the second maxilliped (Pl. XV. fig. 8) is large and stout: the ischium as usual is shorter than broad; the merus is as long as the entire protognath of the first maxilliped, and about a fourth as broad as long; the three distal segments are subequal in length and together about as long as the merus, the propodus about as wide as the merus, but the carpus and dactylus a little narrower; the dactylus is obtusely rounded and armed with a few strong spines distally, and both margins of the three distal segments and the inner margins of the proximal are clothed as usual with stout setæ and hairs. The exopod is very small, slender, nearly cylindrical, about as long as the merus, and the distal half multiarticulate, flagelliform, and furnished with small plumose setæ. The lamellar epipod is narrow-ovate, not bilobed distally, and bears a rather small dendrobranchia.

The external maxillipeds (Pl. XV. fig. 9) are very long and slender, though as thick as any of the legs, longer than the carapax and rostrum, and reach beyond the tips of the antennal scales fully the length of their dactyli: the ischium, merus, and carpus are approximately equal in length and subequal in diameter; the propodus and dactylus taper slightly and regularly; the propodus is fully two thirds and the dactylus half as long as the carpus; all the segments are thickly armed along the inner side with fascicles of exceedingly long and slender spines or stout setæ, and the three distal are similarly armed, but with shorter spines and setæ, on the other sides. The exopod is rudimentary and exceedingly minute, being very slender and much shorter than the diameter of the merus. The epipod is well developed, lanceolate, and undivided at the tip.

All the thoracic legs have very minute exopods, and all except the fifth pair have narrow and undivided epipods like the external maxillipeds. The first legs (Pl. XV. fig. 10) are about as long as the carapax excluding the rostrum, reach to the middle of the antennal scales, are slightly compressed, and stouter than the succeeding pairs: the merus is about twice as long as the ischium and

seven or eight times as long as broad; the carpus is a third or fourth shorter than the ischium, but as broad; the chela is slightly stouter than the carpus and only a little shorter, and has slightly curved digits about two thirds of the whole length; the lower edges of the ischium, merus, and carpus are armed with fascicles of long spines and setæ as in the external maxillipeds, the upper edges of these segments and both edges of the chela are armed with much smaller spines or setæ, and in addition there is a small area densely covered with very short setæ or hairs near the distal end of the lower edge of the carpus, and a similar area in a corresponding position at the proximal end of the chela. The second legs are a half longer and much more slender than the first, nearly cylindrical, reach to the tips of the antennal scales, and are almost entirely naked. The third legs (Pl. XV. fig. 11) are like the second, but longer, reaching to the tips of the external maxillipeds. The chelæ of the second and third pairs are about as long as those of the first, but more slender, with proportionally shorter, straight and weak digits, and naked except for a few very minute hairs near the tips of the digits.

The fourth and fifth pairs of legs are exceedingly long and slender, and apparently very nearly alike, but the distal segments are wanting in all the specimens seen; the meri, however, reach to about the tips of the antennal scales in both pairs, but in the fifth pair a little farther than in the fourth; and the parts which are preserved are almost entirely unarmed.

The branchiæ appear to be less densely branched than in the typical species of *Penæus*, and there are two arthrobranchiæ at the base of the penultimate leg each side instead of one, making nineteen branchiæ on each side arranged as indicated in the following table.

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	1	1	1	1	1	0	(7)
Podobranchiæ,	0	1	0	0	0	0	0	0	1
Arthrobranchiæ,		2	2	2	2	2	2	0	12
Pleurobranchiæ,	0	0	1	1	1	1	1	1	6
									<hr/> 19+(7)

The abdomen to the tip of the telson is slightly more than once and a half as long as the carapax including the rostrum, anteriorly nearly as broad as the carapax, but strongly compressed back of the third somite so that the sixth somite, which is nearly a fourth of the entire length of the abdomen and nearly twice as long as high, is nearly twice as high as broad. The three anterior somites are evenly rounded above, but the three posterior are sharply carinated, and on the fifth and sixth somites the carina terminates at the posterior margin in a small tooth. The epimera of all the somites are rather small, and have the posterior angles more or less rounded.

The telson is not quite perfect at the tip in any of the specimens, but is nearly three fourths as long as the sixth somite, narrowly triangular, thickened at base, has shallow dorsal and lateral sulci nearly the whole length, and the lower edge each side is armed near the tip with a slender spine.

The inner lamella of the uropod is slightly longer than the sixth somite, lanceolate, and about four times as long as broad. The outer lamella is just about as long and wide as the antennal scale, but is broader at the tip.

There are only three specimens in the collection, all apparently females, and all more or less imperfect. The largest specimen, from Station 323, gives the following measurements, which, on account of the soft condition of the specimen, are more or less approximate.

