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Royal Dublin Society.

FAT CATTLE, POULTRY, FARM PRODUCE, SEED, AND IMPLEMENT SHOW,

TUESDAY, 23rd NOVEMBER, 1858, and following Day.

PRIZES WILL BE AWARDED IN EACH OF THE FOLLOWING CLASSES :— **FAT OXEN, FAT COWS, FAT HEIFERS, FAT SHEEP, FAT SWINE, and POULTRY.**

No Animal or Lot can compete in more than one Class.

Silver Medals will be awarded to the Butchers who shall purchase the largest amount of Stock in each of the classes of Fat Oxen, Cows, and Heifers, and of Sheep and Swine.

FARM PRODUCE.

Prizes will, as usual, be awarded for the best Samples of Wheat, Barley, Bere, Oats, Field Beans, Peas, Vetches, Flax-seed, Mangel-seed, Turnip-seed, Kohl Rabi, Onions, Potatoes, Mangel Wurzel and Be urnips, Field Cabbage, Flax, Hemp, Butter and Che ; also, for general Collection of Farm Produce.

Saturday, the 30th of October, will b **Notice** of intention to exhibit in the classes of Fat Sto ural History.

Wednesday, the will be tice of intention to exhibit s and a detailed List of Pr Assistant Secretary, or a t of a Postage-stamp.

NOTICE TO CORRESPO

As Communications and Donations intended for t Societ ICULTURAL MUSEUM,—BOTANIC GARDEN,—LIBRARY,—MUSEUM OF N L HISTORY, ZOOLOGY, GEOLOGY AND MINERALOGY,—GALLERY OF FIN RTS,—and all Specimens of Machinery, Implements, and Manufactures,— re liable to be missent to other Institutions having some similarity of name ;—

It is requested that all such communications or donations shall be carefully addressed to

THE ROYAL DUBLIN SOCIETY,

KILDARE-STREET,

DUBLIN.

NOTICE TO MEMBERS.

MEMBERS of the ROYAL DUBLIN SOCIETY who have no Town Reference can have the copies of the Journal issued in the present year forwarded to them through the Post-office, upon transmitting *Twelve* Postage-stamps to the Assistant Secretary.

cal line through its centre, carries the point A through the cusp at A_1 (Fig. 2), with a sensible horizontal velocity. So that, instead of commencing the new curve under the same circumstances as at first, it does so with a certain horizontal velocity, which, accumulating gradually, finally reaches the amount requisite for the horizontal movement of A. Again, the friction of the vertical pivot which supports the wheel and rings retards the horizontal movement so attained, and thereby causes a gradual and constant decline of the point A. So that, in place of describing a circle in the horizontal plane through its first position, it actually describes a spherical helix, terminating in the vertical through the fixed point.

This investigation of the movement of a particular point in a body revolving freely round a fixed centre applies to many natural cases; the precession of the earth's axis is caused by a force which acts so as to pass constantly through the axis of figure, and not through the instantaneous axis. And the same conditions are found to hold in the case of deflections, caused by the resistance of the air, or the action of oblique currents in the flight of projectiles, such as rifle bullets, which have received a rapid rotation round axes passing through their centres of gravity; and I propose to make these the subject of the second part of the present communication.

VII.—*On a new Genus and new Species of Diastylidæ.* By C. Spence Bate, F. L. S., Honorary Member, Dublin Natural History Society; Honorary Member, Dublin University Zoological and Botanical Association, &c.

[Read Friday Evening, May 28, 1858.]

[Introductory Note.—Amongst the collection of Crustacea made by the late J. Vaughan Thompson in the south of Ireland, and purchased from him by the Royal College of Surgeons of Ireland, and by that body liberally presented to the Museum of the Royal Dublin Society, are three bottles of Crustacea belonging to the group Diastylidæ, as characterized by C. Spence Bate. To these the late Vaughan Thompson affixed in his manuscript catalogue the names of *Scorpionura maxima*, *vulgaris*, and *longicornis*. At the request of the Director of the Museum I undertook the task of carefully examining the Crustacea contained in this collection, with a view to their identification and due record;

many of the species having been hastily named in the manuscript catalogue. A careful examination of these *Scorpionuriæ* led to the conclusion that while, as had been suggested by Professor Melville (*vide* "Proceedings Natural History Review," vol. iv. p. 153), one of them, viz., *Sc. maxima*, was identical with *Bodotria*, or *Alauna* of Goodsir, *Diastylis Rathkii* of C. Spence Bate's paper, the other two forms were distinct from any of those described by that author.

