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ON THE BRITANNIC SPECIES

OF

CRANGON AND GALATHEA:

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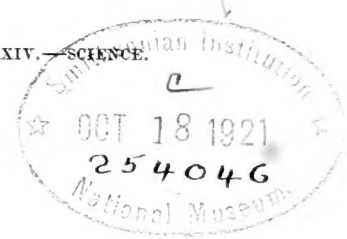
SOME REMARKS ON THE HOMOLOGIES OF THESE GROUPS.

BY

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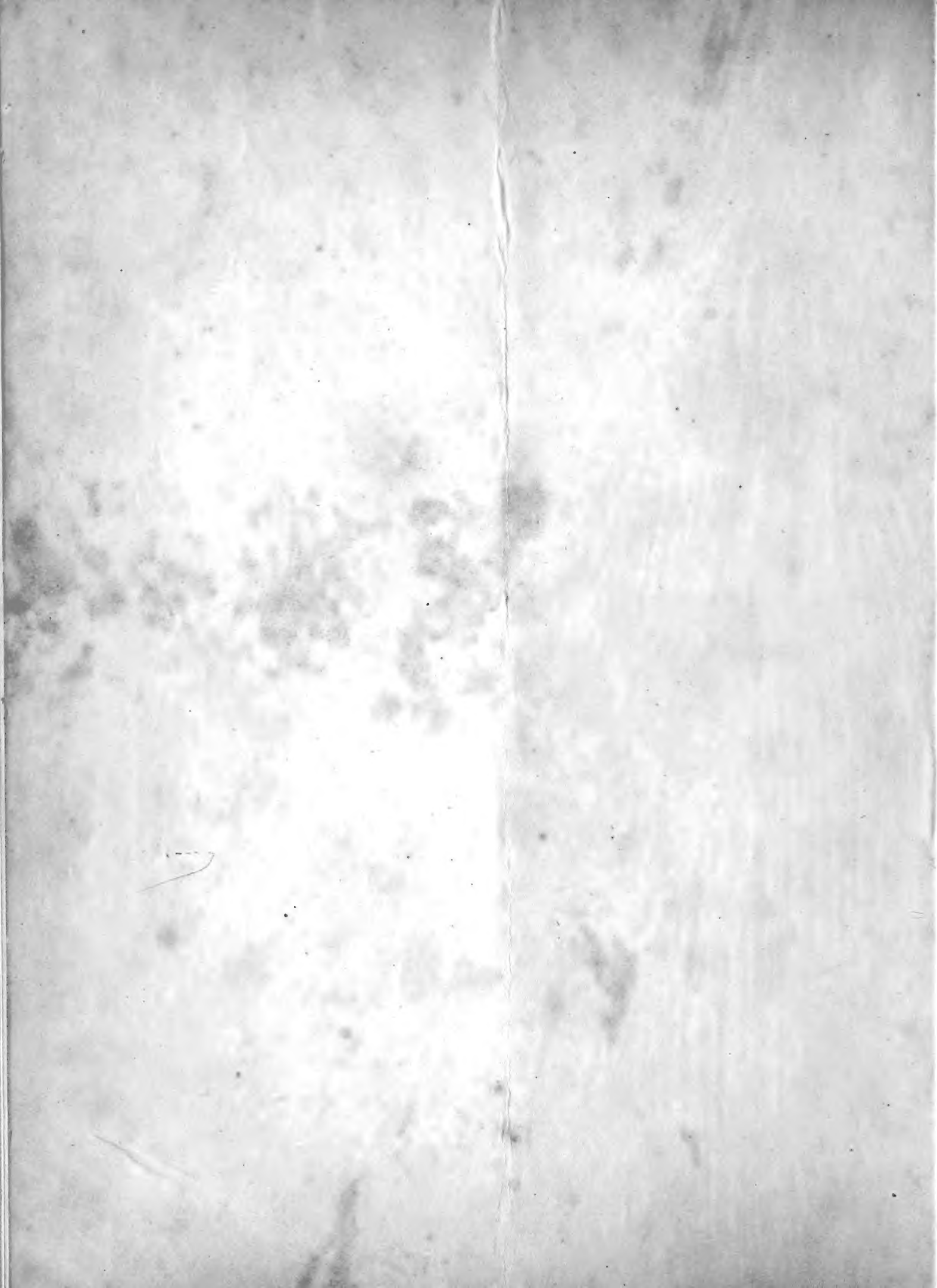


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ON THE
BRITANNIC SPECIES OF CRANGON AND GALATHEA,
&c. &c.

PART I.—CRANGON.

CONSIDERATIONS ON THE SPECIES USUALLY INCLUDED UNDER THE GENUS
CRANGON.

AS at present constituted, the genus *Crangon* comprises the following species, which are here arranged in the order of their presumed affinities, the extra-Britannic species being italicized :—

Crangon vulgaris. Fabricius (not Owen or Dana).

Crangon Franciscorum (1) (Stimpson*). Boston Journal Natural History, VI., 496, pl. xxii. 6.

Crangon rubropunctatus (Risso). Crustaces de Nice, p. 83, Hist. Naturelle de l'Europe Meridionale, t. v. 86.

Crangon propinquus (2) (Stimpson). Prodrusus, 94.

Crangon nigricauda (3) (Stimpson). Bost. Jour. Nat. Hist., VI., 496, pl. xxii., fig. 5.

* I am indebted to the kindness of the author for the descriptions of this and the other species bearing his name. As the works in which these occur are probably not easily accessible, I have, in the note at page 47, given the characters of the species.

- Crangon affinis* (de Haan). Fauna Japonica Crustacea, 182.
Crangon Allmanni (Kinahan). Nat. History Review, iv., p. 82. Proc. Nat. Hist. Soc., Dubl., vol. ii. p. 27 (fig.).

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- Crangon trispinosus* (Hailstone). Mag. Natural History, viii., p. 261, fig. 25.
Crangon bispinosus (Westwood). Mag. Nat. History, viii., p. 262.
Crangon intermedius (4) (Stimpson). Prodromus, 94.
Crangon bidentatus (De Haan). Faun. Jap. Crust., 182.
Crangon angusticauda (De Haan). Ib., 183.
Crangon Pattersonii (Kinahan). Nat. Hist. Review., vol. vi., p. 81. Proc. Dub. Nat. Hist. Soc., vol. ii., p. 130.
Crangon spinosus (Leach). Malacostraca Podophthalmia Britannica, tab. xxxvii., A.
Crangon Boreas (Fabric).
Crangon Capensis (5) (Stimpson). Prod., 93.
Crangon nanus (Kroyer). Tidsskrift, iv. 245.
Crangon munitus (Dana). United States' Exploring Expedition, Crustacea, i., 536, pl. xxxiii., f. 5.

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- Crangon fasciatus* (Risso). Cr. de Nice, 82, pl. iii., fig. 5. Hist. Nat. de l'Eur., Mer., v., p. 64.
Crangon sculptus (Bell). British Crustacea, 263.
Crangon carinicauda (6) (Stimpson). Prod., 93.
Crangon catapraectus (Olivier). Zoologie Adriatique, tab. iii., fig. 1.

Incertæ sedis.

- Crangon maculosus* (Rathke). Memoire Savants de Petropolitane, iii., 366.
Crangon salebrosus (Owen). Supplement to Beechey's Voyage, 88, pl. xxvii., fig. 1.

Though thus usually associated together, the foregoing list really includes several groups deserving generic distinction, the most marked of which are sought to be shown by the groupings of this list.

NOTE.—(1). *Crangon Franciscorum* (Stimpson).—Rostrum small and triangular, rounded in front; spines of thorax nearly as in *Crangon vulgaris*; hand large, with an oblique palm, more nearly longitudinal than transverse, occupying nearly one-third of the length of its inner side; thumb-like process long and spiniform; caudal segment long, slender, and pointed; smoothly rounded above; length about three inches. Californian coast. “Crust. and Echinodermata of the Pacific Shores of North America,” p. 55.

(2). *Crangon propinquus* (Stimpson).—*C. vulgari* and *C. nigricaudæ* valde affinis sed abdominis segmento quarto (et interdum tertio quoque) in adultis carinato, segmentum ultimum extremitate spinulis sex armatum. A *C. nigricaudâ* differt pedum primi paris manu angustiore, palmâ magis obliquâ digitoque immobili longiore. A *C. affini*, maxillipedibus externis et pedibus quintis brevioribus ut in *C. vulgari*. Long. 2.5 poll. “Prope oras boreales Japonicæ.” Prodromus descriptionis animalium evertibratorum quæ in Expeditione ad Oceanum Pacificum Septentrionalem a Republicâ Federatâ missa, C. Ringgold et Johan. Rodgers Ducibus, observavit et descripsit W. Stimpson, p. 94. Proceedings of Academy of Natural Sciences, January, 1860.

(3). *Crangon nigricauda* (Stimpson).—*Crangon vulgaris*, Owen (not Fabricius), Zool. of Beechey's Voyage; Dana, U. S. Explor. Exped., Crust., i. 536; differs from the common shrimp of Europe, and of Northern United States, in its broader carapax, its slightly smaller and comparatively shorter hand, and more pointed caudal segment, which has also a shallow longitudinal furrow along the upper surface. The antepenultimate segment exhibits a rather sharp ridge along the dorsal edge. “Crust. and Echinod. of Pacific Shores,” p. 57.

(4). *Crangon intermedius* (Stimpson), carapax lævis nitidus, medio carinatus. Carina bispinosa, spina anterior debilis prope rostrum sita, altera, mediana, valida; latera spinis quatuor armata, duabus in margine antico unâ validâ in superficie laterali et unâ minutâ prope carinam. Abdomen superficie marginibus que inferioribus læve, carinâ parvulâ, sed in segmento antepenultimo acutâ, in penultimo duplicatâ, segmento ultimo valde elongata, minuyente extremitate fere acuto. Long., i., 7 pol., Prod., 94.

(5). *Crangon Capensis* (Stimpson).—*C. vulgari* paullo affinis, in spinâ medianâ carapacis, &c. Carapax media parce carinatus, carina dente mi-

nuto in medio armata ; dentibus v. spinis lateralibus nullis. Pedum primi paris palma obliqua, fere longitudinalis. Pedes quinti eos primi paris superantes. Abdomen vix carinatum ; cauda valde compressa. Long. 0.9 poll. Prod. 93.

(6). *Crangon carinicauda* (Stimpson).—Carapax depressus, pubescens, septemcarinatus ; carinis lævibus, retrorsum distinctis ; medianâ antice obsoletâ ; tribus lateralibus approximatis. Rostrum valde angustatum, longitudinaliter sulcatum extremitate bifidum. Abdomen insculptum, sulcis plerisque transversis, pubescentibus ; segmentis tertio quarto quintoque gibbosis, valde carinatis. Long. 0.66 poll. Prodrum 93. I have *abbreviated some of these descriptions.*

Before entering into the details of the *Britannic species*, it will be proper to consider whether at least three genera are not distinguishable ; to the better understanding of which question, it will be necessary to set forth the views adopted in this paper as to the homologies of the family type.

ON THE GENERAL HOMOLOGIES.

Adopting the view which recognizes the body of the crustacean as normally consisting of twenty-one articulated rings, or somites, distributed as follows :— (1). Fourteen somites devoted to the appendages of special sense, organs of prehension, mastication, respiration, and ambulation, and constituting a *cephalothorax* (Plate I. K 0) ; (2). Seven somites devoted to the support of natatory and ovigessary appendages, occasionally bearing organs of respiration, and constituting the abdomen (Plate I. A) ; we find that the following general type plan may be traced :—

When present, the appendages are (*vide* Plate I. 1, 2, 3, &c.)—

1st somite—Eyes and ocular appendages.

2nd somite—Auditory, or internal antennæ.

3rd somite—Olfactory, or external antennæ.

4th somite—Mandibles.

5th to 9th—Prehensile organs of mouth, and masticatory organs, viz., maxillæ, or jaws, and maxillipeds—these latter sometimes becoming prehensile, and taking on the office of chelipeds, at least in part.

10th to 14th somite—Ambulatory organs, or chelipeds (the pereopoda of C. Spence Bate).*

15th to 20th somites—Natatory organs, frequently also respiratory.

21st somite, or telson, generally unappendiculate, sometimes bearing natatory plates; and occasionally, as in adult states of some Isopoda (ex. gr. *Ligia*), and in immature stages of some decapoda (ex. gr. zoe of *Pirimela denticulata*), respiratory. All these appendages, except, possibly, the first to fourth pairs inclusive, are arranged on one general type, being septemarticulate, one or more of the articulations being furnished with an appendage, or appendages, which are often multiarticulate.

We further find that in Decapoda, Isopoda, Amphipoda, and probably also in the other groups (my own researches in these latter have not been sufficient to enable me positively to assert it), that the fourth, or mandibular somite, either with or without portions of the ocular and antennal somites, constitutes a more or less extensive shield, beneath which the gastric and oral appendages are placed; the "carapace" of Decapoda, as the author believes, homologizing with the "head," or cephalon, in Isopoda and Amphipoda.

Here it should be noted that some of our writers in Carcinology adopt a different view of the primary divisions of the somites: they regard the anterior seven somites as forming a distinct division, equal in value to the succeeding seven, and to the posterior seven. Thus they divide the cephalo-thorax into a head, or cephalon, and a thorax, or pereion. Spence Bate, by whom the latter terms are used, has ably advocated this view; but I cannot subscribe to it. Dana, in his treatise on Crustacea, has given some strong arguments in favour of the opinion here adopted, to which may be added, that while the appendages of the first four somites in all the crustacea at present known are constant in their offices (for I must dissent from Professor Huxley's explanation of the cheliform arms of the extinct *Pterygotidæ*, the evidence as yet adduced not being sufficient to prove that they were not maxillæ, or maxillipeds, rather than antennæ); the moment we pass the boundary of the 4th somite, the appen-

* Report on British Edriophthalma, Brit. Ass. Rep., 1855, pp. 35, &c. Of the terms there proposed several are adopted in this Paper.

dages from thence to the 14th are indiscriminately interchangeable in their offices,—in some being purely masticatory, in others prehensile, or ambulatory, or a mixture of all three. They vary even in the different periods of life of the same animals, as Spence Bate himself has shown in his valuable paper on development.*

If there be any division in the cephalo-thorax, its natural place will appear to be at the termination of the mandibular, or 4th somite, which, as far as has hitherto been shown, is constant in all crustacea, even in the highly aberrant cirrhipeds.

PARTICULAR HOMOLOGIES OF CRANGON.

In that sub-group of Decapoda which includes Crangon, the following modification of the general archetypal form prevails:—

First, or ocular somite (Plate I. Md, 4 1), small, inserted as a narrow triangular wedge between the third and fourth somites.

Second somite concealed beneath others, and only developed inferiorly.

Third external to first and fourth, moderately developed as a quadrilateral plate on each side, and becoming confluent with fourth.

Fourth forming great mass of carapace, prolonged anteriorly, to form inner border of orbit, and expanded laterally, inclosing beneath it the fifth to ninth somites, and the bases of the chelipeds, with their attached branchiæ. This, from its great extent, for convenience of description, is divided into the following regions, as shown in the figure:—

f, Frontal, extremely small; *g*, Gastric; *h*, Lateral gastric, or hepatic; *br*, Branchial; *cd*, Cardiac.

Fifth to ninth somites, concealed beneath preceding, bearing two pairs of maxillæ, and three pairs of maxillipeds; the inferior portions of the somites only developed.

Tenth to fourteenth somites, also, concealed beneath carapace, forming under surface of cephalo-thorax. These bear the chelipeds and their accompa-

* On the Development of Decapod Crustacea. By C. Spence Bate, F. L. S. Trans. Royal Society of London, 1857, p. 589. The Development of the Thoracic Appendages is, however, in his favour.

nying respiratory organs, the latter being supported on the coxæ of the chelipeds. The coxæ are soldered to each other and their respective somites, and concealed beneath the lateral expansion of the mandibular segment.

Fifteenth to nineteenth somites are fully developed, and each generally bears a natatory foot (pleopod), made up of coxæ, basis, and ischium, the coxæ soldered by its edge to the somite; the basis, in the male, and in the female the first three limbs, furnished with a ciliated appendage; the ischium multiarticulate, and ciliated along its edges: these in the females bear the ova.

Twentieth—well developed; appendage natatory; coxæ soldered; basis with a lamellar appendage, which, with the flattened ischium and the *telson*, constitute the so-called tail-plates.

Twenty-first somite (*telson*)—trigonal narrowed, chitinous, unappendiculate, bearing a series of spines along its borders.

All the true Crangons have the first pair of chelipeds (R 10), with the dactylos (*d*) long and curved, folding down on the internal angle of the propodos (*p*), which is prolonged into a slender tooth. The second pair of chelipeds (R 11) are didactyle, the dactylos articulated to the inner side of the propodos, the outer superior angle of which is developed into a long, rounded, moderately strong tooth, equalling the dactylos in length, and opposing it. This pair of chelipeds is subject to much variety in the several species, as regards its proportional length and thickness.

The remaining pairs of chelipeds are simple, the dactylos arising from the extremity of the propodos.

The auditory antennæ are inserted in a line above the olfactory. Their peduncle is four-jointed, the last joint furnished with a club-shaped multiarticulate filamentous appendage, and terminating itself in a filament which is multiarticulate.

The olfactory antennæ are four-jointed, the basis supporting a squamiform appendage; a long multiarticulate filament terminates each of the antennæ.

The maxillipeds of the ninth somite are subpediform, and six-jointed, the dactylos being apparently wanting.

The eyes are free, uncovered above, and unappendiculate.

The carapace is produced between the orbits as a tooth flattened vertically, constituting a rostrum.