Length from tip of rostrum to tip of telson	42.0mm.
Length of carapax including rostrum	16.3
“ rostrum	5.5
“ antennal scale	8.0
“ external maxilliped	19.0
“ first pair of legs	12.0
“ second pair of legs	18.0
“ third pair of legs	22.0
“ sixth somite of abdomen	6.2
Height of “ “ “	3.3
Length of inner lamella of uropod	6.5
Breadth “ “ “	1.6
Length of outer lamella of uropod	8.2
Breadth “ “ “	2.0

Possibly none of the specimens are fully grown, but all have apparently attained the characters of the adult. The smallest specimen, less than 30 mm. in length, does not differ, except in size, from the largest.

Station.	N. Lat.	W. Long.	Fathoms.
317	31° 57' 0''	78° 18' 35''	333
323	33° 19' 0''	76° 12' 30''	457
326	33° 42' 15''	76° 0' 50''	464

The genus *Penæus*, even after the subdivisions recently made by Bate, includes species differing widely in the structure of the articular appendages and in the arrangement of the branchiæ, but the genus here proposed appears to differ from all these species in the small and narrow terminal segment of the mandibular palpus, the rudimentary character of the exopods of the external maxillipeds and legs, the number and arrangement of the branchiæ, and the membranaceous character of the integument. From the typical species of *Penæus* it differs moreover in the short and unsegmented endognath of the first maxilla and in the sulcation and armament of the carapax. The species here described is possibly closely allied to, or even congeneric with, *Haliporus* Bate, which, however, is so imperfectly characterized, and the four species referred to it so briefly described, that it is impossible to determine its affinities with any certainty.

SERGESTIDÆ.

Sergestes arcticus KRÖYER.

Oversigt Vidensk. Selsk. Forhandl. Kjöbenhavn, 1855, p. (6) ; Monograph. *Sergestes*, Vidensk. Selsk. Skr., V., Naturvidensk. mathem. Afh., IV. pp. 240, 276, Pl. III. figs. 7a-7g, Pl. V. fig. 16, 1856.

SMITH, Proc. National Mus., Washington, III. p. 445, 1881.

Plate XVI. Fig. 4.

Station.	N. Lat.	W. Long.	Fathoms.	Specimens.
304	41° 35' 0''	65° 57' 30''	139	Fragments only.
309	40° 11' 40''	68° 22' 0''	304	1 ♀
326	33° 42' 15''	76° 0' 50''	464	1 ♂, 1 ♀
337	38° 20' 8''	73° 23' 20''	740	1 ♀, 55 mm. in length.

In this species there is an epipod and a well-developed podobranchia at the base of the second maxilliped, and above its base a simple lamella in place of a pleurobranchia, a large anterior pleurobranchia with a simple lamella back of it on each of the three succeeding somites, a large anterior and a small posterior pleurobranchia on the antepenultimate somite, and on the penultimate somite two small branchiæ, of which the posterior is very much the smaller, while the last somite is without branchiæ; or, indicating the simple pleurolamellæ by accents, the branchial formula* may be indicated as follows:—

Somites.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods,	1	1	0	0	0	0	0	0	(2)
Podobranchiæ,	0	1	0	0	0	0	0	0	1
Arthrobranchiæ,	0	0	0	0	0	0	0	0	0
Pleurobranchiæ,	0	0'	1'	1'	1'	2	2	0	7
									8+(2)

* Boas (Studier over Decapodernes Stægtskabsforhold, Vidensk. Selsk. Skr., VI., Natuvidensk. mathem. Afh., I., 1880), for *S. Frisii* Krøyer, gives an epipod and a rudimentary *arthrobranchia* for the eighth somite and a single pleurobranchia for each of the succeeding somites *including the last*. Bate (Ann. Mag. Nat. Hist., 5th ser., VIII. p. 193, 1881), gives, for the genus *Sergestes*, a "mastibranchia" (epipod) and one *pleurobranchia* for the eighth somite, a single pleurobranchia for the ninth, a pleurobranchia and pleurolamella each for the tenth, eleventh, and twelfth, two pleurobranchiæ for the thirteenth, and nothing for the last; but under *S. Krøyeri* he says, "This species has two well-developed pleurobranchiæ attached to the penultimate somite of the pericard, two to the antepenultimate, one plume and a leaflike plate to the next three somites, and one plume and a rudimentary mastibranchial plate to the first pair of gnathopoda" (second maxillipeds). This last statement of Bate would apparently indicate an arrangement of the branchiæ much like that which I have given above, or even nearer to that of *S. robustus* described beyond, but it is very unlike the arrangement indicated by his formula for the genus.

The structure of the branchiæ themselves, in this and in the two following species as well, is very different from that in *Penæus*, or any of the Penæidæ described in this paper. The branchiæ are pinnate in form, and each pinna is a complete phyllobranchia; that is, they are compound phyllobranchiæ, while those of *Penæus* are compound trichobranchiæ. The structure is more like that in *Sicyonia* (judging by Bate's description of the branchiæ of that genus) than that in *Penæus*.

