PART I.

Palinura, Astacura, and Anomura (except Paguridea).

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Plates I–XV.

Introduction.

The present paper is a continuation of the account of the Irish Decapoda, begun by Mr. Stanley Kemp in "The Decapoda Natantia of the Coasts of Ireland" (*Fisheries, Ireland, Sci. Invest.*, 1908, *I.* [1910]), and I have tried to keep the scope of the work as nearly as possible the same, that is to say, every species discovered since the appearance of Bell's "British Stalk-eyed Crustacea" in 1853 has been described and figured. This paper includes the whole of the Palinura, Astacura, and Anomura, with the exception of the Paguridea. The latter will be dealt with in the next part, and a third paper will complete the account of the Reptantia with the Brachyura.

The classification adopted is that drawn up by Borradaile (1907), as slightly altered by Calman in the volume "Crustacea," in Lankester's "Treatise on Zoology."

The material on which the following account is based was nearly all taken by the Irish Fishery cruiser *Helga* since the year 1900. A few specimens taken within the Irish marine area by the Danish Fishery steamer *Thor* are also included. In the collection there are representatives of thirty-one species, four of which are new to science, eleven new to the British, and sixteen to the Irish marine fauna. The following is a list of those new to the Irish area in which those which are also new to British waters are marked with an asterisk :—

**Polycheles typhlops.*
**Polycheles sculptus.*
**Polycheles nanus.*
**Polycheles granulatus.*
**Eryonicus Faxoni.*
Nephropsis atlantica.
**Uroptychus rubrovittatus.*
**Uroptychus nitidus*, var. *concolor.*
**Gastroptychus formosus.*
Munida tenuimana.
**Munidopsis tridentata.*
**Munidopsis curvirostra.*
Axius stirhynchus.
**Jaxea nocturna.*
Callianassa Stebbingi.
Upogebia deltaura.

south-west coast. *Jaxea nocturna*, however, was found in the Irish Sea between the Isle of Man and the coast of Co. Louth. It is a species found commonly in the northern part of the Adriatic, and only very rarely in other parts of the Mediterranean. The single specimen which was taken by the *Helga* in 1905 was the first adult individual to be found outside the Mediterranean. Since then another full-grown *Jaxea* has been found in British waters; it was taken by the Scottish Fishery Board steamer *Goldseeker* in Loch Fyne in 1908. The discovery of *Jaxea* within the British marine area has long been expected, as the peculiar *Trachelifer* larval form has been taken on many occasions in the Irish Sea, and on the west coast of Ireland and Scotland.

Three of the other species new to the Irish fauna, *Axius stirhynchus*, *Callianassa Stebbingi*, and *Upogebia deltaura*, are littoral and shallow water forms with a burrowing habit. It is probably this latter fact which has prevented their being included in earlier lists of Irish Decapoda. With the exception of these few forms the remainder of the species in the foregoing list were found in deep water off the west and south-west coasts.

The feature of the collection is the large number of specimens included in it belonging to the family Eryonidae, of which no examples had hitherto been taken within the British marine area. Four species of *Polycheles* and four of *Eryonicus* have been captured, three of the latter, *E. hibernicus*, *E. Scharffi*, and *E. Kempi*, being new to science. Perhaps the most interesting specimen in the whole collection is a very young *Eryonicus*, only 7 mm. long, in which only the first two pairs of pereiopods are developed, the rostrum has the form of a long median spine, and the abdomen is very small. The most striking fact, however, is the presence of exopodites on the pereiopods and on the second and third maxillipedes. The specimen is, in fact, an *Eryonicus* in the *Mysis* stage of development.

Eryonicus differs from all the other species described in this paper in being a free-swimming form; all the others are true bottom-living forms.

There is also a new species of *Palinurus* in the collection. It is closely allied to the common species, *P. vulgaris*, and also to a South African species, *P. Gilchristi*. In many respects it is intermediate between these two forms, but I consider that its characters are sufficiently distinctive to give it specific rank. Eventually it may have to be reduced to a variety of *P. vulgaris*, on evidence based on the examination of a large number of specimens.

By far the greater part of the material was taken in the beam trawl, or in mosquito and sprat nets attached to the trawl as described in the introduction to Mr. Kemp's paper. The specimens of *Eryonicus* were nearly all taken in the midwater otter trawl, but in one or two instances they were found in

Except in the case of very common species the actual records are given. The depths represent the soundings taken at the beginning and end of each haul, and the mean between these is to be regarded as the approximate depth at which the specimen was taken. Except in a few cases references are given only to the principal papers dealing with each species. Measurements of all specimens were taken from the tip of the rostrum to the end of the telson, when the abdomen is straightened out in macrurous fashion.

The following species are practically confined to the littoral and laminarian zones, that is, done to about twenty fathoms :—

Porcellana longicornis.
Porcellana platycheles.
Axius stirhynchus.
Callianassa Stebbingi.
Upogebia deltaura.

The following are also found in these zones, but they extend into deeper water as well :—

Palinurus vulgaris.
Homarus vulgaris.
Galathea intermedia.
Galathea squamifera.
Galathea nexa.
Galathea strigosa.

The species in the following list are all genuine deep-sea forms :—

Polycheles typhlops.
Polycheles sculptus.
Polycheles nanus.
Polycheles granulatus.
Nephropsis atlantica.
Uroptychus rubrovittatus.
Uroptychus nitidus, var. *concolor.*
Gastroptychus formosus.
Munida tenuimana.
Munidopsis tridentata.
Munidopsis curvirostra.

The various species of *Polycheles* are nearly always found on a bottom of ooze. *Uroptychus nitidus* var. *voncolor* and *Munidopsis tridentata* are usually found clinging to pieces of *Lophelia prolifera.*

The Reptantia treated of here include three species of great economic importance, *Homarus vulgaris*, *Palinurus vulgaris*, and *Nephrops norvegicus.* The Irish Lobster fishery is of increasing importance, as may be seen by the figures given on page 54. The number caught annually has increased steadily since 1903, with the exception of the years 1906 and 1910, and in 1912 the total reached more than half a million for the first time. By far the greatest numbers come from the west

as follows :—

West coast	..	..	42·3%
South coast	..	..	25·9%
North coast	..	..	17·1%
East coast	..	..	14·6%

There is practically no fishery of *Palinurus vulgaris* in Ireland. It does not occur in anything like the same numbers as the Lobster, and it is not held in great estimation as an article of food in this country, whereas on the Continent it is greatly prized and preferred by many to the Lobster itself.*

Nephrops norvegicus, usually known in Ireland as the "prawn," occurs in immense numbers in the northern part of the Irish Sea, especially between the Isle of Man and the coast of Louth and Down. It is from this district that the greatest numbers are brought in by the trawlers.

Many of the Reptantia described in this paper are of importance as a source of food supply for fish of commercial value. Off the south of Iceland *Nephrops norvegicus* occurs in such large numbers that it forms the chief food of the cod. Some of the burrowing species such as *Callianassa Stebbingi*, *Axius stirhynchus*, and *Upogebia deltaura* are much more frequently found in the stomach of bottom-living fishes than taken in the trawl.

MONTHS in which ovigerous females were taken.

	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Polycheles typhlops	....	....	....	....	....	....	....	x				
Polycheles nanus	....	....	....	....	x							
Nephrops norvegicus	x	x	....	....	....	x	....	x	....	x	x	
Nephropsis atlantica	....	x	....	....	....	....	....	x				
Uroptychus nitidus, *var.* concolor.	....	....	....	....	....	....	....	....	x			
Galathea intermedia	....	....	x	....	x	....	....	x	x			
Galathea nexa	x	x	x	x	x	....	x					
Galathea strigosa	....	....	....	x								
Munida bamffica	....	x										
Munida tenuimana	....	....	....	....	....	....	....	x				
Munidopsis curvivostra	....	....	....	....	x							
Porcellana longicornis	....	....	....	x								
Axius stirhynchus	....	x										
Calocaris Macandreae	....	....	....	....	....	....	....	x	....	x		
Jaxea nocturna	....	x										

* See pp. 42, 43.

may be found in the ovigerous condition at any time of the year, is not included.

The next table shows the distribution of those species which are found outside the Atlantic.

The third table shows the Atlantic distribution of each species. It will be seen that nine extend northwards beyond the Arctic Circle, and eighteen are found as far south as the Mediterranean.

A list of the papers to which references are given will be found at page **105**, and an index to the genera and species at page **111**.

I am glad to have this opportunity of expressing my indebtedness to Dr. Calman for his courtesy and patience in replying to my numerous inquiries, and also to the Rev. T. R. R. Stebbing, Dr. Allen of the Marine Biological Association, Dr. H. J. Hansen and Dr. Lundbeck of Copenhagen, and Prof. Steuer of Innsbruck, for the loan of specimens.

EXTRA-ATLANTIC DISTRIBUTION.

	Red Sea	Arabian Sea	Ceylon	Bay of Bengal and Andaman Sea	New Zealand	West Coast of America: San Diego to Ecuador
Polycheles typhlops	....	x	....	x		
Polycheles sculptus	....	x	....	....	....	x
Polycheles nanus	....	....	....	....	....	x
Polycheles granulatus	....	....	x	....	....	x
Nephropsis atlantica	....	x				
Uroptychus nitidus *var.* concolor	....	x	....	x		
Galathea strigosa	?					
Munidopsis tridentata	....	x	x	x		
Calocaris Macandreae	....	?	?	....	?	

	West Coast of Ireland	South Coast of Ireland	Irish Sea	South Coast of England	East Coast of England	East Coast of Scotland	W. and N. Coast of Scotland and Shetlands	East Coast of North America
1. Polycheles typhlops	x							
2. Polycheles sculptus	x	....	....	....	....	....	....	x
3. Polycheles nanus	x	x	x	x	x	x	x	x
4. Polycheles granulatus	x							
5. Eryonicus Faxoni	x							
6. Eryonicus hibernicus	x							
7. Eryonicus Kempi	x							
8. Eryonicus Scharffi	x							
9. Palinurus vulgaris	x	x	x	x	x	....	x	
10. Palinurus Thomsoni	x							
11. Nephrops norvegicus	x	x	x	x	x	x	x	
12. Nephropsis atlantica	x	....	....	....	....	....	x	
13. Homarus vulgaris	x	x	x	x	x	x	x	
14. Uroptychus rubrovittatus	x							
15. Uroptychus nitidus, *var.* concolor	x							
16. Gastroptychus formosus	x							
17. Galathea intermedia	x	x	x	x	x	x	x	
18. Galathea squamifera	x	x	x	x	x	x	x	
19. Galathea strigosa	x	x	x	x	x	x	x	
20. Galathea nexa	x	x	x	x	x	x	x	
21. Munida bamffica	x	x	x	x	x	x	x	
22. Munida tenuimana	x							
23. Munidopsis tridentata	x							
24. Munidopsis curvirostra	x	....	....	....	....	....	....	x
25. Porcellana platycheles	x	x	x	x	x	x	x	
26. Porcellana longicornis	x	x	x	x	x	x	x	
27. Axius stirhynchus	x	....	x	x				
28. Calocaris Macandreae	x	....	x	x	x	x	x	x
29. Jaxea nocturna	....	....	x	....	....	....	x	
30. Callianassa Stebbingi	x	....	x	x	....	x		
31. Upogebia deltäura	x	x	....	x	....	x		
32. Upogebia stellata	....	....	....	x	x	x		

DISTRIBUTION.

	West Greenland	Iceland	Coasts of Norway North of Arctic Circle	Coasts of Norway South of Arctic Circle	Sweden	Denmark	Bay of Biscay	Coasts of Spain and Portugal	Mediterranean	Black Sea	West Coast of Morocco and Sudan	Azores	Canaries	Cape Verde Islands and Senegambia	South and South West Africa	West Indies
1.	....	....	....	....	....	....	x	x	x	....	....	x	x	x	....	x
2.	....	....	....	....	....	....	x	....	x	....	....	....	....	....	x	x
3.	x	x	....	....	....	....	x	....	....	....	....	....	....	....	x	
4.	....	....	....	....	....	....	....	x	....	....	....	x	x	x	?	
5.	....	....	....	....	....	....	....	....	x	....	x					
6.																
7.																
8.																
9.	....	....	....	?	....	x	x	x	x	....	x	....	x			
10.																
11.	....	x	x	x	x	x	x	x	x							
12.	....	....	....	....	....	....	x	....	....	....	....	....	....	....	x	
13.	....	....	x	x	x	x	x	x	x							
14.	....	x	....	....	....	....	x	x	....	....	x	x	x	x		
15.	....	x	....	....	....	....	x	x	....	....	x	x	x	x	x	
16.	....	....	....	....	....	....	x	x	....	....	....	....	x			
17.	....	....	x	x	x	x	x	x	x	....	....	x	x			
18.	....	....	x	x	x	x	x	x	x	....	....	x	x	x		
19.	....	....	x	x	x	x	x	x	x	....	....	x				
20.	....	....	x	x	x	x	x	x	x	....	....	x	x			
21.	....	x	x	x	x	x	x	....	x	....	x	....	x	x		
22.	x	x	x	x	....	x										
23.	....	....	x	x	....	....	x	x	....	....	x	x	x	x		
24.	x	x	....	....	....	....	....	....	....	....	x					
25.	....	....	....	....	....	....	x	x	x	....	....	....	x			
26.	....	....	....	x	x	x	x	x	x	x	....	....	x			
27.	....	....	....	....	....	....	x	....	x							
28.	....	x	....	x	x	x	....	....	x							
29.	....	....	....	....	....	....	....	....	x							
30.	....	....	....	....	....	....	x	....	x	x						
31.	....	....	....	....	....	x	....	....	x							
32.	....	....	....	x	x	x										

less important from an economic point of view than *Palinurus vulgaris*, the "Langouste." Its range is not bounded eastwards by the Adriatic as stated by Herrick (1911), as it extends into the Aegean (see Calman and D'Arcy Thompson, *Nature*, 1911).

Irish Distribution.—The Lobster is found on all the coasts of Ireland, and is the basis of a fishery which is growing in value and importance, as may be seen from the tables given below. In 1912 the total catch was more than half a million for the first time. The figures for England and Wales, and for Scotland, are given below in parallel columns for comparison. The greatest numbers are landed on the west and south coasts.

In the last half-century an extensive literature on the lobster has grown up, and experiments have been carried out in many countries with a view to devising some practical method of lobster-culture, which would counteract the serious depletion of the supply which has been brought about by over-fishing. I have thought it useful to give here references to a few of the most important papers dealing with the lobster and its fisheries.