I, therefore, at the request of Dr. Carte, took occasion of a visit to Plymouth to submit to Mr. Spence Bate, as the best authority on the subject, these specimens. He kindly consented to examine them, and forwarded to me the following communication on the subject, along with the dissections and drawings from whence the illustrations have been engraved.—J. R. KINAHAN.]

An examination of the specimens of Diastylidæ, submitted by Professor Kinahan to me, has resulted in my finding that the collection contains the following species:—

DIASTYLIS RATHKII (*Kroyer sp.*)

Synonyms:—*Cuma Rathkii* (*Kroyer*); *Alauna rostrata* (*Goodsir*); *Scopionura maxima* (*J. V. Thompson*, "Nat. Hist. Ireland," by W. Thompson, vol. iv. p. 394).

A single mutilated specimen.

VAUNTOMPSONIA, *n. g.*

Carapax angulos laterales ante oculos convenientes. Antennæ superiores nullæ. *Pereii* segmenta quinque posteriora carapace nuda. *Pleopoda*, pare ultimo excepto, absunt. *Telson* perparvulum.

The lateral angles of the carapax meeting before the eyes; upper antennæ wanting; five posterior segments of the *pereion* (thorax) not covered by the carapax; all the *pleopoda*, the last pair excepted, absent; *telson* rudimentary.

VAUNTOMPSONIA CRISTATA, *n. s.*

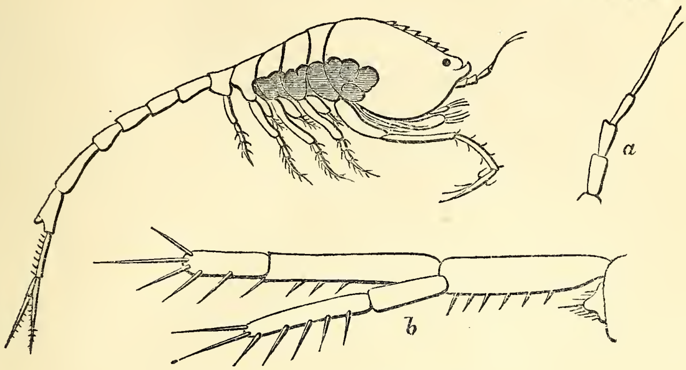
SCORPIONURA VULGARIS (*J. V. Thompson*, *MS.*).

Carapacis regione dorsali medio cristato denticulato.

The anterior portion of the central dorsal region of the carapace with a ridge of minute teeth; lower antennæ, four joints, the last a filamentary appendage; posterior *pleopoda*, with the rami unequally two-jointed, as long as the peduncle, and armed with stout spines arranged chiefly along the inner margin; *telson* triangular, squamiferous, ciliated.

Length, ·25 inch.

The figure and description are from a female carrying ova; there are several specimens in the collection, two of them carrying ova.



a, antenna; *b*, posterior pleopod.

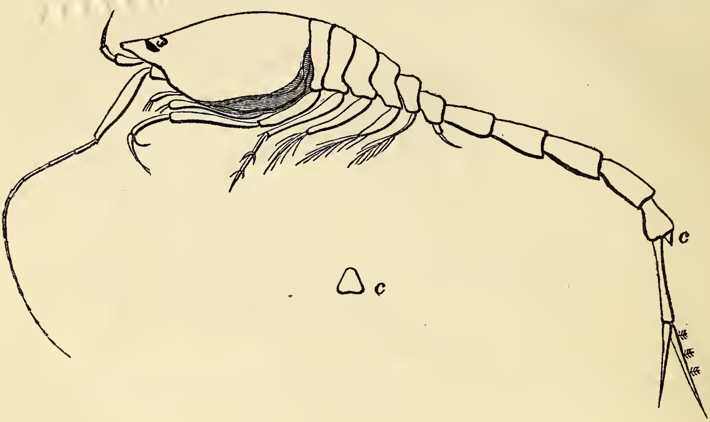
This species approximates nearer to *Cuma Edwardsii* (*Kroyer*) than to any other I am acquainted with. It probably forms with it, as suggested in my memoir on the British Diastylidæ ("Annals," Nat. Hist., 1856), a genus distinct from *Cuma*, and which may be readily distinguished by the character of *five* segments of the *pereion* being perfectly developed posterior to the carapace, whereas in *Cuma* there are but *four* thus developed.