The first pair of thoracic legs are subchelate, and the dactyli of the external maxillipeds and the propodi of the first, second, and third pairs of legs are multiarticulate, as in the next species, the articulations being more conspicuous than in that species. These structural characters of the thoracic legs are, however, undoubtedly characteristic of all the species of the genus.

(*Sergestes robustus*, sp. nov.)

Plate XVI. Figs. 5-8^b.

Male.—The carapax is strongly compressed, the breadth being considerably more than the height at the base of the antennæ, but much less than the greatest height posteriorly, which is rather more than twice that at the base of the antennæ. The dorsum is broadly rounded to the base of the rostrum, which rises rather abruptly from the dorsum, is very thin, acutely triangular, and extends a little forward of the truncated middle lobe of the ophthalmic somite.

The eyestalks to the tips of the eyes are about two fifths as long as the antennal scales, and the diameter of the eye itself about half the length. The peduncle of the antennula is about a fifth longer than the antennal scale, the first segment scarcely half as long as the antennal scale, and the second and third successively a little shorter; all the segments are very stout, the diameter in the second and third being equal to more than half the length. The proximal segment of the upper or major flagellum is scarcely more than a fourth as long as the distal segment of the peduncle, and scarcely longer than the proximal segment of the lower flagellum, which is modified as in the allied species. The antennal scale (Fig. 7) is about half as long as the carapax along the dorsal line, about a third as broad as long, and much broader at the tip than in the allied species.

The oral appendages do not differ essentially from the oral appendages of *P. Frisii* and *arcticus* as figured by Kröyer.

The external maxillipeds reach by the tips of the antennal scales fully the length of their dactyli, and are about as stout as the third pair of legs: all five segments of the endopod are approximately equal in length though the dactylus is slightly shorter than the others, and all are armed with very slender spines; the dactylus is slender and multiarticulate, being composed of about five segments, and tipped with two or three spines. The legs of the first pair fall a little short of the tips of the antennal scales: the merus is about twice as long as the carpus and about as long as the propodus, which is very slender, com-

posed of about ten segments, and armed, like the ischium, merus, and carpus, with exceedingly long, and for the most part simple, setiform spines, and at the proximal extremity with a tuft of serrate setæ corresponding to a similar tuft on the distal extremity of the propodus; the dactylus is very minute, but perfectly distinct, and armed with an exceedingly long and slender spiniform seta, while the tip of the propodus is armed with a very much shorter spine. The legs of the second pair reach to about the tips of the external maxillipeds: the merus is a little longer than in the first pair; the carpus twice as long as in the first pair and only a little shorter than the merus; the propodus is longer than the merus, composed of about twelve segments, and armed very nearly as in the first pair, except that the tuft of setæ at the proximal extremity, with the corresponding one on the carpus, is wholly wanting, while the digits of the well-developed chela (Fig. 6) are considerably longer than the diameter of the propodus at their base, slender, nearly straight, and armed at the tips with a dense brush of setæ, most of which are serrate. The legs of the third pair are almost exactly like those of the second, except that they are considerably longer, reaching by the second pair by about half the length of their dactyli. The legs of the fourth pair reach nearly to the tips of the carpi of the third pair and are very much stouter, and the endopods are composed of only four segments each, the dactylus, apparently, being wanting: the ischium, carpus, and propodus (or the proximal and the two distal segments) are subequal in length, while the merus (or antepenultimate segment) is about once and a half as long as each of the others: the merus is about six times as long as broad, and, like the ischium, densely ciliated along both edges, but the cilia on the lower edge are several times longer than those upon the upper, which are not as long as the breadth of the segment; the carpus is slightly broader than the merus, being more than a fourth as broad as long, ciliated like the merus along the lower edge, but the upper edge naked; the propodus (or ultimate segment) is a little less than a fifth as broad as long, ovate at the tip, and has the lower edge ciliated and the upper naked like the carpus. The legs of the fifth pair are a little more than half as long as those of the fourth, and their endopods are composed of the same number of segments: the ischium and carpus are subequal in length, the merus a little longer, and propodus a little shorter, and all the segments are ciliated along both edges, though the cilia upon the lower edge are much longer than those upon the upper; the merus is about a fourth as broad as long, and considerably broader than the ischium or carpus; the carpus is less than a fourth as broad as long, and slightly tapered distally; the propodus is a little less than a fifth as broad as long, and regularly tapered from near the base to the acute tip.