1888, Ewart and Fulton; 1894, Ehrenbaum; 1895, E. J. Allen; 1896, E. J. Allen; 1896, F. H. Herrick; 1909, Appellöf; 1911, F. H. Herrick.

The most complete account of the European lobster is to be found in the paper by Appellöf (1909). Herrick's splendid monograph (1911) gives a most exhaustive and detailed account of the structure, relationship, habits, development, and fisheries of the American lobster; it also includes a large amount of information on the European species, and contains an almost complete bibliography of the literature of both.

NUMBER AND VALUE OF LOBSTERS LANDED IN IRELAND, ENGLAND AND WALES, AND SCOTLAND FROM 1900 TO 1912.

	Ireland		England and Wales		Scotland	
	Number	Value	Number	Value	Number	Value
		£		£		£
1900	285,821	8,321	654,152	28,590	672,093	31,609
1901	244,854	7,351	650,491	28,735	790,310	36,621
1902	193,820	6,585	648,736	29,403	789,554	37,329
1903	176,656	6,120	549,351	25,431	1,195,788	34,568
1904	190,902	6,452	*546,001	*25,566	*747,121	*35,736
1905	234,592	7,362	585,789	26,712	1,239,317	36,320
1906	196,502	6,733	520,657	25,256	828,252	35,966
1907	323,030	10,088	495,781	23,802	725,421	35,505
1908	374,185	11,883	512,478	24,377	685,371	33,920
1909	420,830	11,361	546,823	26,288	688,526	33,688
1910	324,585	12,499	533,008	25,435	688,856	34,795
1911	493,465	16,722	570,272	27,436	640,797	32,091
1912	508,986	17,490	640,860	30,576	624,703	32,173

* Eleven months only.

Tribe GALATHEIDEA.

The three families having representatives in Irish waters may be separated as follows :—

A.—Posterior half of abdomen bent under the first, but telson not tucked under last segment ; telson broad, made up of separate plates suggestive of a tergum and pair of modified appendages ; antennal peduncle four-jointed ; no acicle ; arthrobranchs normally placed, ... Galatheidae, Dana.

B.—Abdomen bent as in Galatheidae, but in addition the telson and uropods are tucked under the last abdominal segment ; telson narrow, weak, and transversely fissured ; antennal peduncle five-jointed ; second joint usually with an acicle ; arthrobranchs placed on side of thorax, .. Uroptychidae, Henderson.

C.—Cephalothorax very broad, almost circular in outline ; abdomen bent and closely-pressed against sternum as in Brachyura ; third maxillipedes have ischium much flattened, and merus with broad internal lobe ; in the male a single pair of pleopods present, on the second segment ; antennal peduncle four-jointed ; no acicle ; arthro-branchs normally placed, Porcellanidae, Henderson.

Family *UROPTYCHIDAE*.

Chirostylidae, Ortmann, 1892. Diptycinae, Milne-Edwards and Bouvier, 1900. Uroptychidae, Alcock, 1901.

The two genera included in the family may be separated as follows :—

Rostrum spiniform ; lateral margins of carapace very obscure ; no acicle on antennae ; chelipeds often more than five times length of carapace and abdomen ; walking legs very long, ... *Gastroptychus*.

Rostrum flat and triangular ; lateral margins of carapace well defined ; well developed triangular acicle ; chelipeds long ; walking legs moderately long, ... *Uroptychus*.

Edwards and Bouvier, 1894 (*a*). *Uroptychus*, Alcock, 1901. *Uroptychus*, Stebbing, 1903.

The two Irish species may be distinguished from one another by the following characters :—

Dorsal surface of carapace bearing numerous fine hairs, especially on branchial and hepatic areas ; no movable spines on lower edge of propodite of walking legs ; upper and lower surface of chelipeds covered with small scales, which bear each a row of long hairs, .. *U. rubrovittatus.*

Dorsal surface of carapace devoid of hairs, very smooth and shining, minutely punctate ; lower edge of propodite of walking legs bears a row of movable spines ; chelipeds quite smooth, without scales, and without hairs, except at the tips of the fingers,
U. nitidus, var. *concolor.*

Uroptychus rubrovittatus (Milne-Edwards).

Pl. VIII, figs. 1–4.

Diptychus rubrovittatus, Milne-Edwards, 1881.
Diptychus rubrovittatus, Bonnier, 1888.
Uroptychus rubrovittatus, Caullery, 1896.
Diptychus rubrovittatus, Milne-Edwards and Bouvier, 1900.
Uroptychus rubrovittatus, Hansen, 1908.

The carapace is broadest in the branchial region ; it is slightly narrower behind, and considerably so in front. The rostrum is large and triangular, with very slightly crenulated margins ; it is slightly hollowed out on the upper surface. The carapace is arched from side to side, and is almost quite smooth ; the cervical groove is represented by a faint crescent-shaped depression. There is a sparse covering of tufts of fine hairs which are most plentiful on the branchial and hepatic areas, and also occur on the upper surface of the rostrum. The posterior margin is slightly concave. The lateral margins have a row of very small tubercles which do not come to sharp points. There is an inward curved spine at each antero-lateral angle, and there is a smaller spine on the anterior margin above the base of each antenna. The *linea anomurica* is distinctly marked. The submarginal parts of the carapace bear a number of small and rather obscure tubercles, which, however, are absent from the central part.

and are fringed with setae. The terga are smooth and have a very sparse covering of setae. The abdominal segments are much broader in the female than in the male, and in the former the pleura completely enclose the space in which the ova are carried before hatching.

The telson is folded against the lower surface of the sixth abdominal segment. It is divided into a proximal and a distal portion by a transverse suture. Both are thin and feeble, but the proximal part is slightly calcified, while the distal part is wholly membranous and transparent. The lateral borders have each a deep sinus opposite the suture ; the posterior margin is concave ; the posterior angles are rounded ; the lateral and posterior margins are fringed with fine setae. The telson as a whole is much narrower than the abdominal segments which precede it.

The eyes are small and reach only to the middle of the rostrum. The eyestalks are cylindrical, and the border between stalk and cornea is entire and straight. The eyes (in spirit) are of a bright reddish-brown colour.

The basal joint of the antennules is short, and bears a strong curved spine at its upper and outer extremity ; this spine bears two or three small teeth on its margin. The second joint is roughly cylindrical, and the third is very much thickened distally. The upper flagellum consists of about a dozen joints, and the lower, which is much shorter and very slender, of three to five joints. There are no hairs springing from the distal end of the third peduncular joint as in some of the Galatheidea.

The peduncle of the antennae is five-jointed. The basal joint is short and broad, with the opening of the renal gland on its lower surface. The second joint bears a well developed scale, which tapers to a fine point ; its inner border is entire, but the other is very slightly denticulate, and bordered with hairs. The third and fourth joints are short and thick, the fifth long and slightly thickened distally, bearing a thin flagellum which reaches beyond the merus of the chelipeds.

The third maxillipedes are long and pediform ; the propodite is the longest individual joint. When extended they reach beyond the merus of the chelipeds. None of the joints bear spines, with the exception of the ischium, which has the usual *linea cristata*. The carpus is very short and broad. The propodite is as long as the merus and the carpus together ; on its inner surface there is a broad obtuse process which reaches its greatest size in the proximal third of the joint. The inner surface of the dactyl, the distal two-thirds of the propodite, and the carpus bear dense fringes of setae. The peduncle of the exopodite reaches just beyond the middle of the merus ; its flagellum is nearly as long as the peduncle.

merus is very much thicker, and is practically cylindrical; the carpus is about as long as the merus and the ischium together, and becomes thicker at the distal end; the propodite is the longest and stoutest joint of the appendage, and is almost as long as the merus and carpus together; the dactyl is about half as long as the palm of the propodite. On the cutting edge of the dactyl there is a large prominence near the base. The tips of the fingers are incurved, and cross one another. The whole surface of the appendage is covered with a large number of scale-like protuberances arranged in longitudinal rows, and each bearing three or four setae pointing forwards. The scales are not always easy to see; they are most prominent on the lower surface of the merus, and decrease gradually till they disappear about the base of the dactyl. Two teeth are present at the anterior end of the lower side of the merus and also of the carpus.

The three pairs of walking legs which follow also bear scales furnished with hairs, but they are often very difficult to detect. The three pairs are sub-equal. The posterior margin of the dactyl bears a row of teeth, of which that at the tip is the largest.

The fifth pair of pereiopods are very much reduced; they end in chelae covered with long setae. The sternum of the fifth pair is obsolete.

In the male the only pleopods present are those of the first and second pairs. In the female, on the other hand, only the appendages of the third and fourth segments are present; these are slender and three-jointed. The first and second pleopods of the male are similar to those of *U. nitidus* var. *concolor*.

The uropods are tucked underneath the sixth abdominal segment along with the telson. They are rather narrow, and have rounded posterior margins fringed with fine setae. There is no transverse suture on either endopodite or exopodite.

Size.—Hansen (1908) mentions some very large specimens which were taken by the *Thor* off the south of Iceland, a male and a female, measuring 33mm. and 40 mm., respectively. The usual size seems to be about a quarter or a third less than this.

General Distribution.—The species is known from the west coast of Africa as far south as Cape Bojador (Milne-Edwards), from the Canaries and Azores (Milne-Edwards and Bouvier), from the Spanish coast (Bonnier), and the Bay of Biscay (Caullery, Kemp). More recently it has been recorded by Hansen from the south of Iceland.

Irish Distribution.—So far as I know this species has not hitherto been correctly recorded from British or Irish waters. Calman (1896) gives "*Uroptychus rubrovittatus*" in the list of species from the south-west of Ireland, but I have had the opportunity of examining these specimens in the Irish National

S. R. 223.—12 v '05. 53° 7′ N., 14° 50′ W., 410–500 fms., coral. Trawl.—One, 17 mm.

S. R. 327.—8 v '06. 51° 43′ 30″–51° 38′ N., 12° 15′–12° 18′ W., 550–800 fms., ooze. Trawl.—Three.

Vertical Distribution.—The species appears to occur most frequently in depths of 300–700 fathoms, but it has been taken in 160 fathoms on the one hand and 766 fathoms on the other.

Uroptychus nitidus, var. **concolor** (Milne-Edwards).

Pl. VIII, figs. 5–10, Pl. IX, fig. 1.

Diptychus nitidus, var. *concolor*. Milne-Edwards and Bouvier, 1894 (*b*).

Uroptychus nitidus, var. *concolor*, Caullery, 1896.

Diptychus nitidus, var. *concolor*, Milne-Edwards and Bouvier, 1899.

Diptychus nitidus, var. *concolor*, Milne-Edwards and Bouvier, 1900.

In general appearance this species resembles *U. rubrovittatus*, but is distinguishable by well-marked characteristics.

The surface of the carapace and abdomen is quite smooth and glistening; it is sparsely punctate, but this can be seen only when the specimens are dry. The carapace is narrower than in the last species, and is devoid of hairs. The cervical groove is barely distinguishable. The lateral margins are slightly granular, with here and there a denticule. The antero-lateral spine curves slightly more inwards than in *U. rubrovittatus*. The tooth above the base of the antenna is blunt. The rostrum is narrower and rather longer than in *U. rubrovittatus*, and its margins are quite entire; it is quite free from setae. The basal part of the rostrum curves downwards, and the tip is elevated, so that when seen in profile it has quite a different appearance from that of the last species (Pl. VIII., figs. 2, 5.).

The abdomen resembles that of *U. rubrovittatus*, but is free from setae.

The eyes are large and oval; they reach beyond the middle of the rostrum, and almost to the end of the antennal peduncle. The stalks are slightly swollen just below the cornea, which is of an orange yellow colour (in spirit).

The antennules much resemble those of *U. rubrovittatus*. The curved process springing from the basal peduncular joint bears two large sharp teeth. The upper flagellum has fourteen joints, and the lower only four.

chelipeds.

The third maxillipedes differ from those of *U. rubrovittatus* in having a groove on the outer surface of the merus. The teeth of the *linea cristata* are also longer and sharper.

The chelipeds differ greatly from those of the last described species in having no covering of setiferous scales. Setae are absent, except for the tufts at the end of the fingers. The ischium is short and slender; on its lower surface it bears two or three rows of fairly sharp tubercles which point forwards. The merus is a much longer and stouter joint, and its lower surface is furnished with three or four rows of similar but larger tubercles; the rows vary somewhat in distinctness. The merus is more or less cylindrical, but the two succeeding joints are slightly compressed. The carpus is considerably longer than the merus, and the propodite again is longer than the carpus. The carpus, the upper surface of the propodite, and merus are all quite smooth, and are sparsely and minutely punctate. On the lower surface of the propodite, however, there are five or six longitudinal rows of very minute tubercles; they are often very difficult to detect, and are most easily seen in dry specimens; they may be felt by passing the finger backwards along the joint. The dactyl is only about one-third as long as the propodite. Both fingers bear tufts of long setae which are most crowded near the tip. When closed the fingers are in contact for nearly the whole of their length. The inner edge of the dactyl bears near its base a formidable tooth or process which is almost rectangular, and is about a quarter of the whole length of the cutting surface. There is a slight depression in the inner edge of the other finger opposite this tooth; the edges of the latter are crenulated. The teeth on the cutting edges of the fingers are not sharp, but are rounded. The tips of the fingers curve towards one another, and cross when closed. The whole surface of the chelipeds is bright and glistening.

The next three pairs of pereiopods are nearly equal, but the middle pair, the third pereiopods, are the shortest. The merus in the second and fourth pereiopods is flattened laterally, but in the third it is cylindrical. In the second and fourth the carpus is slightly thickened distally, but not in the third. The propodite is more slender in the second pereiopods than in the next two pairs. In each case the dactyl is robust, strongly curved, and bears numerous teeth on its lower surface.

The lower side of the distal half of the propodite bears a row of long, mobile spines, and these, together with the teeth of the dactyl when bent back, form a very efficient subchela, which enables the animal to get a firm grip of the coral on which it lives. The teeth on the dactyl are broad, and not long and narrow as in *U. rubrovittatus*; there are usually ten or eleven.

side, except in the third pereiopods where they are [illegible] absent. The distal half of the propodite bears tufts of long hairs in all three pairs of appendages, and they are also present on both surfaces of the dactyl.

The fifth pereiopods are very slender and reduced. They end in a chela, and the propodite and dactyl are covered with long plumose hairs.