Although I have not had an opportunity of dissecting a typical species of the genus *Cuma*, I do not hesitate to group the present species, and probably *C. Edwardsii*, as distinct from *Cuma*, since Goodsir asserts that both antennæ are present in those *Cumæ* which he examined, the upper in a rudimentary state, a character which I cannot find in *V. cristata;* this, taken with the altered condition of the *pereion*, justifies the presumption of a generic distinction.

In selecting a name, I have fixed on that of the discoverer, being one which is familiar to every carcinologist, and to which honour is due for valuable discoveries in this department of zoology. More than one of the name being eminent as naturalists, a license has been taken: the Christian name has been incorporated with the surname, and both spelled according to sound: the word is thus both shortened and rendered more easy for pronunciation by foreigners.

Cyrianassa longicornis (*J. V. Thomp., MS. sp.*).

Pleopodis, paribus primo et sexto exceptis, nullis. Ceteris ut *Cyr. gracilis.*



No *pleopoda* developed on the second, third, fourth, and fifth segments; the other characters as *C. gracilis.*

All the appendages of the *pleon* are suppressed, except the first and sixth pairs; *telson* squamiform and rudimentary.

Length, ·15 inch.

In the higher forms of Crustacea the pleopoda in the male are often altered in form, and sometimes even wanting, except when they are subservient to the sexual character. It may be, therefore, that the difference between the present species and *C. gracilis* is one of sex only.

A single specimen in the Royal Dublin Society's collection is the only one I have seen.

The specimen is shorter and more robust than *C. gracilis;* the segments are brought closer together; the dorsal surface of the *cephalon* and *pereion* is more arched; the antepenultimate joints of the peduncle of the lower antennæ do not extend beyond the anterior margin of the carapace. I have, therefore, thought it advisable for the present to retain Thompson's name, rather than absorb the species into that previously described. Having seen but a single specimen of each, I have not had the advantage of dissection to compare their separate details.

J. S. Kingsley
from the author
Dec 17. 77

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[*From the* Proceedings of the Zoological Society of London, December 13, 1864.]

Tit Cat.

Characters of New Species of Crustaceans discovered by J. K. Lord on the Coast of Vancouver Island. By C. Spence Bate, F.R.S.

2

[The following new species of Crustaceans, collected on the east side of Vancouver Island, were kindly named, described, and figured for me by Mr. Spence Bate. Some of them were dredged in from 8 to 10 fathoms of water; the rest were collected between tide-marks.

Mr. Spence Bate says, in speaking of the collection generally, "The extremely opposite and varied localities in which many of the species here represented have hitherto been found, suggest the idea that Vancouver Island corresponds with the extreme limit between a northern and a tropical fauna." "It is only in this way I can account for finding the representatives of tropical species, with others that are found only (on the eastern coast of Asia) in the Arctic and, perhaps, North Atlantic Oceans." That he is quite correct in this assumption I think there can be little, if any, doubt; for not only does it apply to the Crustaceans, but with equal force to the Molluscous groups. Several new species of shells, collected at the same time and in the same localities as the Crustaceans, which were named and described by Dr. Baird, with appended notes by myself, and published in the Society's 'Proceedings' of last year, are identical in some cases, in others closely allied to known species from Japan, Australia, and the north shores of our own island.

The tidal irregularities of this coast are perfectly inexplicable. In

May, June, and July, during the twenty-four hours there is but one high and one low water. At the change and full of the moon, high tide happens near midnight, and varies but little as to time during the three months. In August, September, and October there are two high and two low tides in the twenty-four hours. Then in the winter months, November, December, and January, the regular twelve-hour tides recur; but high water is at twelve in the day, instead of twelve at night. The spring tides range from 10 to 12 feet, the neaps from 5 to 8.