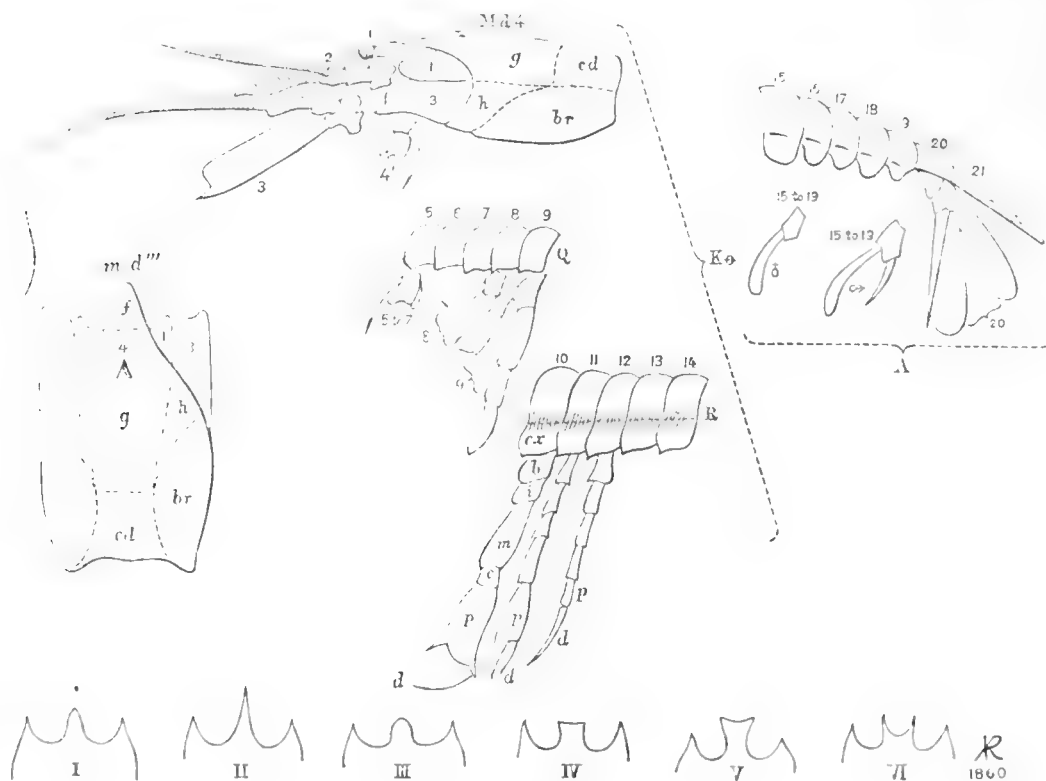


PLATE I.

DIAGRAMMATIC SKETCH, ILLUSTRATING HOMOLOGIES OF CRANGONIDÆ.

A, Abdomen. The numerals refer to the somites, and their respective appendages, the coxæ are represented as attached to the somites.

KΘ, Cephalothorax and its appendages.

Md4, Lateral view of carapace; *g*, gastric region; *cd*, cardiac do.; *h*, hepatic do.; *br*, branchial; 1, first, or ocular segment; 3, olfactory antennal do.; 2, auditory antenna; 4, mandible.

md''', Back view of carapace; *f*, frontal region. The other references as Md4.

Q, Somites of mouth organs and their appendages.

R, Do. of ambulation; 10, 11, 12, first, second, and third chelipeds; those of 13-15 resemble 12; *cx*, coxa; *b*, basis; *i*, ischium; *m*, meros; *c*, carpus; *p*, propodus; *d*, dactylos.

I. Outline rostrum, *C. vulgaris*.—II. *Ch. spinosus*.—III. *Ch. bispinosus*.—IV. *A. fasciatus*.—V. *A. sculptus*.—VI. *Ch. cataphractus*.

DIVISIONS OF CRANGON.

Among the species agreeing in these general characters, types of variations are found in the form of the anterior tooth of the carapace (rostrum), in the characters of the surface of the carapace, and in those of the surface of the abdominal somites. With these are conjoined less generally appreciable, though possibly more important characters, derived from the comparative development and proportions of certain of the cephalo-thoracic somital appendages, which point to a further subdivision of the genus—such, indeed, as was effected long since by Leach and Risso, but rejected by subsequent authors. I am well aware of the evil of carrying generic division too far; but when, as here, we find a number of sets of characters, any one of which enables us to distinguish a group of animals, these groups, no matter which set of characters is chosen, being, as compared type with type, identical as to species contained beneath them, and as to number, surely the principles of a natural classification are not violated by giving distinct names to groups thus marked out, and forming from the wreck of one genus several. It should never be forgotten that, whether we believe genera to be actual existences or not, in practice the intention of them is to enable an author, by the use of a single word or initial letter, to express *an assemblage of common characters*, and thus avoid, in the account of individual species, the repetition of characters common to a number; and that the use of the word “or,” in a generic description, shows one of two things—either that genera are confounded, or else, as is more often the case, that the characters given are specific, and not generic.

Keeping this canon in view, let us then examine the characters in which the most fixed variation prevails among the members of the genus Crangon as constituted by M. Edwardes, Bell, Dana, Stimpson, and others; and I hope to establish that at least three subdivisions are called for, of which, *Crangon vulgaris* of Fabricius, *Pontophilus spinosus* of Leach, and *Ægeon loricatus* of Risso, are the representatives; and although to some the distinctive characters given may seem unimportant when we look to the whole Decapoda, yet, taking into consideration their constancy in Crangonidæ, it must be acknowledged that they have at least convenience of definition and diagnosis of species on their side, and ought therefore to be adopted.

ANALYSIS OF DIAGNOSTIC CHARACTERS.

Firstly, the Rostrum. Of this two marked forms exist:—

- I. In *Crangon fasciatus*; *C. sculptus*; *C. carinicauda* (*fide* *descript.*); *C. cataphractus* (*fide* specimen in Brit. Mus. collection, presented by M. Spinola); its apex is truncate; the anterior angles more or less acutely produced, so as to become somewhat bifid (*Ægeon*).—Plate I., Figs. iv., v., vi.
- II. In the other species enumerated it is somewhat shortened, always triangular, and acute or rounded at apex (*Crangon* and *Cheraphilus*).—Plate I., Figs. i.–iii.

Secondly, the Carapace:—

- I. In all the species included under the first section named above (*Ægeon*), there are rows of spiny teeth, or knobs, on the gastric regions both lateral and median, and also on the branchial.
In the species having a simple beak we find two arrangements.
- II. In *Cr. trispinosus*, *Cr. bispinosus*, *Cr. intermedius* (*fide* *descript.*), *Cr. bidentatus* (*fide* *descript.*), *Cr. angusticauda* (*fide* *descript.*), *Cr. Pattersonii*, *Cr. spinosus*, *Cr. boreas* (*fide* spec. in Brit. Mus.), *Cr. munitus* (*fide* *descript.*), there are rows of carinations—generally three on each branchial, and one to three on the gastric regions,—the carinæ being sometimes represented by spiny teeth; at others, simply by knobs, but always appreciable: these are stronger in the adult than in the younger specimens. Here also, probably, come in *Cr. capensis* and *Cr. nanus*, which are described as having the carapace keeled (*Cheraphilus*).
- III. In *Cr. Allmani*, *Cr. affinis* (*fide* *descript.*), *Cr. nigricauda* (*fide* *descript.*), *Cr. propinquus* (*fide* *descript.*), *Cr. rubropunctatus* (*fide* *descript.*), *Cr. Franciscorum* (*fide* *descript.*), and *Cr. vulgaris*, the carapace is totally destitute of carinæ, its greatest armature being three spiny teeth, viz., one on the median gastric, and one

on each branchial region ; and in *Cr. rubropunctatus* the median gastric tooth would appear to be absent (Crangon).

The carinations may be represented by a single tooth, or row of teeth, especially in the younger specimens; but in the most ambiguous cases examined by me, viz., in *Cr. trispinosus* and *Cr. bispinosus*, careful examination detects traces of the carinæ: the mere number of teeth is of but little value, but their relative position of the greatest.

Thirdly, the Abdominal Somites. These may be either smooth above, the telson included, or covered with carinæ sulcations and spiny teeth, as follows:—

- I. In *Ægeon*, the abdomen is generally more or less keeled, or highly sculptured, the telson being mostly sulcate above.
 - Cr. fasciatus*. 1st to 6th somite smooth; telson sulcate.
 - Cr. sculptus*. 1st to 5th highly sculptured; 6th bicarinated; telson sulcate.
 - Cr. carinicauda*. Highly sculptured; 3rd to 5th highly carinated; gibbous; telson (?)
 - Cr. cataphractus*. 1st and 2nd spined; 3rd and 4th carinated; 5th do., and sculptured; 6th bicarinated; telson round.
- II. In *Cheraphilus* a few of the somites are carinate; the telson is either deeply sulcate or carinate, as follows (carination and sulcation are only forms of the same phenomenon):—
 - Cr. trispinosus*. 6th somite obsoletely carinated; telson sulcate.
 - Cr. bispinosus*. 5th and 6th somites carinated; telson sulcate.
 - Cr. intermedius*. 5th carinated; 6th sulcate; telson not described.
 - Cr. bidentatus**. Somites smooth; telson bicarinato-sulcate.

* *Crangon bidentatus*, De Haan. Pedibus secundis strictis non inflexis latioribus, 3tiis et dimidium tarsum tertiorum æquantibus. Thorace depresso septemcarinato carinâ mediâ bispinosâ. Spinis sensim desinentibus, anteriora acuta, posteriora obtusa, Latera tercarinata, carinâ superiorâ apice et ultra medium inferiore apice unispinosâ medio integrâ. Frontis rostrum, latius quam in *C. vulgari* apice truncatum. Abdomen læve pone medium repentum angustius articulo septimo medio bicarinato medio sulcato.

- Cr. angusticauda**. Somites (?); telson bicarinato-sulcate.
Cr. Pattersonii. 5th sculptured; 6th obsolete carinated; telson sulcate.
Cr. spinosus. 1-4 carinated; 5th sculptured; 6th obsolete bicarinated; telson sulcate.
Cr. boreas. 1 and 2 sculptured; 3-5 carinated and sculptured; telson bicarinato-sulcate.
Cr. Capensis. 6th obsolete sculptured; telson (?)
Cr. nanus (?).
Cr. munitus. Abdomen smooth (?)

This division is easily separated from *Ægeon* by the character of the rostrum.

In *Crangon*, as here restricted, there are two groups which are doubtfully sub-generic *Crangon*, and *Steiracrangon*. In *Crangon* Proper the somites are all smooth, the telson rounded above, and not sulcated. In *Steiracrangon* some of the somites are keeled, and the telson is sulcate.

Crangon. (*Steiracrangon*)

- Cr. nigricauda*. 6th somite keeled; telson sulcate.
Cr. affinis†. Somites (?); telson sulcate.
Cr. Allmanni. 6th somite bicarinated; telson sulcate.
Cr. propinquus. 3rd and 4th somite keeled; telson (?).
Crangon.
Cr. vulgaris } telson and somites smooth.
Cr. Franciscorum. }

* *Crangon angusticauda* De Haan. Pedibus secundis et tertiis æqualibus, thorace convexo carinâ mediâ bispinosâ, Carinis lateralibus tribus obtusis abbreviatis abdomen sensim angustiore. Rostrum ascendens obtusum sulcus transversus pone medium articulorum articulus septem bicarinatus medio sulcatus.

† *Crangon affinis* De Haan. Thorace ante medium trispinosâ, spinis æqualibus, Abdomine sensim angustiore articulo septimo valde angusto medio sulcato utrinque obtuse angulato quasi biannulato. *Cr. vulgari* proximus. In hâc specie vero spinæ laterales thoracis mediâ majores. Maxillæ quintæ laminis antennæ inferiores et pedes quinti pedibus primis breviores abdominis articulus septimus sulcatus.

The characters of the carapace separate Crangon and Steiracrangon from Ægeon and Cheraphilus, and the characters of the rostrum from Ægeon. Examination of the British species, of all sizes, prove that these characters are constant at all stages of their perfect state.

SUB-FAMILY, CRANGONIDÆ.

Carapace depressed; rostrum short, not articulated; eyes not concealed beneath carapace; external antennæ unifilamentous, furnished with a broad scale at their base; internal antennæ dilated at base, peduncle short, bifilamentous; external maxillipeds subpediform, flattened. Chelipeds, five pairs; first pair subcheliform; second didactyle; third to fifth pairs simple acuminate. Branchiæ, seven on each side; antennæ inserted nearly on same line. Genera: Crangon, Cheraphilus, Ægeon.

Genus Crangon. Rostrum triangular, shorter than the eyes. Carapace: median gastric region armed with a single spiny tooth at most; branchial regions with a single tooth, not ridged; antennæ as *family*; abdomen smooth above; telson triangular, smooth above; orbits circular, sparsely pubescent; first pair chelipeds well developed; second pair as strong as fifth; antennal scale large. Species: *Cr. vulgaris*, *Franciscorum*, *rubropunctatus*. Subgenus: *Steiracrangon*; abdominal somites carinated; telson sulcated. Species: *St. propinquus*, *nigricauda*, *affinis*, *Allmanni*.

Genus Cheraphilus (*mihi*), *Pontophilus* (Leach, not Risso or De Haan). Rostrum triangular, moderate; carapace carinate; gastric region armed with one or more carinæ; branchial region multicarinated; abdominal somites carinated and sculptured; telson sulcated above; first pair chelipeds robust, moderate in length; second shorter than first: antennæ as *family*; antennal scale short. Species: *Ch. bispinosus*, *trispinosus*, *intermedius*, *bidentatus*, *angusticauda*, *Pattersonii*, *spinosus*, *boreas*, *Capensis*, *nanus*, *munitus*.

Genus Ægeon. Rostrum truncate, or bifid; carapace: branchial and gastric regions highly carinate; abdominal somites toothed, carinated, and sculptured; telson generally sulcate; first pair chelipeds moderate, barely surpassing second in length; second pair slender; orbits rounded, densely hairy; antennæ as

family; antennal scale short. Species: *Æg. fasciatus*, *sculptus*, *carinicauda*, *cataphractus*.

Of all these genera we have representatives in the Britannic area, which also occur in the Irish seas; and, with the exception of one (*Ch. trispinosus*), all have occurred to me on the east coast, either in the northern or eastern districts (for general distribution, *vide infra*).

DESCRIPTION OF SPECIES.

GENUS I.

CRANGON.

Carapax lævis dente gastrico mediane sæpius, et dente branchialo utrinque armatus. Rostrum breve pedunculo oculorum non superans. Somites (segmenta) abdominales superne læves. Telson (segmentum ultimum) superne planum. Chelipedes (pedes ambulatorii) par primum satis grandes, subcheliformes, par secundum minuti debiles, pare primo longitudinem æquantes didactyli. Paria tertia ad quinta acuminata.

1. *Crangon vulgaris* (Fabricius sp.).

C. Rostro perbrevis, apice rotundato superne excavato, orbites totum circumciliatis. Carapace dentibus gastrico brachialibusque armato. Abdominis somitibus lævibus. Telson læve. Chelipedum pare secundo, paribus primo tertioque æquante, meros dentato. (Syn. *Cr. septemspinosa* (Say.) *Cancer Crangon* (Seba).)

Subgenus *Steiracrangon* (mihi). Carapax ut *Crangon*. Somites abdominis ad 5^{um} supra læves sextus superne canaliculatus; telson supra sulcatum.

2. *Crangon* (*Steiracrangon*), *Allmanni* (Kin.)

Cr. Rostro brevi, apice subrotundato superne excavato. Orbitis totum circumciliatis carapace ut *Cr. vulgaris*. Abdominis somite sexto bicarinato, sulcato. Telson supra sulcato, somitibus aliis lævibus. Chelipedibus ut *Cr. vulgaris*.

GENUS II.

Cheraphilus (mihi), *Pontophilus* (Leach, non Risso nec De Haan).

Carapax carinatus. Rostrum triangulare. Abdominis somites carinati, sculptique; telson suprasulcatum. Chelipedes secundi quam primo aut tertio brevioris.

3. *Cheraphilus bispinosus* (Westwood sp.).

Ch. Rostro brevi apice rotundato supra sulcato. Orbitâ margine externo ciliatâ, carapace, regione gastricâ medianâ bidentatâ, lateribus minute nodosis. Abdominis somitibus quinto sextoque bicarinatis. Telson superne excavato. Chelipedûm pare secundo, dimidio tertii paris æquante. Synonyma *Pontophilus bispinosus* (West); *Crangon bispinosus* (Bell.)

4. *Cheraphilus trispinosus* (Hailstone sp.)

Ch. Rostro perbrevis apice rotundato superne excavato, Orbitâ paucibus ciliis fundo insitis. Carapace uno dente gastrico mediano et uno dente gastrico laterali solum armato. Lateribus lævibus. Abdominis somite sexto, subcarinato, telson superne excavato. Chelipedûm pare secundo, tenui; quam primo tertiove, multo breviori. Syn. *Pontophilus trispinosus* (Hailst.); *Crangon trispinosus* (Bell).

5. *Ch. Pattersonii* (Mihi).

Ch. Rostro brevi apice rotundato, superne excavato. Orbitâ margine externo ciliato. Carapace regione gastricâ medianâ tridentato subcarinatâ, regione gastricâ laterali lineis dentibus minutis, regione branchialâ unidentatâ. Abdominis somite quinto sculpto; somite sexto obsoletè bicarinato. Telson sulcato. Chelipedûm pare secundo dimidio parûm primi et tertii æquante. Syn. (*Crangon Pattersonii* mihi olim).

6. *Cheraphilus spinosus* (Leach sp.)

Ch. Rostro, satis longo, tenui, apice acuto superne infrasulcato, orbitâ profundâ. Carapace regione gastricâ quinque dentium seriebus longitudinaliter armatâ, regione branchiale serie dentium. Abdominis somitibus tertio, quartoque carinato. Somite quinto sculpto. Somite sexto, obsolete bicarinato sulcato. Telson sulcato. Chelipedum pare secundo, dimidio primi aut secundi æquante. Syn. *Pontophilus spinosus* (Leach); *Cr. spinosus* (Bell); *Crangon cataphractus* (Milne Edwards, in part); *Ægeon loricatus* (Guerin).