In the first pleopods of the male the distal joint is expanded into a broad membranous lamella with incurved edges. Its inner surface bears a few short bristles.

The second pleopods of the male have a long cylindrical proximal joint, and a much shorter distal joint, which is greatly expanded and flattened. This part is partially divided into two lobes, both of which are fringed with stiff hairs. In one lobe these are much shorter than in the other, and the same lobe has its surface covered with short bristles. The opposite edge of the distal joint is curled downwards, and bears short, slender bristles on its inner edge. The lobe bearing the bristles represents the *appendix masculina*, which has become fused with the internal ramus of the pleopod. The external part is represented by a small, blunt process at the extremity of the proximal joint.

In the female, pleopods are present on the third and fourth abdominal segments only. They are very slender and serve for the attachment of ova. The latter are large and never numerous. One of the *Helga* specimens bears seven eggs and the other twenty. In ovigerous females the telson is not folded against the sixth abdominal segment, but is extended so that it rests on the surface of the thoracic sternum.

The uropods are similar to those of *U. rubrovittatus*.

Size.—The largest specimen taken by the *Helga* is an ovigerous female, measuring 27 mm. The chelipeds of the same specimen are 45 mm. long.

General Distribution.—The typical *U. nitidus* is confined to West Indian waters. The var. *concolor* is, on the other hand, widely spread. It has been found in many parts of the eastern Atlantic (Mi ne-Edwards, Bouvier, Caullery), on the west coasts of France, Spain, and Morocco, at the Azores and Cape Verdes. Its most northerly record is from the south-west of Iceland (Hansen). It is also recorded from South African waters (Stebbing), and from the Laccadive Islands and Bay of Bengal (Alcock).

The species is represented in the Pacific Ocean by a var. *occidentalis*, Faxon, which was taken by the *Albatross* in the Gulf of Panama.

Irish Distribution.—The species has previously been taken in Irish waters, viz., by the *Lord Bandon* expedition in

The *Helga* has taken this species at three stations.

Helga.

S. R. 493.—8 IX '07. 51° 58′ N., 12° 25′ W., 533–570 fms. Trawl.—One, 21 mm.

S. R. 494.—8 IX '07. 51° 59′ N., 12° 32′ W., 550–570 fms. Trawl.—One, 27 mm.

S. R. 500.—11 IX '07. 50° 52′ N., 11° 26′ W., 625–666 fms. Trawl.—One, 25 mm.

Vertical Distribution.—The species is most commonly found in depths ranging from 400 fathoms to 650 fathoms, but it has been found in 318 fathoms and in 808 fathoms.

GENUS **Gastroptychus,** Caullery.

Ptychogaster, Milne-Edwards, 1880. *Ptychogaster*, Henderson, 1888. *Chirostylus*, Ortmann, 1891–94. *Gastroptychus*, Caullery, 1896. *Ptychogaster*, Milne-Edwards and Bouvier, 1900. *Ptychogaster*, Alcock, 1901.

Gastroptychus formosus (Milne-Edwards).

Pl. IX, figs. 2–8, Pl. X, fig. 1.

Ptychogaster formosus, Filhol, 1886.
Ptychogaster formosus, Perrier, 1886.
Ptychogaster formosus, Milne-Edwards and Bouvier, 1894 (*b*).
Gastroptychus formosus, Caullery, 1896.
Ptychogaster formosus, Milne-Edwards and Bouvier, 1900

The carapace is much narrower in front than behind; its broadest part is a short distance behind the cervical groove. In front there is a narrow spiniform upturned rostrum, about twice the length of the eyestalks; its margins are entire. The gastric region of the carapace is inflated and sharply marked off from the surrounding parts. The carapace is furnished with a large number of spines. At each side of the base of the rostrum, above the eyes, there is a large spine; behind these, and much wider apart, is another pair of large spines; near the posterior edge of the gastric area there are two spines opposite the supra-orbital ones in front; on the centre of the gastric area there is a large unpaired spine, so that on this part of the carapace there is a ring of six large spines enclosing a single median one. Just behind the cervical groove there are two median spines, and farther back a similar pair, while a third pair is situated on the posterior margin of the carapace. On the hepatic region there are two large spines on each side, and between these and nearer the median line is another spine. There are rows of smaller spines on the branchial regions, running parallel to the lateral margin of the carapace. Between the spines the surface of the carapace is perfectly smooth. The cervical groove is

is divided by three deep, transverse furrows. The dorsal part of the last thoracic segment are atrophied, being represented merely by a patch at the base of each of the fifth pereiopods. The *linea anomurica* is distinct, and is deepest in its posterior part. Below it the flanks of the carapace bear a number of small, irregularly-arranged spines.

The first two abdominal terga bear a transverse row of spines, some of which are much larger than others. The first abdominal segment is very narrow and its pleura are rudimentary. All the other segments are much broader and have well-developed pleura ; the latter are largest and most sharply pointed in the second segment, and become successively smaller and blunter backwards. The third, fourth, and fifth terga are practically smooth ; the sixth tergum, however, bears about a dozen spines arranged in two roughly crescentic rows, in addition to three on the posterior margin, which are pressed against the under surface of the thorax.

The terga bear very short setae on the smooth parts of their surface. The anterior edges of the pleura are furnished with setae, and in the second segment bear a few small teeth.

The telson and uropods are completely folded under the last part of the abdomen, which in its turn is bent on itself, so that the end of the sixth segment is pressed against the thoracic sternum. The telson is quite thin and membraneous ; it is slightly concave laterally and posteriorly, and is divided by a transverse suture.

The eyes reach the middle of the rostrum. The corneal part is wider than the cylindrical stalk.

The antennular peduncle extends well past the tip of the rostrum. The basal joint is thicker than the second and third ; the opening of the otolith-chamber is elevated into a ridge fringed with bristles. The third joint is the longest ; it is very slightly thickened distally. The internal flagellum is thick at the base, but tapers rapidly to a fine point ; it is composed of about twenty joints and bears a heavy fringe of hairs. The outer flagellum is much shorter, is quite slender throughout, and is composed of very few joints.

The antennal peduncle is very slender and quite short ; it extends just beyond the cornea of the eye. The flagellum is also short, being very slightly longer than the antennules. The peduncle is five-jointed and has a rudimentary scale. There is a slender spine at the distal end of the terminal joint.

The mandibles have a well developed three-jointed palp. The anterior four or five teeth on the cutting edge are much larger than those behind.

The exopodite of the first maxillae is represented by a mere rudiment ; at the tip of the endopodite there are three or four sharp spines.

The first maxillipedes have a rudimentary epipodite; the basal part of the exopodite is very much flattened.

The exopodite of the second maxillipedes is longer than the endopodite, and its peduncular portion is expanded.

The coxa of the third maxillipedes has a strong spine on the inner edge; the ischium has the usual *linea cristata*. There is a short spine near the distal end of the outer margin of the merus, and a longer and sharper one in the same position on the carpus. The propodite is long and massive, and bears a rounded protuberance near its extremity on the lower side. Neither the propodite nor the dactyl have any spines, but bear thick tufts of setae. The exopodite is very slender; its peduncle reaches the middle of the merus; the first joint of its flagellum is much longer than the succeeding ones.

The chelipeds are developed to an extraordinary extent, being between five and six times as long as the carapace and rostrum. They are slender and cylindrical and thickly covered with sharp spines which are arranged in longitudinal rows. There are six or seven rows on each joint. The longest joint is the merus, and the spines also reach their maximum development there; here and there among the spines there are long setae. The spines are similarly arranged on the carpus and the propodite. The carpus is slightly shorter than the latter. The dactyl is less than a third of the length of the propodite. The fingers bear only a few small spines; both margins are setiferous; on the inner edge, near the base of each finger, there is a blunt tubercle; the cutting edges bear isolated teeth which crowd more closely together towards the tip; the fingers end in sharp and curved claws which cross one another; the cutting edges do not come in contact with one another except in their distal half and where the two tubercles meet.

The next three pairs of pereiopods are more slender than the chelipeds and are subequal in length. They are very much shorter than the chelipeds, reaching only to about the middle of the carpus of the latter. In the merus, which is the longest and stoutest joint, the spines are arranged as in the chelipeds. In the carpus the lower and outer edges are almost free from spines. The propodite is longer and thinner than the carpus, and bears a dorsal tuft of setae at its distal extremity; on the distal half of its lower margin there is a row of about a dozen mobile spines, interspersed with setae. The dactyl ends in a strong curved claw and also bears a row of about eight or nine spines on its lower surface; these spines increase in size distally.

The fifth pereiopods are very small and feeble, and are carried bent on themselves in the manner usual in the group.

There are no pleopods on the first abdominal segment in the female, but they are present on the second to fifth segments. They are uniramous and two-jointed, bearing tufts of long setae at the extremity of each joint.

In the male the distal joint of the first pleopods is expanded

and robust. The distal joint is of peculiar form, slightly twisted into a spiral; near the tip there is a wide ear-shaped plate standing out almost at right angles to the axis of the joint. The rounded margin of this plate, which half encircles the joint, is densely covered with short bristles. It is much thicker at one side than the other, and the bristles all point towards the thick part. A few setae are present on the tip of the joint, and below the plate-like expansion there is a fringe of longer setae on the margin. The other pairs of pleopods are represented by mere rudiments in the male.

The uropods are thin membranous structures, and are folded under the abdomen with the telson. They have no transverse suture on either branch; their lateral and posterior edges are setiferous.

When alive the animal is bright scarlet, and the eyes have a bronze lustre.

Size.—The largest specimen taken by the *Helga* measures 44 mm., when the abdomen and telson are fully extended. Milne-Edwards and Bouvier mention specimens 52 mm. long.

General Distribution.—The species is known hitherto only from those regions with which the names of the *Travailleur*, *Talisman*, and *Caudan* are associated. It has been recorded from stations ranging from Rochefort, in the Bay of Biscay, to the Canaries. More recently it has been taken further north, two specimens having been captured by the *Huxley*, in the latitude of Brest, long. 8° 13′ W., (Kemp). The specimens taken by the *Helga* extend the range of the species still further in a northerly direction.

Irish Distribution.—

Helga.

CXX.—24 VIII '01. 77 mls. W.N.W. of Achill Head, Co. Mayo, 382 fms. Trawl.—One.

S. R. 223.—12 V '05. 53° 7′ N., 14° 50′ W., 410–500 fms., coral. Trawl.—Two, 44–34 mm.

Vertical Distribution.—The depths in which the species has been taken range from 382 fms. (*Helga*) to 929 fms. (*Caudan*). The other specimens were captured in over 444 fms. (*Huxley*), 517 fms., and 482 fms. (*Travailleur* and *Talisman*).

FAMILY *GALATHEIDAE.*

There are two sub-families:—

A.—Integument crisp; exopodite of the first maxillipedes terminates in a flagellum; eyes facetted and well pigmented, .. GALATHEINAE.

facetted, and devoid of pigment, .. MUNIDOPSINAE.

SUB-FAMILY *GALATHEINAE*.

A.—Rostrum broad and flattened, armed with teeth, ... *Galathea*.

B.—Rostrum spiniform; supra-orbital spines very long, ... *Munida*.

GENUS **Galathea**, Fabricius.

Galathea intermedia, Lilljeborg.

Pl. XI, figs. 1–12.

Galathea Andrewsi, Kinahan, 1857 (*d*).
Galathea Andrewsi, Kinahan, 1861.
Galathea intermedia, Bonnier, 1888.

The carapace is roughly pear-shaped. It ends in front in a large triangular rostrum, and is slightly concave on the hind margin. Its surface is traversed by grooves running from one side to the other; they are bordered by fringes of fine setae. The rostrum has four spines on each side but they are not all well developed; the last pair, especially, are very small. The central point is longer than any of the lateral spines. The rostrum is longer and narrower in the male than in the female. The lateral margins of the carapace bear each a row of spines, of which those at the antero-lateral angles are the largest. There is a short, transverse groove surmounted by two spines at the base of the rostrum, separating it from the gastric area. Below the lateral margin there is a distinct *linea anomurica*, and beneath the latter are a number of oblique grooves running forwards and downwards.

Each of the abdominal terga bears a single transverse furrow. The pleura point slightly forwards, and are of equal size from the second to the sixth segment; in the first segment they are much reduced and more or less hidden by the carapace.

The telson is bisected by a longitudinal groove, and further divided by lines running obliquely inward from the postero-lateral angles. Its dorsal surface bears minute scales from which spring groups of bristles and spines, all directed backwards.

The eyes are small, and the eyestalks cylindrical, and partly hidden by the rostrum.

The basal joint of the antennules bears two long pointed processes, from which spring a few bristles near the tip. On the upper surface of the joint there is a deep groove into which the distal portion of the appendage can be folded. When in

is the slit-like opening
margin of the latter there grow inwards a row of long hairs, which form a protective covering to the opening. The slit widens towards the proximal end, and is here partly covered by a rounded flap. The second and third peduncular joints are about equal in length.

The outer flagellum is very thick at the base, but tapers rapidly; it is composed of fifteen joints, and has a dense fringe of setae on its inner margin. The inner flagellum is composed of only six joints and is uniformly slender throughout.

The first, and largest, joint of the antennal peduncle has a sharp spine at the antero-interior angle; there is no trace of a scale. The flagellum is as long as the chelipeds in the female, but scarcely reaches to the middle of the propodite in the male.

The first two joints of the third maxillipedes are short and broad. A small epipodite is attached to the coxa. The exopodite has a long peduncle which extends beyond the merus; it narrows suddenly in its distal third; the flagellum has one long basal joint, the rest being made up of short joints, each of which bears two long setae. The ischium is shorter than the merus, its lower distal extremity ends in three teeth. The *linea cristata* bears about twenty-two teeth. On the inner side of the merus there are two large spines; one is situated at the distal end, and the other near the middle, but rather nearer the distal than the proximal extremity. Both ischium and merus bear fringes of long setae. The carpus is slightly swollen in its second half, and is of about the same length as the propodite. The dactyl is shorter than both.