The abdomen, excluding the telson, is nearly twice as long as the carapax along the dorsal line, is considerably compressed, though anteriorly about as broad as the carapax, and, like the carapax, rounded above, but with a shallow median sulcus on each of the first four somites, inconspicuous on the first and second, but distinct on the third and fourth. [There are similar sulci on the abdomen of *S. arcticus*, and they are possibly, though apparently not, due to

contraction from preservation in strong alcohol.] The epimera of the first three somites are large and project backward in an angle, while the epimera of the fourth and fifth somites project backward quite as far, but have the outline more rounded. The sixth somite is about as long as the antennal scale, considerably more than half as high as long, and strongly compressed.

The telson is considerably shorter than the sixth somite, flattened and slightly sulcated above, with a deep lateral groove each side, acutely angular at the tip, and ciliated along the edges. The inner lamella of the uropod is a little longer than the telson, about three and a half times as long as broad, and lanceolate at the tip. The outer lamella is between a third and a fourth longer than the inner, less than a fourth as broad as long, the outer margin terminating in a strong tooth about two thirds of the way from the base to the tip, and the tip narrow, but rounded.

The peculiar sexual appendages (petasma, Fig. 8) of the first somite of the abdomen have essentially the same structure as in *S. arcticus*, but are much more complicated than would be inferred from the figures for that species given by Kröyer. The appendages of the two sides are usually hooked together along the middle line (*h*), but are really entirely distinct. Each is attached by a narrow process (*a*) to the protopod of the abdominal appendage, and is divided by more or less distinct sutures into three portions. The outer portion, that next the protopod, projects above the point of attachment in a narrow process, and below the point of attachment in a broad lamellar lateral expansion, and below this in a long, flat, chitinous stylet (*b*) terminating in a sharp hook below a rounded sinus in the extremity. The middle portion projects below and alongside of, but far beyond, the hooked stylet (*b*), in a complicated appendage divided distally into three membranaceous and hook-bearing processes (*e*, *f*, *g*) and bearing two slender and unarmed stylets (*c*, *d*); and each of the membranaceous processes is armed along one edge with a series of peculiar chitinous hooks retracted within invaginated papillæ (Fig. 8^b), and at the tip with a larger and somewhat differently shaped but similarly retracted hook (Fig. 8^c). The lateral hooks themselves are semi-mushroom-shaped, like those which serve to hook together the inner rami of the abdominal appendages in many crustaceans, and very much like those along the mesial edge (*h*) of this same appendage, but larger. The terminal hooks are more properly hook-shaped, as shown in the figure, but are broad at the tips. The invagination of the membrane around the hooks is possibly due to contraction in the alcoholic specimens, but the hooks are similarly retracted in all the specimens of *S. arcticus* which I have examined, their bases appear to be connected with strong muscular fibres, and I think there is little doubt that the hooks are capable of being retracted in life. The mesial portion of appendages is thin, lamellar, longitudinally folded, and armed along the mesial edge with great numbers of semi-mushroom-shaped hooks which serve to attach together the appendages of the two sides.

The branchiæ are the same in number and have the same arrangement as in *S. arcticus*, but the posterior branchia on the twelfth (antepenultimate) somite

is nearly as large as the anterior, which is the largest of the series, and the branchiæ of the penultimate segment are very nearly alike, and not very much smaller than the pair next in front of them.

I have seen only four specimens, all males, and but one of these is in the "Blake" collection; this one from Station 328, N. Lat. $34^{\circ} 28' 25''$, W. Long. $75^{\circ} 22' 50''$, 1632 fathoms. The other specimens are from the collections made by the U. S. Fish Commission off Martha's Vineyard: Stations 893 and 952, 372 and 388 fathoms.

Two specimens give the following measurements:—

Station	893	328
Sex	♂	♂
Length from tip of rostrum to tip of telson	58.0mm.	65.0mm.
" of carapax along dorsal line	17.8	19.5
" of rostrum	1.2	1.3
Height of carapax anteriorly	4.0	4.5
" " posteriorly	8.5	9.5
Breadth of carapax	5.6	6.3
Length of eyestalk and eye	3.5	3.9
Diameter of eye	1.7	1.9
Length of antennal scale	9.0	9.2
Breadth of antennal scale	2.9	1.3
Length of sixth somite of abdomen	9.0	10.0
" telson	7.5	8.0
" inner lamella of uropod	8.0	8.3
" outer " "	11.0	12.0

This is the species which I have referred to as "*Sergestes* sp." in Proc. National Mus., Washington, III. p. 445, 1881.

Sergestes, sp. indet.

There are specimens of a third species of *Sergestes* from Station 328, N. Lat. $34^{\circ} 28' 25''$, W. Long. $75^{\circ} 22' 55''$, 1632 fathoms, and fragments of apparently the same species from Station 325, N. Lat. $33^{\circ} 35' 20''$, W. Long. 76° , 647 fathoms. These specimens are all in bad condition and want a large part of the appendages, but they are interesting on account of the modification of the branchial formula. The branchiæ are all much smaller than in *S. robustus*, the posterior pleurobranchia of the twelfth (antepenultimate) somite is replaced by a simple lamella like that upon the somite next in front, and the two branchiæ of the penultimate somite are very small, as in *S. arcticus*. The species is apparently even larger than *S. robustus*, and much like it in general appearance, but the rostrum is much smaller and apparently obtuse, and the eyes are very small, scarcely larger than eyestalks. The specimens are all females.

