DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.

FISHERIES BRANCH.

SCIENTIFIC INVESTIGATIONS, 1921.

No. I.

The Decapoda Reptantia of the Coasts of Ireland.

Part II.—Paguridea.

BY

C. M. SELBIE, B.Sc.
National Museum, Dublin

Plates I—IX.

This paper may be referred to as—

"Fisheries, Ireland, Sci. Invest., 1921, I. [1921]."

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1921.

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THE DECAPODA REPTANTIIS OF THE COASTS OF IRELAND.

PART II.

PAGURIDEA.

BY

C. M. SELBIE, B.SC.,
National Museum, Dublin

[Mr. Selbie joined the Royal Scots Fusiliers in August, 1914, and received a commission in the Camerons (Scottish Rifles). He gave his life for his country at the Somme on the 14th July, 1916. This paper has been completed from the author's rough drafts and prepared for publication by Mr. Stanley W. Kemp, D.Sc., of the Zoological Survey of India, during a recent visit to this country.]

Plates I-IX.

INTRODUCTION.

The first part of this paper, published in 1914, contained an account of the Palinura and Astacura and of the Anomura belonging to the tribes Galatheidea and Thalassimidea. This second part is devoted to the tribe Paguridea, and completes the description of the Anomura.

The material on which the paper is based was nearly all obtained by the Irish Fishery Cruiser Helga. It contains representatives of eleven species, one of which, Nematopagurus longicornis, has not hitherto been recorded from British waters. Eupagurus sculptimanus, recorded by Melville from 60 fathoms, Eupagurus chirocarthus, species, which are known from the shores of Great Britain, have not been discovered in Irish waters. The total number of species now stands at fourteen.

The majority of the species normally inhabit water that is shallow or of moderate depth, but most have a considerable bathymetric range extending beyond the 200 fathom line. Exceptions to this statement are Diogenes pugilator, Eupagurus cuanensis and Anapagurus Hyndmanni which are restricted to coastal waters and are rarely, if ever, found at greater depths than 50 fathoms, and Eupagurus carinus, Eupagurus variabilis, and Nematopagurus longicornis, which are off-shore species.

1 Fisheries, Ireland, Sci. Invest, 1914, I. [1914].

Fisheries, Ireland, Sci. Invest., 1921, I. [1921].
never found in less than 50 fathoms. *Parapagurus pilosimanus* is a true deep-water species occurring at depths varying from 250 to 2,200 fathoms.

The first table on this page shows the months in which ovigerous females of the various species were taken.

The table on pp. 4 and 5 gives a summary of the known distribution of British Paguridea in the Atlantic and Mediterranean. It will be noticed that three species extend north of the Arctic Circle, while eight are found in the Mediterranean. The second table below shows the further distribution of three species which occur outside the Atlantic and Mediterranean.

**Montis in which ovigerous females have been taken.**

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<th>Species</th>
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**Extra-Atlantic Distribution of British Paguridea.**

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<th>Country</th>
<th>West coast of South America</th>
<th>West coast of Central America and Gulf States and Gulf of Mexico</th>
<th>Alaska</th>
<th>Japan</th>
<th>Philippines and Papua</th>
<th>Singapore</th>
<th>Bay of Bengal</th>
<th>Arabian Sea</th>
<th>Red Sea</th>
<th>East Coast of Australia</th>
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**Key to the Genera of British Paguridea.**

I. Abdomen soft, twisted and adapted for living in a spiral mollusc shell (*Paguridae*).

A. Left cheliped larger than right; a sharp movable rostriform process between ophthalmic scales (*Pagurinae*) ... ... *Diogenes*.

B. Right cheliped larger than left; no movable rostriform process (*Eupagurinae*).

1. No tube protrudes from opening on either coxa of fifth pereiopods of male.
   a. Paired pleopods, modified for sexual purposes, usually present on first or first and second abdominal segments; right sexual opening absent in female; fingers of cheliped move in a plane oblique to the horizontal .. *Parapagurus*.
   b. No paired and modified pleopods on first or second abdominal segments; paired sexual openings present in both sexes; fingers of cheliped move in a practically horizontal plane .. *Eupagurus*.

2. A tube protrudes from opening on at least one coxa of fifth pereiopods of male.
   a. A tube protrudes only from left sexual opening of male and is bent outwards in a semicircle; no sexual modified pleopods in female .. *Anapagurus*.
   b. Tubes protrude from both sexual openings of male, the left short and directed inwards, the right long and directed posteriorly; a pair of sexually modified pleopods on first abdominal segment of female .. *Nematapagurus*.

II. Abdomen strongly calcified, pressed against sternum as in Brachyura (*Lithodiidae*) ... ... *Lithodes*
## Atlantic and Mediterranean

<table>
<thead>
<tr>
<th>Species</th>
<th>Weak coats of Ireland</th>
<th>South coast of Ireland</th>
<th>Irish Sea</th>
<th>South coast of England</th>
<th>East coast of England</th>
<th>Bank-storms off Scotland &amp; Shetland</th>
<th>West coast of Scotland &amp; Shetland</th>
<th>East coast of North Atlantic</th>
<th>West Greenland</th>
<th>Iceland</th>
<th>Faeroes</th>
<th>Spitsbergen</th>
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1. Not south of the Moray Firth.

## Distribution of British Puguridea

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<tr>
<th>Species</th>
<th>Mar Menor Sea</th>
<th>White Sea</th>
<th>North coast of Arctic Circle</th>
<th>South of Arctic Circle</th>
<th>Sweden</th>
<th>Denmark</th>
<th>Bay of Biscay</th>
<th>Spain and Portugal</th>
<th>Mediterranean</th>
<th>Black Sea</th>
<th>West coast of Morocco and Spain</th>
<th>Cantabrians</th>
<th>Cape Verde and Sao Tome</th>
<th>South and South-West Africa</th>
<th>Azores</th>
<th>West India</th>
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<td>Diogenes pugilator, Chevreux and Bouvier, 1892.</td>
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<td>Diogenes pugilator, Balis, 1912.</td>
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The anterior part of the carapace is strongly calcified; behind the
cervical groove it is much softer. The rostrum and the
lateral frontal projections are of about equal length, but the
former is slightly more rounded than the latter. In front of
the rostrum and lying between the ophthalmic scales there is
a narrow pointed movable process attached to the ophthalmic
segment. It does not reach the tip of the scales, and ends in
a sharp point. There are tufts of short setae on the dorsal
surface of the carapace especially behind the lateral frontal
projections. At the antero-lateral angles of the carapace there
are two or three small teeth and from these, along each lateral
margin to the cervical groove, there is a row of stronger teeth,
eight or nine in number, separated from the upper surface by a
deep groove, the linea anomurica.

The telson is markedly asymmetrical and concave on its
posterior margin, which bears a row of small sharp teeth.

The eyestalks are of almost uniform length throughout,
tapering very slightly distally. The corneal area is large,
deeply and narrowly emarginate on its posterior border. The
ophthalmic scales are very large and broad, triangular in outline,
and strongly calcified. The anterior margin of each slopes
at an angle of forty-five degrees from its outer to its inner
margin and is divided into strong teeth, which increase in size
anteriorly. The scales lie on the same level as the dorsal
surface of the carapace.

The second joint of the antennular peduncle reaches just to
the tip of the cornea. The upper flagellum is very slightly
longer than the third joint of the peduncle.

The second joint of the antennal peduncle has a strong spine
at the outer and a small tooth at the inner distal angle. The
aicle or scale is broad, flat, and strongly calcified. It tapers
to a sharp point and on its inner edge there is a row of four or
five strong teeth. The tip of the aicle does not reach the
distal end of the fourth joint. As usual the third is scarcely
visible from above. The fourth joint is slender compared with
the second and is cylindrical. The fifth is slightly longer than
the fourth and is still more slender. The flagellum bears a fringe
of long setae. Setae are also present on all peduncular joints,
most plentifully on the second. They are also present in
tufts on the aicle. The cornea reaches just beyond the tip of
the fourth peduncular joint.

The third maxillipeds are contiguous at the base, not separate
as in Eupagurus.

The left cheliped is enormously larger than the right,
the disparity in size being very much greater than is usual in
Eupagurus. The fingers of the left cheliped move in a plane
inclined to the horizontal. The merus is flattened on the outer
side and covered with small pointed tubercles; there is a row
of small pointed teeth at the distal upper end, and a slight
ridge, lined with tubercles, on the upper inner edge. The
carpus has a similar ridge which bears a row of sharp teeth

the rest of the joint is covered with rounded tubercles. The
propodite is large and fairly smooth, being covered only with
minute granules, except on the inner edge, which is lined with
small teeth. The edge of the dactyl also bears a row of teeth,
which are small and rather blunt. The palm is longer than
the fingers, which are acuminate. The cutting edges of the
fingers are furnished with irregular crenulae teeth. The
borders of the palm are parallel, but, opposite the base of the
dactyl, the outer margin bends outwards, so that the axis of
the fixed finger makes an obtuse angle with the long axis of the
palm.

The right cheliped is very small compared with the left and
is densely setiferous. The merus is laterally compressed and
its sides are covered with scales bearing radial groups of setae
(not shown in the figure); there are a few teeth on the outer
lower edge. The carpus is also compressed and bears a dorsal
row of five to seven teeth, which increase in size distally. There
is a very obscure parallel row of indistinct points outside this.
Teeth are scattered irregularly over the upper surface of the
propodite and dactyl. The palm is much shorter than the
fingers, which end in sharp claws. The under surface is almost
or quite smooth, and the dactyl is strongly curved.

The first right walking leg is laterally compressed. The
merus is almost smooth on its inner side; on the outer side
it bears some scale-like tubercles with setae. On the upper
and lower edges there are similar tubercles. The carpus has
a few setiferous tubercles on its outer surface, and more on
the upper surface, on the middle of which there is a row of
teeth increasing slightly in size anteriorly. The inner surface
is smoother and flatter than the outer. The propodite is
slightly curved and bears a few tubercles or scales on the outer
surface. On the upper edge there is a row of about twenty
small teeth interspersed with setae. On the outer surface
there are a few scales dispersed in longitudinal lines. The
daectomy is longer than the propodite, is curved and slender,
and ends in a yellow claw. It is slightly grooved on the outer
side. There are no spines on the lower edge, but there are
four or five longitudinal rows of hairs which are most plentiful
on the inner side.

The other walking legs resemble that just described, except
in the following points. In the first left walking-leg the teeth
on the carpus are larger, and in second left walking-leg these
teeth and those on the propodite are feeble.

The fourth pereiopods are of the usual form covered with
long plumose setae and with a broad imbricate area on the
propodite. They are almost perfectly chelate.

The fifth pereiopods are larger than the fourth, and are min-
utely chelate.

There are four unpaired pleopods, none of which is biramous.
The uropods are of the usual form.

*Size:* The carapace usually measures about 8-10 mm.
General Distribution:—The species has a wide range, extending as it does from the English Channel to the Equator in the eastern Atlantic, and into the Mediterranean, the Adriatic, and the Black Sea. The detailed records of these regions are as follows:—

Plymouth (Marine Biological Association), Boulogne (Tesch), Bay of Biscay off Barquero (Milne-Edwards and Bouvier), Cape Verde (Rathbun), Gaboon River (Milne-Edwards and Bouvier), Marseilles (Roux), Genoa (Canestrini), Sicily and Naples (Costa), Algiers (Lucas), Triest and Venice (Nardo), Spalato (Heller), Gulf of Odessa (Kalichewsky), Novo Rossisk, (Theodosia), Eupatoria, and Sebastopol (Czerniavsky). It is also found in the Red Sea, and at Singapore (Nobili), and there is a somewhat doubtful record, the specimen being damaged, from the Mergui Archipelago (Acock).

It is considered highly probable by many authors that D. brevirostris, Stimpson, is in reality the same species as D. pagilator, in which case the geographical distribution of the latter is extended to west and south-west Africa, specimens of D. brevirostris having been taken in Simon’s Bay (Stimpson, Henderson, Stebbing), and in Great Fish Bay (Balss).

Vertical Distribution:—Heller mentions this species as occurring on the shore, especially in slimy places, and Acock places the limit of its range in depth at about 68 fathoms.

Irish Distribution:—It has not been taken in Irish waters but its occurrence in the English Channel leads us to expect that it may yet be found on the south or south-west Irish coast.

Sub-Family EUPAGURINAE.

Genus Parapagurus, Smith.

Parapagurus pilosimanus, Smith.

Plate VII, figs. 1–6.

Parapagurus pilosimanus, Smith, 1879.
Parapagurus pilosimanus, Smith, 1881.
Parapagurus pilosimanus, Smith, 1882.
Parapagurus pilosimanus, Smith, 1883.
Parapagurus pilosimanus, Smith, 1884.
Parapagurus pilosimanus, Smith, 1886.
Parapagurus abyssorum, Henderson, 1888.
Parapagurus pilosimanus, Pocock, 1889.
Parapagurus pilosimanus, Bourne, 1890.
Parapagurus abyssorum, Wood-Mason, 1891.
Parapagurus pilosimanus, A. Milne-Edwards and Bouvier, 1892.
Parapagurus pilosimanus, A. Milne-Edwards and Bouvier, 1893.
Parapagurus pilosimanus, A. Milne-Edwards and Bouvier, 1894.

Parapagurus abyssorum, Faxon, 1895.
Parapagurus pilosimanus, Bouvier, 1896 (b).
Parapagurus pilosimanus, Caullery, 1896.
Parapagurus pilosimanus, Calman, 1896.
Parapagurus pilosimanus, var. abyssorum, A. Milne-Edwards and Bouvier, 1899.
Parapagurus pilosimanus, A. Milne-Edwards and Bouvier, 1900.
Parapagurus pilosimanus, var. abyssorum, A. Milne-Edwards and Bouvier, 1900.
Parapagurus pilosimanus, A. Milne-Edwards and Bouvier, 1900.
Parapagurus pilosimanus, A. Milne-Edwards and Bouvier, 1900.
Parapagurus pilosimanus, A. Milne-Edwards and Bouvier, 1900.
Parapagurus pilosimanus, Alcock, 1901.
Parapagurus pilosimanus, Alcock, 1905.
Parapagurus pilosimanus, Hansen, 1908.
Parapagurus pilosimanus, Balss, 1912.

The rostrum is subacute with a blunt tip, and varies considerably in prominence. The lateral frontal processes are shallow and not so long as the rostrum. The gastric area is broad and convex from in front backwards, and from side to side. It is strongly calcified. Behind the well-marked cervical groove the carapace is softer, but not so nearly membranous as in Eupagurus. There are a few groups of setae on the hepatic areas and many behind the cervical groove.

The abdomen is long and rather slender, twisted in the usual way. The telson is only slightly asymmetrical and is minutely toothed on the posterior edges.

The eyestalks are rather slender and taper very slightly in a distal direction. They bear large numbers of setae on their dorsal surface. The cornea is rather small, appears brown (in spirit), and is slightly emarginate on the posterior dorsal edge. The ophthalmic scales are small and spiniform.

The antennal peduncle is very long and slender, which is mainly due to the great development of the third joint. It reaches when extended far beyond the antennal peduncle. The cornea reaches slightly beyond the base of the second joint. The upper flagellum is fully two-thirds as long as the third peduncular joint.

The external process of the second joint of the antennal peduncle is short, not reaching the middle of the fourth joint. The process bears a few teeth on its inner edge near the tip. The axil is almost cylindrical, thick, tapering suddenly to a sharp point. It reaches just beyond the tip of the fifth joint, and bears groups of setae on its inner edge. The third joint is, as usual, most easily seen from below and bears a small distal tooth. The fourth joint is short and cylindrical. The fifth is the longest of the series and is slightly compressed. Each joint of the flagellum, which is about four and a half times as long as the carapace, bears several setae.
The right chelifed is very much larger than the left. The carpus, propodite and dactyl are covered with a coating of hair usually forming a thick fur. The tips of the fingers, however, are left bare. The fur is also present on the lower surface of the merus, and sometimes on the upper surface. The form of the chela varies considerably with the sex. Thus in the female the hand is very broad, almost as broad as long, and is roughly oval in outline. In the male, on the other hand, it is much longer than broad, and the outer edge is more nearly straight. The upper surfaces of the propodite, the carpus and the merus are covered with rather sharp granules. There is a row of small teeth on the outer edge of the dactyl. The lower edges of the ischium and merus bear rows of rough tubercles. The fingers, which are of about the same length as the palm, end in small yellow claws.

The left chelifed is much smaller and narrower than the right. It bears a similar coating of fur with practically the same distribution on the various joints. The fur is thickest about the palm and on the carpus. The upper surface of these two joints bear a few scattered granules. The fingers are longer than the palm.

Both pairs of walking legs (second and third pereiopods) are longer than the large chelifed, the second pair is larger than the first, and the right leg of each pair is larger than the left.