GENUS III.

Ægeon Risso (*Crangon*, Bell, Milne Edwards). Carapax percarinatus, rostrum truncatum aut bifidum. Abdominis somites dentati sculpti carinatique telson sæpius suprasulcatum. Chelipedum par secundum quam tertio aut primo brevius.

7. *Ægeon fasciatus* (Risso sp.).

Æg. Rostro satis longo, apice truncato, sulcato. Orbitâ sparse ciliato margine externâ. Carapace regionibus, gastricâ medianâ dente armatâ, gastricis lateralibus sculptis, regionibus branchialibus unidentatis abdominis somitibus lævibus. Telson sulcato. Chelipedum pare secundo primo, tertiove brevioribus. Syn. *Crangon fasciatus* (Risso, Bell, M. Edwards).

8. *Ægeon sculptus* (Bell sp.).

Æg. Rostro satis longo, apice bifido profundè sulcato. Orbitis dense ciliatis. Carapace, quinque dentatocarinatis. Abdominis somitibus sculptis, tertio ad quintum etiam carinatis, sexto etiam bicarinato-sulcato. Telson profunde sulcato. Chelipedum pare secundo quam tertio, multo-breviori. Syn. *Crangon sculptus* (Bell).

GENUS CRANGON.

For characters of genus, *vide supra*, p. 57. In addition, as minor characters, the following are nearly general :—Antennæ long—more than twice length of peduncle of antennæ. Second pair of chelipeds as long as third, which are moderately stout.

GREY SHRIMP.

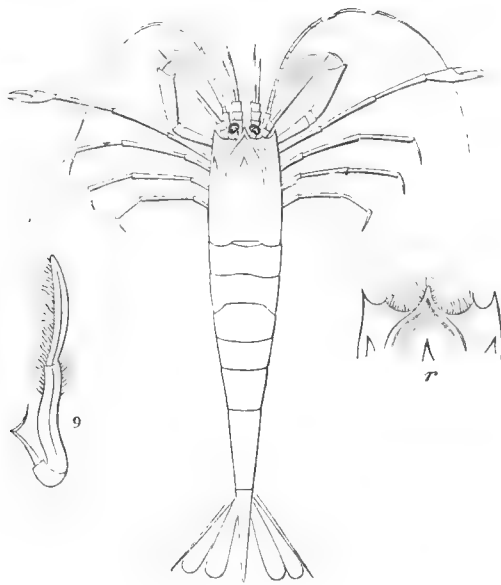


PLATE II.

CRANGON VULGARIS—LIFE SIZE.

9, External Maxilliped.

r, Rostrum, and anterior portion of carapace.

N.B.—In the main figure the artist has omitted the right-hand branchial spine.

Crangon vulgaris. (Fabricius, not Owen or Dana.)

Astacus Crangon. Herbst. II., p. 57, t. xxix., fig. 3, 4 ; Penn. Brit. Zool., IV, t. xv., fig. 30 ; Müller, Zool. Dan., pl. civ., fig. 4–10,

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Crangon vulgaris. Fabric., sup., 410; Lat. Crust., vi., p. 267, t. lv., f. 1, 2; Leach, Mal. Brit., t. xxxvii. B.; M. Edw. Crust., II., 341; Bell, Brit. Crust., p. 256, f.; White, Pop. Brit. Crust., p. 107, pl. viii., fig. 2; Guerin, Icon. R. A., t. 20, fig. 4.

Crangon septemspinosus. Say, Journal, Ac. Sc. Philadelph., I., 246; De Kay, Zool. New York, VI., p. 25, t. 8, f. 24.

Squilla cinerea. Klein, F.

Crango vulgaris. Lam. Syst., p. 159.

Cancer Crangon. Linn. Syst., 1052, 67.

Squilla marina batava. Baster Subs., 2:27, t. 3, fig. 1. 4.

Crangon vulgaris of Dana and of Owen is not this species, but *Crangon nigricauda* of Stimpson: it is found on the south and west coasts of America.

Rostrum very short, narrow, slightly rounded at apex, concave above; ocular notch, and sides of rostrum ciliated; carapace armed with one median gastric and two branchial teeth (one on each side); abdomen smooth, narrowed; telson triangular, smooth; second pair of chelipeds as long as the first or third.

Rostrum only half length of eye-stalks; concave above; ocular notch moderate, ciliated all round. Carapace large, rounded, slightly depressed, a raised ridge running backwards and outwards continuous with base of rostrum. Median gastric region furnished with a small acute tooth. A pointed curved tooth on each branchial region, on a line slightly in advance of the median tooth.

External antennæ moderate in length; peduncle about half length of accessory scale, which terminates in a tooth, and is haired along its inner edge. Internal antennæ bifilamentous, moderate in length.

External maxillipeds long, extending beyond peduncles of external antennæ; terminal joint long. First pair of chelipeds robust, smooth, except tooth on propodos, and a small pointed tooth on meros (fourth articulation). Propodos nearly quadrilateral; sides parallel; palm nearly transverse, rounded. Dactylos long, curved, and spiniform.

Second pair of chelipeds slender, didactyle; hand long; whole limb longer than first pair, and as long as third pair, carried folded up beneath first. Three

succeeding pairs acuminate, simple, and progressively stouter backwards; a stout tooth on hyposternal region, between origins of third pair of chelipeds.

Abdomen regularly tapering, rounded, and perfectly smooth; a tooth on sternal surface of second somite in males; telson long, narrow, triangular, pointed at extremity, slightly flattened above, armed with two short articulated spines on each side, and a series of spines and hairs at extremities. The fourth, fifth, and sixth somites, have their posterior lateral angles dilated backwards, and overlapping the succeeding somite. The second somite has each of its inferior angles similarly dilated as rounded lobes.

Colour pellucid greyish-brown, sprinkled with dots of golden colour and dark-brown; the posterior pleopods, their scales (side-plates of tail), and telson, often broadly tipped and bordered with black.

Length sometimes exceeds two and a half inches, especially specimens from deep water.

Habitats, sandy shores and bottoms, up to 25 fathoms.

Habits very active, and easily kept living for months in the vivarium. It frequents all the tidal pools on our sandy shores, sometimes in myriads, especially in summer and autumn, where thousands often perish, through the drying up and heating of the waters from the sun's influence, as was notably the case at Dublin in 1856, in the months of July and August. Hard frosts, too, sometimes destroy numbers. It likewise frequents rock pools, when these have sandy bottoms, and muddy pools and running streams in slobbs, as at Rush and Malahide, where large specimens may be taken. It ascends rivers, passing up into places where, even at high tides, the waters are but slightly brackish, as in the Dodder. In the dredge I have taken it up to 25 fathoms, on clean sandy bottoms generally. These specimens, which were of large size, differed only in a greater vividness of colour from shore specimens. It also occurs, but only rarely, in the lobster-pots.

Localities, all round Ireland.

In ova from February, and all through summer. Ova purplish, changing, when nearly mature, to a greyish.

The generic characters of the rostrum and carapace, &c., distinguish it from all the British species, except *Steiracrangon Allmanni*, from which it may be readily known by the smoothness of the sixth abdominal somite and telson.

From allied foreign forms it differs as follows:—From *Crangon Franciscorum* in the form of the propodos of chela, which in that species has the palm oblique, and not transverse, as in *Cr. vulgaris*; and from *Crangon rubropunctatus*, according to Risso's description, in the presence of the median gastric tooth, which is wanting, or at least not described at present, in that species.

According to a specimen from East Florida, presented by Thomas Say to the British Museum, and marked in his hand as *C. septemspinosus*, it is identical with that species.

Although found all round Ireland, I cannot find that it is ever collected for sale. It is sufficiently abundant in Dublin to render it worth while so to do.

Sub-genus Steiracrangon (mih).

(For characters, *vide* p. 57, *supra*.)

CHANNELLED-TAILED SHRIMP.

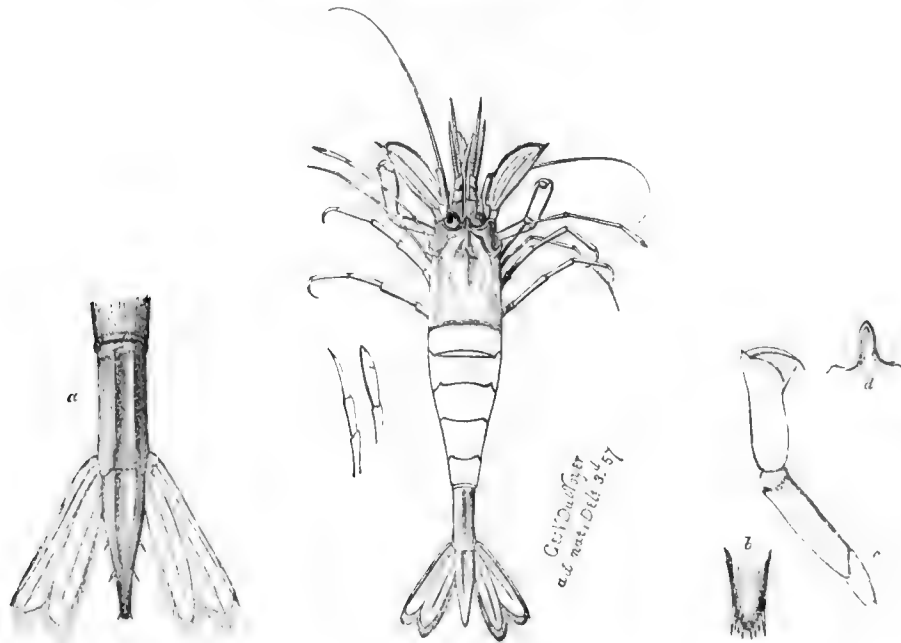


PLATE III.

CR. STEIRACRANGON ALLMANNI—LIFE SIZE.

a, 20th and 21st somites, with posterior pleopods; *b*, termination of telson; *c*, 1st cheliped. The spine on meros is not represented in the figure; *d*, rostrum. The hairs which are on its edges are omitted.

Crangon (Steiracrangon) Allmanni (Nobis).

Cr. Allmanni. Kin., Proc. Nat. Hist. Soc., Dublin, vol. ii, &c.; A. White
Pop. Hist. Brit. Crust., 334.

Rostrum short, narrow; apex slightly rounded, hollowed above; ocular notch ciliated all round; carapace as CR. VULGARIS; sixth somite of abdomen bicarinated, sulcate; telson hollowed, triangular; other somites of abdomen smooth; second pair of chelipeds slender, equalling in length the first and the third pairs.

Rostrum nearly as long as eyes, and slightly longer than the external angles of the orbits, rounded at the apex, hollowed above; orbits moderate, ciliated all round; the carapax resembling that of *Cr. vulgaris*, as do likewise the antennæ and external maxillipeds.

Abdomen tapering, but more robust anteriorly, and more contracted posteriorly, than *Cr. vulgaris*; the first to fifth somites perfectly smooth above; the sixth bicarinated; carinæ smooth, destitute of teeth.

The telson long, triangular, hollowed above at its base, pointed at the apex, bearing four lateral articulated spines, and a series of small apical ones.

Colour pellucid-grey, with dark-brown and gold-coloured dots and blotches. Length one to two and a half inches.

Habitat sandy and gravelly bottoms, in from ten to twenty-five fathoms.

Habits those of common shrimp. I have never taken it except in the dredge.

Localities, Dublin, on Scallop bed, whence I first established the species in 1850; here it occurs abundantly. Belfast, off the Gobbins.

In ova during the summer months; colour dirty greyish.

This species has been, doubtless, confounded with *Cr. vulgaris*. In the Belfast Museum I find specimens thus named and marked in the late William Thompson's handwriting, as obtained at "Fort William, near Belfast." When better known, the above list of localities will be, doubtless, much increased.

GENUS *CHERAPHILUS* (*mihi*), *χερας φιλος*.

(*Pontophilus* of Leach, abandoned by that author, and subsequently applied to other genera by Risso and De Haan.)

For characters *vide p. 57, supra*. In addition may be noted, accessory scale of antennæ moderate, not twice length of peduncle of antennæ; second pair of chelipeds much shorter than third.

TWO-SPINED SHRIMP.

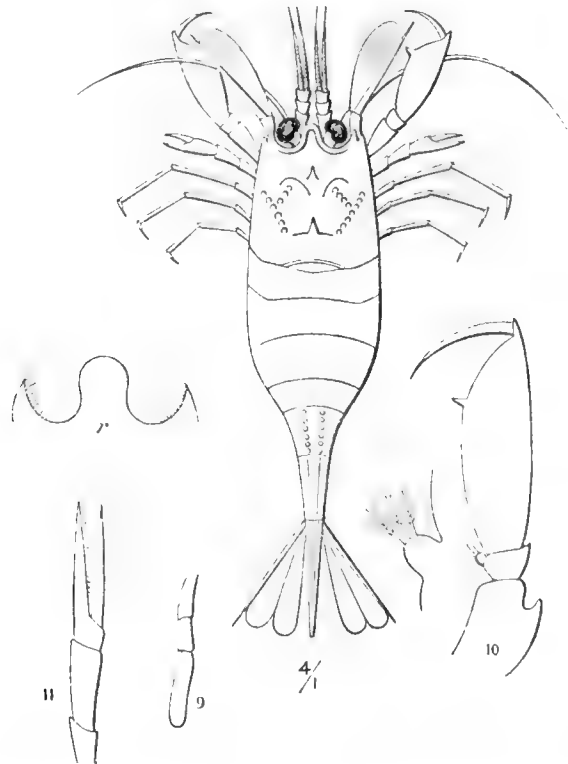


PLATE IV.

CHERAPHILUS BISPINOSUS—FOUR TIMES SIZE OF LIFE.

r, Rostrum; *9*, External maxilliped terminal articulations; *10*, First cheliped, with enlarged view of hairs on carpus; *11*, Second cheliped.

Cheraphilus bispinosus (Westwood Sp.)

Pontophilus bispinosus. Westwood, Hailst., Mag. Nat. Hist., viii., p. 11, 13, f. 30.

Crangon bispinosus. Bell, Brit. Crust., p. 268; A. White, Pop. Hist. Brit. Crust., 111.

Rostrum short, rounded at apex, somewhat narrowed, hollowed above; ocular notch broad, ciliated on outer edge only; carapace rounded above; median gastric region bidentate, the teeth connected by an obsolete-notched carina; lateral gastric and branchial regions furnished with rows of small knobs; fifth and sixth abdominal somites bicarinated; telson elongate, hollowed above; second pair of chelipeds half length of third.

Rostrum short, and somewhat narrow, attaining apex of eyes, sulcate above; ocular notch broad, shallow, ciliated at outer edge only, the external angle developed as a moderately-pointed tooth; the carapace moderately broad, rounded above, and having its surface covered by rows of small scale-like knobs; the median gastric region bears two prominent teeth, set one behind the other, and connected by a row of minute knobs.

The abdomen tapering and rounded above; the first somite as broad as the carapace; the second, third, and fourth gradually narrowing, and the fifth and sixth becoming abruptly almost linear, giving a characteristic contracted appearance to the posterior half of the abdomen, which is also to be seen in the other *Cheraphili*. The superior surface of the first to fourth somite is smooth; that of the fifth and sixth bears two knobbed carinæ, giving a sulcated appearance to the segments. The telson is long, triangular, narrowed, sulcated at its base.

The external plates of the tail (sixth pair of pleopods) are long, narrow, and terminating externally in a tooth.

The first pair of chelipeds are short, somewhat narrowed; the propodos somewhat triangular, the palm narrow, oblique; the dactylos short, spiniform. The meros, in the only specimen I have examined, is smooth internally, and toothed superiorly externally. The second pair of chelipeds are mode-

rately stout, half the length of first and third, didactyle; the hand short and robust. The third pair are very slender, as long as the first, and simple. The fourth and fifth are longer than the third, and somewhat thicker, but yet slenderer than the second.

The external maxillipeds are long, their ultimate joint about equal to the penultimate, moderately broad.

The external antennæ are short; their scale short, broad, toothed externally. Hyposternal tooth long and pointed.

Colour opaque dead white, with black and brown dots.

Length 0.8 inch.

Habitat sandy gravel, in 20 fathoms.

Localities, Dublin, off Back; Galway, Isles of Arran, Professor Melville.

In ova in June; ova greyish.

This species, of which a single specimen only was met at Hastings, by its discoverer, Mr. Hailstone, was added to the Irish lists by Professor Melville: several specimens occurred to him. I dredged a female specimen in ova in June, 1860, off Dalkey, from which the above description is drawn up.

It may be distinguished from the other species of *Cheraphilus* by the characters of its rostrum and carapace. It somewhat resembles *Ægeon fasciatus* when living; but the characters of the rostrum, &c., supply an easy means of distinguishing the two species.

THREE-SPINED SHRIMP.

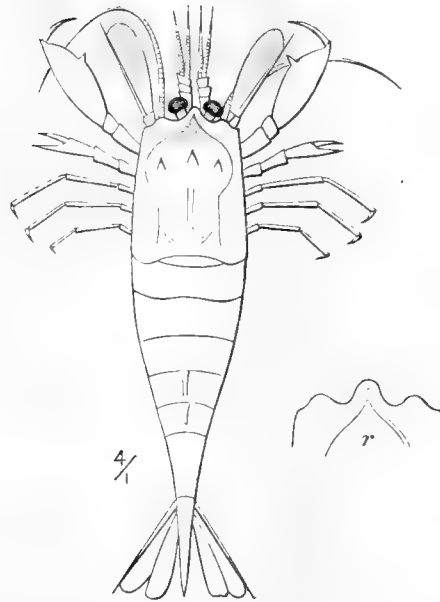


PLATE V.

CHERAPHILUS TRISPINOSUS.—FOUR TIMES SIZE OF LIFE.

r. rostrum.

Cheraphilus trispinosus (Hailstone Sp.)

Pontophilus trispinosus. Hails., Mag. Nat. Hist., viii. p. 261, fig. 25.