In the young male the chelipeds are similar to those of the female; in the adult, however, they become developed to a relatively enormous size, being about twice the length of the body (with the abdomen in its natural folded position). The elongation is accompanied by great thickening, and the unwieldy appearance of the appendage is enhanced by the fact that the first three joints remain slender. The thickening begins at the proximal end of the merus. The largest joint is the propodite. The two chelipeds are unequal, sometimes the right, sometimes the left, being the larger. In the latter the distal part of the propodite is peculiarly modified; the fixed finger curves strongly outwards from the point of articulation of the dactyl, and meets the latter only at its tip. Opposite the curve there is a strong tubercle on the inner margin of the dactyl. The surface of the chelipeds is covered with scale-like tubercles, especially in adult males. The curve in the fixed finger does not seem to develop until the animal has attained maturity. Of two large males in the collection at my disposal, one has the curve and opposite tubercle very prominently developed, whereas in the other, which is only very slightly smaller, there is no trace of it, and the fingers are in contact throughout their entire length.

The extreme tip of the chelipeds is characteristic of the species. Both fingers end in a broad, curved tooth which terminates the inner margin, and above this there is another smaller and sharper tooth in line with the outer margin.

The second, third, and fourth pereiopods resemble one another closely, and are of much the same size ; the merus and propodite are long, the other joints short. All three end simply.

The fifth pereiopods are very feeble, and are usually carried folded on themselves, and half inside the branchial chamber. The merus and carpus are long and slender, the flexure taking place at their point of articulation. The appendage ends in a small chela, thickly covered with setae.

The pleopods are quite different in the two sexes.

In the male the first pair of pleopods consist of a slender peduncle, which is followed by a single lamellar joint of peculiar structure. It consists of a thin plate, the inner edge of which is curved, and is fringed with short bristles ; the outer edge is not curved except near the distal end, where it is folded inwards, so as to form a flap, which bears some longer bristles. The second pleopods are longer than the first, and consist of a fairly stout peduncle, at the end of which there is a small blunt process of one joint which represents the exopodite. The endopodite slopes inwards and broadens out half-way to the tip, after which it narrows again ; the distal half has a covering of short, stiff bristles. This portion probably represents the *appendix masculina* united to the endopodite. The third, fourth, and fifth pairs of pleopods have thin lamellar peduncles, which are straight on the outer side and curved on the inner ; the latter bears a row of long plumose hairs from seven to fourteen in number. At the extremity of the exterior margin there is a short, blunt process representing the endopodite. Of this process Bonnier says : " à son extrémité distale . . . se trouve un rameau interne, d'un seul article et très réduit." In the large number of specimens collected by the *Helga* quite a number of males have this process composed of two joints. In the majority of cases those in which two joints are present are larger than those with one. Altogether fifteen males have only one joint, and eight have two. In some of the latter the second joint is much shorter than the first, while in others the two joints are equal. Probably the possession of one or of two joints depends upon age.

In the female the pleopods of the first segment are altogether absent. Those on the following segments are slender and three-jointed.

The borders of the uropods are furnished with fringes of long, pinnate setae, and also bear rows of large and small spines. The spines are best developed on the posterior edge of the endopodite. The surface also bears small groups of spines and bristles, all pointing backwards.

—	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.
Podobranchs.	ep.	—	ep.	ep.	—	—	—	—
Arthrobranchs.	—	—	2	2	2	2	2	—
Pleurobranchs.	—	—	—	—	1	1	1	1

Size.—This is by far the smallest of the British species of *Galathea.* Adult specimens usually measure from 12 mm. to 20 mm. The largest specimen taken by the *Helga* is an ovigerous female which is 21 mm. long.

General Distribution.—The species is found in all the seas of western Europe. Norway (Lilljeborg, G. O. Sars), Skagerrak and Kattegat (Meinert), Scotland (Norman, Kinahan, Henderson); North Sea (Hoek), Cornwall (Carrington), English Channel (Crawshay), Bay of Biscay (Bouvier), Spain (Göes), Mediterranean (Milne-Edwards), Madeira, Azores (Barrois).

Irish Distribution.—It is very plentiful all round the coast, and is often taken in very large numbers. A large proportion of the females taken by the *Helga* are ovigerous, especially those taken in March, April, and May.

Vertical Distribution.—It extends from the littoral zone down to considerable depths, the *Talisman* having taken a specimen in 123 fathoms. It occurs in greatest abundance in depths of 8–50 fathoms.

Galathea squamifera, Leach.

Galathea squamifera, Bell, 1853.
Galathea squamifera, Kinahan, 1861.
Galathea squamifera, Bonnier, 1888.

Both upper and lower surfaces of the chelipeds, and the upper surface of the rostrum are densely covered with scaly tubercles. The chelipeds are somewhat flattened, and bear long spines on the inner surface, except on the propodite, where the spines are on the outer margin.

The basal joint of the antennular peduncle has three sharp spines.

The ischium of the third maxillipedes is shorter than the merus. On the distal half of the inner margin of the merus there is a row of three or four small teeth, and beyond these, at the distal extremity, a single large spine.

The endopodites of the third, fourth, and fifth pairs of pleopods of the male are three-jointed.

The first three pairs of pereiopods have epipodites.

Size.—It is usually considerably smaller than *G. strigosa,* 0–60 mm., being a common size for adults.

(Bell, Norman, Bonnier), Mediterranean and Adriatic (Heller), Azores and Cape Verde (Barrois).

Irish Distribution.—Common all round the coast, but not occurring in such large numbers as *G. intermedia.*

Vertical Distribution.—Commonest from tide-marks to about 3–4 fathoms, but occasionally it is found at depths of about 40–50 fathoms. The species migrates shorewards in spring, being found in large numbers under stones between tide-marks.

Galathea nexa, Embleton.

Galathea nexa, Embleton, Proc. Berwickshire Nat. Field Club, 18—.
Galathea nexa, Bell, 1853.
Galathea dispersa, Bate, 1859.
Galathea nexa, Kinahan, 1861.
Galathea dispersa, Kinahan, 1861.
Galathea nexa, Henderson, 1886.
Galathea dispersa, Henderson, 1886.
Galathea nexa, Bonnier, 1888.
Galathea dispersa, Bonnier, 1888.
Galathea nexa, Milne-Edwards and Bouvier, 1899.
Galathea dispersa, Milne-Edwards and Bouvier, 1899.
Galathea dispersa, Milne-Edwards and Bouvier, 1900.
Galathea nexa, Appellöf, 1906.
Galathea nexa, Hansen, 1908.
Galathea nexa, Kemp, 1910.
Galathea nexa, Crawshay, 1912.
Galathea dispersa, Crawshay, 1912.

The majority of recent writers on the Galatheidae have united *G. nexa* and *G. dispersa* as one species ; this is done by Appellöf, Hansen, Kemp, and others, while Milne-Edwards, Bouvier, and Crawshay keep the two separate. The most detailed description is that given by Bonnier (1888). The character on which he chiefly relies for their separation is the number of spines on the inner margin of the merus of the third maxillipedes. In *nexa* there is a single large spine on the middle of the joint, and in *dispersa* a large spine in the same position, followed by a varying number of more distal and smaller spines, usually three or four. Bonnier's figure does not show this correctly, the drawing being out of proper perspective, so that the spines appear to be at the distal end of the joint. Milne-Edwards and Bouvier correct this (1899), and give a list of distinguishing characters, most of which are of very little value.

The specimens taken by the *Helga* all approach more or less closely to the *dispersa* type. One hundred and eighty-eight

on which [illegible]
For instance, the spines on the sides of the [illegible]
and sharpness, and in those most nearly approaching the *nexa* type they are not blunter or thicker than in many of the *dispersa* type. The rostrum also varies in length, and it is often impossible to say whether it " almost reaches the extremity of the antennular peduncle " or " just passes the base of the last joint." It depends very much on the way in which the antennules are extended. Another character given by Milne-Edwards and Bouvier concerns the teeth or spines on the transverse furrow immediately behind the rostrum. They say that in *dispersa* "il y a au moins deux paires de saillies spiniformes ou d'épines," and in *nexa* "il n'y a pas de saillies, ou seulement une paire de saillies à peines distinctes," yet in many of the *Helga* specimens of undoubted *dispersa* form there are no teeth or spines on this line, and in others only a single pair. Again, in the great majority of the *Helga* specimens of the *dispersa* type the lateral margins of the carapace are distinctly convex, not " sensiblement droits."

The spines on the third maxillipedes show considerable variation. In some cases the large spine is followed by three or four smaller ones, in others by only one. In two large males from the west coast there is only one very small spine distal to the large one. These two specimens approach more nearly the *nexa* type than any of the others, and this lends support to Hansen's view that *nexa* has been founded on large male specimens of *dispersa*. Bonnier's description of *nexa* was taken from a single large male, and Milne-Edwards and Bouvier also saw only a single specimen, a male, whereas Appellöf and Hansen both had a large amount of material.

More recently Crawshay (1912) has separated the two forms by the character of a small group of three or four setae on the third maxillipedes close to the base of the large meral spine. In *nexa* these are simple, and in *dispersa* pinnate. They are pinnate in all the *Helga* specimens except the two large males mentioned before (from Ballynakill Harbour, Co. Galway), in which they are simple. These two also possess the strong spination and hispidation of the chelipeds of which Crawshay speaks, but the third maxillipedes bear a spine distal to the large central one, so that the characters of *nexa* and *dispersa* are here to some extent combined.

I am quite convinced, with Hansen, that the species *nexa* has been erroneously founded on very large male specimens of *dispersa*. The *dispersa* forms are very much commoner than the other, but the name *nexa* has priority and so must be used for the united species.

Size.—The largest specimen in the Irish collection is a male measuring 40 mm.

General Distribution.—The distribution of this is practically

from West Finmark along the coasts of Norway and Denmark (Sars, Stephensen); it is found on all the coasts of Great Britain (Norman, Henderson, Kinahan, etc.), on the French and Spanish coasts (Milne-Edwards and Bouvier), in the Mediterranean and Adriatic (Heller-Hansen), and at the Azores and Canaries (Milne-Edwards and Bouvier). It has also been recorded from Iceland.

Irish Distribution.—The species is found all round the Irish coasts. It has been recorded from Dublin and Belfast (Kinahan, Thompson), from the south-west coast (Calman), Clare Island, Co. Mayo (Farran), and has been taken with very great frequency by the *Helga* in the Irish Sea, and on the south and west coasts. It was found plentifully at Ballynakill and Bofin Harbours and in Blacksod Bay.

Vertical Distribution.—*G. nexa* seems to be most plentiful at depths of about 25–40 fms., but it may be found from the shore line down to 260 fms. (Bonnier). The greatest depth at which it was taken by the *Helga* was 199 fms. On the west coast it was several times captured in more than 100 fms., and was very common at about 40 fms. On the east coast it occurs most plentifully in depths of about 20–30 fms.

Galathea strigosa, Linne.

Galathea strigosa, Bell, 1853.
Galathea strigosa, Kinahan, 1861.
Galathea strigosa, Bonnier, 1888.

This may be distinguished from the other British species of *Galathea* by its large size, the great length of its chelipeds, furnished on both edges with strong spines, by the absence of epipodites on all the pereiopods and by the form of the third maxillipedes.

Size.—Adult specimens may sometimes grow to a very large size. One specimen found in Cork Harbour is 102 mm. long, and individuals measuring 80–90 mm. are fairly common.

General Distribution.—This species extends along the coasts of the east Atlantic from the North Cape to the Canaries and Azores (Sars, Appellöf, Bouvier, Bonnier, etc.) It extends extends into the Mediterranean and Adriatic (Heller, Senna), and according to Heller has been found in the Red Sea.

Irish Distribution.—Found all round the coast.

Vertical Distribution.—It is frequently found under stones between tide-marks, but also extends to considerable depths. It is common in about 4–7 fathoms. One specimen was taken by the *Helga* in 37 fathoms off the Calf of Man, and Bonnier mentions a case in which it was taken in 328 fathoms.

The two species occurring [illegible] as follows :—

Cornea of eyes surrounded by circlet of hairs, some at least of which extend far out on the pigmented surface; the sternal plates are thickly covered by scale-like tubercles or ridges, which are bordered anteriorly with short setae, ... *M. bamffica.*

Circlet of hair at base of cornea absent or quite rudimentary; sternal plates smooth or with at most a very few setiferous ridges, *M. tenuimana.*

Munida bamffica (Pennant).

Pl. XI, figs. 13–14.

Munida Rondeletii, Bell, 1853.
Munida rugosa, G. O. Sars, 1882.
Munida Rondeletii, G. O. Sars, 1882.
Munida bamffica (*ex parte*), Milne-Edwards and Bouvier, 1894 (*a*).
Munida bamffica (*ex parte*), Milne-Edwards and Bouvier, 1899.
Munida bamffica (*ex parte*), Milne-Edwards and Bouvier, 1900.
Munida bamffica, Appellöf, 1906.
Munida rugosa, Appellöf, 1906.
Munida bamffica, Hansen, 1908.

A great deal of confusion exists with regard to this and the following species. Some writers have looked upon *M. bamffica*, *M. rugosa*, and *M. tenuimana* as constituting three separate species, others as two, and others again as a single species.

Bell (1853) changed the name of the present species to *M. Rondeletii* on quite insufficient grounds, and this name should not be retained at all. Sars, however, uses it (1882) in giving three species of the genus *Munida* as occurring in Norwegian waters, *M. Rondeletii*, Bell, *M. rugosa*, Fabr., and *M. tenuimana*, Sars. He separates these mainly by the size of the eyes, and the presence or absence of a circlet of hairs at the base of the cornea, and also by the spines on the fourth (in Sar's description the third) abdominal segment. Milne-Edwards and Bouvier, after examining the specimens taken by the *Hirondelle*, came to the conclusion that there is a single very variable species containing several varieties, and they adhere to this opinion after seeing the specimens taken by the *Travailleur* and *Talisman*. Appellöf, on the other hand, maintains with Sars that there are three distinct species, and gives a list of characters by which they may

and *M. rugosa* as synonyms.

After examining carefully all the specimens of *Munida* taken by the *Helga*, I have come to the conclusion that Hansen's view of the species is the correct one. The specimens of *M. tenuimana* are at once separable from the rest by well-marked characteristics, but it is impossible to divide the others into *M. bamffica* and *M. rugosa*.

Appellöf gives the following characters as distinguishing marks between *M. bamffica* (=*Rondeletii*) and *M. rugosa*.

M. bamffica.	*M. rugosa.*
(*a*) Eye-bulb hardly broader than the stalk.	(*a*) Eye-bulb distinctly broader than the stalk.
(*b*) Circlet of hairs more or less rudimentary.	(*b*) At least a few hairs extend far out on corneal surface.
(*c*) Hind margin of the carapace has one or two pairs of spines at the sides, the central part being quite unarmed.	(*c*) Hind margin of carapace normally has spines both at sides and in the centre.
(*d*) Fourth abdominal segment always without dorsal spines.	(*d*) Fourth abdominal segment with two dorsal spines.