In structure all these four legs are similar. The dactyl is longer than the propodite, curved and, on the lower edge, furnished with a row of about ten long, sharp spines. These are placed at some distance apart and the spaces are greater towards the distal end of the joint, which ends in a curved claw. On the upper edge of the dactyl there is a row of very long movable bristles which increase in number distally. On the inner face of the joint, and nearer the upper than the lower edge, there is another row of stiff bristles arranged in groups of two or three. The dactyl is very slightly twisted. The other joints of the walking legs are all compressed, their upper and lower edges roughened, but unarmed except for a single small spine on the anterior upper end of the carpus. Groups of setae spring from the roughened edges, especially those on the dorsal side.

The fourth pereiopods are of the form usual in these appendages in the Paguridae. The imbricate scaly area on the propodite is only two scales deep.

The imbricate area on the fifth pereiopods, which are minutely chelate, is rather small.

The pleopods vary very much according to sex.

In the male there is a pair of slender appendages, modified for sexual purposes, on the first abdominal segment. They are directed forwards and are pressed closely against the ventral surface between the coxae of the fourth and fifth pairs of pereiopods. Their bases are widely separate but they almost meet at the tip. They are formed of two joints, the basal one short, thick, and dilated proximally. The distal joint is longer and is expanded into a broad leaf-like structure, the edges of which are curled inwards and lined with stiff bristles.

These appendages are absent in the female.

On the second abdominal segment in the male there is a pair of pleopods which are uniramous like the first pair, but are larger and broader, and more widely separated at the base. The basal joint is stout, uniform in thickness, and bears a group of long setae. The second joint is slightly twisted near its tip and its edges are curled, so that it is concave inwards. The edges are furnished with a number of stiff setae.

Behind these there are, on the left, three unpaired pleopods. They are biramous, but very unequally so, one of the branches being almost vestigial.

In the female there are no paired pleopods. On the left side there are biramous pleopods on the second, third, fourth, and fifth abdominal segments. In the first three the two branches are almost equal, while in the fourth the posterior branch is very minute. These pleopods are much longer and broader than the same appendages in the male.

The uropods are of the usual hook-like structure.

Size.—The carapace usually measures about 25 mm.

General Distribution.—This species affords one of the best known examples of the cosmopolitan distribution of deep-sea organisms. It has been found as far north as Iceland (Hansen), and as far south as Tristan d’Acunha (Henderson). At suitable depths it extends round the globe in temperate and tropical waters. It has been recorded from the following localities:—West of Ireland (Pocock), Faeroes and Iceland (Hansen), off Nova Scotia (Smith), East Coast of the United States (Smith), West Indies (Smith), Sargasso Sea, Bermuda (Henderson), Atlantic coast of South America, Pacific coast of South America (Henderson), Galapagos and Gulf of California (Faxon), off Yokohama (Henderson), Papua and Philippines (Henderson), Bay of Bengal, off Cape Comorin, Arabian Sea (Alcock), East and South coasts of Africa (Balss), Tristan d’Acunha (Henderson), Sierra Leone (Milne-Edwards and Bouvier), off West coast of Sudan and Morocco, at the Azores and Canaries and off Spain and Portugal and in the Bay of Biscay (Milne-Edwards and Bouvier).

Vertical Distribution.—The species inhabits all the great ocean depths. The greatest recorded depth is 2,260 fathoms in the Atlantic. It has also been taken in the comparatively slight depths of 400 fathoms and 500 fathoms, and once even in 750 fathoms (Smith). Hansen records specimens taken in 580 fathoms, and 442 fathoms, Milne-Edwards and Bouvier in 2,224 fathoms, 1,736 fathoms, 509 fathoms; Alcock in 1,997–705 fathoms.
Irish Distribution.—All the Irish specimens have been taken off the south-west coast, within the area bounded by 50° N., 52° N., and 10° W. Here it appears to live in immense numbers as is shown by the frequency with which it has been taken and also by the fact that on many occasions hundreds of specimens have been captured in one haul. The actual records are as follows:—

_Helga._

S. R. 171.—5 xi '04.—52° 7' N., 11° 58' W., 387 fms., fine mud and sand. Trawl.—Four, 11'5-15'5 mm. One ovigerous?.

S. R. 172.—5 xi '04.—52° 2' N., 12° 8' W., 454 fms., fine mud. Trawl.—Five, 4-15'5 mm. One ovigerous?.


S. R. 212.—6 vii '05.—51° 54' N., 11° 57' W., 411 fms., fine mud and sand. Trawl.—Sixteen.

S. R. 327.—8 vi '06.—51° 46' N., 12° 14' 30' W., 550 fms., ooze. Trawl.—About two hundred.

S. R. 331.—9 vi '06.—51° 59' N., 11° 55' W., 610-620 fms., ooze. Trawl.—One.

S. R. 333.—10 vi '06.—51° 37' N., 12° 9' W., 557-579 fms., ooze. Trawl.—Three hundred and fifty.

S. R. 334.—10 vi '06.—51° 35' 30' N., 12° 26' W., 500-520 fms. Trawl.—One.


S. R. 359.—8 viii '06.—51° 59' N., 12° 9' W., 492 fms., ooze. Dredge. Temperature 9°04° C.—About two hundred and fifty.

S. R. 368.—11 viii '06.—51° 38'.—51° 39' 30' N., 12° 5'.—11° 56' W., 608-450 fms., fine sand. Trawl.—Four.

S. R. 387.—7 vii '06.—51° 50' N., 12° 14' W., 530 fms., ooze. Trawl. Temperature, 9°13° C.—Thirty-six.

S. R. 397.—2 ii '07.—51° 49' N., 12° 7' W., 549-646 fms., ooze. Trawl. Temperature at 500 fms., 8°71° C.—Seven hundred and sixty.

S. R. 400.—5 ii '07.—51° 21' N., 11° 49' W., 525-600 fms., mud and ooze. Trawl.—Five.


S. R. 448.—15 vii '07.—50° 21' N., 11° W., 343-346 fms. Trawl.—Two.

S. R. 483.—30 vii '07.—51° 37' N., 11° 56' W., 610-664 fms., mud and sand. Trawl.—Thirty-two.

S. R. 484.—30 vii '07.—51° 35' N., 11° 57' W., 602-610 fms. Trawl. One hundred and seventy.

S. R. 487.—3 ix '07.—51° 36' N., 11° 57' W., 540-660 fms. Trawl.—Ninety-five.

S. R. 489.—4 ix '07.—51° 35' N., 11° 55' W., 720 fms. Trawl.—Forty-seven.

S. R. 490.—7 ix '07.—51° 37' 30' N., 12° 7' W., 470-491 fms., ooze. Trawl. Temperature, 8°68° C.—Three hundred.

S. R. 491.—7 ix '07.—51° 37' 30' N., 13° 13' W., 491-520 fms. Trawl. Temperature, 8°53° C.—One hundred.

S. R. 493.—8 ix '07.—51° 58' N., 12° 25' W., 533-570 fms. Trawl.—Seventy.

S. R. 494.—8 ix '07.—51° 59' N., 12° 32' W., 550-570 fms. Trawl.—One hundred and eighty.

S. R. 495.—8 ix '07.—52° N., 13° 10' W., 846-400 fms., ooze. Trawl.—Twelve.

S. R. 496.—8 ix '07.—51° 54' N., 12° 54' W., 473-500 fms. Trawl.—Six.

S. R. 499.—11 ix '07.—50° 55' N., 11° 29' W., 666-778 fms. Trawl.—Twenty-four.

S. R. 500.—11 ix '07.—50° 52' N., 11° 26' W., 625-666 fms Trawl.—Ten.


S. R. 504.—12 ix '07.—50° 43' N., 11° 18' W., 627-728 fms. Trawl.—Eight.

S. R. 506.—12 ix '07.—50° 34' N., 11° 19' W., 661-672 fms. Trawl.—Seven.

S. R. 509.—3 viii '08.—51° 51' N., 12° 9' W., 480-498 fms. Trawl. Temperature, 9°28° C.—One hundred and ninety.

S. R. 592.—6 viii '08.—50° 39' N., 11° 25' W., 400-510 fms., ooze. Trawl.—Four.

S. R. 746.—14 vii '09.—51° 32' N., 12° 13' W., 620-658 fms., ooze. Trawl.—Twelve.


S. R. 754.—17 vii '09.—51° 26' N., 11° 57' 30' W., 544-572 fms., ooze. Trawl.—Twenty.

S. R. 805.—14 viii '09.—51° 50' 30' N., 12° 14' W., 539-544 fms., ooze. Trawl.—Ten.

S. R. 944.—17 vii '09.—51° 22' N., 12° 41' W., 982 fms. ooze. Trawl.—Eight.

S. R. 1171.—19 vii '11.—51° 54' 30' N., 11° 51' 30' W., 854-267 fms., sand. Trawl.—One.
I. '21.

S. R. 1243.—15 viii '11.—51° 37' N., 12° 1' W., 670–692 fms. 
Trawl.—Three.
S. R. 1454.—24 viii '12.—51° 32' N., 11° 56' W., 509–498 fms. 
fine gravel and sand. Trawl.—Two.
S. R. 1690.—19 viii '13.—51° 38' N., 11° 51' W., 584 fms., 
Trawl.—Twenty-eight, 27-20 mm.
S. R. 1691.—19 viii '13.—51° 34' N., 11° 50' W., 524–539 fms. 
Trawl.—Fifteen.

All the specimens taken by the Helga belong to the typical 
form of the species and none to the var. abyssorum, Milne- 
Edwards. This variety is distinguished by the following 
characteristics:—There are few dorsal setae on the eyestalks; 
there is a small tooth at the inner edge of the front border of 
the second joint of the antennal peduncle; there are many 
strong and sometimes spinous granules on the chelipeds; 
there are granules and rugosities on the lower part of the carpus, 
propodite and merus of the walking legs.
The variety and the typical form are connected by numerous 
transition forms (Milne-Edwards and Bouvier, 1909).

GENUS Eupagurus, Brandt.

Key to the British Species of Eupagurus.

I. A row of slender transparent spines on lower edge of 
dactyl of each walking leg.

A. Right chela practically devoid of setae.

1. Right chela covered with large or small tubercles; external process of second 
joint of antennal peduncle reaching only to middle of fourth joint.

a. Upper surface of right chela gently convex and covered with tubercles of

which a few are slightly larger than the others and form two distally converging lines on the palm; axis of fixed finger in a line with that of palm

E. Bernhardus.

b. Upper surface of right chela with three deep depressions and with strong teeth on margins; axis of fixed finger forming an angle with that of palm

E. sculptimanus.

2. Right chela smooth and glistening; external process of second joint of antennal peduncle reaching base of fifth joint

E. carnesus.

B. Right chela thickly covered with setae, which may be long or short.

1. Rostrum rounded; carpus of right cheliped about as long as palm; no keel on propodite of left cheliped; setae on right chela usually long and plumose forming a matted fur

E. australis.

2. Rostrum produced to a sharp point; carpus of right cheliped nearly as long as palm and fingers together; a strong keel on propodite of left cheliped; setae on right chela arranged in groups springing from bases of tubercles

E. pubescens.

II. No row of spines on lower edge of dactyl of walking legs.

A. External process of second joint of antennal peduncle reaching about to middle of fourth joint; no toothed keel on propodite of left cheliped

E. Prideauxii.

B. External process of second joint of antennal peduncle reaching just beyond the base of fifth joint; a strong keel armed with teeth on upper surface of propodite of left cheliped

E. variabilis.

Eupagurus Bernhardus (Linn.)
Plate I, figs. 1–11.

Pagurus Bernhardus, Bell, 1853.
Eupagurus Bernhardus, Bouvier, 1896 (b).
Eupagurus Bernhardus, A. Milne-Edwards and Bouvier, 1900.
Pagurus Bernhardus, Benedict, 1901.
Pagurus acadicus, Benedict, 1901.
Eupagurus Bernhardus, Hansen, 1908.
Eupagurus Bernhardus, Stephensen, 1910.

The central part of the front of the carapace is produced 
into a distinct rostrum. On each side of this and just beyond 
the eyestalk there is a slight projection which is not quite so 
long as the rostrum itself. The carapace is roughly pear-
shaped, broadening out very much behind the cervical groove, 
which is very distinct and deeply excavated. The anterior 
part is strongly calcified, but on the cardiac and branchial 
areas the surface is almost membranous. The central part 
of the posterior margin is deeply concave. The frontal margin 
bears a sparse fringe of short setae.

The abdomen is large and of the usual twisted form. The 
telson is small, roughly quadrate and slightly concave posteriorly.
The eyestalks are of medium thickness and become slightly 
dilated towards the distal end. The corneal surface is strongly
pigmented and is deeply but narrowly emarginate above. The ophthalmic scales are rather blunt and bear fringes of setae.

The antennular peduncle is long and slender. The first joint is short; the second does not reach the distal end of the eyes; the third, which is the longest, reaches practically as far as the tip of the antennal peduncle.

The first joint of the latter is short and broad. The second is produced into a long massive spine on the outer side and bears a small tooth on the inner. From a point between these two springs the acicle or antennal scale, which is long and slender. It is more or less triangular in cross section and ends in a sharp point. It bears several groups of stiff bristles on its upper surface and reaches the distal third of the fifth peduncular joint. The third joint is most easily seen from the under-side as it is hidden above by the second and fourth joints. It bears a small spine at its distal end. The fourth joint is stout and cylindrical; the fifth is the longest of the series and is compressed. The flagellum is more than twice as long as the carapace.

The mandibles are large and massive, the cutting edge being produced into a central prominence without teeth. There is a three-jointed palp. The two endites of the first maxillae bear fringes of setae on their inner edge, and the anterior one has also a row of sharp teeth. The palp ends in two small lobes, one of which bears three or four stout bristles, while the other curves backwards.

The scaphognathite of the second maxillae is abruptly truncated at its posterior end.

The exopodite of the first maxillipeds is triangular in shape and bears a flagellum.

The second and third maxillipeds are pediform. The flagella of the exopodites are turned inwards as in the Brachyura. The coxae of the third maxillipeds are separated by a broad sternum. There are two small teeth on the inner margin of the merus. The linea cristata of the ischiu bears about a dozen large teeth.

The chelipeds are very unequally developed, that on the right being very much larger and more massive than the left.

In the right cheliped the fingers move in an almost horizontal plane. The three basal joints are very short and comparatively slender. The merus is much broader than the preceding joint and is more or less twisted. It is roughly triangular in cross section, the upper part being narrowed to a ridge and the sides and lower surface flattened. It bears a few tubercles and scales above and below, but the sides are almost smooth. The carpus is of practically the same length as the merus and is slightly thicker. In cross section it is roughly quadrangular and is broader than deep. Its upper surface is covered with large and small tubercles which are moderately sharp. Along the inner margin of the upper surface there is a row of larger tubercles which increase in size anteriorly. The propodite is about half as long again as the carpus, and the palm is slightly longer than the fingers. The two lateral margins of the palm are almost parallel. Its upper surface is gently arched and bears a large number of blunt tubercules which are mostly of small size. On the central part of the palm, however, there are two anteriorly converging rows of somewhat larger tubercules. Along the whole outer margin of the joint there are well-developed but rather blunt tubercules. The dactyl is also covered with small tubercules. The tips of the fingers are blunt.

As already stated the left cheliped is much smaller than the right. On the carpus there is a row of sharp tubercles on the upper inner margin and these increase in size towards the distal extremity of the joint. On the middle of the upper surface there is a similar but less prominent row. The propodite resembles that of the right cheliped but is much more slender.

The next two pairs of legs are long and well developed, those on the right being usually slightly longer than those on the left. The merus is strongly compressed laterally and bears a few scales on its upper edge, but no spines. On the dorsal surface of the carpus there is a single row of spines which increase in size from behind forwards. The upper surface of the propodite bears several irregular rows of tubercules all of which point towards the distal end. The dactyl is much longer than the propodite and bears rows of small spines on its upper surface. A deep groove runs along the inner surface; there is a similar but much fainter groove on the outside. The dactyl is markedly twisted so that in its distal half the inner surface is turned more or less dorsally. On the lower edge of the dactyl there is a row of sharp transparent spines which are largest and most crowded together near the tip, which is furnished with a strong yellow claw. The dactyl does not taper gradually to its tip but is almost as broad quite close to the distal extremity as it is at the proximal end.

The fourth and fifth pereiopods are very small and feeble compared with the preceding pairs. Those of the fourth pair are laterally compressed and end in imperfect chelae. On the outer pair of the propodite there is an area covered with closely crowded imbricate yellow scales.

The fifth pair end in minute chelae and have also an imbricate sealy area near the distal end of the propodite.

On the left side of the abdomen there are three unpaired biramous pleopods. The two branches of these are very unequal, the posterior one being very small. The uropods are unequally developed, that on the left being much larger than that on the right. On both endopodite and exopodite there is a large area covered with minute overlapping scales.

Size.—The length of the carapace in the largest specimen taken by the Helga is 35.5 mm.