Crangon trispinosus. Bell, Brit. Crust., 265; A. White, Brit. Pop. Crust., 110; Kin., Proceed. Nat. Hist. Soc., Dub., vol. ii.

Rostrum very short, moderately broad, rounded at the apex, hollowed above; ocular notch broad, shallow, sparingly ciliated at its base; carapace rounded above, armed with one median and two lateral gastric teeth, which are continuous with an obsolete raised ridge; branchial regions smooth; sixth abdominal somite obsoletely carinated; telson hollowed; remaining somites smooth; second pair of chelipeds slender, much shorter than first or third.

Rostrum short, broadly rounded at apex, barely attaining apex of eyes, hollowed above; ocular notch shallow, ciliated sparingly at base.

Carapace broad, shortened, rounded, bearing three teeth on gastric region—one in the centre, and one on each side, from which a raised line runs backwards; branchial regions smooth.

External antennæ short; antennal scale broad, short, terminating in a tooth externally.

External maxillipeds moderate, their terminal joint somewhat triangular, as broad as penultimate, than which it is slightly longer.

First pair chelipeds robust, short, the propodos somewhat triangular, palm oblique; dactylos curved, spiniform; second pair of chelipeds didactyle, much shorter than first or third; hyposternal tooth long and lance-shaped.

Abdomen short, regularly tapering; first to fifth somite smooth above; sixth obsolete carinated; all the segments furnished on their external aspect with a long pointed tooth; telson elongate, triangular, pointed at apex, hollowed above.

Colour greyish. Gosse describes its colour as a grey pellucid-brown, through which are scattered ruddy golden stars and black pale specks: a speck of opaque white on the fourth somite he looks on as characteristic.

Length 0.75 inch; 1.5 inches (Gosse).

Habitat, sandy bottoms.

Locality, Dublin, off Skerries; five fathoms.

The only Irish specimens I have ever seen or heard of are three captured by Dr. Ball off Skerries, in eight fathoms. In England the species has been recorded from Hastings by its original describer, and by Mr. Gosse from Weymouth.

The characters of the rostrum, carapace, and abdomen, afford ready means of distinguishing this species from its congeners.

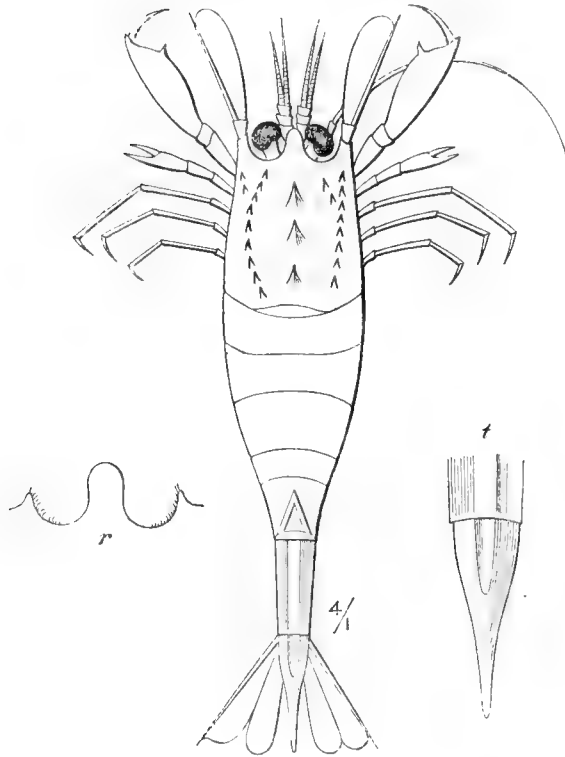


PLATE VI.

CHERAPHILUS PATTERSONII.—FOUR TIMES SIZE OF LIFE.

t. telson. r. rostrum.

Cheraphilus Pattersonii (Kin.)

Crangon Pattersonii. Kinahan, Proceedings Dubl. Nat. Hist. Soc., vol. ii., p. 130.

Rostrum short, rounded at apex, narrowed, concave above; ocular notch narrowed, ciliated on outer border only; carapace rounded above; median gastric region with a row of three principal teeth, connected by an obsolete carina; lateral gastric with rows of minute teeth terminating in one principal tooth; one tooth on each branchial region; fifth abdominal somite sculptured; sixth obsolete bicarinate; telson sulcate, elongate; second pair chelipeds half length of first or of third.

Rostrum short, narrowed, attaining apex of eye, and longer than external angle of orbit, concave above, its apex rounded; orbits narrower and deeper than last, ciliated at outer edge only; carapace moderately broad, rounded above, somewhat elongated in form; its surface covered with rows of scale-like knobs and teeth, as follows:—behind the rostrum a transverse row of five teeth, whereof three belong to the gastric and two to the branchial regions; each of the gastric teeth terminates a longitudinal row of minute teeth, extending to posterior margin of carapace. A similar row of minute teeth passes backwards and inwards from the branchial teeth, and joins the lateral gastric line of its own side at a point situate at about half way down the carapace, the posterior part of each lateral region being smooth.

The first pair of chelipeds attain to the end of the accessory antennal plate; the propodos is narrow, its sides nearly parallel, the palm oblique, extending about one-third down the internal margin of the articulation; the dactylos is short, strong, and spiniform; the carpus is smooth; the meros smooth, terminating in a pointed tooth externally; the second pair of chelipeds as in last; the third pair very slender, long; the fourth and fifth as last.

The external maxillipeds as *Cheraphilus bispinosus*.

External antennæ moderately long, their accessory scale short, broad, and truncate; hyposternal tooth as *Cheraphilus bispinosus*.

The abdomen tapering, and rounded above; the first to fourth somites gradually narrowing, smooth above; the fifth somite with a central triangular elevation at posterior border; sixth obsoletely bicarinated, not sulcate, the carinæ knobbed.

Telson elongate, triangular, concave at base; posterior pleopods and accessory scale long and narrow.

Colour, pellucid grey, with dark dots.

Length, 0·6 inch.

Habitat, black coarse sand.

Locality, off the Gobbins, Belfast, 1858.

Three specimens of this previously undescribed species occurred to me off the Gobbins, one of which was in ova.

In ova in September; ova greyish.

In appearance this species resembles *Ægeon fasciatus*. There can be no

doubt of its specific distinctness, as at the same time I captured specimens of *Ch. spinosus* of the same size, in which the characters of that species were fully shown. It was first described as new at the meeting of the Natural History Society of Dublin, held in December in the same year, and a brief description of it published : it is now for the first time figured.

It differs from *Cher. spinosus* in the comparative shortness and form of the rostrum, in the smoothness of the posterior part of the branchial regions, and the greater degree of smoothness of carapace generally; in the smoothness of the anterior somites of the abdomen, and the ciliation of the ocular notch.

From *Ch. bispinosus* and *trispinosus* it is easily distinguished by the characters of the carapace.

From *Ægeon fasciatus* and *sculptus* the form of the beak at once separates it.

I have coupled with it the name of Robert Patterson, Esq., F.R.S., well known for his long and useful study of the Natural History of Belfast.

SPINOUS SHRIMP.

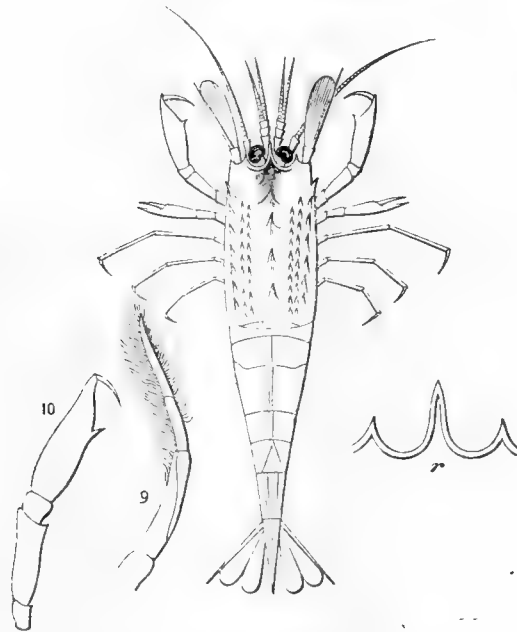


PLATE VII.

CHERAPHILUS SPINOSUS.—LIFE SIZE.

r. rostrum. 9. external maxillipeds. 10. first cheliped.

Cheraphilus spinosus (Leach sp.).

Crangon spinosus. Leach, Linn. Trans., xi., p. 346; Lam, Hist. Nat. Ms. An. S. Vert. v., p. 202; Bell, Brit. Crust., p. 261; A. White, 108; Thompson, Nat. Hist. Ireland, v. iv., p. 392.

Pontophilus. Leach, Mal. Brit., t. xxxvii. A.

Crangon cataphractus. M. Edwards, Hist. de Crust., ii., p. 243 (excluding description of female, which refers to *Ægeon cataphractus* of present list, and Risso and Olivi, Cuv. R. A. (Croch.) t. 51, f. 3.

Ægeon loricatus. Guerin, Exped. Morée, p. 33.

Rostrum moderately long, narrow, and pointed, concave at the base; ocular notch narrow, deep, ciliated all round; carapace contracted, rounded above, armed with five longitudinal rows of teeth on the gastric region, and one on each branchial region; third and fourth abdominal somites carinated; fifth somite sculptured; sixth obsoletely bicarinate, sulcate; telson sulcate, elongate; second pair of chelipeds half length of first or of third.

Rostrum very narrow, almost linear for its superior third, not quite attaining apex of eyes, but surpassing external angle of orbit, concave above; orbit much narrower and deeper than *Ch. Pattersonii*, the eyestalk proportionally much longer, so that the rostrum, though not attaining apex of eyes, as in that species, is really proportionally much longer and more slender; a series of minute ciliæ clothe the orbit from its external angle to the origin of the rostrum; carapace narrow, somewhat compressed at the sides, rounded above, armed with seven longitudinal rows of well-developed, curved, sharp small teeth, whereof the median gastric region bears one, each lateral gastric two, and each branchial region one, those on the gastric region being the best marked. Both Leach and Bell do not notice the branchial row of teeth; but in Leach's specimen in the British Museum I find it present.

First pair of chelipeds surpassing end of accessory antennal scale; in its characters it resembles *Cher. Pattersonii*; second to fifth chelipeds as *Ch. Pattersonii*, as are also the external maxillipeds and external antennæ; the antennal scale is somewhat narrower, but short.

The abdomen gradually tapering, not abruptly, so as in *Ch. Pattersonii*; the first to fourth segments are obtusely carinated, the fifth bicarinated; the carinæ confluent above, so as to include a triangular sulcation. In young specimens, 0·6 inch long, the carinations are parallel, and the sulcation consequently longitudinal; the sixth bicarinated and sulcated in old specimens; in young, bicarinate and plane.

Telson elongate, triangular, and concave at its origin; posterior pleopods and their accessory scales long and narrow.

Colour varies. In the specimens captured at Belfast, I find it of the same colour as *Cr. vulgaris*, but lighter. Mr. Gosse describes a Weymouth specimen as "drab, or pale wood-brown, with a well-defined band of opaque white across the fourth segment, a much broader one across the front of the carapace, an irregular broad white band running down longitudinally on each side, and bounding an oblong insulated drab mark; tail-plates with a transverse drab band, under parts of body and legs, spotted with crimson."

Length, 1·5 inch.

Habitat, clean, gravelly sand.

Localities, Gobbins, Belfast. Cork (J. V. Thompson); Isles of Arran, Galway (Prof. Melville).

A single specimen of this species occurred to me at the Gobbins, in August, 1858; it was only 0·6 of inch. It has occurred but rarely to Professor Melville at Galway.

The synonymy of this species is involved in much confusion. Examination of the suite of specimens in the British Museum and Jardin des Plantes lead me to coincide with Professor Bell in the rejection of the alleged synonymes of Roux, Risso, and Olivi; the species alluded to by them belongs to the next section, *Ægeon*.

There is no doubt of the distinctness of this species from *Ch. bispinosus*, *trispinosus*, and *Pattersonii*, as it is much more sculptured and carinated, and differs in the form of the rostrum. The form of the rostrum likewise separates it from *Ægeon sculptus*, which has been by some looked on as merely made up of specimens of this species with the spines worn off by the action of the gastric juice of fishes!! Having had that species in hundreds alive, I can positively assert the falsity of this idea.

GENUS ÆGEON.

For characters of genus, *vide* p. 57. In addition, the following are pretty general:—Antennal scale not twice as long as peduncle of antennæ; second pair of chelipeds stout, but much shorter than first or third.

BANDED SHRIMP.

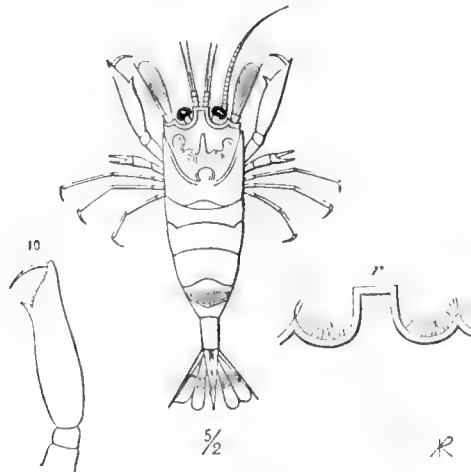


PLATE VIII.

ÆGEON FASCIATUS.

Ægeon fasciatus (Risso sp.).

Crangon fasciatus. Risso *Crust. de Nice*, t. iii., f. 5 (bad), p. 82; *Hist. Eur. Mer.* v., p. 64; *M. Ed., Crust.*, ii., p. 342; Bell, *Brit. Crust.*, p. 259; A. White, *Pop. Hist. Brit. Crust.*, 187; Lucas, *Exped. Alg.*, 38; W. Thomps., *Nat. Hist. Ireland*, iv., p. 390.

Rostrum moderate, broadly truncate at apex, deeply longitudinally sulcate; ocular notch broad, shallow, smooth, or very sparingly ciliate on outer edge only; median gastric region armed with a tooth; lateral gastric sculptured; branchial region with a short tooth; abdominal segments smooth; telson triangular, sulcate; second pair of chelipeds shorter than first or third.

Rostrum moderately long, broad, apex dilated, broadly truncate, deeply sulcated, expanded over eyes laterally, slightly surpassing the eyes; orbits shallow, broad; eye-stalks very short, completely enclosed in orbits; external tooth of orbit broad, acute, attaining tip of eyes, but shorter than rostrum; orbits smooth, or clothed with a few long cilia externally.

Carapace broad, short, rounded above, a bi-curved ridge marking out hepatic and cardiac regions, this terminates behind frontal region in a flattened triangular short tooth; on each side of which the gastric region bears a rounded short raised lobe; branchial teeth short and triangular, situate on same line as median gastric tooth; first pair of chelipeds robust, larger than accessory scale of antennæ; propodos swollen, robust; palm nearly transverse; dactylos short, strong, and spiniform; meros smooth; second pair chelipeds short, extremely small; third pair as long as first, very slender; fourth and fifth pairs progressively stouter.

External maxillipeds attaining end of antennal scale, their terminal joint short, broad, and blunt at its apex; external antennæ short; scale broad, truncate at its apex, and moderately long, surpassing the peduncle of the antennæ; hyposternal spine short and triangular; abdomen smooth; first to third somites nearly as broad as carapace; fourth slightly narrower than third, gibbous; fifth and sixth segments suddenly narrowing, and short; telson short, triangular, spined at its margins and apex; posterior pleopods and accessory plates long, narrow, somewhat oval in shape; hypo-abdominal spines short.

Colour varies much. The only constant marking in the specimens captured by me was the remarkable brown band across the fourth segment of the abdomen. In some specimens shades of gray and brown prevail; in others opaque white, emerald green, and varying shades of black and purplish, deck this pretty species.

Length, from 0·2 inch to 0·7 inch.

Habitat, near Dublin, in clean sand in extreme littoral zone; and in the same bottom up to three fathoms in the dredge. At Belfast I dredged it up to about ten fathoms not unfrequent, and in spawn.

Habits extremely active, much more so than *Crangon vulgaris*.

Localities, Belfast, off the Gobbins, and at Ballyholme Bay; Dublin, Howth, Sandycove, Bray. Galway, off Arran (Professor Melville).

In ova, May to August; ova bright orange-red; when near shedding, deep brown.

This species, first added to the Irish lists by William Thompson, from specimens obtained by Doctor Ball at Bray, occurs not uncommonly to me in sandy pools in the littoral zone: it is much rarer in the dredge, and I have not taken it as a deep-water species.

Its characteristic stunted form, the truncated beak, and the smooth abdomen, distinguish it readily from all the British species known, and indeed from all foreign species which have been described. The great extent of range given above leaves little room to doubt that further research will bring it to light all round Ireland.

SCULPTURED SHRIMP.

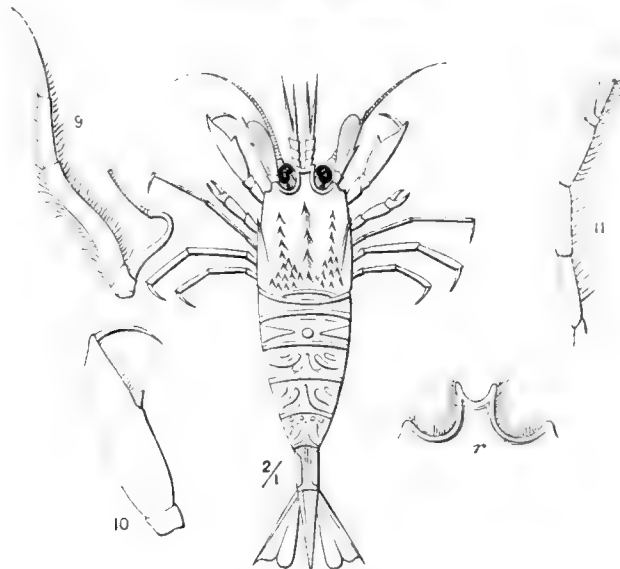


PLATE IX.