Some of the Irish specimens agree with nearly all the characters of *M. bamffica* given above, and some with those of *M. rugosa*, but between these there are individuals in which the characters of both are combined. For instance, two specimens from station S. R. 196 agree with *M. rugosa* in regard to the eye and the fringe of hairs round it, yet the hind margin of the carapace is practically devoid of spines, having merely a hint of one at each side, and there are no spines on the fourth abdominal segment. Appellöf admits that in young specimens of *M. rugosa* of less than 15 mm. these last spines may not be developed, but the Irish specimen is much larger than this, measuring 27 mm.

Of the ten adult specimens taken by the *Helga*, those from stations S. R. 194, S. R. 215, and S. R. 185 agree with Appellöf's characters of *M. rugosa* as regards the eyes, the circlet of hairs, the spines on the hind margin of the carapace and on the fourth abdominal segment. Those, on the other hand, from S. R. 178, S. R. 196, and S. R. 201 all possess some of the characters of *M. rugosa* and some of those of *M. bamffica*. Several of those in which the eye and circlet of hairs are of the *rugosa* type have no spines on the middle part of the hind margin of the carapace, and in some even the spines at the sides are wanting. Three specimens, again, which have the *rugosa* type of eye and circlet, have no spines on the dorsal surface of the fourth abdominal segment.

one and some of the other. I therefore follow [illegible] *M. bamffica* as a somewhat variable species in which the circlet of hairs is usually well developed, with some hairs extending far out on the cornea, in which the hind margin of the carapace may or may not bear spines on the central portion and sides, and in which spines may or may not be present on the fourth abdominal segment.

Size.—One very large specimen measuring 75 mm. was taken at station S. R. 215. Other large individuals, measuring 52 mm. and 42 mm., were also captured. Hansen' slargest specimen was 53 mm. long.

General Distribution.—The most northerly record for this species is one given by Birula, between Jan Mayen and Greenland, at 73° 34′ N., 17° 20′ W. It is also known from the Varanger Fjord in the Murman Sea (G. O. Sars) and from the south and west of Iceland (Hansen). It extends along the whole west coast of Norway (Sars, Appellöf), is known from Bohuslän (Göes), and from the Skagerrak (Stephensen, Björck). It occurs round all the British coasts from the Shetlands to Falmouth, off the Breton coast (Bonnier), in the Bay of Biscay (Kemp), and extends southwards along the coasts of Spain and Portugal and west Morocco to Cape Bojador (Milne-Edwards and Bouvier). It also extends into the Mediterranean (Adensamer) and the Adriatic (Senna).

Vertical Distribution.—The species is commonest in depths 100–300 fathoms, though it is also frequently taken in much shallower water—Appellöf records it from 5½ fathoms at Byfjord, and also from very much greater depths, Hansen having taken five specimens off the south of Iceland, in 691 fathoms.

Irish Distribution.—Pocock, Bourne, and Calman all record this species from the south-west coast, and Thompson mentions it as having been found off Co. Down and at Youghal, Co. Cork.

Helga.

Helga LXXVII.—29 VI '01. 124 mls. W. by N.½N. of Cleggan Head, Co. Galway, 53° 24′ 30″ N., 13° 36′ W., 91 fms., in stomach of fish.—One.

Helga CXVII.—23 VIII '01. 30 mls. W.N.W. of Cleggan Head, Co. Galway, 74½ fms., shelly sand and gravel. Dredge.—One, small.

Helga CXXI.—24 VIII '01. 64 mls. N.W.½W. of Cleggan Head, Co. Galway, 199 fms., sand. Trawl.—Twenty, all quite small.

S. 44.—12 II '02. 7 mls. off Howth, Co. Dublin, 25-27 fms., sand. Trawl.—Two.

S. 70.—9 VII '02. 7 mls. off shore, Lambay to Rockabill, Co. Dublin, 25-26 fms., fine sand and mud. Trawl.—One.

S. 201.—23 I '04. 10 mls. off Rockabill, Co. Dublin, 44-48 fms. Trawl.—Two, 23 mm.

S. R. 145.—24 VIII '04. 50 mls. W.N.W. of Slyne Head, Co. Galway, 53° 24′ 30″ N., 11° 38′ W., 112 fms., fine sand. Trawl.—Two.

S. R. 178.—16 XI '04. 53° 36′ 30″ N., 11° 15′ 30″ W., 74½ fms., coarse gravel. Dredge. Temperature at depth 10·8° C.—One, 32 mm.

S. R. 185.—30 I '05. 50° 20′ N., 10° 20′ W., 82½ fms., fine sand and shells. Trawl. Temperature at 80 fms., 11·05° C., salinity 35·62 °/₀₀.—Four, 15–52 mm.

S. R. 194.—10 II '05. 54° 49′ N., 10° 30′ W., 366 fms., rock. Dredge. Temperature at 340 fms., 9·6° C., salinity 35·44 °/₀₀.—Three, 20–33 mm.

S. R. 196.—11 II '05. 54° 42′ N., 10° 34′ W., 242 fms., stones and coral. Dredge. Temperature at 235 fms., 9·8° C.—Three, 27–42 mm.

R. 8.—3 V '05. 16½ mls. S.W. of Coningbeg Lightship, 51° 47′ 30″ N., 6° 52′ W., 40 fms., mud. Trawl. Temperature at 40 fms., 8·9° C.—Two.

R. 9.—3 V '05. 17½ mls. S.W.½W. of Coningbeg Lightship, 40 fms., fine sand and shells. Trawl.—Three.

S. R. 215.—9 V '05. 52° 1′ N., 11°21′ W., 106 fms., fine sand. Trawl.—One, 75 mm.

S. 323.—21 VIII '05. 6 mls. off Howth Head, Co. Dublin, 21½–23½ fms., fine sand. Trawl. Temperature at depth 13·5° C.—One.

S. R. 360.—8 VIII '06. 52° 4′ N., 11° 27′ W., 108–120 fms., fine sand. Trawl.—Two.

S. R. 367.—11 VIII '06. 51° 38′ N., 11° 37′ W., 287–332 fms., mud and sand. Trawl.—Two, 22 mm.

R. 29.—17 VIII '06. 15 mls. S.E. by S. of Mine Head, Co. Waterford, 40–42 fms., shelly sand and gravel. Trawl. Temperature at depth 9·6 C.—One, small.

S. 457.—15 X '06. 19½ mls. W.S.W. of Chicken Rock, Isle of Man, 41–80 fms., mud. Trawl.—Two.

S. 476.—19 X '06. 6 mls. E.S.E. of Bailey Light, Co. Dublin, 23 fms., shelly sand. Trawl. Temperature at depth 12·6° C.—One.

S. R. 399.—5 II '07. 51° 28′ N., 11° 33′ 30″ W., 342 fms., mud and stones. Dredge.—One, 12·5 mm.

S. R. 447.—18 V '07. 50° 20′ N., 10° 57′ W., 221–343 fms., fine sand. Trawl. Temperature at 300 fms., 9·87° C., Salinity 35·48 °/₀₀—One, small.

S. R. 581.—31 VII '08. 44 mls. S.W. by S. of Hook Light, Co. Wexford, 48 fms., coral sand and gravel. Trawl. Temperature at depth 8·8° C., Salinity 35·05 °/₀₀.—One.

Munida tenuimana, G. O. Sars, 1871.
Munida tenuimana, G. O. Sars, 1882.
Munida tenuimana, Appellöf, 1906.
Munida tenuimana, Hansen, 1908.

This species is very closely allied to *M. bamffica*, but it is separable from the latter by certain well-marked characters.

Appellöf (1906) gives the following summary of its characters : "Eye-bulb broader than in *M. rugosa* (=*bamffica*) ; circlet of hairs quite rudimentary or altogether absent ; spines always present on the middle part of hind margin of carapace ; two spines on fourth abdominal segment ; dorsal surface of abdominal segments with 6–7 furrows ; limbs slenderer than in *rugosa* (=*bamffica*)."

All these characters are reliable, but Hansen points out that Appellöf has not observed the best distinguishing mark, viz., the surface of the sternal plates. He says : "In both species the sternum is divided into four segments by raised cross-lines furnished with marginal hairs. In *M. bamffica* it is further, as if covered with scales almost everywhere, which is due to the presence of numerous large and small, slightly-arched tubercles, the convex, anterior, or outer margin of which is well marked off and provided with hairs. . . . In *M. tenuimana* the sternum is very shining and without the scale-formations as in *M. bamffica* ; there are some rows of bristles on a part of the first sternal segment, but the scale-like tubercles are rudimentary, and as a rule the second, third, and fourth segments are smooth, with altogether extremely few short rows of hairs, chiefly out towards the lateral margins ; sometimes, also, we meet with a small number of such rows scattered over the surface of the segments, but the scale-formation, *i.e.*, the raised, seemingly imbricate areas are never developed."

M. tenuimana is, on the whole, more slightly built than *M. bamffica* ; the carapace is not quite so broad, and its margins are not so convex as in the latter species. The pereiopods, and in particular the first pair, are longer and more slender.

The circlet of hairs round the eye is almost entirely absent, and in some specimens completely so. The eyes are usually slightly larger than in *bamffica*. The sternum is as described by Hansen in all the specimens taken by the *Helga*. In some cases there are a few hair-fringed ridges on the second and third plates, but otherwise they are absent except near the anterior edge of the first sternal plate. In all the specimens of *bamffica*, on the contrary, the sternum is covered throughout with curved ridges and tubercles.

In all the specimens which I have examined the supra-orbital spines are elevated at a greater angle than they are in *bamffica*, in which, indeed, they lie almost in the same plane as the rostrum.

in *bamffica* these are barely half as long as the supra-orbital spines, and are thickened near the base; in *tenuimana*, on the other hand, they are very slender throughout, and are often very nearly as long as the supra-orbital spines.

Appellöf's distinction, based on the number of tergal furrows, is reliable only in the case of adult specimens, as the number of furrows varies with age. In *bamffica* there are from nine to fifteen, and in *tenuimana*, only six or seven.

The differences between the two species may, therefore, be tabulated as follows :—

M. bamffica.	*M. tenuimana.*
Eyes surrounded by circlet of hairs, some of which extend far out on corneal surface.	Circlet of hairs absent or rudimentary.
Sternal plates covered closely with raised tubercles and ridges which are bordered anteriorly with hairs.	Sternal plates devoid of such ridges and tubercles altogether, or having at most a few widely-scattered.
Spines on middle part of hind margin of carapace sometimes present.	Spines always present on middle part of hind margin, and usually larger than in *bamffica*.
Spines sometimes present on tergum of fourth abdominal segment.	Spines always present on fourth abdominal segment, and larger than in *bamffica*.
Supra-orbital spines horizontal or very slightly elevated.	Supra-orbital spines elevated at a considerable angle.
Spines at antero-lateral angles of carapace, about half as long as the supra-orbital spines.	Spines at antero-lateral angles of carapace, very long and slender, very nearly as long as the supra-orbital spines.

Dr. Lundbeck, of Copenhagen, has kindly sent me a specimen of *M. bamffica*, from the Faeroes, and three of *M. tenuimana* from the Skagerrak. These were named by Dr. Hansen, and I find that they agree exactly with the Irish specimens of the respective species.

Size.—The largest specimen measures 59 mm., and others in the collection are 58 mm., 53 mm., 51 mm., and 46 mm. Hansen mentions a female taken in the Skagerrak which was 87 mm. long, and a male taken by the *Ingolf* was about 74 mm. long.

samer, and others. It has been ...
(Sars), in the Skagerrak (Stephensen, Björck), at a large number of stations to the west and south of Iceland (Hansen), and in Davis Straits (Stephensen). The *Helga* records are the first for the Irish marine area, but it is known from the Shetlands (Norman). It is at present impossible to mention a limit to its southern extension owing to its probable confusion by various authors with the last species.

Vertical Distribution.—*M. tenuimana* is a deep-water form, uniformly inhabiting greater depths than does *M. bamffica*. Sars took it in the Norwegian fjords in depths of 300–672 fms. Hansen records a remarkable haul of 104 specimens taken by the *Ingolf* off the south-west of Iceland, in a depth of 799 fms., the greatest yet recorded for the species. The *Helga* specimens were taken in 550–795 fms. Occasionally it seems to be found in comparatively shallow water, as Björck (1913 (*a*)) records it from 53 fms., from the Skagerrak.

Irish Distribution.—All the stations at which this species was taken lie close together, about 60 or 70 miles south-west of Tearaght, Co. Kerry.
Helga.

S. R. 331.—9 v '06.—51° 12′ N., 10° 55′ W., 610–680 fms., ooze. Trawl. Surface Temperature 10·75° C.—Two, 43–50 mm.

S. R. 353.—6 viii '06. 50° 37′–50° 40′ N., 11° 32′ W., 250–542 fms., mud and sand. Trawl. Temperature at 500 fms., 8·58° C. Salinity 35·46°/$_{oo}$.—Two, 26–46 mm.

S. R. 363.—10 viii '06. 51° 22′ N., 12° W., 695–720 fms., ooze. Trawl.—24–58 mm.

S. R. 364.—10 viii '06.—51° 23′ 30″ N., 11° 47′ W., 620–695 fms., ooze. Trawl. Temperature at 600 fms., 7·92° C., Salinity 35·37 °/$_{oo}$.—One, 32 mm.

S. R. 401.—5 ii '07. 51° 14′ N., 11° 51′ W., 600–660 fms. Trawl. Temperature at 580 fms., 8·35° C., Salinity 35·5 °/$_{oo}$.—One, 34 mm.

S. R. 477.—28 viii '07. 51° 15′ N., 11° 47′ W., 707–710 fms., ooze. Trawl. Temperature at depth 7·19° C.—Four, 28–53 mm.

S. R. 491.—7 ix '07. 51° 57′ 30″ N., 12° 13′ W., 491–520 fms. Trawl. Temperature at depth 8·53° C., Salinity 35·44 °/$_{oo}$.—One.

S. R. 497.—10 ix '07. 51° 2′ N., 11° 36′ W., 775–795 fms., ooze. Trawl.—One, 43 mm.

S. R. 499.—11 ix '07. 50° 55′ N., 11° 29′ W., 666–778 fms. Trawl. Temperature at 600 fms., 8·22° C., Salinity 35·41 °/$_{oo}$.—One.