General Distribution.—The species is found in great numbers in all British seas (Bell, Norman, Scott). It has been recorded
also from the north coast of France and the Bay of Biscay, Portugal, and the Mediterranean (Milne-Edwards and Bouvier). It occurs on the southern and eastern coasts of the North Sea (Metzger, Tesch), in the Skagerak and Kattegat (Meinert, Björn), on the coasts of Sweden (Goës, Lagerberg), and at Kiel (Möbius). It extends along the whole coast of Norway round the North Cape into the Murman Sea (Birula, Sars). It occurs off the south and south-west coasts of Iceland, but has never been found on the north and east (Hansen). At the Faeroes it is common. It has not been taken by any of the expeditions to Greenland, but is found on the east coast of North America from about 45° N. to 72° N.

The specimens which have been recorded from Unalaska by Brandt as "Pagurus Bernhardus var. granulata-denticulata," and from Kamchatka by Owen as "P. strebolongus" appear to belong to some other species than E. Bernhardus.

**Vertical Distribution:**—The species occurs in all depths from the littoral zone, where it often literally swarms in the rock-pools, down to 265 fathoms (Benedict). It occurs in greatest numbers between the shore and the 15-fathom line, but the Helga has also taken several specimens from much greater depths, including several from 91 fathoms and one from 245 fathoms (S. R. 1843).

**Irish Distribution:**—Found in great abundance all round the coast.

The shell inhabited by E. Bernhardus is very often covered with colonies of the hydroid Hydactinia. Many of the Irish specimens also bear anemones, and sometimes the shell is entirely embedded in the sponge Ficulina. In some cases the shell has gradually been dissolved away by the encrusting sponge, so that the hermit ultimately comes to lie in a tunnel in the substance of the latter. The shells inhabited by this species vary, but it shows a decided preference for Buccinum. The following list shows the numbers inhabiting the different kinds of shells amongst the specimens taken by the Helga:

<table>
<thead>
<tr>
<th>Shell</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Buccinum</em></td>
<td>56 per cent.</td>
</tr>
<tr>
<td><em>Fusus</em></td>
<td>26</td>
</tr>
<tr>
<td><em>Natica</em></td>
<td>12</td>
</tr>
<tr>
<td><em>Turritella</em></td>
<td>4</td>
</tr>
<tr>
<td><em>Nassa</em></td>
<td></td>
</tr>
<tr>
<td><em>Dentalium</em></td>
<td>2</td>
</tr>
<tr>
<td><em>Trocillus</em></td>
<td></td>
</tr>
<tr>
<td><em>Littorina</em></td>
<td></td>
</tr>
<tr>
<td><em>Cassidaria</em>, etc.</td>
<td></td>
</tr>
</tbody>
</table>

Those individuals who inhabit *Dentalium* shells show certain peculiarities. They are quite straight and the hind part of the carapace is as narrow as the front. The abdomen is not twisted but is straight and slender. The fourth and fifth pereiopods and the uropods are pressed closely to the body, and the chelipeds are more nearly equal than in specimens living in spiral shells. These individuals are all of small size measuring from 9 to 15 mm., from the rostrum to the end of the telson.

**Eupagurus sculptimanus** (Lucas).

Plate V, figs. 4–8.

*Pagurus sculptimanus*, Lucas, 1849.
*Pagurus Forbesii*, Bell, 1853.
*Eupagurus sculptimanus*, Stimpson, 1858.
*Pagurus Forbesii*, Melville, 1860.
*Eupagurus sculptimanus*, Heller, 1863.
*Eupagurus sculptimanus*, Carus, 1885.
*Eupagurus sculptimanus*, Chevreux and Bouvier, 1892.
*Eupagurus sculptimanus*, Bouvier, 1896.
*Eupagurus sculptimanus*, A. Milne-Edwards and Bouvier, 1900.
*Eupagurus sculptimanus*, Crawshay, 1912.

The centre of the frontal margin of the carapace is not produced into a distinct rostrum but is rounded off. The lateral processes are also rather blunt. There are numerous radial groups of setae on the carapace, especially on the hepatic and branchial areas. The cervical groove is deep and distinct.

The abdomen is of the usual spirally twisted form and is rather slender. The telson is slightly conical on the hind margin, which is lined with small teeth.

The eyestalks are long and slender, slightly expanded at the base, narrow in the middle, and more distinctly expanded towards the distal end. They reach nearly to the tip of the antennal peduncle, and to about the middle of the third joint of the antennular peduncle. The hind dorsal edge of the cornea is sharply but not deeply emarginate. The ophthalmic scales are rather small, blunt at the end, and hollowed out on their dorsal surface. A strong spine is inserted on the lower surface of each scale just below the tip and slightly towards the inner side. There are a few small bunches of hairs on the inner upper surface of the eyestalks, and a fringe of stiff setae on the anterior edge of the ophthalmic scales.

The first joint of the antennular peduncle is short and thick, the second is scarcely longer, but the third is much longer than either, is slightly dilated distally and bears a sparse covering of setae. The upper flagellum is slightly shorter than the third peduncular joint.

The outer process of the second joint of the antennal peduncle is strong, bears only one or two teeth on its inner
edge, and reaches the middle of the fourth joint. The acicle bears a sharp tooth at the inner side of the base; it is slightly curved and does not reach the middle of the fifth joint. The third and fourth joints are of the usual form. The fifth is much longer than any of the others, and is laterally compressed. The whole peduncle bears setae in greater or less profusion, but they are most plentiful on the inner side of the second joint and on the acicle. Each joint of the flagellum bears two or three long slender hairs.

The form of the right cheliped, which is as usual much larger than the left, is very characteristic. There are two or three irregular rows of small teeth on the upper surface of the carpus, and a row of about ten much larger, strong, curved teeth on the upper inner margin of the same joint. There are also two or three teeth on the upper distal margin, pointing towards the propodite. The carpus has a sparse covering of fine silky hairs which are most numerous on the inner edge and near the distal end.

The inner margin of the hand, from the base of the propodite to the tip of the dactyl is almost straight. The dactyl curves only very slightly towards the fixed finger near the tip. The outer margin, on the other hand, is more or less crescent-shaped. Along its entire length there is a row of strong distinct teeth, which reach their greatest development about the middle of the fixed finger. They are all slightly upturned and decrease in size towards the proximal end of the joint until they become hard to distinguish from mere tubercles. There is a row of similar, but rather smaller teeth, on the inner margin of the propodite. This row is continued on the edge of the dactyl. The fingers taper to narrow points which end in blunt yellow claws, their tips crossing slightly when closed, the dactyl tip passing below that of the fixed finger.

The name of this species refers to the deeply sculptured upper surface of the right chela. It bears three deep depressions. The first of these is confined to the proximal half of the propodite and lies towards the inner edge; it is slightly narrower distally than behind and has sharply defined margins. The second depression lies on the outer half of the propodite, separated in its proximal part from the first depression by a well-marked but blunt ridge. It is narrow at its proximal end, widens in the middle, the widest point being just opposite the base of the dactyl, and fades away gradually towards the tip of the fixed finger. Its margin is steep on the inner part of the proximal half, but forms a more or less gentle slope elsewhere. The axis of the third depression lies along the line of contact of the fixed finger with the dactyl. Each finger has a slight rounded median ridge and from this the surface slopes rapidly downwards so as to form a marked hollow between the fingers. Besides the ridge already mentioned between the first and second depressions there is another between the first depression and the inner edge of the propodite. At the proximal end of this joint the surface is raised into a large rounded prominence or tubercle, at the surface of the ridge, separating the first from the second depression.

To the left of this and opposite the end of the ridge on the inner side of the first depression there is another but much smaller tubercle. The whole of the upper surface of the hand, with the exception of the marginal teeth, which are smooth, is thickly studded with low rounded granules. On the under surface of the margin, below the lines of teeth, there is a fringe of fine hairs, arranged more or less regularly in tufts. The setae are more than twice as long as the teeth. The under surface of the hand is almost smooth, with the exception of a number of low scale-like tubercles bearing setae and situated near the outer margin. The cutting edges of the fingers are furnished with small calcareous teeth.

The left cheliped is very much smaller than the right. The merus, which is laterally compressed, bears tufts of setae on its upper edge, and a few teeth on either lower margin. The carpus bears a row of sharp teeth on the distal part of the upper surface, the row curving down on the inner side near the end. The teeth increase in size anteriorly. The hand broadens rapidly from its base to the point of origin of the dactyl, and then narrows to the distal end of the fingers. The fixed finger is much broader than the dactyl at its base, but is narrower than the dactyl at its tip. The outer edge bears a row of teeth, which are largest in the middle and decrease in size towards either end. The fingers end in yellow claws. The outer edge of the dactyl is smooth except for a few tubercles near the distal end. Just opposite the base of the dactyl there is on the upper surface of the propodite and towards the outer edge a deep round depression. Its edges are not very sharply defined. The whole upper surface of the propodite is studded with rounded granules as in the case of the right cheliped. The upper surface of the dactyl is practically smooth. There is a large prominence on the middle of the upper surface, at the proximal end, as in the right cheliped. The under surface is nearly smooth. The setae are grouped as in the right cheliped, but are distinctly longer. The cutting edge of the dactyl is furnished with a long row of slender transparent spines. There are also a few of these on the cutting edge of the fixed finger interspersed with blunt calcareous teeth.

All the joints of the walking legs (second and third pairs of pereiopods) are laterally compressed, and all bear fringes of long setae. In the first right walking leg the lower edge of the merus bears from six to eight strong teeth; the distal part of the carpus has six or seven teeth on the upper surface; the upper edge of the propodite has eight to ten teeth; the dactyl is furnished with about fourteen or fifteen small slender spines on the distal part of its lower edge, is curved, is longer than the propodite, and ends in a sharp claw.

In the only specimen of this species which I have been able
to examine the first left walking leg is missing, but it probably resembles in all respects its right neighbour, as Milne-Edwards and Bouvier, who note the peculiar structure of the second left walking leg, make no remark on it.

In the second right walking leg there are no teeth on the lower edge of the merus, the teeth on the carpus are reduced to one or two at the distal end, and the teeth on the upper edge of the propodite are obsolete.

In the second left walking leg the lower edge of the merus bears no teeth; on the upper edge of the carpus there are about five teeth, the distal one the largest; the upper edge of the propodite has no teeth, but there is a row of six or seven on the distal half of the lower edge. On the lower edge of the dactyl there is the usual row of slender spines leading up to the terminal claw, but, in addition to this, there is on the same edge, and further towards the outside, a row of short thick teeth, about thirteen in number, extending from the proximal end of the joint about two-thirds of the way to the tip and decreasing in size distally.

The fourth pereiopods are, as usual, imperfectly chelate. The dactyl ends in a long hyaline claw. The imbricate area is fairly broad.

The pereiopods of the fifth pair end in minute chelae as in the other species of the group.

There are four unpaired pleopods on the left side in both male and female. Of these the last is much feebler than the others.

Size.—The carapace of the Naples specimen, from which the foregoing description is taken, measures 8.5 mm. In Chevreux and Bouvier's specimen the carapace was 8.8 mm. long.

General Distribution.—The centre of distribution of this species seems to be the Mediterranean, where it has been taken at many localities by Lucas and others. It also occurs plentifully in the Adriatic (Heller). Outside the Mediterranean it extends southwards along the west coast of Morocco and the Soudan to Gorée Bay just south of Cape Verde (Chevreux and Bouvier). It occurs at the Canaries and at Madeira (Milne-Edwards and Bouvier). To the north it has been taken in the outer western part of the English Channel (Crawshay), and near Falmouth (Bell). There is also a record, which Henderson (1886) regards as extremely doubtful, from the Firth of Forth.

Vertical Distribution.—The depths at which this species has been taken range from 8 fms. at Gorée Bay to 100 fms. at the Canaries. In the Adriatic it is found in depths of 20–30 fms., and in the outer part of the English Channel in 42–51 fms. It may therefore be regarded as essentially a shallow-water species.

Irish Distribution.—The only Irish record of the species is one by Melville (1860) from 60 fms., just south of the Aran Islands.

The species has not been taken by the *Helga.*

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**Eupagurus carneus**, Pocock.

Plate III, figs. 1–8.

*Eupagurus carneus*, Pocock, 1889.
*Eupagurus carneus*, Bourne, 1890.
*Eupagurus carneus*, A. M.-Edwards and Bouvier, 1892.
*Eupagurus carneus*, Bouvier, 1896.
*Eupagurus carneus*, A. M.-Edwards and Bouvier, 1900.
*Eupagurus carneus*, Kemp, 1910.

The rostral projection is distinct and sharply pointed; the lateral frontal projections are less acute, but each ends in a minute sharp point. The cervical groove is well marked; the hind margin of the carapace is rather less deeply concave than in some of the previously described species. A few tufts of fine setae are scattered on the dorsal surface of the carapace, and are most noticeable on the parts behind the lateral frontal projections. The abdomen is nearly twice as long as the carapace; the telson is as broad as long, with concave posterior margin, and is furnished with an irregular row of fairly sharp teeth.

The peduncle of the antennules, when fully extended, is about the same length as that of the antennae. The third joint is by far the longest and is slightly thickened at its distal end. The upper flagellum is distinctly longer than the third peduncular joint and the thickened proximal portion bears a dense fringe of setae on its lower side. There are from 32 to 35 joints in the upper flagellum and 8 or 9 in the lower.

The antennal scale reaches beyond the middle of the fifth joint and is long, curved and slender, bearing groups of setae on its inner margin. The second joint of the peduncle has a sharp tooth on the inner side at the base of the scale; the projection on the outer side is unusually long, it reaches the base of the fifth joint and bears a row of large teeth on its inner edge. The third joint, which is not visible from above, bears a strong spine at its inner distal angle. The fourth joint is stout and cylindrical. The fifth is cylindrical, more slender than the fourth and much longer. The flagellum is about three and a half times the length of the carapace.

The opthalmic scales are narrow and sharp, concave on the upper surface and with a small spine just below the apex. The eyestalks are stout and cylindrical, dilated distally, and the portion of the stalk which encroaches upon the cornea on its dorsal side is small and sharply angulate. The cornea reaches just beyond the base of the third peduncular joint of the antennules. The eyestalks bear a few setae.

The fingers of the chelipeds open and shut in a horizontal plane; the right is very much larger than the left and is about two and a half times the length of the carapace. The merus of the larger limb has a blunt dorsal ridge and is practically smooth on all sides, except for a few very low transverse
ridges from which setae arise. Dorsally there are a few teeth at the distal extremity. The carpus is broad and its upper surface is gently arched from side to side. Its outer and inner borders are sharply defined and slightly upturned and are dactylized into irregular teeth, those on the inner margin being the larger. At its proximal end the upper surface bears some short transverse ridges and is elsewhere covered with a multitude of minute granules which are so small that the surface appears smooth and shining to the naked eye. The inner face of the carpus is minutely granulate with some rugae near the lower edge; the outer face is finely rugose. The chela is broadly expanded, gently convex from side to side, and slightly convex or nearly flat from end to end. The outer and inner edges are sharp, slightly elevated, and finely notched. The upper surface of the propodite appears smooth, like that of the carpus, but is in reality minutely granulate. The lower surface is similar but with slightly larger granules. The fingers are a trifle shorter than the palm and bear on their inner edges a number of calcareous teeth, which are irregular in their distribution. On the fixed finger there is usually a large rounded tooth near the middle and on the dactyl a similar tooth, placed a little further forwards. The fingers end in yellow claws and there is a row of yellow corneous denticles on the distal third of the inner margin of the dactyl.

The left cheliped is very much shorter and more slender than the right. The merus is laterally compressed and bluntly ridged above. The upper edge and outer side are covered with low transverse ridges; the inner side is smooth and the lower edges bear a few teeth. The carpus is strongly compressed and the upper surface bears two longitudinal ridges, with teeth which tend to increase in size anteriorly. The sides and lower surface of the joint are granulate or with a few low ridges. The chela is longer than the carpus, with fingers much longer than the palm; the outer edge is almost straight and the inner slightly curved. The upper surface, like that of the larger chela, is minutely granulate, appearing smooth to the naked eye; but it bears a very conspicuous median serrate keel which runs throughout its length, from the base to the tip of the fixed finger and is highest opposite the base of the dactyl. The outer edge of the propodite is sharp and is minutely and obscurely denticulate; the under surface is almost flat. The outer edge of the dactyl is smooth. The cutting edge of the dactyl is furnished with a large number of transparent corneous spines, while that of the fixed finger has a row of small blunt calcareous teeth, between which are groups of two or three corneous spines. Both fingers bear a few tufts of setae near their distal ends and terminate in yellow claws.