The temperature of the sea taken during the summer months near the surface ranges from 52° to 56° F. The sea-water seldom, I may say never, looks clear, but always presents a turbid muddy appearance, as if a large quantity of sand was mixed with it. This may in some measure be accounted for by assuming that strong undercurrents flow from north to south, and, sweeping past the island and being (from their low specific gravity) close to the bottom, stir up the sand and mud. The sea-bottom in and adjacent to the numerous bays, harbours, and long canals which, like the fiords of Norway and Sweden, everywhere intersect the mainland and island coasts, varies in accordance with the character of the bounding rocks: where trap, soft clay-slates, or felspathic rocks form the coast-line, a thick blue clay is the usual bottom; where grits and sandstones, there it is sandy.

Little, if indeed anything, is as yet known of the deep-sea productions from the west side of the island, which will afford a rich harvest to future explorers.—J. K. Lord.]

Pugettia lordii, n. s.

Carapace quadrate behind the orbits; the anterior portion abruptly narrowing and produced into a double rostrum, the horns of which divaricate. The anterior extremity of the orbital margin is produced to a sharp point—that is, elevated slightly above the beak; the posterior extremity is defined by a distinct fissure. The anterior hepatic region is produced by a tooth immediately posterior to the postorbital fossa, laterally extended to an obtuse tooth or point, and posteriorly separated from the branchial regions by a decided fossa or lateral constriction. The branchial region is laterally produced to a strong anteriorly-curved point. The dorsal surface is tolerably smooth, exhibiting but faintly the marking of the internal viscera. The eyes are small, and reach but little beyond the orbital margin. The external antennæ have the first joint fused with the carapace, the second and third compressed and arcuate, and terminate in a smooth flagellum. The first pair of pereiopoda are moderately long, having the meros triangulate, the upper angle forming a prominent carina that extends along, but terminates abruptly a little short of, both extremities of the joint; the carpus is tricarinated; the propodos is laterally compressed, and forms about half the length of the limb, and is about one-third its breadth. The dactylos is slightly curved and slightly serrated on the inner margin, and antagonizes at the extremity with the produced propodos. The second pair of pereiopoda are nearly as long as the first, but much more slender, having the meros and propodos subcarinated. The three posterior pairs are shorter. The pleon is small and narrow, the second and third segments being the broadest, while the seventh is abruptly narrower than the sixth, and forms a triangular plate. The female differs from the male in being more protuberant over the stomachal region, and consequently the rostrum is more depressed; anteriorly, there is less development of the lateral branchial teeth, and there is a relatively greater distance between the fifth pair of pereiopoda. The pleon is almost circular, and covers the entire surface of the ventral region.

The colour of the animal is of a reddish brown, which increases in brightness as it approaches towards the extremity of the chelæ. In one or two young females the carapace was smooth and glabrous.

Found in tolerable abundance in Esquimalt and Victoria Harbours, and, indeed, in all the sheltered inlets along the mainland coasts from the mouth of the Fraser to San Francisco. Dredged in about eight fathoms of water, but easily obtained in pools at extremely low tides. Its favourite haunt is under a large flat stone, or hid under the seaweed that fringes the margin of a pool. The specimen from which the drawing was made was taken in Esquimalt Harbour.

Oregonia longimana, n. s.

Carapace coarsely granulated or minutely tuberculated, free from hairs, except upon the rostrum, which is slender and twice the length of the interorbital space. Pleon, in the male, narrow, concave upon each side, corresponding with the fourth, fifth, and sixth segments. Telson rather broader than the preceding segment, and emarginate at the terminal extremity. The first pair of pereiopoda are very long, being twice the length of the carapace, and much longer than in either of the species described by Dana and Stimpson; the meros reaches quite to the extremity of the rostrum, and is furnished with two or more longitudinal rows of small granulated tubercles; the propodos is rather longer than the meros, and its breadth is equal to about one-third of its length; the dactylos is about one-third the length of the propodos, slightly curved and minutely serrated on the inner margin, which impinges throughout its entire length upon the produced extremity of the propodos. The three succeeding pairs of pereiopoda are imperfect in the only specimen procured; but the last pair are long, cylindrical, slender, and terminated in a powerful dactylos.

This specimen was obtained in Esquimalt Harbour, and in its habits and general distribution it is very similar to the preceding.

Platycarcinus recurvidens, n. s.

This very pretty species may easily be distinguished by the sharp points of the inner lateral teeth, granulated or minutely baccated along the margin, and having the apex recurved. The intraorbital margin is three-lobed and granulated, the central lobe being the smallest. The dorsal surface of the carapace is granulated on the prominent lobes in the larger specimens, but almost smooth in the young. The first pair of pereiopoda have also lines of granulations along the outer surface of the propodos and carpus.