ÆGEON SCULPTUS—TWICE SIZE OF LIFE.

r, rostrum; 9, external maxilliped; 10, terminal articulations of first cheliped; 11, second cheliped.

Ægeon Sculptus (Bell sp.).

Crangon sculptus. Bell, Brit. Crust., 263; A. White, Pop. Brit. Crust., 109.

Rostrum moderate, bifid at apex, deeply concave above; ocular notch moderate, densely ciliated all round; carapace armed with five principal toothed carinæ; abdomen highly sculptured; third to fifth somites carinate; sixth bicarinate, sulcate; telson triangular, deeply triangularly sulcate above; second pair of chelipeds much shorter than third.

Rostrum long, broad, its apex dilated, the anterior angles produced, so that it becomes bifid, much longer than eyes, which it partially conceals; orbits narrower than *Æg. fasciatus*, the external angle somewhat rounded, much shorter than rostrum, the entire orbit closely fringed with long ciliae, which nearly conceal the eyes; eye-stalks very short.

Carapace broad, somewhat flattened superiorly, roughened with denticulated carinae as follows: one on median gastric region, terminating in a well-marked tooth; one bounding each lateral gastric region, likewise terminating in a tooth on a line posterior to median gastric tooth, the series bifurcating posteriorly; the space between the lateral gastric and median gastric carinae is armed in each posterior half by a bifurcating toothed carina, the anterior half being smooth. Each branchial region bears one principal carina, terminating in a well-marked tooth, on a line slightly in advance of the median gastric tooth, beneath which, inferiorly, is a curved similar line, imperfectly marked, and continuous with the produced angle of the carapace external to the outer antennae.

The first pair of chelipeds are moderately long; the propodos with its sides parallel, elongate, the palm oblique, the dactylos long, slender, curved, and spiniform; the carpus smooth. The second pair of chelipeds are scarcely one-half the length of the first, moderately stout, the propodos and dactylos very short. The third and fourth are very slender, as long as the first pair; the fifth stout and long.

The external maxillipeds attain the end of the antennal scale; their terminal joint is elongate and triangular.

The external antennae are moderately long, their scale narrow, curved, and much longer than the peduncle; the internal antennae are likewise long; hyposternal tooth short, triangular.

The abdomen is highly sculptured, the raised portions smooth, the depressions slightly pubescent; the third, fourth, and fifth somites are sculptured, and longitudinally carinated; the sixth sculptured, bicarinate (the carinae smooth), and sulcate; the telson is elongate, triangular, deeply and distinctly sulcate; the posterior pleopods and their accessory plates are narrow. A row of teeth on hyposternal region.

Colour varies much, no two specimens being alike; shades of plain drab,

with minute blackish dots and star-shaped patches of reddish-brown, pale reddish-brown in stripes, pale blue, deepening into bright azure-blue on the abdomen, before the spawn is extruded, patches of opaque white,—all combine, along with the varied tracery of its sculpturing, to render this one of the most lovely of its family.

Length, from 0·7 inch to 1·25 inch.

Habitat, sandy gravel, and, though rarely, sludgy sand, in from five to twenty-five fathoms.

Habits active, swimming freely in the aquarium.

Localities, Belfast, off the Gobbins ; Dublin, in deeper waters, very common in suitable grounds ; Galway, Isles of Arran, rare (Prof. Melville).

In ova in March ; ova salmon-red.

This species, first established by Professor Bell, is very common about Dublin, especially on the oyster and scallop (*Pecten opercularis*) beds.

If due regard be paid to the characters of the rostrum and abdomen, it cannot be confounded with any other British species, and from the foreign species it may also be easily distinguished.

From *Æg. carinicauda* (vide p. 48, *supra*), by the denticulations on the carinæ of the carapace, &c.

From *Ægeon cataphractus** it differs in the lesser amount of emargination

* *Ægeon cataphractus* (Olivi), *Ægeon loricatus* (Risso). Milne Edwards has looked on this species as identical with the male of *Pontophilus spinosus* (Leach), why, I know not. Examination of a male specimen thus marked in the British Museum (presented by Marquis Spinola, from the Mediterranean), and of female specimens in the same collection marked as from the Mediterranean, and of female specimens in the Jardin des Plantes, furnish the following characters, which also agree with Risso's descriptions and imperfect figure.—*Vide* N. H. de l'Eur., mer. 5, p. 58, pl. 1, fig. 3.

Rostrum deeply emarginate; carapace armed with *numerous* strongly-toothed carinæ terminating in teeth, which in the females project over the orbits. The abdominal segments in male—first, with several distinct, but not continuous lines of teeth; second, a single median tooth; third and fourth carinated and sculptured; fifth bicarinated (the carinæ divergent) and sculptured; sixth bicarinated; telson, as in *Crangon*, sulcate. Females—first, bicarinate and coarsely sculptured; second, third, and fourth, carinated and highly sculptured; fifth and sixth, bicarinated and sculptured; telson deeply sulcate. The carinæ in the female are all more strongly marked than in the male, being mostly denticulate on their margins. The sexes may belong to different species, but their differences are only in degree, and the female specimens are much larger than the male.

of rostrum (cfr. pl. i., fig. v. and vi.), and of denticulation of the segments, and smaller size.

Its distribution round Ireland can be by no means imagined to be accurately made out. (For general distribution of species, see end of Galatheidæ.)

PART II.—THE BRITANNIC GALATHEIDÆ.

CONSIDERATIONS ON GENUS.

THE following list shows the species now included under this genus, according to Stimpson:—

- Galathea strigosa* (Fabricius).
- Galathea Andrewsii* (Kinahan).
- Galathea nexa* (Embleton).
- Galathea dispersa* (Spence Bate).
- Galathea squamifera* (Leach).
- Galathea tridentata* (Esmark).
- Galathea intermedia* (Liljebourg).
- Galathea serricornis* (Löven).
- Galathea latirostris* (Dana).
- Galathea spinosirostris* (Dana).
- Galathea Vitiensis* (Dana).
- Galathea longirostris* (Dana).
- Galathea elegans* (A. White).
- Galathea monodon* (Milne Edwardes).
- Galathea integrirostris* (Dana).
- Galathea Australiensis* (Stimpson).
- Galathea labidolepta* (Stimpson).
- Galathea orientalis* (Stimpson).
- Galathea acanthomera* (Stimpson).
- Galathea pubescens* (Stimpson).
- Galathea grandirostris* (Stimpson).

Of these, five species are Britannic, all of which have occurred to me in the Eastern Irish Seas.

The exact position of the group has been a subject of dispute, M. Edwards placing it among the macrourous Decapoda; Bell, and most subsequent authors, among the Anomoura. With these last my own investigations would lead me to concur, since the imperfect cheliform development of the fifth pair of chelipeds (appendages of the fourteenth somite), conjoined with the depression of the body from above, is peculiar to and characteristic of Anomoura; for, with the exception of a curious crustacean described by Professor Bell as allied to the Pinnotheridæ (and I suspect, had we more specimens, even this will be found to be only an additional proof of the law), these are always found to be accompanied by the peculiar arrangement of the sixth pair of pleopods, which is characteristic of the group.

Observations on the Galatheidæ alive, in the dredge and in the aquarium, confirms this—anomourous are they in all their actions. I have kept all the British species, except *nexa*, in the aquarium, and find that in confinement the abdomen is carried closely folded up under the body; and although in swimming the animals progress by darts backwards in the same mode as *Homarus*, yet their ordinary manner of progression is by ambulation, like other anomoura. The submembranous nature of the telson, and the great length of the external maxillipeds, are also arguments in favour of their anomorous tendencies.

HOMOLOGIES OF THE GROUP.

Ocular, auditory antennal, and olfactory antennal, or first, second, and third somites, only developed inferiorly, and completely concealed above by mandibular (fourth) somite, which alone forms carapace; beneath a suture separates from this a portion which probably belongs to the sixth somite (6?).

The carapace is entirely made up superiorly of the fourth somite, and in all the British species has its surface covered with a series of transverse raised ridges, which are divided into two sets: a principal, the anterior borders laterally developed into teeth, the posterior smooth on their edges; and a secondary, which is generally edentulous. It is flattened from above horizontally, and produced anteriorly as a toothed rostrum, in the same plane as the

carapace. Inferiorly, two triangular plates on each side probably represent respectively the second antennal and sixth somites.

The eighth and ninth somites have their appendages (the first and second maxillipeds) developed to a great extent as legs; their chief office appears to be to act as hands for the conveyance of the food to the maxillæ, and for the guidance of the respiratory currents to the branchiæ. The second maxillipeds are highly subpediform.

The first chelipeds (tenth pair of limbs) are didactyle, the dactylos well developed, hollowed like a spoon, and the opposing angle of the propodos, produced, long and strong.

The second to fourth chelipeds are well developed, nearly of equal size, acuminate and simple.

The fifth chelipeds (fourteenth pair) consist of the normal seven articulations, but are developed as a pair of imperfect chelæ; the basis, ischium, meros, and carpus, slender; the propodos slender, its distal angle developed as a tooth, against which the dactylos is folded: this last is short, and not nailed, the whole limb being carried folded up in the interspace between the carapace and the fourth cheliped (*vide infra*).

The eyes are moderate, and for the greater part of the length of their peduncles concealed beneath the rostrum. In British species these bear a short, haired scale on their summit.

The olfactory antennæ are moderate; their peduncle is four-jointed, the basal joint soldered to a narrow triangular plate, which fits in between the mandibular segment and the branchial plate, which last, as already noted, probably belongs to the sixth somite.

The auditory antennæ are small, inserted on the membranous space beneath the ocular peduncles, their somite appearing to be represented by a small toothed triangular piece, which forms the external edge of the orbit; their peduncle is made up of four articulations, unless we look on the plate just spoken of as the basal joint; the uppermost two of these are elongated and slender, the basal short and robust.

The filament is extremely short, multiarticulate, and bears at its origin a curved multiarticulate appendage.

The fourth pair (mandibles, Fig. X. 4) is six-jointed; the coxæ soldered

to the somite ; the ischium dilated into a cutting edge, behind which the succeeding articulations are folded down.

The fifth pair (first maxillæ, Fig. X. 5) is three-jointed ; the coxæ soldered as before ; the ischium armed with teeth on its inner edge, and bearing a secondary appendage. That this plate is respiratory is shown by its position and structure, as distinct chains of respiratory tubes may be seen traversing its structure, and terminating at the base of the articulated hairs with which its borders are fringed. In structure it is but slightly simpler than the respiratory lobes found attached to the abdominal somites in many of the subterranean crustacea (ex. gr. *Trypæa porcellana*).

The seventh pair (third maxillæ, Fig. X. 7) is two-jointed ; the coxæ membranous, except a linear longitudinal ridge, which is calcified, dilated externally into a respiratory plate (z), from the upper margin of which the accessory appendage (x) springs. The basis completes the limb ; its inner edge is straight, sparingly denticulate, and ciliated with thick-set long hairs, and also bearing a raised ridge set with hairs ; its outer margin is curved. By some this limb is looked on as three-jointed, the coxa being represented by a small squared membranous plate, internal to the calcified column, and the ischium bearing what is here called the respiratory plate and its appendage ; but I cannot agree to this view ; and as to the objection, that in the other limbs the ischium always bears the most important cutting edge, an examination of the external maxilliped shows that the basis also may bear a set of teeth, even when the ischium is present.

The eighth pair (internal maxillipeds) (Fig. X. 8) is seven-jointed, the basis squared, the ischium (i) toothed on its inner edge, which shows a double ridge, and is fringed with hairs ; the accessory appendage (x) is two-jointed, arising from the coxæ, but also articulated to the basis.

The external maxillipeds (ninth pair of limbs) are seven-jointed, and bear a secondary appendage, which arises from the outer superior angle of the coxæ, and is articulated by a lateral process to the basis. The appendage is four-jointed ; the basal joint short and imperfect, the second long, the third short and slender, and the fourth a curved, flattened, multiarticulate, hairy filament. A lateral process of the coxæ bears a set of branchial palps and plates articulated to it. *Query*—Is the office of the appendage gustatory ? The basis and

ischium are connate, their line of junction marked by a suture, their inner edge dilated, and generally finely serrated; they are also often hirsute and toothed. The meros, carpus, and propodos, are slender, generally denticulated and hairy. The dactylos is blunt at its extremity, and hairy. The comparative lengths of the ischium and meros afford valuable specific distinctions.

The abdomen generally equals the carapace in length, and is as broad as the posterior margin of that organ; it is flattened from above downwards, and each of its somites sculptured transversely; the sixteenth to twentieth somites bearing well-developed coxa; in the fifteenth the coxa is absent in the females.

The telson (twenty-first) is triangular, submembranaceous, with a varying number of chitinous plates, thickened with carbonate of lime scattered throughout; it is also unappendiculate.

The abdominal appendages vary in the sexes.

I. In the males (Plate X., 15, 16, 17–20, left-hand side of plate).

First abdominal pair (fifteenth pair; anterior pleopod Spence Bate) coxa sparingly developed and connate with somite, which is expanded outside it; basis and ischium flattened, the latter membranaceous; somite developed inferiorly.

Second abdominal pair (sixteenth pair). Coxæ soldered to somite, well developed, basis small; ischium and meros flattened, the latter membranaceous.

Third to fifth (seventeenth to nineteenth). Coxa well developed, connate; basis dilated into a truncated scale; ischium and meros very short, cylindrical, arising from a notch in side of basis, and barely attaining its apex.

II. In the females (Plate X., figs. 16, 17–19, right-hand side of plate).

First abdominal somite unappendiculate.

Second abdominal somite (sixteenth). Coxæ soldered; basis, ischium, and meros elongated, flattened, ciliated along edges; the apex of meros rounded.

Third to fifth (17th to 19th) as last, except that the meros (incorrectly marked *c* in plate) is acuminate.

Sixth abdominal somite (twentieth pair). Coxæ connate; basis flattened, broad, articulated to coxa, and by a small lateral process to telson; furnished on its inner side with a flattened squamiform appendage (but *vide infra*, Gal. squamifera, p. 92).

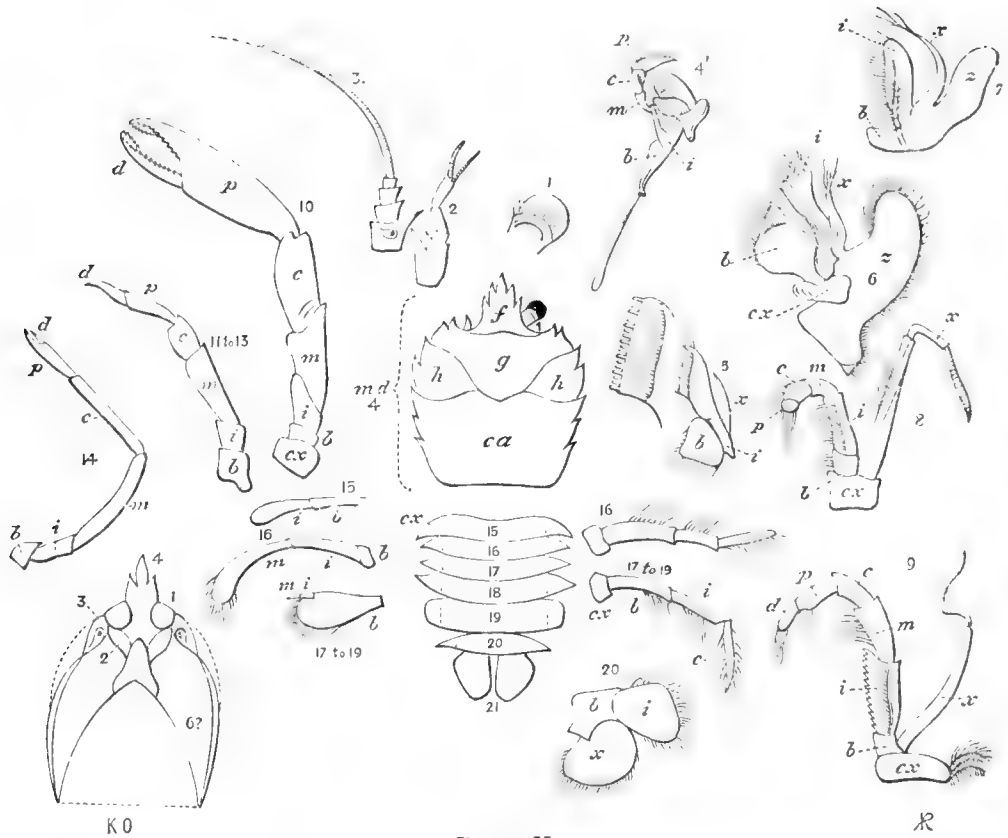


PLATE X.

DIAGRAMMATIC SKETCH, ILLUSTRATING HOMOLOGIES OF GALATHEA.

Kθ, lower view of carapace, etc.; 1, ocular somite; 2, auditory antenna; 3, olfactory do.; 4, mandibular do., frontal portion; 6?, probably second maxillary.

- 1, eye and scale.
- 2, auditory antennæ.
- 3, olfactory antennæ.
- 4', mandible; *b*, basis; *i*, ischium; *m*, meros; *c*, carpus; *p*, propodos.
- 5, first maxilla, with enlarged view of cutting edge; *b*, basis; *i*, ischium; *x*, appendage.
- 6, second maxilla; *cx*, coxa; *b*, basis; *i*, ischium; *x*, appendage; *z*, respiratory plate.
- 7, third maxilla; *b*, basis; *i*, ischium; *x*, appendage; *z*, respiratory plate.
- 8, internal maxilliped; *cx*, coxa; *b*, basis; *i*, ischium; *m*, meros; *c*, carpus; *p*, propodos; *x*, appendage.

9, external maxilliped, references as last.

10, first cheliped, do. do.

11-13, second to fourth do.

14, fifth pair of chelipeds.

15, first pleopod, male.

16, second do. do.

17-19, third and fourth do.; the corresponding numerals on the right-hand side of the plate show the same limbs in the female. In 17-19, *c* has been inserted for *m*.