672 fms. Trawl. Temperature at 600 fms., 8·22° C., Salinity, 35·53 $^{o}/_{oo}$.—One.

S. R. 593.—6 VIII '08. 50° 31′ N., 11° 31′ W., 670–770 fms., ooze. Trawl. Temperature at 650 fms., 7·75° C., Salinity, 35·53 $^{o}/_{oo}$.—Two, very small.

S. R. 752.—16, 17 V '09. 51° 48′ N., 12° 11′ 30″ W., soundings 523–595 fms., ooze. Midwater otter trawl, 0–595 fms. Temperature at 500 fms., 8·9° C., Salinity 35·43 $^{o}/_{oo}$.—Five, small.

S. R. 753.—17 V '09.—51° 24′ N., 11° 59′ 30″ W., 561–572 fms., ooze. Trawl. Temperature at 550 fms., 8·79° C., Salinity 35·46 $^{o}/_{oo}$.—One, 59 mm.

S. R. 805.—14 VIII '09. 60 mls. W.½N. of Tearaght Light, Co. Kerry, 51° 50′ 30″ N., 12° 14′ W., 539–544 fms., ooze. Trawl.—One, 21 mm.

S. R. 1242.—14 VIII '11. 51° 27′ N., 11° 55′ W., 550–590 fms. Trawl.—Two, 44–51 mm.

Genus **Munidopsis**, Whiteaves.

Munidopsis, Whiteaves, 1874. *Galathodes*, A. Milne-Edwards, 1880. *Orophorhynchus*, A. Milne-Edwards, 1880. *Elasmonotus*, A. Milne-Edwards, 1880. *Anoplonotus*, S. J. Smith, 1883. *Galathopsis*, Henderson, 1885. *Munidopsis*, Henderson, 1888. *Elasmonotus*, Henderson, 1888. *Munidopsis*, A. Milne-Edwards and Bouvier, 1894 (*b*). *Galathodes*, A. Milne-Edwards and Bouvier, 1894 (*b*). *Elasmonotus*, A. Milne-Edwards and Bouvier, 1894 (*b*). *Orophorhynchus*, A. Milne-Edwards and Bouvier, 1894 (*b*). *Bathyankeristes*, Alcock and Anderson, 1894. *Munidopsis*, Faxon, 1895. *Munidopsis*, Alcock, 1901.

Following Faxon and Alcock, I have united the various genera into which this group has been split up, in the single genus *Munidopsis*. The two species which have been taken in Irish waters, *M. tridentata* and *M. curvirostra*, are widely different, and might well be placed in separate genera were it not for the fact that they are connected by transitional forms which make it impossible to draw any hard and fast line between the various groups. Alcock (1901) gives the genera proposed by Milne-Edwards and Bouvier, and his own genus *Bathyankeristes*, the rank of sub-genera with a synopsis of their characters.

The two Irish species are easily separable by the form of the rostrum :—

Rostrum spiniform ; strongly upturned, *M. curvirostra.*

Rostrum broad, ending in three teeth, the central one the longest, .. *M. tridentata.*

Mundiopsis (Galathodes) tridentata (Esmark.)

Pl. XII, figs. 1–5.

Galathea tridentata, Esmark, 1856.
Galathodes rosaceus, A. Milne-Edwards, 1881.
Galathodes tridentata, G. O. Sars, 1882.
Munidopsis rosacea, Alcock and Anderson, 1899.
Galathodes tridentata, A. Milne-Edwards and Bouvier, 1899.
Munidopsis tridentata, Alcock, 1901.
Galathodes tridentata, Appellöf, 1906.

The carapace, excluding the broad, flattened rostrum, is roughly quadrilateral. The two lateral margins are very slightly convex, and each bears four small teeth. The posterior tooth is situated immediately behind the cervical groove, and the anterior and largest one forms the antero-lateral angle of the carapace. The rostrum is less than half the length of the carapace, and is slightly but distinctly carinated in the median line, ending in a trifid tip, the central point of which is the longest. Between the base of the rostrum and the antero-lateral spine there is a sharp tooth above the base of the antenna. The hind margin of the carapace is smooth and very slightly concave. The whole dorsal surface is rugose and covered with short hairs. The cervical groove is most distinct at the sides and is more vague in outline in the middle. On the central part of the cardiac region there is a short transverse furrow which extends about half way to either lateral margin and has at each end a circular depression. There is another depression just in front of the hind margin. The *linea anomurica* is distinct. The sub-lateral surface of the carapace is rugose like the dorsal part.

The abdomen, when straightened out, is of about the same length as the carapace, excluding the rostrum. None of the terga bear spines. The covering of setae is not so dense as on the carapace.

The second and third abdominal segments have a dorsal transverse groove which is wanting on the other segments. The pleura of the second segment are broader than the others. The basal part of the telson is bounded by a straight line in front and rounded behind. It is followed by a very small triangular plate. The hind part of the telson is divided by a deep median and two oblique lateral grooves.

The eyes are not facetted and are devoid of pigment. They are terminal on the sub-cylindrical eyestalks. Immediately to the exterior of each stalk there is a small sharp tooth.

The antennules are short, reaching only slightly beyond the tip of the rostrum when extended. The basal joint is massive

about equal and become thicker distally. The two flagella are both quite short, the internal one consisting of only four joints, and being slender throughout, while the outer is made up of about fifteen joints and is broad at the base but narrows rapidly into a long, thin distal portion. The tip of the last peduncular joint bears a semicircle of long plumose hairs which surround the base of the exterior flagellum, which also has a dense fringe of hairs along its inner margin.

The antennal peduncle consists of four joints, the basal one of which is embedded in a sinus in the sub-marginal part of the carapace just at the end of the *linea anomurica*. It gives off an internal and an external spine, of which the former is the larger; both are thick and blunt. The second joint has a sharp spine at the outer side. The flagellum is very slender and is about one and a-half times as long as the carapace, including the rostrum.

The ischium of the third maxillipedes is triangular in section. It thickens very considerably towards the distal end, which bears two sharp teeth. The merus has two long spines on the inner side; the carpus is swollen and rough; the propodite is club-shaped.

The chelipeds are as long as, or longer than, the body from rostrum to tip of extended telson. They are well developed in both sexes, but are more massive in the male. They are covered above and below with little elongated tubercles or scales, from which spring groups of setae. The three basal joints are slender compared with the others. On the merus, which is more or less quadrilateral in section, there is a dorsal row of four or five teeth; on the upper distal part of the internal face a single large spine; near the proximal end of the lower side and pointing inwards, a row of three large spines; and at the distal extremity four sharp teeth. The carpus is short and bears several spines, including one large one on the inner face. The propodite is the largest joint of the appendage; the palm is nearly twice as long as the fingers; it bears no spines. The fixed finger curves slightly outwards at its base and touches the dactyl at the tip only. The interior edges of the fingers are minutely serrate. Opposite the hollow of the fixed finger the inner margin of the dactyl curves towards the latter, but not far enough to bring the two into contact.

It should be noted that the form and dimensions of the chelipeds of this species are extremely variable. Among 237 specimens Alcock could not find two in which the arrangement of spines was identical.

The next three pairs of legs are very similar in appearance. The dorsal side of the merus bears a row of sharp, forward-directed spines, the last of the row projecting distally beyond the joint. There is also a distal spine at the lower end of the merus. The carpus bears a similar sharp dorsal tooth at the tip, but the row of spines is continued on this joint merely by

teeth. The dactyl is only about half the length of the propodite, and its posterior edge bears about ten small teeth ; it terminates in a sharp curved claw.

The fifth legs are feeble and are carried folded in the manner usual in this group of Decapods.

The first pair of pleopods arise very near the median line in the male ; they have a stout basal part and a distal joint, which expands into a broad lamella which is curved downwards. The basal joint has a distal tuft of setae, and the inner edge of the lamella is fringed with hairs, which are longest at the proximal end. The second pleopods in the male have a very long and thick peduncular part which bears at its end a short, blunt tubercular process which represents the exopodite. The inner branch and the *appendix interna* are united to form a large flattened and twisted structure. It is heavily fringed with setae, and the outer portion at the broadest part is covered with short, stiff bristles. It is this part which constitutes the *appendix masculina*, and has become fused with the endopodite of the pleopod.

The pleopods of the third, fourth, and fifth segments are feeble and rudimentary.

In the female, pleopods are present on the second to fifth segments, and are all slender and feeble.

The exopodite of the uropods is rough and calcareous towards the outer edge, but the inner part is smooth. The endopodite is rough all over, and bears short transverse ridges armed with groups of little teeth. Both have marginal spines and fringes of setae.

Size.—The largest specimen taken by the *Helga* is a male which measures 33 mm.

General Distribution.—The species is found, but not commonly, on the west coast of Norway : Lofoten (Esmark), Hardangerfjord (Sars), Trondhjemfjord (Norman). It has been recorded from the Bay of Biscay (Caullery, M. Edwards and Bouvier), off the west coast of Morocco and the Sudan, from the Azores, and Cape Verde (M. Edwards and Bouvier). It has also been taken plentifully in the Indian Ocean : Arabian Sea, North Maldive Atoll, Travancore coast, off Ceylon (Alcock).

Irish Distribution.—This species has not previously been recorded from British waters.

Helga.

S. R. 335.—12 v '06. 51° 12′ 30″–51° 17′ 30″ N., 12° 18′–12° 16′ W., 893–673 fms. Trawl and Sprat net on Trawl.—Four.

S. R. 504.—12 ix '07. 50° 42′ N., 11° 18′ W., 627–728 fms., coral. Trawl and Sprat net on Trawl.—Two, one male and one immature.

fine sand. Trawl. Temp. at 650 fms., 7·12° C.—Two, one male, 33 mm., one female, 28 mm.

Vertical Distribution.—Like the other members of the genus, it inhabits deep water, occurring most commonly in depths of 550–750 fms. In the Bay of Biscay it was taken in 808 fms. In the Indian Ocean it apparently inhabits shallower water, the depths given by Alcock ranging from 210 fms. to 430 fms.

Very often the specimens are found clinging to coral, especially *Lophohelia prolifera.*

Munidopsis curvirostra, Whiteaves.

Pl. XIII, figs. 1–4.

Munidopsis curvirostra, Whiteaves, 1874.
Munidopsis longirostris, A. Milne-Edwards and Bouvier, 1900.
Munidopsis curvirostra, Hansen, 1908.
Munidopsis curvirostra, Stephensen, 1912.

Hansen (1908) examined a specimen of M. *longirostris* taken by the *Talisman* off the west coast of the Sudan, and found that it agreed perfectly with the specimens of *M. curvirostra,* taken by the *Ingolf.* Neither the *Talisman* nor the *Ingolf* specimen, however, agrees with Milne-Edwards and Bouvier's figures (1900), which show the carapace wider in front than behind, and with very long and broad antero-lateral processes.

The sides of the carapace are almost parallel, converging very slightly in front. The lateral margins are entire and do not come to a sharp edge. The postero-lateral angles are rounded, and the posterior margin is feebly concave and unarmed. At each antero-lateral angle there is a large horizontally-projecting spine, with a broad, rounded base, and tapering rapidly to a fine point. The anterior edge of the spine bears a small accessory tooth near the tip. The front of the carapace is rounded and unarmed, except for the very long and slender upturned rostrum, which is usually about two-thirds the length of the carapace. The gastric region is more or less inflated and bears a variable number of spines. Behind this lies the deeply-channelled cervical groove, which on either side gives off a groove which runs forwards to the antero-lateral angle. On the middle of the cardiac region there is a sharply-defined transverse ridge bearing a single large spine. Almost the entire surface of the carapace is marked by low, short transverse ridges which are most numerous near the sides.

The arrangement of the spines on the gastric area is extremely variable. In the ten specimens taken by the *Helga,* six different arrangements can be seen. Normally there is a pair of spines in front, some distance behind the base of the rostrum, and

(See also Hansen, 1908, [illegible])

The *linea anomurica* is distinct, and the sub-marginal part of the carapace is covered with low oblique ridges.

The carapace, excluding the rostrum, is as long as the straightened abdomen without the telson.

The first abdominal segment is partly hidden by the carapace and is very narrow. The second, third, and fourth segments have each a transverse furrow on the tergum. The second and third terga each bear a median spine which points forwards. Sometimes a spine is present on the fourth tergum also; it occurs in only one of the *Helga* specimens.

The pleura are well developed, and are long and narrow, with blunt ends, except those of the second segment which are broad and rounded. On the first segment they are rudimentary. On the anterior margin they are all fringed with setae, and on the sixth segment on both margins. The telson differs somewhat in structure from that of *M. tridentata*. The basal plate comes to a truncate end and is followed by three small plates in the middle, the central one of which is prolonged in a narrow process extending to the posterior margin.

The eyes are large but quite devoid of pigment. They vary somewhat in shape; in some the cornea is more or less pointed in front, and in others is quite globular.

The antennules resemble those of *M. tridentata*, except with regard to the basal joint of the peduncle, which bears three long spines instead of two. One of the spines, immediately at the base of the second joint, is divided into three points, and bears also two or three small teeth between the larger ones.

The antennal peduncle differs from that of *M. tridentata* in having the spines of the basal joint represented by blunt tubercles. The flagella are as long as the body excluding the telson.

The third maxillipedes are similar to those of *M. tridentata*, except that the two teeth on the internal margin of the merus are shorter, and the terminal teeth on the ischium are more rounded.

The chelipeds are long and slender. One is usually slightly larger than the other; this may be either the right or the left. They are covered throughout with small scales, some of which are fringed with extremely short setae, but they are devoid of long hairs, such as are present in *M. tridentata*. The first three joints are slenderer than the others, the thickening beginning at the base of the merus, which is more or less quadrangular in section. Each of the four edges of the merus ends in a sharp distal spine. The carpus terminates in two double spines above, and a broader spine below, which has also sometimes a double point. The propodite is broadest at the base of the fingers, which are in contact throughout their whole length. The cutting edges are serrate. The palm is longer than the fingers.

distal spine on the dorsal side, but this is often absent in the third and fourth pairs. There is a small tuft of setae at the distal end of the propodite. The lower edge of the dactyl is furnished with a row of sharp teeth which increase in size towards the point, which has the form of a strongly-curved claw. These teeth are accompanied by fringes of setae.