The second pereiopods are compressed and reach very slightly beyond the tip of the right cheliped. The dactyli are the longest joints and are considerably longer than the propodites. There is a series of about ten teeth on the lower edge of the merus and few scale-like ridges on the upper surface. There are some prominent teeth on the upper edges of the carpus and propodite and on the lower edge of the latter a few small corneous spines. The dactyl is curved, slightly contorted, and ends in a long corneous claw; it is smooth on the outer surface and on the inner surface bears a number of strong corneous spines and a few tufts of setae (see fig.).

The third pereiopods resemble the second; but the lower edge of the merus is unarmed and the teeth on the upper border of the propodite are smaller. The arrangement of spines on the dactyl is similar to that found in the preceding pair. The fourth pereiopods are very feebly sub-chelate. The rugose area is represented by a single row of rough teeth on the edge of the propodite. The fifth pereiopods are usually carried bent double and resemble those of the preceding species. The chela is very minute and there are long curved hairs at the ends of the propodite and dactyl.

Three pleopods of the usual form are found in the male on the left side of the abdomen. Milne-Edwards and Bouvier state that there are four pairs in the female. The uropods are normal, much larger on the left than on the right side.

Size.—In the largest specimen obtained by the Helga the carapace is 14 mm. in length. The largest individual recorded by Milne-Edwards and Bouvier had a carapace 13·5 mm. in length, but Pocock's type was 15·5 mm.

General Distribution.—The species has been found on a number of occasions in the N. E. Atlantic, in an area extending from the west coast of Ireland to Cape Bojador on the coast of Morocco. It was taken off the south-west of Ireland (Pocock, 1889) and Bourne recorded it from the same locality a year later. Kemp (1910) mentions three specimens from the northern part of the Bay of Biscay, and Milne-Edwards and Bouvier recorded it from a number of stations off the north and west coasts of Spain and Portugal. The most southerly record given by these authors is off Cape Bojador, 25° 39' N., 18° 18' W., with the exception of a doubtful record from the Cape Verde Islands. The specimens taken by the Helga extend the known range of the species northwards to 54° 17' N.

Vertical Distribution.—The species appears to occur most frequently in depths of about 800–1000 fms. The greatest recorded depth is 744 fms. (Milne-Edwards and Bouvier) off the north of Spain, and the least 58 fms. (Milne-Edwards and Bouvier) off Cadiz.

Irish Distribution.—Known from the south-west coast from the records of Pocock and Bourne mentioned above. The Helga has taken the species on only two occasions, each time a single specimen:

**Helga.**

S. R. 151.—27 VIII '04.—50 miles W.N.W. of Eagle Island, Co. Mayo, 54° 17' N., 11° 33' W., 388 fms., stones and rock,
The end of the antennal peduncle reaches about to the end of the cornea. The process at the outer angle of the of the second joint bears about six sharp teeth on its inner border and a great number of long pinnate setae on its outer and inner edges; it does not quite reach the end of the fourth joint. There is no spine on the inner side of the second joint at the base of the acicle. The acicle is thickened at the base, very strongly curved, and its apex, which is furnished with two or three short spines, reaches slightly beyond the middle of the fifth joint. On its inner margin there are many setae, some pinnate, some simple. The fourth joint is short and narrowed distally, the fifth slender, somewhat compressed and bearing groups of setae. The flagellum is setose and longer than the carapace.

In the right or larger cheliped the merus is stout, rounded above and with low transverse ridges from which setae arise on its upper and outer surfaces. On the lower outer edge there is a row of about ten teeth and two or three on the inner lower edge; the lower surface is densely setose. The carpus is about the same length as the merus and is more or less flattened above. The upper inner margin is defined by a row of six or seven sharp teeth, largest anteriorly. The upper surface bears scattered teeth, some situated on the distal margin, and many tufts of setae springing from them or from low scales. The outer upper edge is rounded and the lower surface is setose, but without teeth. The propodite is nearly twice the length of the carpus and is covered with setae. Occasionally the setae are rather sparse but more frequently they are dense, forming a matted coating, which greatly obscures the features of the surface and becomes thin only in the neighbourhood of the finger tips. Both edges of the propodite are defined by rows of teeth, those on the inner margin stronger than those on the outer. The upper surface bears a number of sharp tuberules which extend on to the fingers; in the middle of the palm some tend to form a definite longitudinal row. The fingers have yellow conical tips and are about as long as the palm. The under surface of the hand is almost smooth, with few tufts of setae. Near the cutting edge on the under surface of both fingers a double row of pencils of yellow setae may be seen, each directed towards the other finger.

The left cheliped is smaller than the right, but is similar in general appearance. The merus is more compressed, with its upper edge better defined, and the carpus has three or four strong teeth on its upper outer edge. The hand is narrower, with the dactyl strongly curved and longer than the palm; the marginal teeth are not strong but there is a distinct median row of tuberules on the palm. In disposition of setae the left cheliped resembles the right.

The next two pairs of pereiopods are laterally compressed and about equal in length with the large cheliped. The two pairs differ somewhat as regards the arrangement of spines. In
the first right leg there are teeth on the lower edge of the merus and on the upper edges of the carpus and propodite. In the second right leg the merus is unarmed below, there is one distal tooth, rarely one or two others, on the upper border of the carpus and none in a similar position on the propodite. In the first left leg there are few if any inferior teeth on the merus, a distal tooth and occasionally one or two others on the upper edge of the carpus and none on the upper edge of the propodite. In the second left leg the only teeth present are those on the carpus, one at the distal end of the upper border and rarely one or two others. In all the legs of the first two pairs there is a thick coating of setae on the lower surface of the merus and on the upper parts of the carpus, propodite and dactyl. The dactyl is the longest joint, stout and curved, and with about ten to seventeen slender conical spines on the under side of its distal half, closely pressed against the lower edge.

The fourth pereiopods bear long setae and are imperfectly chelate. The imbricate area is large and broad with long, sharp, tooth-like scales. The dactyl ends in a sharp claw, preceded by a row of narrow pointed spines. The fifth pereiopods are similarly setose; the imbricate area is broad and the chela very small.

There are four rather long and densely setose pleopods on the left side of the abdomen in both sexes. The uropods are normal in type.

**Size.**—In the largest specimen obtained by the *Helga* the carapace is 1½ mm. in length.

**General Distribution.**—The species ranges over an area extending from Norway and the British coast to the Mediterranean and the Canary Islands. It has been recorded from Bergen (Sars), Bohuslän (Lagerberg), Väderöärne (Goës), Gulmaren (Stuxberg), the Kattegat (Stephensen), the Shetlands (rare, Norman), Moray Firth, Firth of Forth, St. Andrews, Firth of Clyde (Henderson, Balfour, etc.), Isle of Man (Eytón), Northumberland and Durham (Norman and Brady), Plymouth (Marine Biol. Assoc.), Channel Islands (Norman), St. Vaast-la-Hougue, Cherbourg, Concarneau (Bouvier), Mediterranean (Heller, Lucas) and the Canary Islands (Milne-Edwards and Bouvier).

**Vertical Distribution.**—Eupagurus pubescens is rarely found while shore collecting and seems to prefer depths of about 4 to 15 fathoms. It extends, however, into deeper water; on the south coast of Ireland it has been taken in 41–42 fathoms; off Lambay Island in 44 fathoms; and, in the Bay of Biscay in 50 fathoms.

**Irish Distribution.**—The species is mentioned in Kinahan’s Dublin List and is recorded from Belfast and Galway by Thompson and Melville, respectively. The *Helga* has taken it on numerous occasions in Blacksod Bay, in Galway Bay, at Ballynakill, and in 15–25 fathoms off the mouth of Dublin Bay, other records are:

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**Eupagurus pubescens (Krøyer).**

*Pl. II, figs. 4–7.*

*Pagurus pubescens*, Krøyer, 1838 (a).
*Pagurus pubescens*, Krøyer, 1838 (b).
*Pagurus pubescens*, Krøyer, 1846.
*Pagurus Thompsoni*, Bell, 1838.
*Eupagurus pubescens + E. Krøyeri*, Stimpson, 1858.
*Eupagurus pubescens + E. Krøyeri*, Smith, 1879.
*Eupagurus pubescens*, Henderson, 1886 (b).
*Eupagurus pubescens*, Ortmann, 1892.
*Eupagurus pubescens*, A. Milne-Edwards and Bouvier, 1894.
*Eupagurus pubescens*, Ohlin, 1901.
*Eupagurus pubescens*, Lagerberg, 1908.
*Eupagurus pubescens*, Hansen, 1908.
*Eupagurus pubescens*, Stephensen, 1913.

The rostral projection is distinct and sharply pointed; the lateral projections on the frontal margin are blunter. That part of the carapace which lies in front of the cervical groove, which is deep and well marked, is strongly calcified; behind the groove the surface is much softer, and becomes almost membranous on the flanks. The posterior margin is concave.
as usual. The upper surface of the carapace is furnished with tufts of setae, which become sparse and finally extinct on the flanks.

The abdomen is well developed and of the usual form. The telson is asymmetrical, narrow, and short.

The eyestalks are stout, and are slightly dilated, both at the distal end and at the base. The corneal area is fairly large and is deeply pigmented; the part of the unpigmented surface, which encroaches on the dorsal surface of the cornea, is shallow and pointed. The ophthalmic scales are rather small, and have sharp tips, which are furnished with a few radiating setae. There are also three or four groups of setae on the upper surface of the eyestalks. The end of the cornea reaches just beyond the base of the third joint of the antennular peduncle (extended to its full length), and does not reach the end of the fifth joint of the antennular peduncle.

The joints of the antennular peduncle are slender, cylindrical, and smooth. The third joint, which is the longest, is slightly thickened at its distal end.

The antennal scale is long and narrow, and bears a number of stiff setae; it is swollen and rounded at the base, and its tip extends slightly beyond the middle of the fifth peduncular joint. The external fixed process of the second joint reaches only a short distance beyond the base of the fourth joint. The flagellum is about three and a half times as long as the carapace, and is setiferous.

The right cheliped, which is much larger than the left, is nearly three times as long as the carapace. The hand lies in an almost horizontal plane. The merus is massive and much thickened distally. The upper surface and sides are covered with low transverse scales, the lower surface with tubercles. Its head surface bears tufts of setae. There is a row of teeth on the whole upper distal edge. The carpus is very slightly longer than the merus and is flattened dorsally. The upper surface is covered with rough tubercles, which are replaced by large spines on the inner margin. From the base of each of these there springs a group of setae of varying length. The surface of the palm of the propodite is gently convex. This joint is very slightly longer than the carpus as a rule; sometimes the two are practically equal. The outer edge is curved, and bears a continuous row of strong teeth. The dorsal surface is covered with rough tubercles tending to become spinous. From the base of each tubercle there springs a bunch of setae, sometimes short, sometimes fairly long, but never so long as those on the carpus. There is no definite arrangement of the tubercles on the propodite, except that sometimes there is a slight resemblance to the two converging rows seen in Eupagurus Bernhardus. The fingers are acuminate, and are tipped with yellow claws. The outer edge of the dactyl is furnished with a row of small but sharp teeth; its upper surface bears a row of similar teeth. In the distal half of the joint the outer edge becomes fairly narrow and sharp.

The left cheliped is much smaller than the right, reaching usually only to the middle of the propodite of the latter. The merus and carpus are strongly compressed laterally. There is a row of strong teeth on the upper inner edge of the carpus, and tufts of long setae on both joints. From the hind margin of the propodite a raised keel topped with strong teeth runs forwards and slightly outwards on to the fixed finger, extending far beyond the base of the dactyl. It is most prominent near its proximal end and diminishes in height distally. The hand is very broad in its basal portion, and narrows rapidly to the tips of the fingers. The outer edge, which is fairly sharp, especially at the proximal end, has a series of small teeth. There is a line of blunt tubercles on the inner edge as far as the base of the dactyl. The dactyl is smooth. The lower surface of the hand is flat, and both fingers are slightly but distinctly turned downwards near the tip. The keel of the propodite falls away much more steeply on the inner than on the outer side.

The first two pairs of walking legs (second and third pereiopods) are longer than the right cheliped, and those on the right are slightly longer than those on the left. All the joints are laterally compressed. The merus has a row of eight to ten tubercles on the lower edge, and a line of setiferous scales above. The carpus is much shorter, is thickened distally, and bears a row of strong teeth interspersed with setae on its upper surface. The propodite is longer than the carpus, but shorter than the merus. It has a slight groove on both the outer and inner face. On the upper edge there is a row of setiferous scales, and on the lower a few, usually three or four, transparent conical spines, some of which are double; one is at the extreme distal end. The dactyl is strong, curved, compressed, very slightly twisted, and grooved on the inside. It ends in a strong transparent claw. On the lower surface there is a row of long, sharp, slender spines, about twelve to fifteen, sloping forwards and diminishing in size backwards. There are also a few similar spines a short distance above them on the inner face, and a more numerous series near and on the upper edge, especially in the distal half of the joint. The upper edge is covered with tufts of setae.

The fourth pereiopods are similar to those of E. Bernhardus, but the chela is even more imperfect, the fixed finger of the propodite being very short.

In the fifth pereiopods the chelae are small and imperfect. The area covered by the imbricate scales is slightly larger than in E. Bernhardus.

There are three fairly large unpaired pleopods on the left side of the abdomen in the male. One ramus is much smaller than the other, as usual.

The uropods are of the usual type, the left being much larger than the right.
Size.—In the largest specimen taken by the *Helga* (from S. R. 321), the carapace is 20·5 mm. long, and the propodite of the large cheliped measures 20 mm. The propodite of Hansen's largest specimen (1908), taken in the Önundar Fjord, on the north of Iceland, was 31 mm. long.

**General Distribution.**—The species is known from the Shetlands and the Hebrides (Norman), and extends along the west coast of Scotland into the Irish Sea (Walker), and to the south-west of Ireland (Pocock). On the east coast of Great Britain it has been taken at Peterhead (Metzger), at the Bell Rock, Holy Island, Sumburgh Head and Spurn Point (Tesch), the Firth of Forth (Scott), Northumberland (Meech). It does not extend farther south than Durham (Norman). It has been recorded from the Skagerak and Kattegat (Meinert), and from stations along the whole west coast of Norway (Sars). It rounds the North Cape, and is found in the Murman Sea (Birula) and the White Sea, and off Nova Zembla at Jugor Sehar (Hansen) and Matotschekin Schar (Stauberg). It is not known as yet from the Kara Sea or the north coast of Siberia. It occurs at Spitzbergen (Dolfin, Ohlin), and at Bear Island (Sars). It is common at the Faeroes and all round Iceland (Hansen). On the east coast of Greenland it is very rare, but has been taken at a large number of stations on the west (Hansen, Stephensen). On the east coast of North America it is found off Labrador (Smith), in the Gulf of St. Lawrence (Smith), Newfoundland (Milne-Edwards and Bouvier), Nova Scotia, and southwards along the coast of the United States to 37° 8' N.L. It has been recorded from Kamchatka (Brandt).

Hansen (1908) thinks it very probable that *E. trigonoceirus* Stimpson, belongs to the same species, in which case its range is extended to north and north-west Alaska. He holds the same view with regard to *E. capillatus*, Benedict, *E. Brandti*, Benedict, and *E. Dalli*, Benedict, which have been taken off Alaska, the Aleutian Islands, Unalaska, and in the Bering Sea.

The geographical distribution is boreal-arctic rather than arctic, as the species is apparently absent from the Kara Sea, Jan Mayen, and Franz Josef's Land.

**Vertical Distribution.**—It has a considerable range in depth, being known from 2 fathoms down to nearly 600 fathoms.

**Irish Distribution.**—The species is mentioned by Kinahan in his lists of Crustacea from Dublin and from Belfast. Walker records it from the Irish Sea to the west of the Calf of Man, and Pocock from 200 fathoms off the south-west coast. Farran mentions it in the list of Decapods from Clare Island, Co. Mayo, and there is a specimen in the National Museum, from Bray Head, near Valenta, County Kerry (23 fathoms). The *Helga* has taken it at several stations, notably off Howth Head and near Rathlin Island. It was also taken at a station fifty miles off Mayo, and at four points off the south-west coast,

these last records marking the extreme southern limit of its known distribution.

The actual records are as follows. The measurements refer to the length of the carapace.