20, posterior pleopod; *b*, basis; *i*, ischium; *x*, accessory plate.

md 4, carapace upper view; regions, *f*, frontal; *g*, gastric; *hh*, hepatic; *ca*, cardiac.

The figure below this shows the 15th to twenty-first somites, with attached coxa (*cx*).

The group is represented in the Britannic area by five species, which have occurred in both Irish and British seas. For their distribution see end of Paper.

CHARACTERS OF GENUS.

GALATHEA.

Anomoura; anterior chelipeds strong, equal, didactyle; fifth pair chelipeds weak, didactyle, carried folded up; second, third, and fourth pairs acuminate.

External maxillipeds elongate, subpediform. Carapace depressed, beaked.

Abdomen depressed; no spines on somites; six anterior abdominal somites appendiculate in male; appendages of first somite wanting in female.

Telson unappendiculate, submembranaceous.

Antennæ unappendiculate; external long; internal inserted beneath eye-stalks; peduncle elongate.

Eyes large, with a hairy scale (?).

Chelipedum: par primum cheliforme: paria 2dum, 3tum, 4tumque simplicia: par quintum debile, cheliforme. Maxillipedes externi subpediformes. Carapax depressus, rostratus.

Abdomen depressus, superne inermis; somitum, anteriora paria primum ad sextum in maribus appendiculata; in fœminis paria secundum ad sextum solum.

Somite, ultimus submembranaceus, sine appendice.

Antennæ exappendiculatæ: par primum (internum) infra oculos insitum, par secundum (externum) satis longum. Oculi magni. Species *G. squamifera*, Andrewsii, dispersa, nexa, strigosa.

1. *Galathea squamifera* (Fabricius).

G. Rostro brevi, tuberculis squamosis, ciliatis superne velato, mediane sulcato; dente cylindrico terminante, marginibus fortiter denticulatis; chelipedum pare primo lato, denticulatis tuberculis conferto; articulis, secundo, tertio,

quartoque, externe fortiter denticulatis; maxillipedibus externis, cum ischio (articulo tertio) quam meros (articulo quarto) breviori.

2. *Galathea Andrewsii* (Kinahan).

G. Rostro brevi, squamosis tuberculis pilosis parce velato; chelipedum pare primo (pedum par primum) elongato, rotundato, angusto, parce squamosè-tuberculato, tuberculis sæpissime denticulatis; chelipedum paribus, 2do, tertioque externe dentatis, interne squamulatis; maxillipedibus externis, cum ischio (articulo tertio), quam meros (articulo quarto) breviori.

3. *Galathea dispersa* (Spence Bate).

G. Rostro brevi, superne subplano, squamato, alteris ut *G. squamifera*; chelipedum pare primo elongato, sub compresso, squamato, propodos parce dentato, carpo, et meros parce fortiter interne dentato; maxillepedibus externis cum meros quam ischio breviori.

4. *Galathea nexa* (Embleton).

G. Rostro brevi, superne lævi, subpiloso, mediane sulcato; dente cylindrico terminante, dimidio posteriori longitudinis suæ serrato; alteris, ut *Gal. squamifera*; chelipedum pare primo globoso, satis lato, elongato, articulo sexto (propodos) externe dentato, supra parce tuberculato, villosa, articulis quinto, quartoque fortiter superne dentato; maxillepedibus externis cum meros (articulo quarto) quam ischio (articulo tertio) multo breviori.

5. *Galathea strigosa* (Linnæus sp.).

G. Rostro brevi, tuberculis squamosis pilosis superne consperso, mediane sulcato, deflexo; dente cylindrico terminante, marginibus fortiter dentatis; chelipedum pare primo lato, fortiter omnino dentato; maxillepedibus externis cum ischio (articulo tertio), meros (articulo quarto), longitudinem æquante.

DESCRIPTION OF SPECIES.

SCALY GALATHEA.

Vulgo Spanish Lobster.

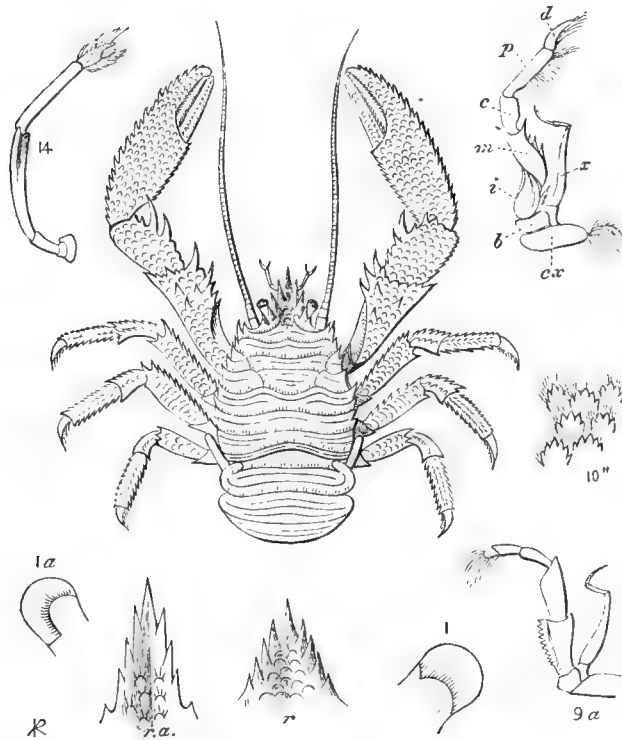


PLATE XI.

GALATHEA SQUAMIFERA—SIZE OF LIFE.

- r, rostrum
- ra, rostrum, Galathea Andrewsii.
- 1, eye and scale.
- 1a, do. do., Galathea Andrewsii.
- 10'', sculptured frontal region, Galathea squamifera.
- 9a, external maxilliped, Galathea Andrewsii.
- 14, fifth cheliped, Galathea squamifera.
- The unnumbered figure represents the external maxilliped of Galathea squamifera.
- Vide* also Plate X., figs. 15 to 19.

GALATHEA SQUAMIFERA. Leach, Mal. Pod. Brit., t. xxviii., A, excluding Fig. 2.

Cancer astacus squamifer. Montagu.

Gal. squamifera. Leach, Edinburgh Encyclopedia, vii., p. 393; Dictionnaire des Sciences Naturelles, xviii., p. 51; M. Edwardes, Histoire Naturelles des Crustacés, ii., p. 275; Conch. Cornish Fauna, p. 77; Thompson, Natural History of Ireland, vol. iv., p. 385; Bell, British Crustacea, p. 197; White, Popular History British Crustacea, p. 87; Kinahan, Proceedings Natural History, Dublin, vol. ii., pp. 68, &c.; Report British Association, 1859; Proceedings Dublin University and Zoological Association, vol. i., p. 270; Zoologist, 3rd Series, 5775.

(?) *Gal. Glabra*. Risso, Crust. de Nice, 72; H. N. de l'Eur. Mer., v. 47.

Rostrum: short, covered with squamiform tubercles above, tubercles ciliated along margins; deeply depressed in median line, terminating in a cylindrical pointed tooth; four pointed teeth on lateral margins on each side, the posterior one much smaller than the others; first pair chelipeds broad, flattened, covered with squamiform dentated tubercles; dactylos moderate, not twisted; sides of propodos curved, outer margin toothed, two succeeding joints strongly toothed on outer edge; ischium (third joint) of external maxillipeds shorter than meros (fourth joint).

The general form of this species is elongate, the breadth being to the length as 3 : 8. The carapace is one-fourth longer than broad, and much narrower in front than behind. The abdomen much narrower than the carapace.

The carapace is rounded, perfectly free from teeth above, except two small spiniform ones behind the orbits; the surface marked out by transverse ciliated raised lines in two series bounding the regions, a principal dilated laterally into teeth in front, but untoothed behind; and a secondary, which is generally smooth. The gastric region has two or more small teeth on the median portion of its anterior boundary. The frontal region and rostrum (Fig. *r*) are covered with squamiform tubercles.

The rostrum deeply concave above, terminating in a strong cylindrical sharp tooth, its surface covered with squamiform tubercles, which are rounded in outline, and ciliated at their margins with thick-set short hairs; these are present, and easily distinguishable, even in specimens barely a quarter of an inch

long. I have, however, met two small specimens out of some hundreds examined, which, while agreeing more closely with this species than any other, differ in having the beak perfectly smooth. There are other characters in the squamulation of the hands in which they also differ. If a variety of squamifera, it is certainly a rare one, as all the other specimens I have met agree with each other in the characters given above. The margins of the beak are produced into eight teeth, four on each side, which are cylindrical and sharp, the posterior pair the smallest. The rostrum surpasses the eyes by about the length of the peduncle of the latter.

The internal antennæ, with the third joint short, dilated externally, and strongly toothed anteriorly.

External antennæ equal to the body from rostrum to telson; basal articulations short; the filament very long.

The first chelipeds exceed the cephalo-thorax and abdomen by one-fifth of their own length, are moderately broad, generally somewhat flattened. Varieties occur in which they are somewhat globose. The propodos finely serrate on outer margin, and obsoletely so on inner, especially in young specimens; its upper and under surfaces densely covered with squamiform tubercles, which are dented at the free edges, and ciliated. The dactylos and opposing process of propodos are nearly parallel: varieties occur in which they are curved, leaving a broad interval between them, the tips alone touching. The meros is squamulate, and armed with strong teeth along its inner edge. The carpus is strongly toothed internally, a few spiniform teeth being scattered through the squamiform tubercles on its upper surface. These limbs are remarkably easy of replacement, the animal casting them at once if seized by them. I possess a specimen in which both the chelipeds had been cast, and are now replaced by a very short pair, still soft, and only half the length of the external foot-jaws. I have constantly seen the animal in good health and condition, though wanting these organs. The second and third pairs of chelipeds are more or less serrate along their upper edge, and squamulate. The fourth pair bears a row of stiff hairs along its upper margin; its under margin is serrated. The fifth pair of chelipeds is as long as the carapace, smooth, terminating in a small blunt hand; it is generally carried folded up. The only use I have seen the animal make of these limbs is in combing out and arranging the fringes of the branchiæ.

The external maxillipeds, when extended, surpass the rostrum by their sixth and seventh articulations; their coxæ are somewhat quadrilateral, and connate with their own somite and the succeeding; their basis short, somewhat triangular; their ischium double the length of the basis, four-sided, its inner side hollowed longitudinally, two-edged, the innermost armed with rows of fine teeth. The meros is remarkably twisted, dilated at its base, much longer than the ischium, bears four cylindrical teeth on its outer edge, terminates in a pointed tooth, and is fringed with long hairs. The carpus is much shorter than the meros, twisted *en revers*, and rounded. The propodos is much longer than the carpus, cylindrical; the dactylos extremely short and blunt. The last three joints are clothed with hairs. A four-jointed appendage arises from the coxa.

The eyes are short; the scale rounded (*vide* Figure).

The abdomen is much narrower than the cephalo-thorax, smooth; the edges of the somites ciliated.

In the male it bears six pairs of appendages, and in the female five, the appendages of the first segment being absent, and the somite itself deficient below.

In the male the first pair is made up of two free joints, and the connate coxa. The terminal joint, broadly dilated, twisted, and hairy. The second articulation has three free joints and the connate coxa, the terminal joint (meros) as in the last. The three succeeding limbs are four-jointed; the coxa soldered as before; the basis (*vide* Fig.) dilated into a broad plate; the apex rounded and hairy, its inner side deeply and truncately notched. From this notch arise the ischium and carpus, which are cylindrical and short, conjointly barely attaining the dilated apex of the basis; the outer side of the basis is ciliated.

In the female the first pair are wanting; the second to fifth four-jointed, flattened, slender, and haired.

The sixth pair in both sexes is made up of ischium, basis, and connate coxa, the ischium dilated; a broad appendage is articulated to the coxa and basis.

Length of the largest specimens I have met, two inches and a half or three inches, including outstretched chelæ four and a half inches. The subjoined measurements are taken from an individual captured at Sandycove, and represents a medium adult specimen:—

| | Inches. |
|--|---------|
| Length from tip of chelæ to extremity of curved abdomen, | 2·875 |
| Length from rostrum to extremity of telson, | 3·4 |
| Length of carapace, | 1·0 |
| Length of abdomen, | 1·0 |
| Length of chelæ, | 2·875 |
| Length of propodos of chelæ, | 1·25 |
| Breadth of carapace, | 0·75 |
| Breadth of chela, | 0·375 |

Colour, greenish-brown, with greyish-brown streaks and blotches, occasionally, especially in young specimens, tinged with red. When heated in drying, and on immersion in spirits, it turns red.

It appears to be a generally diffused species around Ireland, and by no means rare, though local—that is to say, only inhabiting peculiar kinds of localities, viz., weedy stones, beneath which it lurks. The nature of this habitat—the rocks being too weighty to be lifted by an ordinary dredge—perhaps accounts for its apparent rarity. All the localities I have found it in were situate at the margin of the laminarian zone, and only approachable at low spring and neap tides. I have never dredged it, even when carrying out a careful series of explorations at Sandycove; nor has it occurred to me in Dublin in the pots, being in fact unknown to the fishermen there. William Thompson and Professor Bell both record it—the former in the dredge, the latter in the dredge, and also in lobster-pots. I have taken it abundantly, of all sizes, from the length of one-fourth inch upwards, clinging to the under sides of the stones, at Sandycove at all seasons, and also on the coast of Clare. There is no appreciable difference, except in size (excluding the variety already spoken of), in the specimens.

In habits the animal is active. I have never seen it feign death. When at liberty, as also in the aquarium, it carries the abdomen close appressed to the under surface of the cephalo-thorax. Swimming is performed by quick, short flaps of the abdomen: it walks at the bottom of the water nearly directly backwards over the stones; it progresses forwards, backwards, and sideways.

Localities, Belfast, on authority of specimens collected by William Thompson and also in Mr. Edward Waller's collection: Dublin, abundant near Howth, Sandycove, and Dalkey: Youghal, authority of late Dr. Ball; Valentia Island; Lahinch, abundant; Galway, according to Professor Melville.

In ova all the year;—at least I have taken it so in every month from January to November. Ova, when immature, coral-red; when approaching maturity, muddy-red.

Habitat, under large stones in clear pools, and also in sludge in the laminarian zone, where they occur in hundreds.

The species was first distinguished by Montagu: it is difficult to establish in a tank; but when once established, requires little care.

The species is easily distinguished, when alive, from all the other British species by its colour, and the characters of the chelipeds and rostrum. It may be also distinguished from all save *G. Andrewsii* by the ischium of the external maxillipeds being shorter than the meros; whilst from *G. Andrewsii*, even excluding colour, the squamation of the chelæ separates it.

Leach has given a characteristic plate and description of the species in the *Malacostraca Britannica*, excluding Fig. II. and his description of young specimens taken in the dredge, both of which refer to *Galathea Andrewsii*.

SLENDER-ARMED GALATHEA.

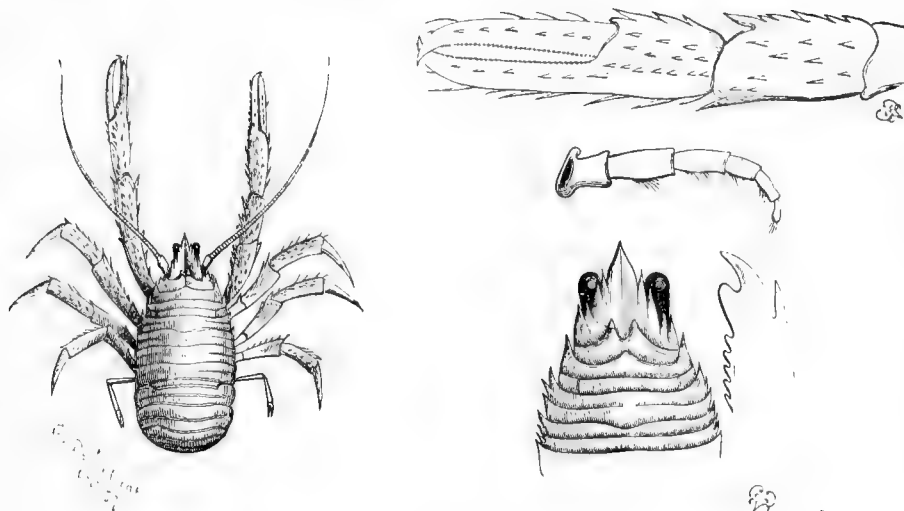


PLATE XII.

GALATHEA ANDREWSII.

Vide also Plate XI, figs. ra, 1a, and 9a.

Galathea Andrewsii (Kinahan).

Galathea Andrewsii. Kin., Proceedings Nat. Hist. Society, Dublin, vol. ii., p. 58, pl. xvi., fig. 8, and fig., p. 71; *ib.*, p. 47, as nexa, &c.; Zoologist, 3rd series, p. 5775, &c.; Report British Assoc., 1857, p. 104, &c.; Stimpson, Prod., p. 76; Spence Bate, Proceedings Linn. Soc., vol. iii., p. 104.

Galathea squamifera (Junr.). Leach (in part), Mal. Pod. Brit., p. xxvii., fig. 2.

Rostrum moderate, sparingly covered with elongated, squamiform tubercles above, depressed in the centre, terminating in a flat, pointed tooth, armed with four flattened teeth on each side, the last two of which are separated from the others. First pair of chelipeds elongate, narrowed, covered with a few squamiform tubercles, terminating in a few scattered hairs, or ciliated. Sides of propodos sparingly dentate. Two succeeding pairs of chelipeds strongly dentate on outer margin and upper surface. Ischium of external maxillipeds shorter than meros.

The general form of this species is elongate, the breadth being to the length as 3 : 7; the carapace longer than broad, narrowed in front for two-thirds of its length, then suddenly broader, and then slightly contracted behind. The abdomen is nearly as broad as the carapace.