Dana has merged this genus into that of *Cancer*; but the greater length of the animal in relation to its breadth is a very convenient generic diagnosis, and one that appears to correspond with Milne-Edwards's description relative to the more longitudinal position of the two pairs of antennæ.

The specimens were obtained in Esquimalt Harbour. It frequents pools between tide-marks; but Mr. Lord thinks it is common everywhere along the Oregon coast.

Chlorodius imbricatus, n. s.

Carapace having the posterior portion smooth, the anterior being rough with flattened prominences that form an irregularly imbricated surface. Anterior margin slightly baccated. Antero-lateral margin five-toothed, the central tooth being the largest, the posterior the most prominent. A small secondary tooth stands upon the anterior surface of the fourth and fifth teeth. The first pair of pereiopoda are short and robust; they have the carpus deeply corrugated upon the external surface, so also the propodos; the dactylos is ribbed upon the upper surface; a slight rib is also present upon the carpus of each of the four succeeding pairs of pereiopoda.

Only a single specimen of this pretty little species was obtained. It was dredged in about eight fathoms of water in Esquimalt Harbour.

Cryptolithodes typicus.

Cryptolithodes typicus, Brandt, Bull. de l'Acad. de St. Pétersbourg, 1849, vii. 175; Stimpson, Crust. et Echin. of Pacific North America, Journal of the Boston Soc. of Nat. Hist. vol. vi. p. 472, pl. 20.

A specimen of this species, which was first described by Brandt, and afterwards more fully, as well as figured, by Stimpson, was taken in Rosario Strait, Vancouver Island, as well as in Upper California.

The male, which has not hitherto been described, differs from the female in being less produced posteriorly. The posterior margin, instead of being projected in an arch inversely corresponding with that of the anterior margin, traverses a line that is nearly direct from side to side, slightly posterior to the points of the broadest diameter in the carapace. The pleon is triangular, and smaller and narrower than in the female, having the lateral margins more straight and symmetrical.

The only male specimen in the collection is smaller than the female, and the surface generally more tuberculated. The right propodos of the first pair of pereiopoda is larger than the left, and is so well developed as scarcely to be capable of being folded within the limits of the carapace. The length of the male animal, from the extremity of the rostrum to the centre of the posterior margin of the carapace, is about $\frac{3}{4}$ths of an inch; its breadth, from the point of one lateral extremity to the other, is about $1\frac{1}{4}$ inch.

The size of the largest female in the collection is in length about $1\frac{1}{4}$ inch, and breadth about 2 inches.

CRYPTOLITHODES ALTA-FISSURA, n. s.

Female.

This species may readily be detected from the two previously known by the smoothness of the carapace, propodi, and pleon, and more distinctly by the deep orbital notch on each side of the rostrum.

The carapace is nearly as broad again as long, and produced considerably posteriorly to the cardiac elevation—a feature that appears to belong to the female. The rostrum is broad, flat, and rectangular. The antero-lateral margins are produced so far anteriorly as to be nearly in a line with the extremity of the rostrum ; a deep notch, in which the eyes are situated, exists on each side of the rostrum. The anterior margin is slightly marked with distant small points. The posterior margin is quite smooth and even. The dorsal surface is quite smooth, and pencilled in light red upon a yellowish ground, the red pencilling being fine and delicate, following the contour of the margin and surface of the carapace.

The pleon is subsymmetrical and very smooth, and planted considerably within the posterior margin of the carapace. The second segment (first visible) has the marginal plates fused with the central. The sixth segment is without lateral plates; and the telson is situated beneath, and anterior to, the posterior extremity of the sixth segment.

The eyes are small, and placed upon peduncles that gradually taper from the base to the extremity. The first pair of antennæ are short, and developed upon the type of those of the Brachyura; but the first joint is reduced to a size that is only about twice the diameter of the second. The second pair of antennæ are but little longer than the first, and are furnished with a broad round scale at the third joint, and a terminal flagellum that is about the length of the fifth joint of the peduncle. The squamiform appendage is circular and disk-like; the inner margin is straight or somewhat excavated.