**Helga.**

S 45.-12 II '02.—Lambay Deep, 40–60 fms., sand. Trawl. —One, ♂ 9·5 mm.
S R 118.—13 V '04.—55° 20' N., 6° 8' W., 103 fms., rocks and sand. Dredge.—Twelve, all quite small.
S R 118c.—13 V '04.—55° 19' 45" N., 6° 10' W., 115 fms., rock. Dredge.—Seventeen, all quite small.
S R 118.—3 II '05.—51° 53' N., 11° 59' W., 320–372 fms. mud. Trawl.—One ♀ (ovigerous), 14 mm.
S 265.—23 II '05.—63 mls., off Howth Head, 241–25 fms. sand. Trawl.—Two ♀ and ♀ (ovigerous), 6 mm.
S R 233.—21 V '05.—55° 20' N., 6° 11' W., 110–130 fms., rock. Dredge.—Two ♀, 4·5 mm.
S 237.—30 V '05.—64 mls., off Howth Head, 22 fms., fine shelly sand. Trawl. Temperature 9·7°C.—One ♀, 11 mm.
S R 277.—15 XI '05.—54° 17' 30" N., 11° 34' W., 550 fms., gravel and shells. Dredge.—Three, two ♀ one ♀, 6·5–9 mm.
S R 321.—1 V '06.—50° 50'–51° 6' 30" N., 11° 17' W., 480–208 fms., fine sand. Trawl.—One ♀, 20·5 mm.
S 476.—19 X '06.—6 mls. E.S.E. of Baily Light, 23 fms., shelly sand. Trawl. Temperature 12·6°C.—One ♂, 10·5 mm.
S 514.—25 IV '07.—7 mls. E. S. of Baily Light, 22–24 fms., sand. Trawl.—One ♀, 10·5 mm.
S R 440.—16 V '07.—51° 45' N., 11° 49' W., 380–389 fms. Trawl.—Two, ♀ and ♀, 8–20 mm.
S 597.—6 II '11.—Ballyvaldon Oyster Beds, off Norris Castle C.G.S., Wexford, 7–8 fms. Dredge.—Three ♀, 6·5–9·5 mm.
S R 1242.—14 VIII '11.—51° 27' N., 11° 55' W., 550–590 fms., Sprat net on trawl.—Four, two ♀, two ♀, 5–7 mm.
S R 1454.—24 VIII '12.—51° 32' N., 11° 56' W., 509–493 fms., fine gravel and sand. Trawl.—One ♀, 7–5 mm.
S R 1848.—22 V '14.—51° 41' N., 11° 53' W., 434 fms., coarse sand. Dredge.—One ♀, 8 mm.

Specimens of *Peltogaster* sp. were found at S. R. 277 and at S. R. 597, in each case on males from 9 to 10 mm. long (carapace only).

After examining all the specimens taken by the *Helga*, I quite agree with Hansen (1908) that it is impossible to divide this species into two, *E. pubescens* and *E. Krügeri*, as has
been done by American authors. It is true that there are considerable variations in the form of the left cheliped, but between the extremes of the *pugnaxen* type and the *Krogieri* type there are a large number of transitional forms. The specimens taken by the *Helga* may be divided as follows:—

<table>
<thead>
<tr>
<th>Type</th>
<th>Specimens</th>
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<tbody>
<tr>
<td>Krogieri</td>
<td>3</td>
</tr>
<tr>
<td>Pugnaxen</td>
<td>2</td>
</tr>
<tr>
<td>Transitional forms</td>
<td>8</td>
</tr>
</tbody>
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The form of the left cheliped does not appear to vary consistently according to the depth, as specimens of both types have been taken in water as shallow as 20 fathoms and as deep as 480 fathoms.

**Eupagurus Prideauxii** (Leach).

*Plate II, figs. 1–3.*

*Eupagurus Prideauxii*, Bell, 1853.

*Eupagurus Prideauxii*, Heller, 1863.

*Eupagurus Prideauxii*, Henderson, 1886.

*Eupagurus Prideauxii*, Bonnier, 1887.

*Eupagurus Prideauxii*, Milne-Edwards and Bouvier, 1900.

The middle of the frontal margin of the carapace is not produced into a definite rostral process, but is rounded. The lateral projections just above the outer edge of the eyestalks are well-developed and produced into fairly sharp points. The cervical groove is well-defined. The whole surface of the carapace bears scattered tufts of minute setae, which are longest and most plentiful on the anterior lateral parts. The carapace does not become so broad posteriorly as in *E. Bernhardus*, the abdomen is more slender and the whole animal less strongly calcified.

The eyestalks are much thicker than in the preceding species and are strongly dilated distally. The cornea is densely pigmented and is deeply and widely emarginate dorsally. The ophthalmic scales end in rather sharp points and are fringed with setae; they are more slender than in *E. Bernhardus*. The eyes reach to beyond the base of the third joint of the antennular peduncle when the latter is fully extended, and at least to the middle of the last joint of the antennal peduncle.

The antennular peduncle is composed of slender cylindrical joints, the third the longest. The two flagella are of the usual form, the upper about as long as the ultimate antennular joint.

The antennal peduncle is similar to that of *E. Bernhardus*, but the scale is more slender, less curved and shorter, reaching just beyond the tip of the eyes. The external process of the second joint reaches only to the middle of the fourth joint. The antennae are about three and a half times as long as the carapace.

In the right or larger cheliped the merus is granular with some fine spines on the upper edge of its anterior margin. The carpus has a series of moderately large spines on the inner upper edge and a faint median row, most distinct at the proximal end; it is otherwise covered with small sharp-pointed tuberules and very short setae. The propodite is much longer than the carpus, with the fingers shorter than the palm. The upper surface is minutely granular; sometimes faint indications of a median ridge are to be found and the proximal end of the ridge near the junction with the carpus is often clearly visible. A row of blunt spines or tuberules, sometimes elevated above the level of the upper surface, usually extends along the outer edge to the tip of the fixed finger and a similar but less regular row on the inner side. The fingers are strong and tapering, with blunt teeth on the cutting edges, and tufts of setae on either side of them.

The left cheliped is smaller and more slender than the right. The carpus bears a conspicuous spinous ridge mid-dorsally and another similar ridge on the inner edge. The propodite is narrow, finely granular, and with a slight median ridge near the proximal end. The fingers are slender and longer than the palm.

The next two pairs of pereiopods are long, slender and compressed, slightly longer on the right side than on the left. The third is a little longer than the second. The upper borders of the merus, carpus and propodite are coarsely serrate. The dactyl is long, slender and curved, ending in a yellow transparent claw; on both sides of it there is a longitudinal ridge defined by a pair of shallow grooves. The upper border is very minutely serrate, while the lower border is unarmed except for rows of fine setae.

The fourth pereiopods are almost perfectly chelate and bear tufts of mixed plumose and simple setae. A quadruplet row of scales is present as in *E. Bernhardus*. The fifth pereiopods are similar to those of *E. Bernhardus*.

In the female three fairly large well-developed abdominal appendages are present serving as an attachment for the eggs; these are altogether absent in the male. The uropods are similar to those of the preceding species, but the telson is rather longer and more quadrate. The eggs are numerous and smaller than in *E. Bernhardus*.

**General Distribution.**—The species is found on the coast of Norway (Appellöd) as far north as Hardanger (Sars), but does not appear to have been recorded from Denmark or Sweden. It is known from the Shetland Islands, and the Moray Firth, but is “apparently absent from the rest of the east coast of Scotland” (Henderson). It is recorded from the Clyde (Hoyte), the west coast of Ireland, the Irish Sea (Farran), Devon and Cornwall (Norman), the Channel Islands (Sinel) and the Bay of Biscay (Caullery, Kemp). It is common on the coast of Spain and in the Mediterranean and Adriatic (Heller).
and reaches the southern extremity of its distribution at the Cape Verde Islands (Milne-Edwards and Bouvier).

**Vertical Distribution.**—The species is most abundant at depths of from 10 to 40 fms. but frequently occurs in deeper water. On the west coast of Ireland it has been found seventeen times at depths of over 70 fms. and four times at depths of over 100 fms. On one occasion it was taken at 199 fms. (*Helga*, exxi, 24-8-01) and it is recorded by Caullery from 217 fms., in the Bay of Biscay.

**Irish Distribution.**—*Eupagurus Prideauxii* occurs on all the coasts of Ireland, but most sparingly on the north; it is very plentiful on the east coast off Dublin, Louth and Down, and is also common in the south and on the west. It is nearly always taken on a sandy or muddy bottom and is almost invariably associated with the Actinian, *Adamsia palliata*.

*Eupagurus variabilis* (Milne-Edwards and Bouvier).

Plate IV, figs. 4, 5; Plate V, figs. 1-3.

*Pagurus tricarinatus*, Norman, 1869.
*Eupagurus excavatus*, Pocock, 1889.
*Eupagurus meticulous*, Bourne, 1890.
*Eupagurus variabilis*, A. Milne-Edwards and Bouvier, 1892.
*Eupagurus variabilis*, Bouvier, 1896 (b).
*Eupagurus variabilis*, A. Milne-Edwards and Bouvier, 1897.
*Eupagurus variabilis*, A. Milne-Edwards and Bouvier, 1899.
*Eupagurus variabilis*, A. Milne-Edwards and Bouvier, 1900.
*Eupagurus variabilis*, Senna, 1908.
*Eupagurus tricarinatus*, Hansen, 1908.
*Eupagurus variabilis*, Kemp, 1910.

A great deal of obscurity exists with regard to the exact characters and geographical distribution of this species, owing to its confusion with the very closely allied form *E. excavatus*, Herbst. Of *E. excavatus* itself there are several types and the right cheliped in particular exhibits considerable variation. There is, indeed, a very striking parallelism between the two species. In both cases the right cheliped varies from the form having three sharp unbroken carinae separated by deep hollowed spaces, through all gradations to the form in which the surface of the hand is covered with rough tubercles, the median keel is represented by an obscure and gentle elevation in the median line and the lateral keels are almost obsolete. In spite, however, of the very great resemblance between the two species they may always be distinguished by certain characters which remain constant. Milne-Edwards and Bouvier, in their admirable account of *E. variabilis* (1900), give the following characters for the separation of the two species:

1. **E. excavatus.**
   - Four unpaired pleopods in the male.

2. **E. variabilis.**
   - Three unpaired pleopods in the male.

   - The left chela has a prominent carina, on the outer side of which there is always a smooth hollow.

   - Near the inner border of the right chela the inner face is smooth, granular, or tubercular up to the very edge without interruption.

   - The process at the outer side of the second joint of the antennal peduncle does not reach the base of the terminal joint.

   - The lower surface of the merus of the right cheliped is covered with hairs which are much longer than the granules on the surface.

   The most reliable characters in this table and the easiest to use are those numbered 1 and 4.

   It is with the var. *meticulous*, Roux, of *E. excavatus* that *E. variabilis* is most likely to be confused. Milne-Edwards and Bouvier (1900) give the following summary of the characters of the typical form and of the variety:

   "*E. excavatus* (typical form)—Characterized by two deep excavations, usually quite smooth, which are hollowed out in the propodite of the right cheliped, and are bounded by three carinae, one median and two marginal, which are high and sharp. The daetlyl is also excavated above. The carina of the left chela is always smooth and sharp.

   *E. excavatus*, var. *meticulous*—Right propodite less deeply excavate. The concavities of this hand are more or less roughened and granular in part of their length, especially posteriorly. The three carinae are of medium size, thick, obtuse, and granular on the edges, especially in the ease of the middle one. The median carina of the left hand is always rather obtuse and granular; as to the lower edge of the same hand it is less drawn out and much less sharp than in the typical form of the species."
Transitional forms are common between these two extremes. *E. variabilis* was first described under that name by Milne-Edwards and Bouvier in 1892, and there is no doubt that both before and after that date many specimens were referred to *E. excavatus*, which in reality belonged to *E. variabilis*. I have investigated the records of "E. excavatus," from northern European waters, so far as I have been able, with the result that I have found more than twenty specimens in the Irish National Museum labelled "E. excavatus" or "E. menticulus." These were taken by various expeditions sent out to the west and south-west of Ireland by the Royal Irish Academy and the Royal Dublin Society in the years 1888-90, and were recorded by Pocock (1889), Bourne (1890) and others. I find that every one of these specimens, without exception, must be referred to *E. variabilis*. Calman (1896), writing after the description of *E. variabilis* by Milne-Edwards and Bouvier (1892) had been published, records only that species from the same areas and does not mention any specimens of *E. excavatus*. All the Irish records, then, really refer to *E. variabilis*.

But even prior to 1892 the present species had been described, though under a different name. Norman (1896) described a species which he called *Pagurus tricarinatus*, from the Shetland Islands. He afterwards came to regard this as really belonging to the Mediterranean species *E. menticulus*, and mentions his specimens under that name in the "Museum Normanianum" (1905). The three original specimens from the Shetland Islands are in the British Museum. At my request Dr. Calman has kindly examined them with regard to the characters for the separation of *E. variabilis* and *E. excavatus*, with the result that all the three specimens were found to belong to *E. variabilis*. Hansen, in 1908, suggested that this would prove to be the case. Norman's name, *E. tricarinatus*, has of course priority over *E. variabilis*, and Hansen (1908) uses it for the designation of the species. But *E. tricarinatus* is preoccupied, having been given to a Japanese species by Stimpson (1858), as is pointed out by Henderson (1896). Hansen is also of opinion that the specimen described by Sars (1885) under the name of *E. tricarinatus* (identified in the "Supplementary Notes" at the end of Part II as *E. menticulus*), really belongs to *E. variabilis*. Specimens have also been referred to *E. excavatus* var. *menticulus* from Scandinavian waters by Appellöf (1906). I have written to Professor Sars with regard to the specimens recorded by him in 1885, and in reply he tells me that after comparing his original drawings with the description of Milne-Edwards and Bouvier (1900), he is convinced that the Norwegian specimens really belong to *E. variabilis* and not to *E. excavatus* (= *E. menticulus*). I have also received a letter from Dr. Grieg, of the Bergen Museum, regarding the specimens recorded by Appellöf (1906). After examining them with regard to the differentiating characters given above, he comes to the conclusion that they all belong to *E. excavatus* but to *E. variabilis*.

The result then of these investigations is that there is no genuine record of *E. excavatus* from a locality further north than the southern part of the Bay of Biscay, from which specimens have been recorded by Milne-Edwards and Bouvier.

Not a single specimen of *E. excavatus* has been taken by the *Helga*, but *E. variabilis* has been captured at upwards of forty different stations off the west and south-west coasts of Ireland, the total number of specimens being about two hundred and twenty. Amongst these are found all the different variations described by the French authors (1900).

The rostral projection is gently rounded and not prominent. The lateral frontal processes end each in a small sharp tooth. The dorsal surface of the carapace and the frontal and lateral edges bear a sprinkling of setae which are mostly present in small groups.

The telson is almost symmetrical. Its posterior edge is concave and fringed with small teeth.

The eyestalks are moderately long and much swollen distally. The corneal area is large, slightly emarginate behind, on the upper surface. There are a few tufts of long setae on the dorsal surface of the eyestalks. The ophthalmic scales are rather small. A sharp spine is attached just below and to the inside of the tip. The scales are deeply hollowed on the upper surface. The eyes reach the base of the third joint of the antennular, and slightly beyond the middle of the fifth joint of the antennal peduncle.

On the basal joint of the antennular peduncle there is a tooth at the side of the opening of the auditory sac, and a pair of teeth at the distal lower extremity. The second and third joints are longer and thinner, the third being longer than the second and slightly dilated at the distal end. The upper flagellum is slightly longer than the third joint.

The first joint of the antennal peduncle is short and broad and has a very short spinule on the outer edge. The second is large and massive; the outer process reaches or passes slightly beyond the base of the fifth joint and ends in a sharp point; it has a row of eight to ten teeth on its inner edge. The acicle is long and narrow, reaching the middle of the fifth joint or slightly beyond. The third and fourth joints are of the usual form. The fifth is longer than any of the others and is slightly compressed laterally. The whole peduncle is more or less setiferous. The antennae are about three times as long as the carapace.

The right cheliped is extremely variable in form and it is owing to this circumstance that much confusion has arisen with regard to the synonymy of the species. The variation is practically confined to the propodite and the dactyl. The remaining joints are more or less uniform in all specimens. The carpus bears a covering of sharp denticules on its upper surface, and on the inner edge these are enlarged to form a row of strong teeth. The propodite exhibits all grades of variation.
between two extremes; (a) those in which there is a very high and prominent median crest, separated from an outer and inner lateral keel by deeply hollowed spaces, which are practically smooth except for a few granules near the proximal end and (b) those in which the median crest and lateral keels are so reduced as to be almost indiscernible and the surface of the hand is almost flat and covered throughout with granules. In those specimens in which the median crest and lateral keels are present the dorsal surface of the dactyl is slightly hollowed out. The keel on the inner edge is higher than that on the outer, and all three keels are usually more or less serrate. The palm is slightly longer than the fingers.

In the left cheliped the merus is laterally compressed, with a rounded upper edge. The carpus is also compressed but its upper edge bears a row of ten or twelve strong teeth increasing slightly in size distally; there are also a few smaller teeth at the side of this row. The propodite has a line of strong teeth along the outer margin, and also a slight median keel furnished with prominent teeth. Between the median keel and the outer edge the surface is tuberculate; between the keel and the inner edge, however, it is smooth. The fingers are longer than the palm and end in yellow claws. The median keel is highest in the proximal part of the joint and becomes less distinct distally but can still be traced almost to the tip of the fixed finger. The dactyl is smooth except for a few small denticules on the outer edge. The form of the left cheliped remains constant and does not vary with the right.