The carapace is rounded above, smooth, except the usual row of small teeth posterior to frontal region. The rostrum is deeply depressed in the median line, moderately long, terminating in a flattened tooth, and produced laterally into four flattened teeth on each side, the posterior two of which are smaller than the others, from which they are separated by an interspace, close together, and situate at the inner canthus of the orbit. The upper surface of the rostrum and the frontal region are covered with a few comparatively broad, rounded, squamiform tubercles, which are margined with long ciliæ. The transverse lines are shortly ciliated, and toothed laterally. The rostrum surpasses the eyes by half its own length. *Vide* Plate XI., fig. *ra*.

The internal antennæ bear cylindrical teeth on their peduncle, and, when extended, surpass the eyes.

The external (olfactory) antennæ are nearly as long as the first chelipeds, their peduncle sparingly toothed.

The first pair of chelipeds are as long as the conjoined carapace and abdomen; the propodos is rounded above, narrow, its sides parallel, their outermost border margined with teeth, their innermost sparingly toothed, slightly hairy. The dactylos and opposing process of the propodos are linear, twisted, and parallel; their upper surface covered with rows of minute, irregular, denticulated, squamiform tubercles, which are margined with a few long ciliæ; the under surface is polished, covered with ciliated squamiform tubercles. The carpus bears a row of moderately strong teeth internally; its surface and outer margin are squamulate. The superior border and inner side of the meros is toothed, its surface squamulate. The second and third chelipeds are toothed, their upper borders squamulate above and below, their terminal articulations furnished with strong stiff hairs below. The fifth pair is smooth and slender.

The external maxillipeds are short, the ischium much shorter than the meros, the accessory appendage long. Plate XI., fig. *9a*.

The eyes are short, the eye-scale wide and haired. Plate XI. fig. *1a*.

The abdomen is the same breadth as the posterior margin of the carapace, smooth, the transverse lines ciliated.

Length of largest specimens one inch, or 1·2 inch, with outstretched chelæ; it seldom, however, attains these dimensions.

| | Inches. | Inches. |
|---|---------|---------|
| Length from tip of chelæ to curvature of abdomen, | 0·875 | 0·90 |
| Length from rostrum to extremity of telson, . . . | 0·75 | 0·75 |
| Length of carapace, | 0·375 | 0·375 |
| Length of abdomen, | 0·375 | 0·375 |
| Length of first pair of chelipeds, | 0·75 | 0·7 |
| Length of propodos of first chelipeds, | | 0·325 |
| Length of dactylos of do., | | 0·175 |
| Breadth of carapace, | | 0·225 |
| Breadth of propodos of first chelipeds, | 0·093 | 0·075 |
| Length of external antennæ, | | 0·6 |
| Length of second pair of chelipeds, | | 0·45 |

With these measurements, which represent average Dalkey specimens, I find specimens obtained at Plymouth and Belfast by myself; from the west Irish coast, furnished me by Professor Greene and Dr. Wright, and from the north of Scotland, correspond, as well as specimens from Madeira, communicated by Professor Bell, and from Algeria by M. Lucas.

Colour, shades of pale red, banded and blotched with light red and white.

Habitat, clean bottom everywhere about Dublin, in from five to twenty-five fathoms; also in lobster and whelk-pots from rocky ground. I have never met it either in the littoral or exposed laminarian zone. Dr. Perceval Wright assures me he met it thus off the south-west coast.

Habits extremely active; lives well in the aquarium, where I have had it for months; it is fond of climbing to the top of the sea-weeds in the tank, and basking there in the sun.

From the numbers met in the pots, it must be a very roving species. It is far in a way the commonest Galathea met in dredging during my researches on the Dublin coasts: it occurred everywhere, and abundantly, except in black shingly sand, though most abundantly on the oyster-grounds.

Localities, Belfast, 1858 ; specimens, unidentified, occur also in the Ordnance Survey collection from the north of Ireland, and in the Museum of the Belfast Natural History Society, from Strangford Lough and Belfast Bay.

Dublin, everywhere. From the south of Ireland specimens unnamed occur in J. Vaughan Thompson's collection ; and Dr. Wright and Professor Reay Greene have furnished me with specimens from the south-west coast. Its extra-Britannic range, Algeria and Madeira, conjoined with its Orkney habitat, would lead me to expect it all round our coasts.

In ova during the months December to June: ova pale red.

Since the establishment of this species as distinct in 1857, I have examined some hundreds of specimens, many of them in ova, and from various localities, not merely Irish, English, and Scotch, but also Continental, and find that the dimensions and characters of this species are constant. It has by earlier authors been confounded with *Galathea squamifera*, with which the only characters it has in common are the form (but not squamulation) of beak and proportions of foot-jaws ; these latter, however, are remarkably twisted in *Galathea squamifera*. Leach, as already noted, has figured and described it in the Mal. Pod. Brit. as the young of that species ; and I believe William Thompson, in the supplemental volume of the Natural History of Ireland, p. 385, has fallen into the same mistake into which also Professor Bell has fallen, through quoting Leach's statement, given above.

It is distinguished from the allied species as follows :—

From *Galathea squamifera*, by colour, form, and character of sculpture of first pair of chelipeds, form and degree of squamulation of rostrum, and size.

From *Galathea dispersa*, *nexa*, and *strigosa*, by the characters of the rostrum, first chelipeds, proportions of meros and ischium of external maxillipeds, and size.

As already stated, it is a very common, and apparently commonly diffused species.

The species is named after William Andrews, M.R.I.A., President of the Natural History Society of Dublin.

SPENCE BATE'S GALATHEA.

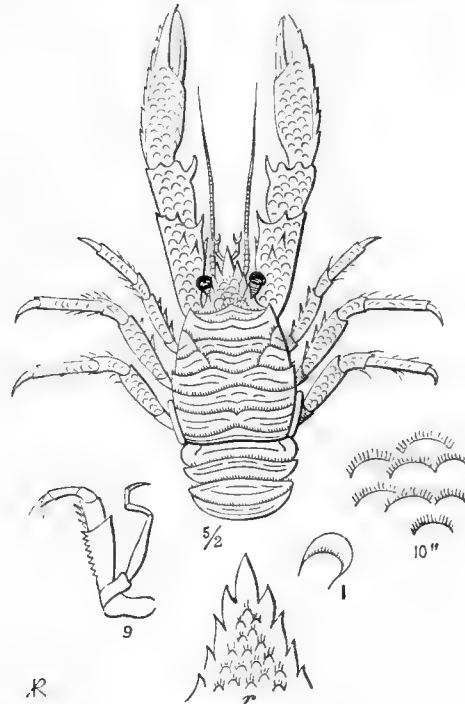


PLATE XIII.

GALATHEA DISPERSA.

Galathea dispersa (Spence Bate).

Galathea dispersa. Spence Bate, Proceedings Linnæan Society, London, vol. iii. p. 3; Kinahan, Proceedings British Association, Report on Dublin Bay Dredging, 1860; Proc. Nat. Hist. Soc., Dublin, vol. iii. p. 49.

Rostrum moderate, nearly plane above, squamate, terminating as a flattened tooth, and bearing four flattened teeth on each side. First pair of chelipeds elongate, somewhat flattened; dactylos narrowed; sides of propodos nearly parallel, minutely toothed on outer margin, squamate; two succeeding articulations sparingly strongly toothed on inner margin; internal antennæ barely surpassing tip of rostrum; ischium of external foot-jaws nearly double length of meros of same limb.

The general form of body of this species is elongate, the breadth being to the length as 3 : 8, the carapace being longer than broad, narrowed in front. The abdomen is nearly one-third narrower than the broadest part of the carapace, and much narrower anteriorly than posteriorly. The carapace is rounded above ; it bears a row of small teeth behind the frontal region. The transverse lines are hirsute, and terminate laterally in teeth.

The rostrum is nearly plane above, flattened, terminating as a moderately broad tooth, and surpassing the eyes by two-thirds of their length. Its margins are produced into four small flattened teeth on each side, which are equidistant from each other, and the last situate at the inner margin of the ocular notch. The upper surface of the rostrum and the frontal region are squamate ; the scales rounded, ciliated, and thick-set.

Internal antennæ longer than the eyes when outstretched, the basis strongly toothed.

External antennæ are nearly as long as the body, their third articulation very sparingly toothed.

First pair of chelipeds elongate, as long as cephalo-thorax and abdomen, a row of small cylindrical teeth along each margin of the propodos, carpus, and meros, which are toothed on inner margin and superiorly, the upper surface covered with squamiform tubercles, which are rounded in outline, close-set, and densely bordered with long hairs, which give the limb a slightly villose appearance. In young specimens, these scales are present as teeth. The under surface is polished, thickly set with squamiform tubercles, which are serrated, rounded, and ciliated. The dactylos and opposing process of the propodos are hollowed, coarsely and evenly denticulate. The carpus is furnished with a strong tooth at its superior margin, and a second smaller about half way down. The meros bears two teeth on its superior margin, and a smaller one at the inner edge. Its outer border terminates in a cylindrical tooth. The second pair of chelipeds is toothed on its inner border. The fifth pair of chelipeds are slender, as long as the carapace without the rostrum, and terminating in a blunt hand.

The external maxillipeds barely attain extremity of rostrum when extended; the ischium is much longer than the meros.

The eye-scale is rounded, broad, and ciliated.

The abdomen is narrower than the carapace, smooth, the margins of the somites haired.

Length of largest specimens I have seen, one inch from rostrum to telson, or, including outstretched chelæ, 1·75 inch. The subjoined measurements are taken from a Belfast specimen :—

| | Inches. |
|--|---------|
| Length from tip of chelæ to extremity of curved abdomen, | 1·5 |
| Length from rostrum to extremity of telson, | 1·0 |
| Length of carapace, | 0·5 |
| Length of abdomen, | 0·5 |
| Length of chelæ, | 1·0 |
| Length of propodos of chelæ, | 0·5 |
| Breadth of carapace, | 0·375 |
| Breadth of chelæ, | 0·125 |
| Length of external antennæ, | 0·5 |
| Length of second pair of chelipeds, | 0·625 |

Colour, various shades of dull salmon-red, with a few scattered greenish-brown blotches.

Habitat—To me it has only occurred in deeper water, on a sandy, shingly bottom. In Belfast it has also been taken only in deep water. It is much rarer than *nexa*.

Habits—The animal lived well in the tank, and was active.

Localities, Dublin, south of the Mugglins, in ten to fifteen fathom water. Cnock, in a similar locality. In Mr. Waller's collection, obtained off the Turbot Bank and elsewhere, Belfast, occur several specimens of this species. I have not seen it in the pots.

This species was first established by Charles Spence Bate, from specimens taken at Plymouth. It is distinguishable from *G. squamifera* by the proportions of the external foot-jaws and colour, &c.;

From *Galathea strigosa*, by the absence of teeth on the surfaces of the chelipeds, squamulation of the rostrum, and globosity of chelæ;

From *Galathea nexa*, by the form and squamulation of rostrum, comparative

smoothness and lesser amount of villosity of hands, and proportions of abdominal somites.

From *Galathea Andrewsii* it is at once separated by the comparative breadth of first chelipeds, squamulation of rostrum, and propodos of first chelipeds, and comparative lengths of articulations of foot-jaws.

EMBLETON'S GALATHEA.

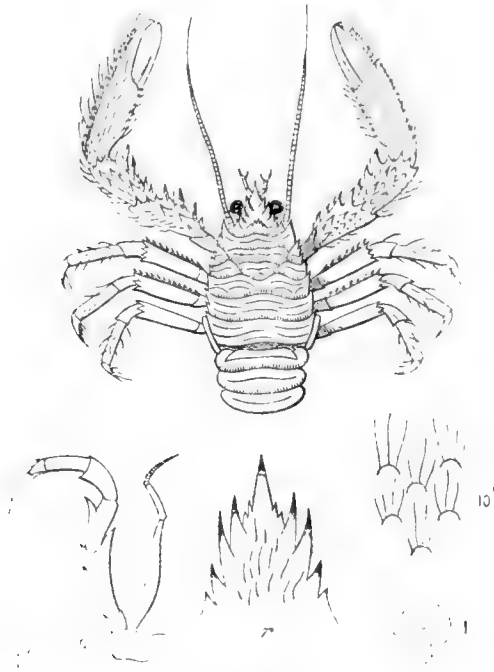


PLATE XIV.

GALATHEA NEXA.

Galathea nexa (Embleton).

Galathea nexa. Embleton, Proceedings Berwickshire Club; Thompson, Annals of Natural History, p. 255; Natural History of Ireland, vol. iv., p. 385; Bell, Brit. Stalk-eyed Crust., 204; White, Pop. Hist. Brit. Crust., p. 88; Kinahan, Proceed. Nat. Hist. Soc., Dublin, vol. ii., excluding p. 47, which refers to *G. Andrewsii*; Zoologist, 3rd series, p. 5775, &c.; Spence Bate, Proceed. Linn. Soc., vol. iii., p. 3.

Rostrum moderate, quite smooth above, covered with scattered hairs, depressed in the median line, terminating in a cylindrical tooth, which is serrated on its edge for its posterior half; borders of rostrum armed with two principal rounded teeth, and two secondary and smaller; first pair of chelipeds somewhat globose, moderately broad, elongate, twisted; sides of propodos parallel, toothed on outer margin, surface sparingly tuberculated, hairy; two succeeding joints strongly toothed on upper surface; internal antennæ surpassing rostrum; ischium of external foot-jaw nearly double length of meros.

The general form of this species is somewhat elongate, though less so than *dispersa*, breadth at its broadest part being to the length as 2 : 7·5; the carapace being not quite one-third longer than broad, and nearly of equal breadth throughout. The carapace is rounded above and smooth, the transverse lines ciliated at their borders, and produced into pointed teeth laterally; it bears a row of teeth behind the frontal region. The rostrum is concave, terminating in a cylindrical pointed tooth, which is dilated and serrated at its base: the serrations are not visible to the unassisted eye. Its margins are produced on each side into four slightly flattened, curved teeth, the posterior two of which are the smallest, and separated from the others by a short interspace. It surpasses the eyes by nearly their own length. The upper surface of the rostrum and the frontal region are smooth, furnished only with a few scattered long hairs.

The internal antennæ, when extended, surpass the eyes.

The external antennæ are much shorter than the body, their third articulation sparingly toothed.

The first pair of chelipeds as long as entire body, moderately broad, the propodos hairy, a row of strong, sharp-pointed teeth along its outer margin, and a row of smaller ones internally, its surface covered with scattered minute squamiform tubercles, each set with long hairs, giving a hairy appearance to the entire limb. The under surface is set with squamiform tubercles, bordered with long hairs: the produced angle of the propodos bears a raised ridge beneath its denticulated cutting edge.

The dactylos is triangular, minutely denticulated at the outer border, and bears a raised ridge above its cutting edge. Both it and the opposing process

of the propodos are hollowed like a spoon at the tips, twisted and hairy. The carpus is hairy, with rows of curved, pointed teeth on its superior surface and outer margin : the inner margin bears two or three strong teeth. The meros is also toothed and hairy. The fourth and fifth pair of chelipeds are more or less beset with sharp-pointed teeth ; the fifth pair slender and smooth.

The external maxillipeds are moderately long, their ischium much longer than the meros.

The eye-scale is rounded and narrow.

The abdomen is much narrower than the posterior border of carapace ; narrowed in the middle, and smooth.

Length, about two inches from rostrum to telson ; or, including chelæ, three inches. The greater number of specimens which have come under my notice do not exceed an inch and a half.

The following measurements are from specimens obtained at Loughshinny from the lobster-pots :—

| | Loughshinny. |
|---|--------------|
| Length from tip of chelæ to curve of abdomen, | 1·875 |
| Length from rostrum to extremity of telson, | 1·3 |
| Length of carapace, | 0·687 |
| Length of abdomen, | 0·625 |
| Length of first chelipeds, | 1·25 |
| Length of propodos of first chelipeds, | 0·625 |
| Breadth of carapace, | 0·50 |
| Breadth of propodos of first chelipeds, | 0·187 |
| Length of external antennæ, | 0·875 |
| Length of second pair of chelipeds, | 0·90 |

Colour, shades of red, varying from salmon-red to brick-red.

Habitat, stony gravel, in from ten to twenty fathom water. In the spring it also at Dublin occurs in the crab and whelk-pots, which are set in the same depths in weedy, rocky grounds.

Habits—In the aquarium I find the species active. My experience of the species thus has been very limited, as the specimens soon died.

Localities: On the East coast I have obtained this species near Dublin, at

Loughshinny, south of the Mugglins, and off Dalkey Island. Several specimens occur among the collection made by Edward Waller, Esq., at Belfast.

The late William Thompson notes the species at Belfast; but he was unacquainted with *Galathea dispersa*, which, as is already shown, also occurs there.

In ova in February and March; ova scarlet.

This species was first established by Embleton, as stated above.

In appearance this species approaches to *Gal. dispersa*, *Gal. Andrewsii*, and *Gal. strigosa*; and, I doubt not, has been confounded with the latter by early writers. It may be the true *Cancer strigosus* of Linnæus, which Leach looked on as distinct from that called *Gal. strigosa* here. It is a very distinct species, and is distinguished as follows:—

From *Gal. dispersa*, by the form and smoothness of the rostrum, greater degree of tothing, and hairiness of first chelipeds, and proportions of abdominal somites;

From *Gal. strigosa*, by absence of teeth on upper surface of propodos of first chelipeds, and general comparative smoothness of ditto; absence of teeth on carapace behind eye externally, smoothness of beak and frontal region, and general proportions of body;

From *Gal. Andrewsii*, by form, sculpturing, and hairiness of chelipeds, proportions of ischium, and meros of external maxillipeds, smoothness of rostrum, and superior size;

From *Gal. squamifera*, by the smoothness of rostrum, proportions of ischium and meros of maxillipeds, form and greater amount of tothing of first chelipeds, and colour.

When better known, I have no doubt it will be noted all round Ireland.

SPINY GALATHEA.