EXPLANATION OF THE PLATES.

All the figures on Plates I., III., and V.; Figs. 1 to 4^b, 5, Plate II.; Fig. 1, Plate IV.; Figs. 1, 2, 3, Plate VI.; Figs. 1, 1^a, 1^b, 2, 2^a, 4, 4^a, 5, 5^a, Plate VII.; Figs. 1, 1^a, 1^b, 2, Plate VIII.; Figs. 1, 2, 2^a, Plate IX.; Figs. 1, 2, Plate X.; Figs. 4, 5, 8, Plate XI.; Fig. 1, Plate XIII.; and Fig. 5, Plate XVI., were drawn by J. H. Emerton. All the other figures were drawn by the author.

PLATE I.

- Fig. 1. *Lithodes Agassizii*. Dorsal view of female from Station 329, half natural size.
- “ 2. Dorsal view of a young specimen taken off Martha's Vineyard by the U. S. Fish Commission, Station 1029, enlarged two diameters.
- “ 2^a. Lateral view of the carapax of the same specimen, enlarged two diameters.

PLATE II.

- Fig. 1. *Cyclodorippe nitida* A. Milne-Edwards. Dorsal view of female, enlarged two diameters.
- “ 1^a. Front view of same specimen, enlarged four diameters.
- “ 1^b. Ventral view of same specimen, the distal portions of the legs omitted, enlarged four diameters.
- “ 2. *Amathia Agassizii*. Dorsal view of the carapax of the male from Station 319, natural size.
- “ 3. Dorsal view of a young specimen from Station 317, enlarged two diameters.
- “ 4. *Parapagurus pilosimanus* Smith. Lateral view of the left side of the originally described male specimen, taken on a trawl line, off Nova Scotia, half natural size.
- “ 4^a. Dorsal view of the chelipeds of the same specimen, half natural size.
- “ 4^b. Dorsal view of the carapax and anterior appendages of the same specimen, natural size.
- “ 4^c. Appendage of the right side of the first somite of the abdomen of the same specimen, seen from behind, enlarged four diameters.
- “ 4^d. Appendage of the right side of the second somite of the abdomen of the same specimen, seen from behind, enlarged four diameters.
- “ 5. *Eupagurus politus*. Lateral view of left side of male, dredged by the U. S. Fish Commission off Martha's Vineyard, Station 922, natural size.

PLATE III.

Fig. 1. *Pentacheles sculptus* Smith. Dorsal view of female, from Station 326, natural size.

PLATE IV.

- Fig. 1. *Pentacheles sculptus* Smith. Ventral view of the cephalo-thorax of the specimen figured on the last plate, the distal portions of the appendages omitted, natural size; *a*, tubular process containing the canal of the green gland; *b*, process of the ophthalmic lobe.
- “ 2. Mandible and lobe of metastome of the right side, as seen in place from below, from the male from Station 326, enlarged about two diameters.
- “ 2^a. Palpus of the same mandible, seen from below, enlarged about two diameters.
- “ 3. First maxilla of the right side of the same specimen, seen from below, enlarged about two diameters.
- “ 4. Second maxilla of the right side of the same specimen, seen from below, enlarged about two diameters.
- “ 5. Diagrammatic outline of the anterior portion of the first maxilliped of the right side of the same specimen, as seen in place from below, enlarged about two diameters; *a*, proximal, and *a'*, distal lobe of the protopod; *b*, base of endopod, the terminal portion being entirely hidden by the exopod; *c*, basal portion of the exopod; *d*, *e*, terminal lobes of the exopod.
- “ 5^a. The same maxilliped removed from the animal, slightly compressed and seen from a little one side and below, enlarged about two diameters; *a*, *a'*, *b*, *c*, *d*, same as in last figure; *f*, *g*, epipodal lamella.
- “ 5^b. Terminal portion of the same maxilliped, seen from above under slight pressure, enlarged about two diameters; lettering the same as in figures 5, 5^a.
- “ 6. Second maxilliped of the right side of the same specimen, enlarged about two diameters.
- “ 7. External maxilliped of the right side of the same specimen, enlarged two diameters; *a*, rudimentary epipod.
- “ 8. Chela of the right great cheliped of the female figured on Plate III., natural size.
- “ 9. Chela of the right leg of the second pair of the male from Station 326, enlarged about two diameters.
- “ 10. Rudimentary chela of the right leg of the third pair of the same specimen, enlarged about two diameters.
- “ 11. Rudimentary chela of the right leg of the fifth pair of the same specimen, enlarged about two diameters.
- “ 12. Rudimentary chela of the right leg of the fifth pair of the female from Station 898, U. S. Fish Commission, enlarged about two diameters.
- “ 13. Appendage of the left side of the first somite of the abdomen of the female figured on Plate III., enlarged about two diameters.
- “ 14. Appendage of the left side of the first somite of the male from Station 326, enlarged about two diameters.