In the male, the first pair of pleopods is practically identical in form with those of *M. tridentata*, but their point of attachment is not so near the median line. The second pair differs only in detail from that of the last species. The other pairs are reduced to the merest rudiments in the male. In the female, five pairs are present and are long and slender.

The uropods have no transverse suture on either exopodite or endopodite, and are usually carried half concealed under the telson.

All the female specimens taken by the *Helga* are ovigerous. The eggs are large and few in number. In the different individuals the eggs number 12, 20, 25, 30, 38 and 45. They measure from 1·2 mm. to 1·4 mm. in diameter.

Size.—The largest specimen taken is a male measuring 31 mm. Hansen's largest one was 35 mm. long.

General Distribution.—The species was first taken in the Gulf of St. Lawrence (Whiteaves), and has since been recorded from the east coast of the United States between 33° 35′ N. and 40° N., and off Newfoundland. More recently it has been taken in Davis Straits (Hansen, Stephensen), and to the south and south-west of Iceland (Hansen). It has also been recorded, under the name of *M. longirostris*, from the west coast of the Sudan at 30° N. (Milne-Edwards and Bouvier).

Irish Distribution.—The *Helga* has taken this species on only one occasion.

S. R. 944.—17 v '10. 86 mls. W.¼N. of Great Skellig, Co. Kerry, 51° 22′ N., 12° 41′ W., 982 fms., ooze. Shrimp-Trawl.—Ten, three males, and seven ovigerous females, 31–25 mm.

Vertical Distribution.—Usually found in depths of about 700–900 fms., but has been taken in 180 fms. (Gulf of St. Lawrence), and in 1,175 fms. (off Sudan).

Chelipeds bear a [illegible]
on their outer edge ; carpus has a denticulated lobe at its inner lower angle ; hands very large, ... *P. platycheles.*

Chelipeds devoid of setae ; no denticulated lobe on carpus ; hands narrow, .. *P. longicornis.*

Porcellana platycheles, Pennant.

Porcellana platycheles, Bell, 1853.
Porcellana platycheles, Heller, 1863.

The chief specific characters are the following : dense fringes of long setae on the propodite of the chelipeds ; denticulated process near proximal end of carpus ; carapace slightly longer than broad ; its margins setiferous ; front of carapace divided into three lobes, the central one having a slight median groove, but not divided as in *P. longicornis* ; chelipeds, very massive, and practically equal ; edges of abdominal segments heavily fringed with setae, especially in the female ; walking-legs also setiferous.

Size.—Large specimens measure about 14–16 mm., from front to back of carapace.

General Distribution.—This species has a more limited distribution than *P. longicornis.* It occurs on all the British coasts, even as far north as the Orkneys and Shetlands (Bell). It is also found plentifully on the French side of the Channel, and in the Bay of Biscay (Milne-Edwards), off the Spanish and Portuguese coasts, and at the Canaries (Heller). It is very common throughout the shores of the Mediterranean and Adriatic (Heller).

Irish Distribution.—Found abundantly all round the coast. It is not apparently quite so common on the east as on the west coast, but the larger amount of shore-collecting done on the latter may explain the comparative paucity of records from the east.

Vertical Distribution.—Very common between tide-marks, and extending only a short distance beyond the low-water line.

Porcellana longicornis, Linn.

Porcellana longicornis, Bell, 1853.
Porcellana longicornis, Heller, 1863.
Porcellana longicornis, Meinert, 1877.

Carapace almost circular ; the frontal margin divided into three lobes, the central one divided by a deep groove ; the margin of the central lobe is denticulate. Antennules reach beyond the merus of the chelipeds. Antennae, long and very

Fig. 6.—Lateral view, ×13·3.
Fig. 7.—Dorsal view of anterior end of carapace, ×16·6.
Fig. 8.—Second maxillipede, ×24·6.
Fig. 9.—Third maxillipede, ×24·6.

Plate V.

Eryonicus hibernicus, n. sp.

Fig. 1.—Lateral view, ×4·6.
Fig. 2.—Telson and uropods, ×4·3.

Eryonicus Kempi, n. sp.

Fig. 3.—Lateral view, ×4·3.
Fig. 4.—Dorsal view, ×4·3.
Fig. 5.—Telson and uropods, ×5.
Fig. 6.—Antennular peduncle, ×13·3.
Fig. 7.—Antennal peduncle, ×13·3.
Fig. 8.—Merus and carpus of second pereiopod, ×8·6.

Eryonicus Scharffi, n. sp.

Fig. 9.—Lateral view, ×4.
Fig. 10.—Anterior end of carapace from dorsal aspect, ×6.
Fig. 11.—Telson and uropods, ×4·6.
Fig. 12.—Merus and carpus of second pereiopod, ×8·6.

Plate VI.

Palinurus Thomsoni, n. sp.

Fig. 1.—Dorsal view, ×·8.
Fig. 2.—First pereiopod, ×·8.

Palinurus vulgaris, Latreille.

Fig. 3.—First pereiopod, ×·7.

Plate VII.

Nephropsis atlantica, Norman.

Fig. 1.—Lateral view of female, ×·75.
Fig. 2.—Mandible, ×3·5.
Fig. 3.—First maxilla. ×5.
Fig. 4.—Second maxilla, ×3·5.
Fig. 5.—First maxillipede, ×3·5.
Fig. 6.—Second maxillipede, ×3.
Fig. 7.—Third maxillipede, ×3.
Fig. 8.—First pleopod of female, ×3.
Fig. 9.—First pleopod of male, ×3.
Fig. 10.—Second pleopod of male with *appendix masculina*, ×3.
Fig. 11.—Openings of oviducts and spermatheca of female, ×3·5.
Fig. 12.—Spermatophore, ×5.
Fig. 13.—Spermatozoa, ×430.

Fig. 2.—Lateral view of carapace, ×3·5.
Fig. 3.—Cheliped, ×3·5.
Fig. 4.—End of second pereiopod, ×13.

Uroptychus nitidus, (A. Milne-Edwards), var. *concolor*, Milne-Edwards and Bouvier.

Fig. 5.—Lateral view of carapace, ×3·5.
Fig. 6.—Antennal peduncle, ×21·5
Fig. 7.—Third maxillipede, ×4·3
Fig. 8.—Lower surface of ischium of cheliped, ×3·5
Fig. 9.—End of second pereiopod, ×13.
Fig. 10.—Distal part of second pleopod of male, ×35.

Plate IX.

Uroptychus nitidus (A. Milne-Edwards), var. *concolor*, A. Milne-Edwards and Bouvier.

Fig. 1.—Dorsal view, ×5·1

Gastroptychus formosus (Milne-Edwards and Bouvier).

Fig. 2.—First maxilla, ×17·3.
Fig. 3.—First maxillipede, ×14·6.
Fig. 4.—Second maxillipede, ×14·6.
Fig. 5.—Third maxillipede, ×4·6.
Fig. 6.—First pleopod of male, ×17·3.
Fig. 7.—Second pleopod of male, ×17·3.
Fig. 8.—Second pleopod of female, ×17·3.

Plate X.

Gastroptychus formosus (Milne-Edwards and Bouvier).

Fig. 1.—Dorsal view, ×2·3.

Plate XI.

Galathea intermedia, Lilljeborg.

Fig. 1.—Antennule, ×23·3.
Fig. 2.—First maxilla, ×17·3.
Fig. 3.—Second maxilla, ×17·3
Fig. 4.—First maxillipede, ×17·3.
Fig. 5.—Second maxillipede, ×17·3.
Fig. 6.—Third maxillipede, ×17·3.
Fig. 7.—End of propodite of cheliped, ×17·3.
Fig. 8.—Fifth pereiopod, ×23·3.
Fig. 9.—First pleopod of male, ×17·3.
Fig. 10.—Second pleopod of male, ×17·3.
Fig. 11.—Third pleopod with two-jointed endopodite, ×28·6.
Fig. 12.—Third pleopod with one-jointed endopodite, ×28·6.

Munida bamffica (Pennant).

Fig. 13.—Dorsal view, ×4.
Fig. 14.—Thoracic sternum, ×8.

Fig. 15.—Dorsal view, ×4.
Fig. 16.—Thoracic sternum, ×8.

Plate XII.

Munidopsis tridentata (Esmark).

Fig. 1.—Dorsal view, ×2.
Fig. 2.—Telson and uropods, ×3.
Fig. 3.—Third maxillipede, ×19·5.
Fig. 4.—First pleopod of male, ×13·5.
Fig. 5.—Second pleopod of male, ×18·5.

Plate XIII.

Munidopsis curvirostra, Whiteaves.

Fig. 1.—Dorsal view, ×5·1.
Fig. 2.—Lateral view of carapace, ×4·6.
Fig. 3.—Telson and uropods, ×4.
Fig. 4.—Second pleopod of male, ×28·6.

Plate XIV.

Axius stirhynchus, Leach.

Fig. 1. Dorsal view, ×·83.
Fig. 2.—Lateral view of anterior part of carapace, ×3·6.
Fig. 3.—Cheliped, ×3·6.
Fig. 4.—Openings of oviducts and spermatheca of female, ×4·3.

Calocaris Macandreae, Bell.

Fig. 5.—Lateral view of ovaries and testes exposed, ×4·6.
Fig. 6.—Third maxillipede, ×4·6.
Fig. 7.—First pleopod, ×28·6.

Callianassa Stebbingi, Borradaile.

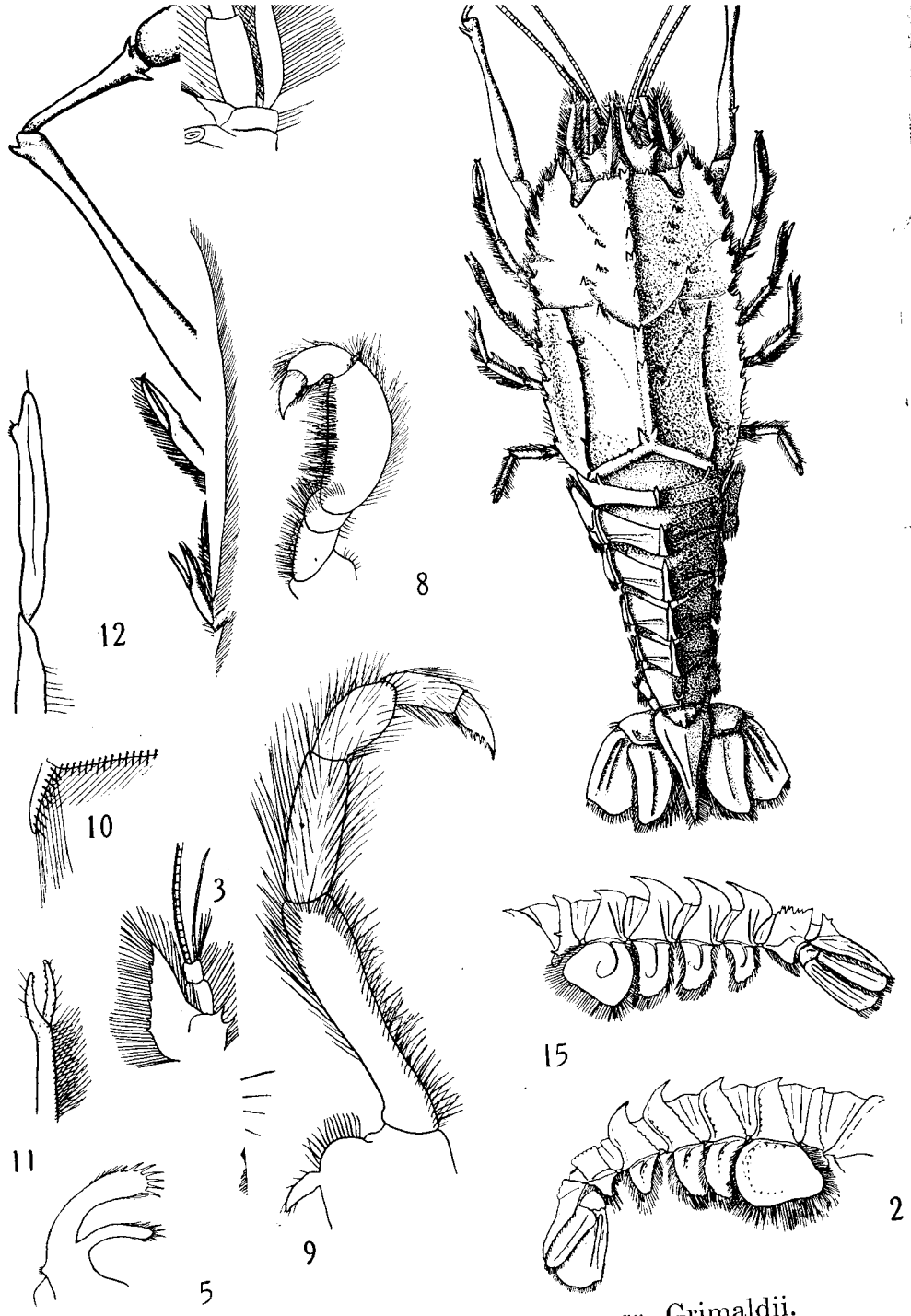
Fig. 8.—Outer side of third maxillipede, ×4·6.
Fig. 9.—Inner side of third maxillipede, ×4·6.
Fig. 10.—Third pereiopod, ×4·6 .

Plate XV.

Jaxea nocturna, (Chiereghin) Nardo.

Fig. 1.—Lateral view of adult male, ×4·3.
Fig. 2.—Telson and uropods, ×4·6.
Fig. 3.—Anterior end of carapace from dorsal aspect, ×4·3.
Fig. 4.—First maxilla, ×16.
Fig. 5.—Second maxilla, ×7·3.
Fig. 6.—First maxillipede, ×6.
Fig. 7.—Second maxillipede, ×10·6.
Fig. 8.—Third maxillipede, ×4·6.

Wt. P.533.—S. 425. 750. 2/14. B. & N., Ltd.



C.M.S. del.

Figs. 14. 15.—P. nanus, *var.* Grimaldii.