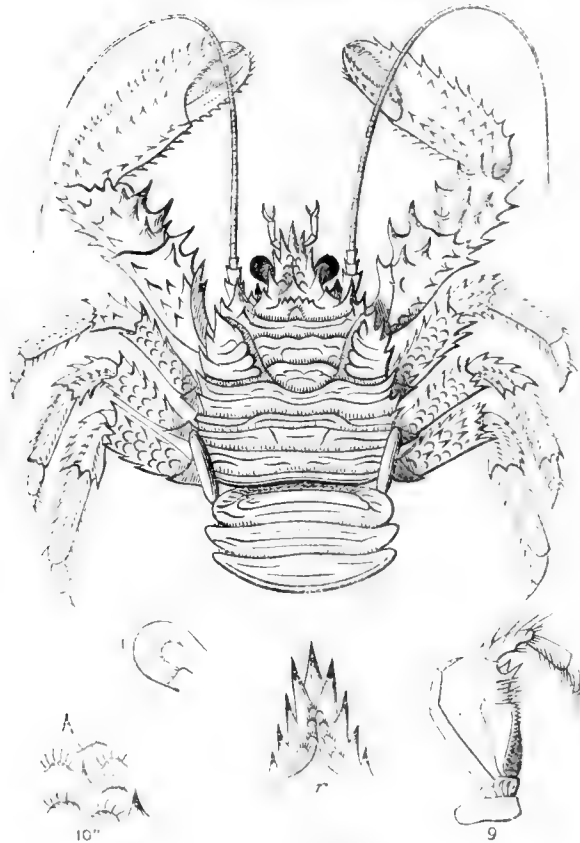
Vulgo Spanish Lobster.

PLATE XV.

GALATHEA STRIGOSA.

GALATHEA STRIGOSA (Fabricius), (altered from Linn.)

Cancer strigosus. Linnaeus, Systema Naturæ, 1053; Herbst, II., p. 50, t. xxvi.*Astacus strigosus*. Pennant, British Zoology, IV., p. 24, t. xv.*Galathea strigosa*. Fabr., Suppl. 414; Latreille, Genera Crustacés et Insectes, I., p. 49; Leach, Edin. Encycl., VII., p. 398; Edw., N. H. Crust., II., p. 273; Bell, Brit. Crust., p. 200; White, Pop. Hist. Brit. Crust.; Kin., *loc. cit.*; Spence Bate; Couch; and most British Authors.*Galathea spinifera*. Leach, Mal. Pod. Brit. xxviii.

Rostrum short, deflected, clothed above with a few scattered hairy squamiform tubercles; depressed in median line, terminating in a cylindrical pointed tooth, its sides armed with three pointed teeth, and one minute tooth over inner border of orbit; first pair of chelipeds broad, all the articulations very spinous on their borders and superior surfaces; dactylos short; propodos clothed with squamiform tubercles, scattered among the toothed tubercles; meros of external maxillipeds longer than ischium.

The general form of this species is somewhat stunted, the breadth being to the length as 2 : 4.

The carapace is but slightly longer than broad, and of nearly equal breadth from behind the eyes backwards; the abdomen of nearly same breadth as the carapace.

The carapace is depressed above, and armed along its sides and lateral regions with spiny teeth. A row of moderately strong teeth marks out the frontal region posteriorly. The rostrum is curved downwards, slightly sulcate in the median line; it terminates in a short cylindrical pointed tooth; the lateral margins are produced into three strong teeth on each side, and a smaller one behind over orbit. It surpasses the eye by the entire length of the peduncle. The rostrum and frontal region are sparingly clothed with squamiform tubercles, which are oblong and toothed, ciliated with thickset short hairs, and with a number of long hairs scattered among the tubercles, which, in old specimens, give a hirsute appearance to the region.

The external antennæ scarcely surpass the entire length of the body. The internal antennæ surpass the rostrum by their terminal two joints.

The first pair of chelipeds are generally as long as the body, closely covered with strong cylindrical, curved, sharp teeth, arranged in rows: these occur on both margins, and on all the articulations.

The propodos is flattened, moderately broad, and, in addition to the spines, bears above and below a number of dentated, ciliated, squamiform tubercles, which above, in addition, bear scattered long hairs, giving a hirsute appearance to the limb. The dactylos is triangular in form, coarsely dentated on its outer edge, and covered with tufts of long hairs.

The second, third, and fourth pairs of chelipeds are coarsely toothed

along their superior margins, squamulated, and haired. The fifth pair is smooth.

The external maxillipeds exceed the rostrum by their propodos and dactylos. The ischium is longer than the carpus, which latter is but moderately twisted. Owing to its size, the characters of these appendages can be readily studied in this species; their details are therefore given at some length.

The fourth pair of limbs (mandibles), (Plate X. 4'), is six-jointed, the coxæ soldered to the somite, the basis and ischium connate, the latter dilated at its distal extremity into a strong process, which is hollowed longitudinally, two-ridged, and its cutting edge rounded. Springing from the outer side of this is the continuation of the limb, which is three-jointed; the meros and carpus somewhat cylindrical and stout; the propodos lanceolate, its upper margin ciliate: these are carried folded down within an interspace behind the dilated lobe of the ischium. From the proximal extremity of the basis, which is bifid, arises the styliform accessory process, and from the junction of the basis and ischium a small rounded membranous scale.

The fifth pair (first maxillæ) (Plate X. 5) is made up of two distinct articulations. The basal (basis) quadrilateral, flattened, membranous; its external distal angle truncate, and furnished with a calcified rounded process below for articulation with ischium; its internal border fringed with long hairs. The second articulation (ischium) is elongated, triangular, its inner distal edge, which represents the base of the triangle, armed with sharp, short, chitinous teeth, which are arranged in three rows. Behind these, on its superior surface, is a raised ridge, which is densely ciliated. From its outer edge, near its origin, arises a curved membranous appendage (*x*). The coxa, which is very small, is connate with the somite; a raised minute ridge crosses the ischium opposite the origin of the appendage, which may by some be looked on as an articulation; but to me it does not appear to be such.

The sixth pair (second maxillæ) (Plate X. 6) is the most complicated of the mouth appendages. The coxa (*cx*) is of a quadrilateral shape, but very imperfectly calcified; from its margin arises a broadly-lobed respiratory plate (*z*), which nearly completely encircles it; this is unequally three-lobed; an internal lobe, small, extending into the mouth, and from the upper margin of which the other articulations of the limb take their origin; a basal, triangular,

fringed on its margins, likewise extending into the mouth, and a superior, which is somewhat semi-ovoid in shape, fringed with articulated hairs, traversed by vessels, and lying on the upper part of the branchial cavity, which it completely covers. The basis is membranous for its upper two-thirds, broadly triangular; its distal margin ciliated, two-lobed; its base calcified, narrow, and enveloped in the respiratory plate. The ischium is likewise dilated, bifid, semicalcified, arising above the basis in a notch in the superior lobe of the respiratory plate, and bears on its external margin, near its base, a curved accessory appendage, which is dilated at its base, pointed, and fringed with hairs at its apex. By some this may be looked on as the meros; but a comparison with the other limbs is sufficient to point out its true homologies.

The third maxillæ (seventh pair) (Plate X. 7) three-jointed, the coxæ narrow, furnished with a simple respiratory plate (z), from which the accessory appendage (x) springs; its basis is quadrilateral, membranous, attached for its entire length to the border of the coxa; the ischium elongated, flat, its inner margin armed with rows (generally three) of fine chitinous teeth, internal to which is a raised, chitinous ridge.

The internal maxillipeds (eighth pair) (Plate X. 8) with six free joints, the coxæ soldered as before; the basis is squared and short; the ischium toothed on its inner edge, which bears a double ridge, and is fringed with hairs. The accessory appendage (x) is made up of two joints, the basal longer than the entire limb, somewhat cylindrical, dilated externally, its apical segment cylindrical at the base, flattened, and ciliated at the apex. The meros is long, curved, with a double fringe of stiff hairs along its inner margin. The three succeeding joints are short and cylindrical; the propodos and dactylos terminating in bunches of stiff hairs; the dactylos is omitted in the figure.

The external maxillipeds (ninth pair) (Pl. X. 9, and Pl. XV. 9) are seven-jointed. The coxa short, somewhat triangular, its external inferior angle dilated into a long process, which bears a set of branchiæ. The secondary appendage is four-jointed, arises from the outer superior angle of the coxa, and is articulated by a lateral process to the basis. Its basal joint is short and imperfect; the second long, curved, somewhat trigonal; the third short, slender; the terminal joint curved, flattened, multiarticulate, and hairy. The basis and ischium are connate, the line of junction marked by a suture, the inner edge dilated, hollowed,

two-edged, finely denticulated on the innermost ridge, the outer ridge sparingly denticulate, hairy. External to this, the ischium bears a hairy ridge. The meros is barely as long as the ischium, and bears two or three strong cylindrical teeth on its inner border, and a single tooth externally at its superior margin. The carpus is curved, short, and strongly haired internally: the propodos is elongate, and haired externally and internally. The dactylos is short, rounded, and haired at its apex.

The eyes are short, their scale rounded.

The abdomen is as broad as the posterior border of carapace, and smooth, its margins ciliated. The other appendages as in *Galathea squamifera*.

The largest specimens I have seen measured four inches from the tip of the rostrum to the end of the telson, and eight inches, including the outstretched chelæ. It only sometimes, however, attains these dimensions, seldom exceeding six inches in length. I give the dimensions of two specimens captured at Dalkey in 1861.

| | Inches. | Inches. |
|--|---------|---------|
| Length from tip of chelæ to extremity of curved abdomen, | 6·25 | 4·75 |
| Length from rostrum to end of telson, | 4 | 4 |
| Length from tip of chelæ to end of telson, | 8 | 5·75 |
| Length of Carapace, | 2 | 1·875 |
| Length of abdomen, | 2 | 2 |
| Length of chelæ, | 5·375 | 3 |
| Length of propodos of chelæ, | | 1·375 |
| Breadth of carapace, | 2 | 1·5 |
| Breadth of propodos of chelæ, | | 0·5 |
| Length of external antennæ, | 4 | 3·25 |
| Length of second chelipeds, | 3·25 | 2·75 |

In colour this is by far the handsomest of all our British species: when living, it is dressed in bright salmon-red, picked out and banded with blue and white: the colours fade much in drying. I have not met any varieties.

This species appears generally diffused, but not common.

Habitat, among rocks, in ten to twenty fathoms. I have never met it either

in the littoral zone nor in the dredge. It is not uncommon in the spring months in lobster and whelk-pots set in rocky ground in ten to twenty fathom water. All the specimens thus obtained are adult, the majority females, and in ova. I have never met young specimens, as it is impossible to work the dredge in the ground these animals frequent.

Habits.—Thrives in the aquarium, but is not so active as either *Galathea squamifera*, *dispersa*, or *Andrewsii*. It is rather a troublesome pet, as sometimes it takes fits of destructiveness, and kills everything else (even Actiniæ) which it can master, in one night destroying six or seven animals, without attempting to eat any of them.

Localities, East coast, Belfast; I have, near Dublin, procured it under the circumstances detailed above, from Bray, Dalkey, Howth, and Loughshinny, where it appears to be not scarce, though it can scarcely be called common.

The species is most frequently met with in March; but specimens have been brought to me in December, January, February, and April. Cork, J. V. Thompson; west coast, Galway, where, according to Professor G. Melville, it is rare.

Ova, coral-red.

This species is easily distinguished from all the other British species by the spinosity of the limbs and the form of the chelæ, which are much broader than those of *Andrewsii*, with which alone it could be confounded, as neither *nexa* nor *dispersa* have spines on the dactylos: the characters of the rostrum are also of value in distinguishing it from both these species; and the colour, when living, at once separates it from *squamifera*.

RANGE OF SPECIES OF CRANGON, CHERAPHILUS, ÆGEON,
AND GALATHEA.

This table is compiled from various sources. Of many species, especially of Galathea, the range could be much extended. I have quoted no notices of species of whose identity there is not good evidence, as the distinction of several of the species are as yet but imperfectly known.

PART I.

| | |
|--------------------------------|--|
| Crangon vulgaris, | Great Britain; from extreme North to South all round coasts. |
| " " | Ireland: from extreme North to South all round coasts. |
| " " | Europe: North seas; Mediterranean. |
| " " | America: North-east coast; Florida. |
| Cr. Steiracrangon Allmanni, . | Ireland: North and East coast. |
| " " | Scotland: Linnæus ^{Shetland} , Rev. A. M. Norman. |
| Cheraphilus trispinosus, . . . | England: South coast. |
| " " | Ireland: East coast, Dublin. |
| Cheraphilus bispinosus, . . . | England: South coast, Hastings. |
| " " | Ireland: East coast, Dublin; West coast, Isles of Arran. |
| Cheraphilus Pattersonii, . . . | Ireland: North, Belfast. |
| " " | Scotland: Shetland, Rev. A. M. Norman, q.v. |
| Cheraphilus spinosus, | Great Britain: North, Shetland; East coast; West coast; South coast. |
| " " | Ireland: North coast, Belfast; East, Dublin; South, Cork (?); West, Galway. |
| Ægeon fasciatus, | Great Britain: South coast. |
| " " | Ireland: North, Belfast; East, Dublin; West, Galway. |
| " " | Europe: Mediterranean. |
| Ægeon sculptus, | Great Britain: East coast, Moray; South; West. |
| " " | Ireland: North, Belfast; East, Dublin; West, Galway. |

PART II.

| | | |
|----------------------|-------|---|
| Galathea squamifera, | . . . | Great Britain: Firth of Forth; Firth of Clyde; South coast generally. |
| " | " | Ireland: North, East, South, West. |
| " | " | Europe, &c.: France; Mediterranean; Nice. |
| Galathea Andrewsii, | . . . | Great Britain: Scotland: South coast. |
| " | " | Ireland: general round coast. |
| " | " | Extra-Britannic: Madeira; Algiers. |
| Galathea dispersa, | . . . | Great Britain: South coast. |
| " | " | Ireland: North, Belfast; East, Dublin. |
| Galathea nexa, | . . . | Great Britain: Scotland, East coast; South coast. |
| " | " | Ireland: North, Belfast; East, Dublin; South, Cork. |
| Galathea strigosa, | . . . | Great Britain: Moray Frith; South coast. |
| " | " | Ireland: North, East, South, West. |
| " | " | Extra-Britannic: Mediterranean. |







Professor J. May Greene

Sundays Well

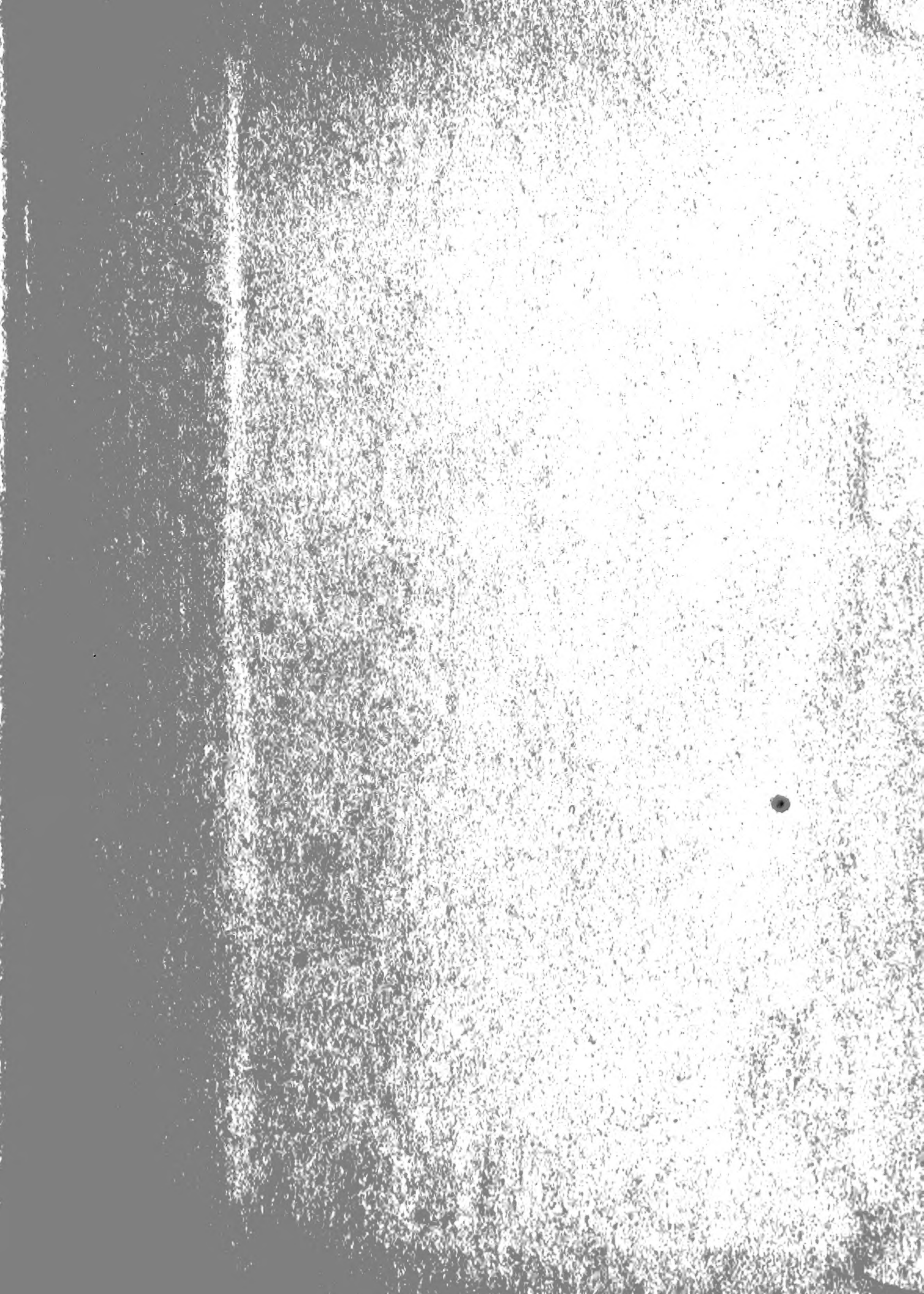
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