The walking legs, as usual, are strongly compressed laterally. On the right leg of the first pair there is a row of about ten strong teeth on the upper edge of the carpus, and from twelve to fourteen on the propodite. The dactyl is longer than the propodite, curved and tapering; there are no spines on the lower edge; it is fringed with setae, above and below. On the left leg of the first pair, the teeth on the carpus and propodite are less numerous, being reduced to about eight on either joint. The walking legs of the second pair are very similar to those of the first, the only difference being that the teeth on the carpus and the propodite are much feebler, especially in the case of the left leg.

The fourth and fifth pereiopods exhibit no characters peculiar to the species.

In the male there are, on the left side of the abdomen, three unpaired pleopods of the usual aspect, and in the female, four.

The uropods are of the usual form.

Ovigerous females have been taken on many occasions by the Helga, most frequently in August and November, but also in February and March, and there are ovigerous specimens in the Irish National Museum from the same area which were taken in July.

Size.—The carapace of the largest specimen taken by the Helga is 19 mm. long. The females appear to become sexually mature while still very small, numerous ovigerous individuals having been taken in which the carapace measures only 5 mm.

**General Distribution.**—The species occurs on the west coast of Norway at least as far north as 63° 10' N. (Sars and Appellöf). It has been taken at the Shetlands (Norman), on the west and south-west of Ireland, in the Bay of Biscay (Kemp, Milne-Edwards and Bouvier), off the Portuguese coasts, at the Canaries, and as far south as Cape Blanco, 21° 51' N. (Milne-Edwards and Bouvier). It has also been taken in the Mediterranean (Senna).

**Vertical Distribution.**—The species appears to live in greatest numbers in depths of 100-250 fms., but it is frequently found in about 70-90 fms., and has been taken also in 740 fms (Milne-Edwards and Bouvier).

**Irish Distribution.**—The Helga has taken this species in large numbers off the west and south-west coasts. The following are detailed records:

**Helga.**

_**Helga CXIV.**—2 viii '01.—40 mls. S.W. of Cleggan Head 62° 1/2 fms., sand and stones. Dredge. Temperature 9° 5° C.—One ovigerous ♀, 5 mm._

_**Helga CXXI.**—24 vii '01.—64 mls. N. W. 1/2 W. of Cleggan Head, 199 fms., fine sand. Trawl.—One, 11 mm._

_**Helga CXXXI.**—12 ii '01.—50 mls. W. N. W. of Cleggan Head, 110 fms., fine sand. Dredge. Temperature at 100 fms., 9° 8° C.—Eighty, 5-15 mm._

_**S. R. 44.**—17 vii '03.—50 mls. W. N. W. of Cleggan Head, 116° 1/2 fms., Townet near trawl. Temperature 10° 15° C.—Three, 9-18 mm._

_**W. 7—24 viii '04.—27 mls. W. by N. N. of Bray Head, Valencia, 100 fms., sand. Trawl. Temperature 9° 8° C.—Four, 8-17.5 mm., including 2 ovigerous ♀._

_**S. R. 107.**—20 vii '02.—53° 37' N., 11° 33' W., 121 fms., fine sand. Trawl. Temperature 9° 3° C.—Two, 13-15 mm._

_**S. R. 145.**—23 vii '04.—53° 24' 30" N., 11° 38' W., 112 fms., fine sand. Townets near trawl.—Seven, 5-18 mm., including one ovigerous ♀._

_**S. R. 146.**—24 viii '04.—53° 24' W., 12° 29' W., 181 fms., fine sand. Trawl.—One, 16-5 mm._

_**S. R. 147.**—24 viii '04.—53° 27' N., 13° 37' W., 91 fms., gravel and shells. Dredge.—One ♀ with six Pachygrapsus, 9-5 mm._

_**S. R. 148.**—24 viii '04.—53° 38' N., 13° 19' W., 135 fms., fine sand and shells. Trawl.—One, 9 mm._

_**S. R. 152.**—27 vii '04.—54° 37' N., 11° 37' W., 220 fms., Trawl.—One 9-5 mm._

_**S. R. 164.**—3 xi '04.—52° 6' N., 12° 01' W., 375 fms., fine mud and sand. Dredge. Temperature at 350 fms., 9° 7° C.—Five, 6-7 mm., one ovigerous ♀._
I. '21.

| S. R. 169 | 4 xi '04 | 51° 50' N, 11° 26' W, 129 fms., fine sand. Trawl. Temperature 10°8' C.—Three, 11-15 mm., one ovigerous ♀. |
| S. R. 171 | 5 xi '04 | 52° 7' N, 11° 58' W, 337 fms., fine mud and sand. Trawl.—One, 19 mm. |
| S. R. 172 | 5 xi '04 | 52° 2' N, 12° 8' W, 454 fms., fine mud. Townet on dredge.—One ovigerous ♀, 5-5 mm. |
| S. R. 185 | 30 vii '05 | 50° 20' N, 10° 20' W, 82½ fms., fine sand and shells. Trawl. Temperature at 80 fms., 11°05' C.—Ten. |
| S. R. 187 | 31 vii '05 | 50° 14' 30" N, 0° 43' W, 57 fms., sand and mud. Trawl. Temperature 10°2' C.—One, 10 mm. |
| S. R. 212 | 6 v '05 | 51° 54' N, 11° 37' W, 411 fms., fine mud and sand. Trawl.—Eleven. |
| S. R. 216 | 9 v '05 | 52° 21' N, 11° 54' W, 143-164 fms., fine sand. Trawl.—Two. |
| S. R. 220 | 11 v '05 | 53° 39' N, 12° 24' W, 185 fms., fine sand and shells. Trawl.—Two, 11-15 mm. |
| S. R. 225 | 13 v '05 | 53° 2' N, 13° 48' W, 105-109 fms., fine sand and shells. Trawl. Temperature 9°5' C.—Ten, 4-10 mm. |
| S. R. 226 | 13 v '05 | 59° 12' N, 13° 57' W, 89 fms., gravel and shells. Dredge.—Four, 6-9 mm. |
| S. R. 227 | 13-14 v '05 | 53° 29' N, 13° 16' W, 164 fms., fine sand. Trawl.—Two. |
| S. R. 321 | 1 v '06 | 50° 56'-51° 0' 30" N, 11° 17 W, 480-208 fms., fine sand. Trawl.—One, 13.5 mm. |
| S. R. 338 | 13 v '06 | 51° 28' 30" N, 11° 39' W, 291-330 fms., mud. Trawl.—One, 14 mm. |
| S. R. 353 | 6 viii '06 | 50° 37'-50° 40" N, 11° 32' W, 250-542 fms., mud and sand. Trawl.—One. |
| S. R. 350 | 8 viii '06 | 52° 6' N, 12° 6' W, 465-492 fms., ooze. Trawl. Temperature 9°4' C.—One, 8 mm. |
| S. R. 390 | 8 viii '06 | 52° 4' N, 11° 27' W, 108-120 fms., fine sand. Trawl.—Two ovigerous ♀, 10-11 mm. |
| S. R. 400 | 5 x '07 | 51° 21' N, 11° 49' W, 525 fms., Dredge.—One. |
| S. R. 440 | 16 v '07 | 51° 45' N, 11° 49' W, 350-389 fms., Trawl.—One, 11.5 mm. |
| S. R. 448 | 18 v '07 | 50° 21' N, 11° W, 343-346 fms., Trawl.—Three. |
| S. R. 490 | 7 ix '07 | 51° 57' 30" N, 12° 7' W, 470-491 fms., ooze. Trawl. Temperature 8-68° C.—Four, 12-18.5 mm. |

| S. R. 590 | 8 viii '08 | 51° 51' 30" N, 12° 8' W, 480 fms., ooze. Midwater Otter Trawl, 0-480 fms. Temperature at 480 fms., 9-28° C.—Twelve, 4-8 mm. |
| S. R. 755 | 19 v '09 | 52° 3' N, 11° 20' W, 92-100 fms., fine sand. Trawl.—One. |
| S. R. 807 | 17 vii '09 | 51° 37' 30" N, 11° 6' W, 105 fms., fine sand. Trawl.—Two. |
| S. R. 1005 | 12 viii '10 | 51° 22' N, 11° 30' 30" W, 249 fms., fine sand. Dredge.—Two. |
| W. 176 | 17 ii '11 | 51° 54' N, 10° 41' W, 58 fms., fine sand. Dredge. Temperature 9-1° C.—Two ovigerous ♀, 9-11 mm., and one ♀ with eight Pellogaster. |
| S. R. 1175 | 19 v '11 | 51° 36' N, 11° 54' 30" W, 300-500 fms., Midwater Otter Trawl.—One, 11.5 mm. |
| S. R. 1176 | 22 v '11 | 51° 26' 30" N, 11° 2' W, 100 fms., sand. Dredge.—Ten, 8-14 mm. |
| S. R. 1177 | 22 v '11 | 51° 26' 30" N, 11° 2' W, 152 fms., sand. Dredge.—Six, 9-14 mm. |
| S. R. 1391 | 14 v '12 | 51° 33' N, 11° 28' 30" W, 149 fms., sand. Dredge.—Two, 10-18 mm. |
| S. R. 1444 | 10 viii '12 | 51° 56' N, 11° 28' W, 142 fms., sand. Dredge.—Seven. |
| S. R. 1845 | 21 v '14 | 51° 6' N, 11° 28' W, 240-249 fms., Trawl.—Two, 12-16 mm. |

**Genus Anapagurus, Henderson**

Key to the British species of Anapagurus.

I. Chela of large cheliped much longer than carpus; third joint of antennular peduncle about one and a half times as long as second.

A. Eyes swollen with cornea strongly dilated; upper surface of chela of large cheliped without longitudinal ridges

... A. latus.

B. Eyes slender with cornea little dilated; upper surface of chela of large cheliped with two more or less distinct longitudinal ridges

... A. chiroacanthus.

II. Chela of large cheliped very little longer than carpus; third joint of antennular peduncle about three times as long as second [Eyes slender; upper surface of large chela without ridges]

... A. Hyndmani.
Anapagurus laevis (Thompson).
Plate VII, figs. 7–9, Plate VIII, figs. 1–3.

Pagurus laevis, Thompson, 1843.
Pagurus laevis, Bell, 1853.
Eupagurus laevis, Stimpson, 1858.
Anapagurus laevis, Henderson, 1886 (a).
Anapagurus laevis, Henderson, 1886 (b).
Anapagurus laevis, Bouvier, 1891.
Anapagurus laevis, Chevreux and Bouvier, 1892.
Anapagurus laevis, Milne-Edwards and Bouvier, 1894.
Anapagurus laevis, Bouvier, 1896.
Anapagurus laevis, Milne-Edwards and Bouvier, 1899.
Anapagurus laevis, Milne-Edwards and Bouvier, 1900.
Anapagurus laevis, Senna, 1903.
Anapagurus laevis, Hansen, 1908.

The carapace is strongly calcified in front and submembranous behind the cervical groove, which is deeply chiselled. In the branchial region it is very broad and inflated. The gastric area is convex from side to side and from the front backwards; its surface is smooth and glistening. On the hepatic areas there are a few scattered granules, and a few tufts of short setae are present on the line dividing the hepatic from the gastric area. The rostrum is fairly well developed and rounded off. It does not extend so far forward as do the lateral processes; each of the latter bears a small tooth in front.

The abdomen is of the usual form and is longer than the carapace. The telson is only slightly asymmetrical. Its posterior border is divided by a very deep and narrow indentation, and on each side of this there are three or four sharp teeth.

The eyestalks are short and thick, and are very much dilated distally. The cornea is large and deeply pigmented. The dorsal area encroaching on the cornea is shallow and broad. The ophthalmic scales are broad and rounded and are each furnished with a spine which is attached just below the tip. They bear fringes of short setae in front.

When fully extended the antennular peduncle is about twice as long as the eyestalks. The cornea does not quite reach the base of the third joint, which is longer than the first and second. It is considerably thickened near its distal end. The upper flagellum is very slightly longer than the third peduncular joint. The lower flagellum is about half as long as the upper.

The cornea reaches almost to the middle of the fifth joint of the antennal peduncle. The outer process on the second joint reaches the middle of the fourth. Its edges are entire. There is a sharp tooth at the inner anterior end of the second joint beside the base of the aecile, which is curved and tapering and reaches to or slightly beyond the end of the cornea. The third joint is best seen from below and bears a sharp tooth at its anterior end. The fourth joint is short, stout, and cylindrical. The fifth is as long as all the others together; it is compressed and slightly thickened distally. The flagellum is almost devoid of hairs and is about three times as long as the carapace. There are few setae on the peduncle except on the aecile.

The chelipeds are very unequal, the right being enormously larger than the left. In the female it is not developed to such an extent as in the male, but it is always markedly the larger of the two. In the male the right cheliped may be four times as long as the carapace. Its merus is short, slightly compressed in its upper part so as almost to form a ridge. The lower surface is flattened. There are a few sharp teeth on the outer edge of the lower surface towards the front. The outer surface is minutely granular, the granules becoming larger and rougher on the upper edge; the inner surface is almost smooth. At the anterior end of the upper edge there is a single small tooth directed forwards. The carpus is about as long as the palm of the propodite. On all sides it is minutely granular. The upper inner edge is marked by a row of strong teeth. The propodite is long and fairly broad, the palm longer than the fingers. It is covered with minute granules above and below. The outer edge is almost straight but may be slightly concave opposite the base of the dactyl. The fingers are acuminate without terminal claws. The upper surface of the palm is slightly arched from side to side. The outer edge is not sharp but rounded and in its proximal half is defined by a series of very minute points which fade away distally. The inner edge of the palm is slightly roughened but has no definite teeth. On the upper surface at the posterior end and nearer the inner than the outer edge there is a row of rounded prominences or tubercle. The cutting edges of the fingers are formed of rounded calcareous teeth.

The left cheliped is very small and slender compared with the right; it reaches to the base of the propodite of the latter. The merus is more strongly compressed than in the right. The carpus has a row of teeth on the inner upper edge and has also a second row of less distinct teeth on the upper outer edge. The hand is very narrow and the rounded tubercle is relatively larger than in the right. The fingers are about equal in length to the palm and end in yellow claws. Their cutting edges are lined with large numbers of fine transparent yellow spines which slope towards the tip.

The walking legs (second and third pereiopods) are long and laterally compressed. In the right walking leg of the first pair, the merus is long, its upper edge is rough and bears small bunches of setae and bristles; there are also a few of these present on the lower edge. The carpus is of the usual form and bears a row of from eight to eleven strong teeth on its upper surface. On the upper edge of the propodite there is a row of very minute points from which spring a few setae.
There are two or three small transparent spines at the lower distal end. The dactyl is longer than the propodite and is curved and slender. It ends in a sharp claw. There is a row of fairly stiff setae along its entire upper edge. On the inner surface and near the lower border there is a row of small groups of setae which all point distally and are closely pressed against the joint.

The other three walking legs are similar to that just described, except that the teeth on the carpus are rather less numerous and are not so well developed.

In the fourth peraeopods, which are of the usual form, the imbricate scaly area of the propodite is reduced to a single row of blunt teeth.

The fifth peraeopods are of the usual form found in the group.

In the male the left coxa of the fifth pair bears a long process issuing from the sexual opening. It is curved outwards in a semicircle and is slightly thicker than the fifth thoracic leg itself. It has the form of an almost closed tube, there being an open slit along the side next the body.

There are three unpaired pleopods on the left side in the male. The first two are biramous, with one of the branches almost vestigial. The third is uniramous. In the female there are four unpaired pleopods on the left. The first three are biramous, the fourth is feeble and single; it does not assist in the attachment of the ova.

The uropods are of the usual form.

Size. The carapace of the largest specimen taken by the *Helga* measures 8 mm.

**General Distribution.** It occurs in all British seas: Shetland and Hebrides (Norman), Firth of Forth (Scott), Northumberland (Meck), Aberdeen (Sim), Channel (Crawshay), Firth of Clyde (Patience). It occurs also around the Faeroes (Hansen), and along the coast of Norway as far as 62° 30’ N.L. (Sars, Ohlin). It has been recorded from the Skagerrak and Kattegat (Melnit, Stephenson). Southwards it extends through the Bay of Biscay (Kemp, Milne-Edwards and Bouvier), along the coasts of Spain (Milne-Edwards and Bouvier), into the Mediterranean: Toulon, Corsica (Milne-Edwards and Bouvier) off the west of Sicily (Senna). It extends along the west coast of northern Africa down to 17° 12’ N.L., and is also found at the Azores (Milne-Edwards and Bouvier).

**Vertical Distribution.** The species is found in depths ranging from three to three hundred fathoms. It appears to be commonest from about twenty to fifty fathoms.

**Irish Distribution.** The original types of the species were taken at Portaferry in Co. Down (Thompson). It has also been recorded from Dublin and Belfast (Kinahan), and Galway (Melville). The records of the *Helga* show that it occurs all round the Irish coast.