PLATE V.

- Fig. 1. *Rhachocaris longirostra*. Lateral view of female from Station 330, enlarged two diameters.
- “ 2. *Rhachocaris Agassizii*. Lateral view of female from Station 326, natural size.
- “ 3. *Rhachocaris sculpta*. Lateral view of female from Station 339, natural size.

PLATE VI.

- Fig. 1. *Rhachocaris longirostra*. Dorsal view of carapax and anterior appendages of the specimen figured on Plate V., enlarged two diameters.
- “ 2. *Rhachocaris Agassizii*. Dorsal view of the specimen figured on Plate V., natural size.
- “ 3. *Rhachocaris sculpta*. Dorsal view of the specimen figured on Plate V., natural size.
- “ 3^a. First maxilla of the right side of the same specimen enlarged six diameters.
- “ 3^b. Second maxilla of the right side of the same specimen, enlarged four diameters.
- “ 3^c. First maxilliped of the right side of the same specimen, enlarged six diameters.
- “ 3^d. Second maxilliped of the right side of the same specimen, enlarged four diameters.

PLATE VII.

- Fig. 1. *Pontophilus brevirostris* Smith. Dorsal view of adult female, enlarged two diameters.
- “ 1^a. Lateral view of the carapax of the same specimen, enlarged two diameters.
- “ 1^b. Dorsal view of rostrum of the same specimen, enlarged eight diameters.
- “ 2. *Pontophilus gracilis*. Dorsal view of female, enlarged two diameters.
- “ 2^a. Lateral view of the carapax of the same specimen, enlarged two diameters.
- “ 2^b. Appendage of the left side of the first somite of the abdomen of the same specimen, enlarged eight diameters.
- “ 2^c. Appendage of the left side of the second somite of the abdomen of the same specimen, enlarged eight diameters.
- “ 3. Appendage of the left side of the first somite of the abdomen of a male taken off Martha's Vineyard by the U. S. Fish Commission, Station 1029, enlarged eight diameters.
- “ 3^a. Appendage of the left side of the second somite of the abdomen of the same specimen, enlarged eight diameters.
- “ 4. *Ceraphilus Agassizii*. Dorsal view of female from Station 326, natural size.
- “ 4^a. Lateral view of the carapax of the same specimen, natural size; *a*, anterior gastric spine; *b*, rostrum; *c*, orbital spine; *d*, antero-lateral angle.
- “ 5. Lateral view of carapax and abdomen of a male from Station 317, enlarged two diameters; *a*, *b*, *c*, *d*, the same as in fig. 4^a.
- “ 5^a. Dorsal view of carapax of the same specimen, enlarged two diameters; *a*, *c*, *d*, the same as in fig. 4^a.

PLATE VIII.

Fig. 1. *Sabinea princeps*. Lateral view of female, natural size.

- " 1^a. Dorsal view of carapax and anterior appendages of the same specimen, natural size.
- " 1^b. Dorsal view of the terminal portion of the abdomen of the same specimen, natural size.
- " 2. *Munidopsis curvirostra* Whiteaves. Dorsal view of male from Station 325, enlarged four diameters.
- " 3. Appendage of the right side of the first somite of the abdomen of a male, from 220 fathoms, Gulf of St. Lawrence, enlarged eight diameters.
- " 3^a. Appendage of the right side of the second somite of the same specimen, enlarged eight diameters.

PLATE IX.

Fig. 1. *Anchistia tenella*. Lateral view of female, enlarged four diameters.

- " 1^a. Dorsal outline view of right eye and peduncle of antennula of the same specimen, enlarged eight diameters.
- " 1^b. Outline of left antennal scale of the same specimen, enlarged eight diameters.
- " 2. *Galucantha rostrata* A. Milne-Edwards. Dorsal view of male from Station 341, natural size.
- " 2^a. Lateral view of carapax of the same specimen, natural size.

PLATE X.

Fig. 1. *Munida* sp. indet. Dorsal view of a large male, taken by the U. S. Fish Commission off Martha's Vineyard, Station 877, natural size.