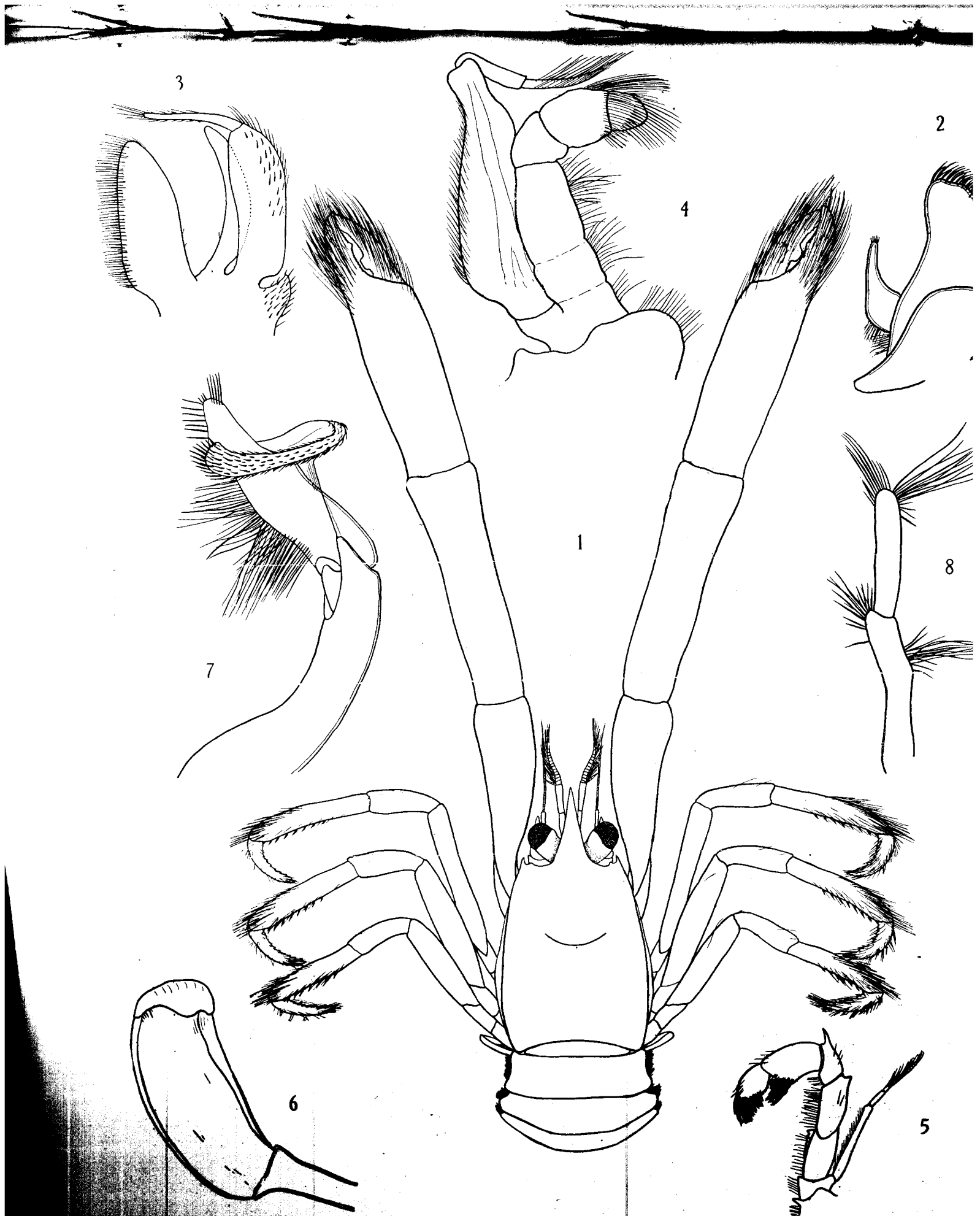
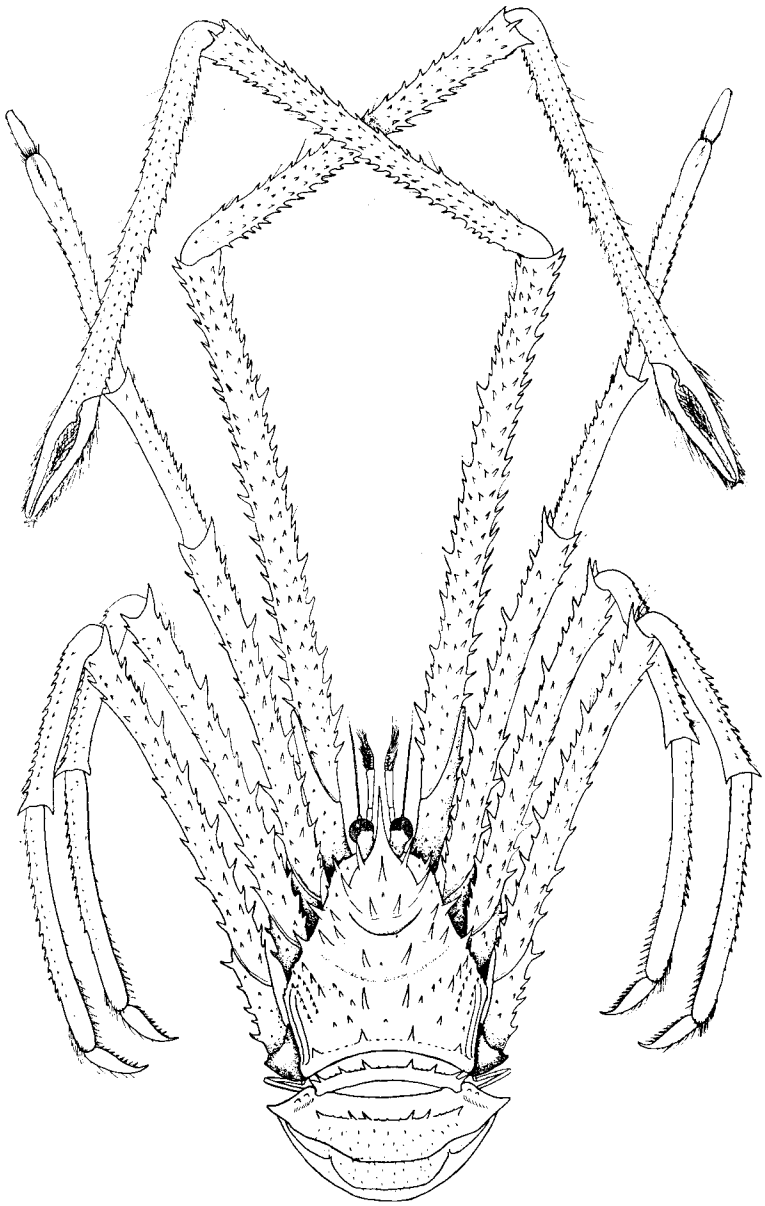


Fig. 1.—Uroptychus nitidus, var. concolor.
Figs. 2–8.—Gastroptychus formosus.



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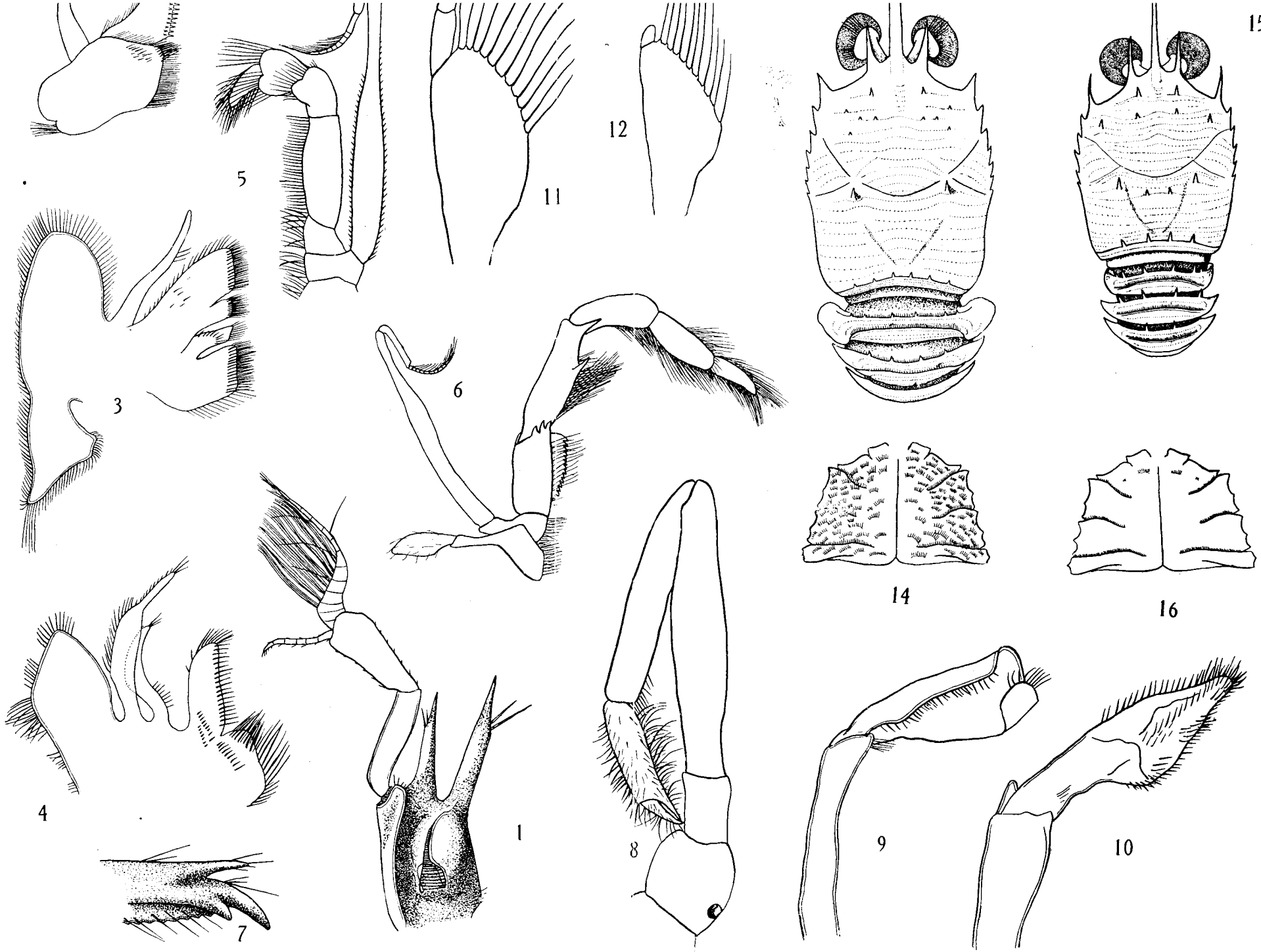
Gastroptychus formosus.



C.M.S. del. Figs. 1–12.—Galathea intermedia. Figs. 13, 14.—Munida bamffica. Figs. 15, 16.—M. tenuimana.

C.M.S. del.

Munidopsis tridentata.

Munidopsis curvirostra.

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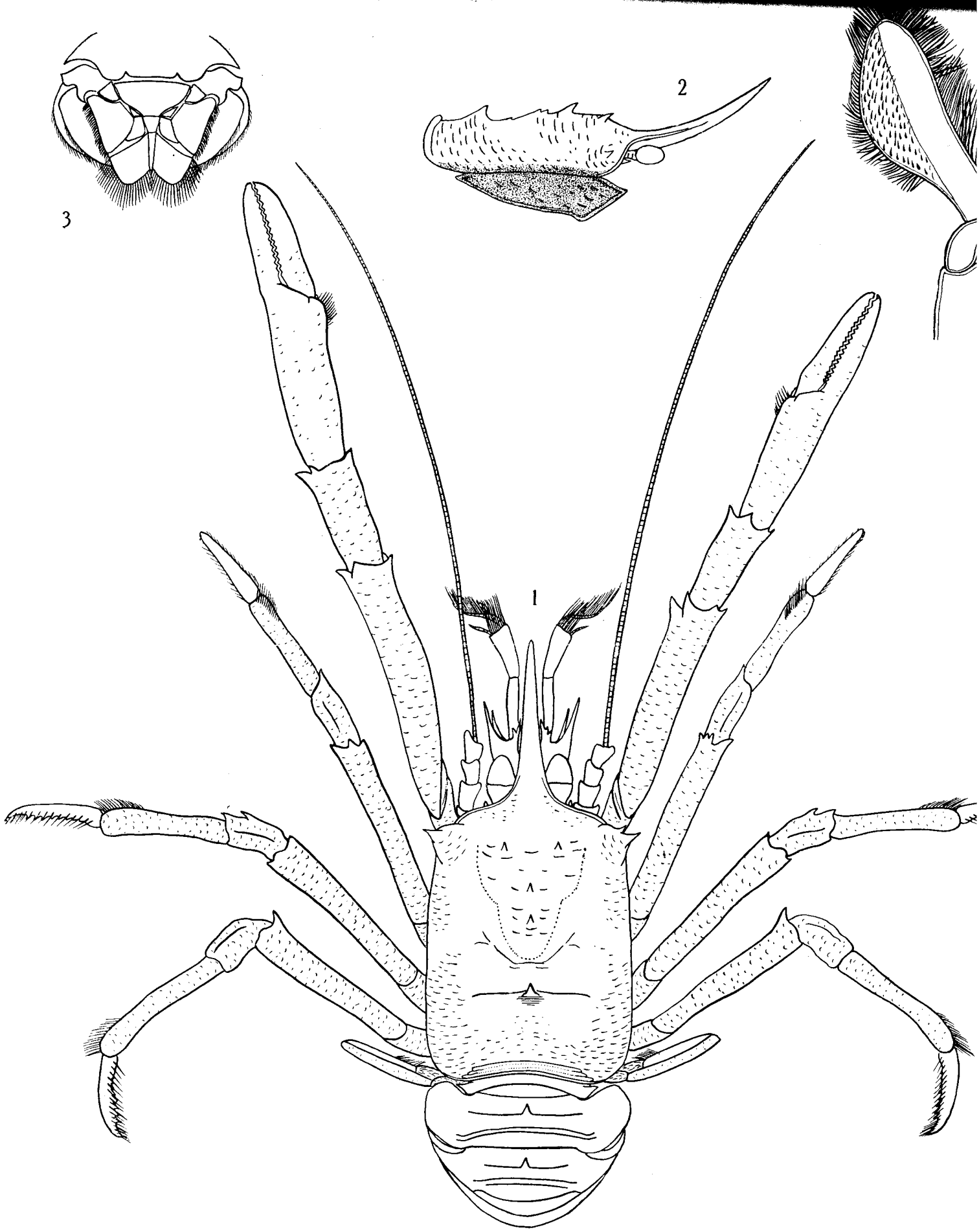

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Munidopsis curvirostra.