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**Helga**

*CXXXIX.*—11 ix '01.—40 mls. W.N.W. of Cleggan Head, 76½ fms., stones. Dredge.—One ovigerous ♀


W. 6.—23 vii '04.—7 mls. S. by W. of Teearlought Lk., 40-58 fms. Trawl. Temperature 81° C.—Ten (in *Epipezia* sp.).

A. 21.—8 vii '04.—4½ mls. E. by N. of Black Head, 10 fms., Dredge. Temperature 13-4° C.—One.

W. 14.—13 vii '04.—Dingle Bay, 31-38 fms., fine mud and sand. Trawl.—Six.


S. R. 145.—23 vii '04.—53° 24' 30" N., 11° 38' W., 112 fms., fine sand. Trawl.—One.


A. 98.—7 ii '05.—Mweelo Bay, 3 fms. Dredge.—One.


S. 265.—26 ii '05.—6½ mls. off Howth Head, 25 fms., sand and shells. Trawl.—One.


R. 8.—3 vii '05.—51° 17' 30" N., 6° 52' W., 40 fms., mud. Trawl. Temperature 8-9° C.—One.

R. 9.—3 vii '05.—17½ mls. S.W. ½ W. of Coningbeg LIGHTSHIP, 40 fms., fine sand. Trawl.—One.

R. 11.—4 vii '05.—7½ mls. off Mine Head, 31 fms., mud and sand. Trawl.—Three.


A. 124.—9 vii '05.—S. W. of 2nd buoy of Margaretta Shoal, 10 fms. Dredge. Temperature 12-8° C.—One.

S. 332.—25 xi '05.—2½ mls. S. of Rockabill, 17 fms., sand and shells. Trawl.—One.


S. 438.—27 vii '06.—3 mls. E. by N. of Balbriggan Light, 8-8½ fms., fine sand and shells. Trawl. Temperature 12-9° C.—One.

R. 24.—16 viii '06.—9½ mls. E.S.E. of Mine Head—28-29½ fms., coarse sand. Trawl.—One.

R. 25.—16 viii '06.—9 mls. E.S.E. of Helvick Head, 26-29 fms., sand and stones. Trawl.—One.
S. 509.—26 ii '07.—3 mls. E. by S. of Dalkey Tower, 16 fms., shells. Dredge.—Two.
S. 545.—13 viii '07.—4 mls. S.E. by E. of Cloagh Head, 16½–18½ fms., mud. Trawl.—Three.
S. 558.—24 vii '07.—21½ miles W.S.W. of Chicken Rock, Isle of Man, 39½–42 fms., mud, sand and shells. Trawl.—Six.
W. 136.—13 ii '10.—N. of Carrigeenmore, 3 fms., sand. Dredge.—One.
S. R. 1005.—12 viii '10.—51° 22' N., 11° 30' 30" W., 249 fms., fine sand. Dredge.—One.
W. 176.—17 ii '11.—51° 54' N., 10° 41' W., 58 fms., fine sand. Dredge. Temperature 9·1° C. One ovigerous♀.
S. R. 1153.—18 vii '11.—51° 4' 30" N., 8° 50' W., 60 fms., sand. Dredge.—One.
S. R. 1178.—22 vii '11.—51° 20' N., 11° 30' W., 212–229 fms., sand. Trawl.—One.
W. 244.—9 ii '12.—52° 3' 30" N., 10° 17' W., 25 fms., stones. Dredge.—Two.
S. R. 1358.—6 v '12.—59° 50' N., 4° 51' W., 45 fms., gravel and shells. Dredge.—Five.
S. R. 1444.—19 viii '12.—51° 56' N., 11° 28' W., 142 fms., sand. Dredge.—One.
W. 260.—19 viii '12.—52° 3' N., 10° 12' W., 19–20 fms., gravel. Dredge.—One.
S. R. 1446.—20 viii '12.—51° 56' 30" N., 10° 39' W., 54 fms., sand. Dredge.—One ovigerous♀.
W 264.—18 xi '12.—4½ mls. S. ½ E. of Dingle Lighthouse 22 fms., coarse sand and stones. Dredge.—One.
S. R. 1843.—21 vi '14.—51° 6' N., 11° 28' W., 249 fms., fine sand. Trawl.—One, 8 mm.

Anapagurus chiroacanthus (Lilljeborg).

Pagurus ferrugineus, Norman, 1861.
Anapagurus ferrugineus, Henderson, 1886 (a).
Anapagurus ferrugineus, Henderson, 1886 (b).
Anapagurus chiroacanthus, Bouvier, 1896 (b).
Anapagurus chiroacanthus, Lagerberg, 1908.

This species has not yet been found in the Irish marine area; it occurs however in English and Scottish waters. Unfortunately I have not seen a specimen, and the following account of the characters of this Pagurid is taken from Lagerberg's admirable paper on Swedish Decapoda (Sveriges Decapoda, 1908):—

"Carapace with a sparse covering of long hairs above. Ocular peduncles long and slender, the end of the corna reaching about as far forward as the tip of the scaphocerite. The latter is narrow, setiferous, and slightly curved. The flagellum of the outer antennae is sparsely setiferous. The chelipeds are of very unequal size, the right being the stronger; its chela is convex, oval in outline and smooth in the proximal part (always without spines), with a row of fine points along the curved outer margin; longer and broader than the carpus. On the upper surface there are two or less distinct longitudinal ridges running forwards, of which the outer, which is the feeble but longer of the two, extends from the junction with the carpus to the angle between the fingers; the inner, which is sharper but considerably shorter, is seen only near the end towards the carpal joint. The cutting edges of the fingers have teeth of unequal size. The tip of the daeyl is sharply bent. The carpus is long, with almost parallel edges, tapering slightly proximally. The inner edge is serrate. The merus is short with a U-shaped shallow depression on the inside. The underside is broad and thickly covered with long hair. The hand of the left cheliped is oblong, the carpus laterally compressed, spiny on the inner edge. The merus is short, the underside smooth and strongly setiferous. The two following pairs of pereiopods are long and slender, the second pair somewhat shorter than the third. The daetyls are slender, slightly curved, smooth on the lower edge, and not twisted. All the pereiopods are sparsely covered with long hairs. The abdomen is smooth, without hairs."

Size.—Lagerberg gives the length of the carapace as 5·5 mm.

General Distribution.—The species is confined to British and Scandinavian waters. Skagerak (Stephensen), Kattegat (Meinert), Sweden (Lagerberg), Hardangerfjord (Appellöf), Shetlands (Norman), Moray Firth (Henderson), Northumberland (Brady), Guernsey (Henderson), Firth of Clyde (Patience).

Vertical Distribution.—It is essentially a sub-littoral species, occurring in depths of about five to eighty fathoms.

Anapagurus Hyndmanni (Thompson).

Plate VIII, figs. 4–7.

Pagurus Hyndmanni, Thompson, 1843.
Pagurus Hyndmanni, Bell, 1853.
Anapagurus Hyndmanni, Henderson, 1886 (a).
Anapagurus Hyndmanni, Henderson, 1886 (b).
Anapagurus Hyndmanni, Bouvier, 1896 (b).

This species is smaller and more slightly built than A. laevis, from which it may be readily distinguished by the form of the
eyes, the antennules, and the large cheliped. Males appear to be very much commoner than females.

The rostrum is fairly prominent and is well rounded off. The lateral processes of the front are well developed and bear a small sharp tooth. The gastric area of the carapace is flatter than in A. laevis; the hepatic areas bear a few groups of short setae as in the latter species. The posterior part of the carapace, behind the cervical groove, which is very deep, bears many long setae.

The abdomen is well developed and of the usual form. The telson is similar to that of the species last described and bears four sharp teeth on either side of the recess in the posterior margin.

The ocellar peduncles are much longer and narrower than in A. laevis, and are slightly dilated at the distal end. The cornea is fairly large and is deeply pigmented. The encroachment of unpigmented surface on the dorsal part of the cornea is shallow and pointed. The ophthalmic scales are triangular, tapering to a narrow point in front. At the tip each bears a strong spine, which is inserted on the lower surface. The margins of the scales are furnished with setae. The ophthalmic segment is exposed between the scales. There are a very few small groups of setae on the upper and inner surfaces of the eyestalks.

The peduncles of the antennules are extremely long and slender. When fully extended they are about four times as long as the eyestalks. The third joint is much longer than the first and second combined. On the lower edge of the second and third joints there is a fringe of very long fairly stiff setae; these two joints are slightly compressed and expand at the distal end. The upper flagellum is of the usual form and is less than half as long as the third peduncular joint. The lower flagellum is about half as long as the upper. The first peduncular joint reaches almost to the tip of the cornea.

The tooth on the second joint of the antennal peduncle at the inner side of the base of the acicle is very prominent. The external process of the same joint is rather short, reaching only slightly beyond the base of the fourth joint. The acicle is slender and curved, and reaches the middle of the fifth joint; it bears tufts of long stiff setae on its inner side. There is a small tooth at the distal end of the third joint on the lower surface. All the peduncular joints are more or less setiferous. The flagellum, each joint of which bears several setae, is about three times as long as the carapace.

The right cheliped is longer than the left and is very much more massive. The merus resembles the same joint in A. laevis, but bears more numerous tufts of setae. There is an irregular row of teeth on the upper inner edge of the carpus, the surface of which is covered with minute granules. The hand is oval, the broadest point being at the base of the dactyl, and is very little longer than the carpus. The outer edge is bordered with small but distinct teeth which diminish in size towards the proximal end. There is a more irregular row of teeth on the inner edge of the palm; those on the dactyl are similar to the row on the outer margin. There are also a few teeth on the upper surface of the dactyl near its tip. The distal ends of the fingers are not furnished with claws. The outer edge of the hand becomes narrow and sharp in its distal half. The upper surface is slightly convex from side to side and from in front backwards and is covered with minute granules. On the edge of the dactyl and on the outer margin of the fixed finger there are a few groups of fine setae. These are also present in considerable numbers on the lower surface of the hand. The carpus is much longer than the palm of the propodite. The right cheliped is much smaller in the female.

The left cheliped is very slightly built compared to the right. It resembles the same appendage in A. laevis, except in the following points:—setae are present in larger numbers on all the joints; the teeth on the upper surface of the carpus are confined to the distal half of the joint; there is no rounded tubercle at the proximal end of the palm; on the inner margin of the palm there is an irregular line of blunt teeth.

In the first right walking leg, the lower edge of the merus bears a dense fringe of setae; there are fewer on the upper margin. There is a row of seven or eight teeth on the upper surface of the carpus. On the upper edge of the propodite there is a row of small scales, some of which bear a few hairs. The dactyl is slightly longer than the propodite and is gently curved. There is a row of small groups of hairs along the upper edge, and a similar row on the inner surface near the lower border. There is a third row on the middle of the outer surface. The joint ends in a strong claw.

In the second right walking leg the setae are less numerous on the merus, and there are only two teeth on the upper surface of the carpus near the distal end. The first left walking leg resembles the right of the same pair, except that there are only two teeth on the carpus.

The second left walking leg is similar to the second on the right side.

The fourth pereiopods are of the usual form. The scaly imbricate area is reduced to a single row of blunt teeth.

The fifth pereiopods are similar to those of A. laevis. The sexual tube in the male is perhaps a little longer and thinner.

There are three unpaired uniramous pleopods in the male. In the female there are four; the first three are biramous and serve for the attachment of the ova, the fourth is uniramous and takes no part in supporting them.

The uropods are of the usual form.

Size.—The carapace of the largest specimen taken by the Helga measures 7 mm.

General Distribution.—The species has a somewhat restricted range, being confined to the coasts of the United Kingdom
and France. It has been recorded from the Shetlands (Norman), the Firth of Forth (Scott), Northumberland and Durham (Norman and Brady), the Channel Islands (Sinel), the western part of the Channel (Crawshay), the Firth of Clyde (Patience) and Boulogne (Giard). It occurs along the whole of the French coast, from the southern part of the Bay of Biscay to Calais (Bouvier).

**Vertical Distribution.**—It is essentially a shallow water species having been taken only from between tide marks down to about thirty fathoms. It occurs most frequently in depths of from four to eight fathoms.

**Irish Distribution.**—It has been recorded from the following localities: Portaferry (Thompson), Belfast and Dublin (Kinnamon) and Galway (Melville). The records of the specimens taken by the *Helga* show that it occurs all round the Irish coasts.

*Helga.*


L. 180.—22 xi '02.—Off Coastguard Bay, 4-8 fms. Dredge.—One.

L. 310.—12 iii '04.—Coastguard Deep. 6-8 fms. Dredge.—One ovigerous, 4 mm.

L. 313.—15 iii '04.—33°35' N., 10°1' W., 3-5 fms. Dredge.—One.

A. 5.—1 vi '04.—½ ml. S. by E. of Mutton Island, 6 fms. Dredge.—One.

R. 21.—15 viii '06.—6½ mls. E.S.E. of Mine Head, 29 fms., sand Trawl. Temperature 10°-94° C.—Two.

S. 509.—26 ii '07.—3 mls. E. by S. of Dalkey Tower, 16 fms., sand. Dredge.—Several.

W. 98.—27 vii '09.—3–4 mls. E.S.E. of Clare Island Lighthouse, 15 fms. Dredge.—Three.

W. 100.—27 vii '09.—½ mls. E. by S. of Clare Island Lighthouse 19½ fms. Dredge.—Four.

W. 124.—18 ix '09.—Blacksod Bay, 4½ fms. Dredge.—Many, one ovigerous ½.

W. 126.—18 ix '09.—Blacksod Bay, 7-8 fms. Dredge.—Several.

W. 127.—18 ix '09.—Blacksod Bay, 8-9 fms. Dredge.—One.

W. 129.—10-15 iii '10.—Blacksod Bay, shore.—Six.

W. 131.—11 iii '10.—Blacksod Bay, shore.—Many.

W. 132.—12 iii '10.—Blacksod Bay, shore.—Many, Two ovigerous ½.

W. 133.—12 iii '10.—Blacksod Bay, 4 fms., Dredge.—Two, 5 mm.

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**Nematopagurus longicornis**, Milne-Edwards and Bouvier.

Plate VI, figs. 1–5.

**Nematopagurus longicornis**, Milne-Edwards and Bouvier, 1892.

**Nematopagurus longicornis**, Bouvier, 1896 (b).

**Nematopagurus longicornis**, Milne-Edwards and Bouvier, 1899.

**Nematopagurus longicornis**, Milne-Edwards and Bouvier, 1900.

The rostrum is rounded and does not project quite so far as the frontal lateral processes. The latter are blunt and each bears a small spine on the outer side. The carapace is rather feebly calcified, even on the gastric area, and is almost membranous behind the cervical groove. There is a slight sprinkling of hairs on the hepatic and branchial areas, and two or three tufts on the dorsal surface arranged in two lines, one behind each of the lateral frontal processes.

The abdomen is larger than the carapace, rather slender, and twisted spirally in the usual way. The telson is small only slightly asymmetrical, and gently concave posteriorly.

The eyestalks are stout and slightly dilated both at the
distal and the proximal end. The cornea is large and deeply pigmented; its posterior margin is slightly emarginate above. There are a few small groups of setae on the stalks. The ophthalmic scales are very small, widely separated and blunt. They are hollowed out on the upper surface and bear a spine, which is inserted just below, and slightly to the inside of the tip. The ophthalmic segment is exposed.

The cornea reaches the middle of the third joint of the antennular peduncle when the latter is fully extended. The third joint is considerably longer than either the first or second. The upper flagellum is unusually long and thin; it is much longer than the third peduncular joint.

The cornea reaches the middle of the fifth joint of the antennal peduncle. The external process of the second joint of the peduncle is massive and pointed; it bears a few teeth on its upper edge, and reaches to the middle of the fourth joint. The acicle is large and strong, and extends just beyond the tip of the fifth joint. There is a small tooth at the inner side of the base of the acicle. The third joint, which is hardly seen from above, has a small sharp tooth at its distal end. The fourth joint is short, thick and practically cylindrical. The fifth joint is more than twice as long as the fourth and is laterally compressed; it is slightly dilated towards the distal end. The flagellum is nearly three times as long as the carapace.

The right cheliped is much larger and more massive than the left. The merus is laterally compressed and its surface is covered with low, broad scales fringed with hairs. The upper and outer surfaces of the carapace are flattened. The inner edge of the upper surface is marked by a row of about twelve or fourteen strong teeth; on the outer edge of the upper surface there is a similar row but it is composed of smaller teeth. There are many low scales on the flanks of the joint but hardly any on the dorsal surface. The propodite and dactyl form a narrow oval. The palm is a little shorter than the carpus and considerably longer than the fingers, which end in small yellow claws. A low median ridge, made up of rough tubercles, begins at the proximal end of the propodite but it dies out about half way to the base of the fingers. The outer margin of the hand is well defined and is entire. The inner margin of the palm bears a row of teeth, which decrease in size distally and die out before reaching the base of the dactyl. The margin of the latter is rounded and entire. The upper surface of the hand is smooth and bears only a very sparse sprinkling of hairs.