- " 2. *Pandalus carinatus*. Lateral view of female, enlarged two diameters.
- " 2^a. First maxilliped of the right side of the same specimen, seen from beneath, enlarged twelve diameters.
- " 2^b. Second maxilliped of the right side of the same specimen, enlarged twelve diameters.
- " 2^c. Distal portion of right chelate leg of the same specimen, enlarged twelve diameters.
- " 2^d. Lamellæ of the appendage of the left side of the first somite of the abdomen of the same specimen, seen from behind, enlarged twelve diameters; the marginal setæ and the distal portion of the outer lamella omitted.
- " 2^e. Outline of tip of outer lamella of right uropod of the same specimen, enlarged four diameters.
- " 2^f. Tip of telson of same specimen, seen from above, enlarged twenty-four diameters.

PLATE XI.

Fig. 1. *Pandalus carinatus*. Right mandible of the specimen figured on Plate X., seen from in front, enlarged twelve diameters.

- " 2. Right first maxilla of the same specimen, seen from beneath, enlarged twelve diameters.

- Fig. 3. Right second maxilla of the same specimen, seen from beneath, enlarged twelve diameters.
- “ 4. *Miersia gracilis*. Lateral view of young male, enlarged two diameters.
- “ 4^a. Distal extremity of the posterior leg of the left side of the same specimen, enlarged eight diameters.
- “ 4^b. Rami of the appendage of the right side of the first somite of the abdomen of the same specimen, seen from behind, enlarged eight diameters; the marginal setæ of the outer ramus omitted.
- “ 4^c. Portion of the base of the inner lamella of the appendage of the right side of the second somite of the abdomen of the same specimen, seen from behind and showing the small secondary stylet characteristic of the male, enlarged twenty-four diameters.
- “ 4^d. Distal part of the second maxilliped of the right side of the same specimen, seen from below, enlarged eight diameters.
- “ 5. *Miersia Agassizii*. Lateral view of male from Station 330, natural size.
- “ 5^a. Second maxilliped of the left side of the same specimen, seen from below, enlarged eight diameters.
- “ 6. Distal extremity of the posterior leg of the right side of a male from Station 305, enlarged twelve diameters.
- “ 7. Inner lamella of the appendage of the left side of the same specimen, seen from in front, enlarged eight diameters.
- “ 8. *Meningodora mollis*. Lateral view of female, natural size. The lateral carinæ of the carapax are indicated by simple lines.
- “ 8^a. Outline of the right eye of the same specimen, seen from above, enlarged two diameters.
- “ 9. Second maxilliped of the right side of the same specimen, seen from below, enlarged eight diameters.

PLATE XVII.

- Fig. 1. *Miersia Agassizii*. Distal portion of the left mandible of the specimen figured on Plate XI. fig. 5, seen from beneath.
- “ 1^a. The same mandible seen from above.
- “ 2. First maxilla of the left side of the same specimen, seen from beneath.
- “ 3. Second maxilla of the left side of the same specimen, seen from beneath.
- “ 4. First maxilliped of the left side of the same specimen, seen from beneath.
- “ 5. *Meningodora mollis*. Distal portion of the right mandible of the specimen figured on Plate XI. fig. 8, seen from beneath.
- “ 5^a. The same mandible seen from above.
- “ 6. First maxilla of the right side of the same specimen, seen from beneath.
- “ 7. Second maxilla of the right side of the same specimen, seen from beneath.
- “ 8. First maxilliped of the right side of the same specimen, seen from beneath.
- “ 9. Distal extremity of posterior leg of the same specimen, enlarged twenty-four diameters.
- “ 10. *Miersia gracilis*. Endopod and exopod of the second maxilliped of the right side of the specimen figured on Plate XI. fig. 4.

All the figures, except Fig. 9, are enlarged eight diameters.

PLATE XIII.

- Fig. 1. *Eumiersia ensifera*. Lateral view of female from Station 340, natural size.
- “ 2. Mandible of the left side of another female of about the same size and from the same station, seen from beneath, enlarged four diameters.
- “ 2^a. The same mandible seen from behind, enlarged four diameters.
- “ 3. First maxilla of the left side of the same specimen, seen from beneath, enlarged four diameters.
- “ 4. Second maxilla of the left side of the same specimen, seen from beneath, enlarged four diameters.
- “ 5. First maxilliped of the left side of the same specimen, seen from beneath, enlarged four diameters.
- “ 6. Second maxilliped of the left side of the same specimen, seen from beneath, enlarged four diameters.
- “ 7. Distal extremity of right chelate leg of the first pair of a male 44 mm. long from Station 330, enlarged about eight diameters.
- “ 8. Distal extremity of right chelate leg of the second pair of the same specimen, enlarged eight diameters.
- “ 9. Distal extremity of left leg of the fifth (?) pair of a female 108 mm. long from Station 308, enlarged four diameters.
- “ 10. *Pandulus acanthonotus*. Carapax and anterior appendages of the female from Station 321, enlarged four diameters.
- “ 11. Propodus and dactylus of the second maxilliped of the right side of the same specimen, seen from beneath, enlarged twelve diameters.
- “ 12. *Pandulus tenuipes* Smith. Same part of second maxilliped of a specimen from 115 fathoms, off Martha's Vineyard (U. S. Fish Commission, Station 871), enlarged twelve diameters.

PLATE XIV.

- Fig. 1. *Benthescymus Bartlettii*. Diagrammatic sketch of the left side of the male, with most of the appendages omitted, natural size.
- “ 1^a. Similar dorsal view of the anterior part of the carapax and the anterior appendages of the same specimen, natural size.
- “ 2. Distal part of the mandible of the left side of the same specimen, seen from beneath, enlarged six diameters.
- “ 3. First maxilla of the left side of the same specimen, seen from beneath, enlarged six diameters.
- “ 4. Second maxilla of the left side of the same specimen, seen from beneath, enlarged six diameters.
- “ 5. First maxilliped of the left side of the same specimen, seen from beneath, enlarged four diameters.
- “ 6. Second maxilliped of the left side of the same specimen, seen from beneath, enlarged four diameters.
- “ 7. Appendage (petasma) of the protopod of the appendage of the left side of the first somite of the abdomen, seen from in front, enlarged twelve diameters; *a*, process standing out, in its natural position, at nearly

right angles to the rest of the plate, but here represented as compressed nearly to the plane of the plate.

- Fig. 8. *Amalopenæus elegans*. Diagrammatic sketch of the left side of the carapax and anterior appendages of a female from Station 328, enlarged about two diameters.
- “ 9. Mandibular palpus of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 10. Endognath of the first maxilla of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 11. Second maxilla of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 12. Outline of the antennal scale of the left side of the same specimen, seen from above, enlarged nearly four diameters.
- “ 13. Appendage (petasma) of the protopod of the appendage of the left side of the first somite of a male from Station 324, seen from in front, enlarged twelve diameters; *a*, process below the base; *b*, process between the middle and inner or distal parts of the plate, and which turns readily either in or out.
- “ 14. Same appendage from a specimen from Station 330, seen in the same position, enlarged twelve diameters; *a*, *b*, as in Fig. 13.

PLATE XV.

- Fig. 1. *Amalopenæus elegans*. First chelate leg of the right side of the female figured on Plate XIV. fig. 8, enlarged about eight diameters.
- “ 2. Second chelate leg of the left side of the same specimen, enlarged about eight diameters.
- “ 3. First maxilliped of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 4. Second maxilliped of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 5. External maxilliped of the left side of the same specimen, enlarged four diameters.
- “ 5^a. Distal extremity of the same maxilliped, enlarged twenty-four diameters.
- “ 6. *Hymenopenæus debilis*. Diagrammatic sketch of the left side of the carapax and anterior appendages of a female from Station 323, enlarged about two diameters.
- “ 7. First maxilliped of the left side of a female from Station 326, seen from beneath, enlarged eight diameters.
- “ 8. Second maxilliped of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 9. External maxilliped of the left side of the same specimen, enlarged four diameters.
- “ 10. First chelate leg of the right side of the same specimen, enlarged four diameters.
- “ 11. Distal part of the third chelate leg of the right side of the same specimen, enlarged four diameters.

PLATE XVI.

- Fig. 1. *Hymenopencæus debilis*. Mandibular palpus of the left side of the female from Station 326, seen from beneath, enlarged eight diameters.
- “ 2. First maxilla of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 2^a. Tip of endopod of the same maxilla, enlarged twenty-four diameters.
- “ 3. Second maxilla of the left side of the same specimen, seen from beneath, enlarged eight diameters.
- “ 3^a. Tip of the endopod of the same maxilla, enlarged seventy-two diameters.
- “ 4. *Sergestes arcticus* Kröyer. Antennal scale of the right side of a male from off Martha's Vineyard, U. S. Fish Commission, Station 1030, enlarged four diameters.
- “ 5. *Sergestes robustus*. Lateral view of male from off Martha's Vineyard, U. S. Fish Commission, Station 893, enlarged two diameters.
- “ 6. Distal extremity of chela of the second leg of the left side of another male from the same station, enlarged twenty-four diameters.
- “ 7. Antennal scale of the right side of the same specimen, enlarged four diameters.
- “ 8. Appendage (petasma) of the protopod of the appendage of the right side of the first somite of the same specimen, seen from in front, enlarged eight diameters; *a*, point of attachment to the protopod; *b*, hooked stylet; *c*, *d*, unarmed stylets; *e*, *f*, *g*, terminal processes armed with invaginated hooks; *h*, mesial line where the appendages of the two sides are hooked together.
- “ 8^a. Invaginated hook at the tip of process *f*, enlarged one hundred diameters.
- “ 8^b. Invaginated hook from the side of the same process, enlarged one hundred diameters.

NEW HAVEN, CONN., June, 1882.