The left cheliped is smaller than the right but not so markedly so as in most species of Eupagurus. Each joint is narrower than in the right cheliped, otherwise the structure is much the same. The teeth of the carpus and the ridges are more accentuated and the setae are more plentiful than on the right. The fingers are equal in length to the palm. Both margins of the hand are entire. The cutting edges of the fingers are furnished with chitinous spines.

The first pair of walking legs (second peripods) are slightly shorter than the second pair.

In the first right walking leg the merus is laterally compressed, and bears rough scales on both upper and lower edges; these are fringed with long setae. The carpus bears similar scales on the upper edge, and a single spine at the upper distal extremity. There are scales on the upper and lower margins of the propodite and these also bear short setae. There are two short spines at the lower distal end of the joint. The dactyl is slightly curved and is longer than the propodite. It ends in a sharp transparent claw. On the lower edge there are about fifteen slender transparent spines, increasing slightly in size distally. On the upper edge there is an equal number of much smaller spines, and from the base of each of these there springs a single long hair. In addition to this there is a row of about ten or twelve spines on the inner surface, nearer the upper than the lower edge. These also have a few setae about their bases. Finally there is a row of bunches of setae on the inner surface near the lower edge.

The first left walking leg is generally similar to that just described, but the spines composing the rows on the inner surface of the dactyl and near the upper edge are not so numerous.

In the second right walking leg the teeth on the upper edge of the dactyl are larger, and the spines on the lower edge are rather more numerous, being about twenty in number.

The second left walking leg is similar to the second right.

The fourth peripods are of the usual form, small, compressed, setiferous and imperfectly chelate. The imbricate scale area of the propodite is reduced to a single row of yellow chitinous teeth.

The fifth peripods are about as long as the fourth pair, and end in minute chelae. There is a broad imbricate area on the upper surface of the propodite.

In the male there are three unpaired pleopods on the left side of the abdomen; in the female there are four unpaired and on the first segment one pair of sexually modified pleopods.

The uropods are of the usual form.

The structure of the coxae of the fifth peripods in the male is very peculiar and is characteristic of the genus. From the right coxa there issues a long tube, which is broad at its base but rapidly narrows and ends in a long slender lash. From the left coxa a process also protrudes, but it is quite short, barely reaching the coxa of the opposite side, towards which it is directed. It is broad at the base and tapers rapidly to a narrow point. The long lash of the right coxal process is turned backwards towards the abdomen. I have not seen a female specimen of this species, and the following account is taken from the description by Milne-Edwards and Bouvier (1900):—

"The paired sexual appendages of the female are sepa-
rate at the base, are composed of two joints, and are pressed against the last thoracic sternum. The unpaired pleopods are four in number, the three anterior ones alone serving for the attachment of the ova as usual. The inner or posterior branch remains free; it is broader and much shorter than the anterior branch. Both sexual openings are present in the female."

**Size.**—The length of the carapace in the single Irish specimen is 7.5 mm.

**General Distribution.**—The species has been recorded by Milne-Edwards and Bouvier from the north coast of Spain, the Atlantic coasts of Spain and Portugal, near Toulon, the west coast of Morocco and the Sudan down to the Cape Verde Is. and the Azores. The specimen taken by the Helga off the west of Ireland extends the known distribution of the species nearly ten degrees to the north.

**Vertical Distribution.**—The depths at which the species has been taken range from 57 to 438 fms.

**Irish Distribution.**—The Helga has taken only a single specimen, the first to be found in British waters.

**Helga.**—


**FAMILY LITHODIDAE.**

**Genus Lithodes, Latreille**

**Lithodes maia (Linn.)**

Plate IX, figs. 1-4.

**Lithodes Maia, Bell, 1853.**

**Lithodes arctica, Bouvier, 1895.**

**Lithodes Maja, Bouvier, 1896 (a).**

**Lithodes maia, Lagerberg, 1908.**

**Lithodes Maja, Hansen, 1908.**

**Lithodes Maja, Stephensen, 1913.**

In general aspect this species is crab-like. It does not live in a shell like the species of Paguridae described above, though the structure of the abdomen and pleopods in the female clearly indicate that it has been evolved from similar asymmetrical stock.

The carapace is pear-shaped or obovate. The rostrum is produced into a long process ending in a bifid point and bearing a number of other spines. On the upper surface, near the middle, there is a pair of large spines, projecting upwards and forwards, and a pair of smaller spines near the base. Between or slightly in advance of the latter there are one, less commonly two, small or medium-sized unpaired spines. On the under surface near the base there is a single large curved spine, projecting between the eyes.

The regions of the carapace are well-marked. The gastric area is large and arched and is separated by the cervical groove from the similarly arched anterior part of the cardiac area. The *linea anomurica* is distinct. The dorsal surface of the carapace bears a large number of strong spines, which spring from broad bases and taper rapidly to sharp points. The posterior margin is straight, slightly arched in the middle. It is bordered by a row of spines which are as large as or larger than those on the dorsal surface. The spines are continued along the lateral margins and increase in size from behind forwards. They reach their greatest development on the antero-lateral edges, where four or five are frequently very large, and end in a medium-sized spine limiting the outer angle of the orbital notch.

The second abdominal segment is fused to the first and consists of one piece, not of three or five, as in some nearly allied species. These segments together form a solid strongly calcified plate, which, in the natural position, is practically vertical, lying in a plane at right angles to the dorsal surface of the carapace and to the posterior segments of the abdomen. The plate bears a number of spines which are roughly arranged in three rows. In the first row there are only two spines lying in the centre. The second and third rows mark the positions of the first and second abdominal segments and in these the spines tend to be largest in the middle.

The remaining part of the abdomen is pressed closely against the very broad sternum, as in the Brachyura. The third, fourth and fifth segments are each represented by a pair of plates, roughly oval in shape, which slope outwards and towards the telson. The plates do not meet in the centre, but are separated by a triangular area of soft skin, thickly studded with round calcified tuberces. Outside the large paired plates of the third, fourth and fifth segments there is on each side in the male (in the female only on the right side) a row of small marginal plates. These and also the large plates bear numerous broad-based spines. The sixth segment is represented by a single central plate of about the same size as the lateral ones of the three preceding segments. Beyond it is the short rounded telson.

In the female the posterior part of the abdomen is markedly asymmetrical. The plates of the third, fourth and fifth segments are much larger on the left than on the right and, as stated above, the row of small marginal plates is absent on the left.

1 Bouvier (1895) refers to this spine as "le rostre" and calls the rest of the structure "la saillie dorsale du rostre."
The eyes are placed close together beneath the rostrum; they are short, much dilated at the base and slightly so at the distal end. The cornea is deeply pigmented and on its dorsal surface exhibits a deep, rounded emargination. The portion of the stalk, extending into this emargination, bears a small terminal spine. There are also small tubercles on the upper surface of the stalk.

The antennules are short, inserted below the eyes and slightly external to them. The first joint is thick, the other two cylindrical and slender. The third is longer than the second and slightly shorter than the first. When fully extended the first joint just reaches the end of the cornea. The upper flagellum is very slightly longer than the third joint; the lower flagellum is unusually long.

The antennal peduncle is slightly shorter than that of the antennules and is inserted immediately below it. The second joint has a long, massive, sharply-pointed external process which reaches the base of the fifth joint. There is a rudimentary acicle, a small, rounded, movable body. The third, fourth, and fifth joints are of the usual form. The flagellum is about one and a half times the length of the rostrum.

The chelifeds are more or less equal in length, but that of one side (either right or left) is more massive than the other. In the larger limb the ischium is short, with a few spines beneath. The merus is long with numerous spines; those on the lower border are small, while two, placed on the inner side near the distal end, are specially large. The carpus is shorter and thicker than the merus; it has two very large spines on the inner side and numerous others on the upper surface; on the lower surface there is only one spine of any size. The propodite is large and massive, almost or quite as long as the carpus and merus combined. The upper surface is convex, with the palm slightly longer than the fingers. On the middle of the upper surface of the palm there is an irregular double row of rather short broad-based spines and there are similar spines scattered irregularly over the outer surface. The fingers are massive, with spatulate tips. The under surface of each finger is hollowed out, so that the cutting edge, which bears large rounded calcareous teeth, is much narrower than the outer edge. Both fingers bear numerous tufts of dark setae, most numerous near the cutting edge and towards the tip; there is a spine on the outer edge of the dactyl near the base.

The smaller cheliped bears a general similarity to the larger, but the joints are more slender, especially the propodite which is also proportionately shorter. The irregular double row of spines on the upper surface of the palm is rather indistinct and the fingers are slightly longer than the palm.

The first three pairs of walking legs are similar; all are longer than the chelifeds. The ischium is very short, with one or two spines on the lower surface. The merus is long, compressed above and triangular in transverse section. There are rows of large spines on the upper and posterior edges and another row of smaller spines on the inferior edge. Except on the inner side there are scattered spines on the surfaces. The carpus is short, with large spines above and almost smooth below. The propodite is compressed and not quite so long as the merus; it bears spines on the upper, outer and lower surfaces. The dactyl is curved and about two-thirds the length of the propodite, ending in a sharp dark claw. On the lower edge there is a row of about seven slender transparent spines, sloping towards the terminal claw, and in the proximal two-thirds of the upper edge a row of four or five low calcareous teeth. On the outer side, near the base, there is a single strong tooth, and a similar tooth slightly further forward on the inner surface. There are a few very small bunches of setae near the lower edge.

The legs of the last pair are very small and slender, and are usually carried folded out of sight inside the branchial chamber. Each ends in a minute chela, with broad flat fingers, which appears admirably suited to the work of keeping the gills clean.

There are no pleopods in the male. In the female they are present on the left side only; they are uniramous and are found on the second, third, fourth, and fifth segments. Uropods are completely absent in both sexes.

Size.—The extreme length of the carapace, spines included, is at least 145 mm. in large specimens.

General Distribution.—*Lithodes maia* occurs along the whole length of the Norwegian coast, round the North Cape to Varanger Fjord (Sars) and the south-western shores of the Murman Sea, but not in the White Sea. One specimen is recorded from Spitzbergen (Doflein) and one from the S. W. of Bear Island, 74° 25' N., 17° 36' E. (Birula). It is known from Denmark Strait, S. of Iceland, and from the Faeroes (Hansen), is common on the east coast of Scotland, and is found off Northumberland (Meek) and Yorkshire (Leach). It is recorded from the Skagerak and Kattegat (Stephensen, Björek), from Bohuslan in Sweden (Goex), Denmark (Meinert) and as far south as Holland (Hoeck) and Belgium (van Beneden). It is abundant on the west coast of Scotland, in the Shetlands and Orkneys and has been found at the Isle of Man (Bell). The species is also known from W. Greenland (Stephensen), Davis Straits (Hansen) and from Nova Scotia, the Gulf of Maine and as far south as 40° 3' N. on the American coast (Smith). It is not found in water with temperature below zero.

Vertical Distribution.—The species appears to live mainly in waters of moderate depth, but has been found in 289 fms. in the Davis Straits and at 291 fms. on the east coast of America.

Irish Distribution.—Bell (1853) mentions a specimen "in the Museum of T.C.D., recorded to have been taken on the coast of the county Wexford." The only specimen taken by
the *Helga* consists of partially digested remains found in the stomach of a fish obtained on the Porcupine Bank.

*Helga.*

LXXVII.—29 vi ’01.—124 mls. W. by N. 3/4 N. of Cleggan Head, 53° 24′ 30″ N., 13° 36′ W., 91 fms. In stomach of fish.—One, about 47 mm.

The species is very abundant in the Firth of Clyde and may thus be expected to occur on the north-east coast of Ireland.

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**EXPLANATION OF PLATES I-IX.**

**PLATE I.**

_Eupagurus bernhardus_ (Linn.)

Fig. 1.—Front of carapace, ×4.
Fig. 2.—Right chela, ×4.
Fig. 3.—Dactyl of second peraeopod, ×4.7.
Fig. 4.—Fourth peraeopod, ×4.
Fig. 5.—Fifth peraeopod, ×4.
Fig. 6.—Mandible, ×3.3.
Fig. 7.—First maxilla, ×2.7.
Fig. 8.—Second maxilla, ×3.3.
Fig. 9.—First maxillipede, ×3.3.
Fig. 10.—Second maxillipede, ×3.3.
Fig. 11.—Third maxillipede, ×2.7.

**PLATE II.**

_Eupagurus Pridiaxii_ (Leach).

Fig. 1.—Front of carapace, ×4.
Fig. 2.—Right chela, ×4.
Fig. 3.—Dactyl of walking leg, ×2.7.

_Eupagurus pubescens_ (Kröyer).

Fig. 4.—Front of carapace, ×4.
Fig. 5.—Right chela, ×4.
Fig. 6.—Left cheliped, ×4.
Fig. 7.—Walking leg, ×4.

**PLATE III.**

_Eupagurus carneus_ (Pocock).

Fig. 1.—Front of carapace, ×4.
Fig. 2.—Right chela, ×4.
Fig. 3.—Left chela, ×4.
Fig. 4.—Antennule, ×ca.10.
Fig. 5.—Antennal peduncle, ×ca. 8.
Fig. 6.—Second peraeopod, from inside, ×4.
Fig. 7.—Third peraeopod, from inside, ×4.
Fig. 8.—Fourth peraeopod, ×8.

**PLATE IV.**

_Eupagurus cuanensis_ (Thompson).

Fig. 1.—Front of carapace, ×4.
Fig. 2.—Right chela, ×4.
Fig. 3.—Second right peraeopod, ×4.

_Eupagurus variabilis_ (M.-E. & B).

Fig. 4.—Right chela (excavate type) ×4.
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**PLATE V.**

_Eupagurus variabilis_ (M.-E. & B.).

Fig. 1.—Front of carapace, ×4.
Fig. 2.—Left chela, ×4.
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Eupagurus sculptimanus (Lucas).
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Fig. 5.—Right chela, ×4.
Fig. 6.—Left cheliped, ×4.
Fig. 7.—Second right pereiopod, ×4.
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Plate VI.
Nematopagurus longicornis, M.-E. & B.
Fig. 1.—Front of carapace, ×4·3.
Fig. 2.—Right cheliped, ×4·3.
Fig. 3.—Left cheliped, ×4·3.
Fig. 4.—Second right pereiopod, ×4·3.
Fig. 5.—Coxae of fifth pereiopods of male, ×8.

Diogenes pugilator (Roux).
Fig. 6.—Front of carapace, ×4·3.
Fig. 7.—Right cheliped, ×4·3.
Fig. 8.—Left cheliped, ×4·3.
Fig. 9.—Second right pereiopod, ×4·3.

Plate VII.
Parapagurus pilosimanus, Smith.
Fig. 1.—Front of carapace, ×4·3.
Fig. 2.—Right cheliped, ×4·3.
Fig. 3.—Left cheliped, ×4·3.
Fig. 4.—Third right pereiopod, ×4·3.
Fig. 5.—First pleopod of male, ×9·3.
Fig. 6.—Second pleopod of male, ×6·7.

Anapagurus laevis (Thompson).
Fig. 7.—Right cheliped of male, ×4·3.
Fig. 8.—Left cheliped, ×4·3.
Fig. 9.—Coxae of fifth pereiopods of male, ×4·3.

Plate VIII.
Anapagurus hydmanii (Thompson).
Fig. 1.—Front of carapace, ×6·3.
Fig. 2.—Walking leg, ×4·3.
Fig. 3.—Telson, ×6·5.

Anapagurus laevis (Thompson).
Fig. 4.—Front of carapace, ×6·3.
Fig. 5.—Right cheliped, ×4·3.
Fig. 6.—Left cheliped, ×6·5.
Fig. 7.—Second right pereiopod, ×6·5.

Plate IX.
Lithodes maia (Linn.).
Fig. 1.—Male, dorsal view, ×0·4.
Fig. 2.—Male, lateral view of front of carapace, ×0·4.
Fig. 3.—Male, abdomen, ×0·4.
Fig. 4.—Female, abdomen, ×0·4.

C.M.S. del.
Eupagurus Bernhardus.
Figs. 1-3.—Eupagurus Prideauxi.
Figs. 4-7.—Eupagurus pubescens.

C.M.S. del.
Eupagurus carneus.
Figs. 1–3.—Eupagurus cuanensis.
Figs. 4, 5.—Eupagurus variabilis.
Figs. 1-3.—Eupagurus variabilis.
Figs. 4-8.—Eupagurus sculptimanus.
Figs. 1–5.—Nematopagurus longicornis.
Figs. 6–9.—Diogenes pugilator.
Figs. 1-6.—Parapagurus pilosimanus.
Figs. 7-9.—Anapagurus laevis.
Figs. 1-3.—Anapagurus laevis.
Figs. 4-7.—Anapagurus Hyndmanni.
Lithodes maia.

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