The second pair of gnathopoda have the third joint much broader than the fourth (the secondary appendage reaches not to the extremity of the third), and have the terminal joints small and rudimentary. The first pair of pereiopoda are subequal in the female, the propodos upon the right side being somewhat larger than that on the left; the surface is smooth and even, and the dactylos is furnished with a prominent carina that terminates abruptly near the basal articulation, and loses itself gradually towards the apex. The fifth pair of pereiopoda are completely hid from view; the three basal joints are short; the two terminal ones subequally long, and furnished with a copious brush of strong cilia. These appendages are folded together and enclosed within the branchial chambers, where they, no doubt, fulfil the office of the flabella of the highest forms of Crustacea—affording an interesting illustration of an organ being converted, by the force of circumstances, from its original purpose to the fulfilment of another, for which it was apparently most unsuited.

Petalocerus bicornis, n. s.

Carapace triangular, anteriorly produced into two horizontal horn-like processes; tuberculated with nodulated prominences all over the surface, but furnished with a series of large tubercles corresponding in line with the external margin of the carapace; the antero-lateral margin constricted between the branchial and hepatic regions, furnished posteriorly to the orbit with two strong, blunt processes, and, posteriorly to the central constriction, armed laterally with two distant narrow processes, and posteriorly with six closely situated large, round tubercles.

The pleon is nearly symmetrical, being rather larger on the left than the right side. Each segment is defined by a marginal prominence; that upon the left side is continued from near the middle to a process that terminates in a point or tooth at the side, but that on the right becomes confluent with a posterior ridge, and forms an irregular circle, the centre of which is deeply depressed.

The eyes are small, of a green colour, and surmounted on denticulated peduncles. The first pair of antennæ consist of three equal-lengthed joints (of which the first is the more robust), together with a short, stout, pilose flagellum and a slender secondary appendage. The second pair of antennæ have a compound scale, consisting of two large and two short compressed processes, and the third joint is furnished with two or three sharp, strong processes.

The first pair of pereiopoda are chelate and strong, echinated with blunt-pointed spines, and terminate in fingers that are flattened at the extremity, and furnished upon the outer surface with numerous tufts of hair, that spring from the summits of the numerous tubercles that are found there. The second, third, and fourth pairs of pereiopoda are more slender than the first, resemble one another very considerably, and are furnished with short, sharp, and slightly curved dactyli. The fifth pair of pereiopoda are rudimentary appendages; they consist of but five joints, the last of which terminates in a blunt extremity that is furnished with a considerable brush of hair, and is probably used for the purpose of cleansing the branchial appendages.

The pleopoda are present in the female, with the exception of the first pair (which are small) only upon the left side of the pleon, as exemplified in our specimen.

This species differs from White's *P. bellianus* in having a horizontal bifurcate rostrum to the carapace, being more distinctly tuberculated, and in the pereiopoda being more strongly spinated.

This handsome species is of a yellow colour, picked out with purple between the tubercles.

It was dredged in Esquimalt Harbour, in ten fathoms of water.

Hippolyte esquimaltiana, n. s.

Rostrum as long as the carapace, armed with four teeth at the base, the posterior being just behind the orbits, and the anterior being near the centre of the rostrum, the anterior half of the rostrum being straight and smooth. The inferior margin is excavate at the base, and furnished with seven small teeth, the four posterior being near together and posterior to the centre of the rostrum, the three others being further apart, the most anterior being subapical.

The third segment of the pleon is dorsally produced posteriorly to a point. The eyes are small; the superior antennæ have the primary ramus of the flagellum tolerably robust, and reaching to about two-thirds the length of the rostrum, the secondary slender and longer than the primary. The inferior antennæ have the scale reaching to about three-fourths of the length of the rostrum, rounded at the apex, subapically furnished with a small tooth upon the external margin; the flagellum (wanting).

First pair of pereiopoda short, robust, chelate; second pair long, slender, and chelate; the posterior terminating in a robust dactylos.

Taken in Esquimalt Harbour.

MŒRA FUSCA, n. s.

The body is long and slender; the superior antennæ are about half the length of the animal, the peduncle being scarcely longer than the flagellum, the secondary appendage being half the length of the primary, the second joint of the peduncle being about the same length as the first. Second pair of gnathopoda having the propodos large; palm without teeth, and defined by a small pointed process. Posterior pair of pereiopoda having the posterior margin of the base smooth.

In its general appearance this species bears a near affinity to *Mœra grossimana*, as well as to *M. tenella*, from the Feejee Islands, the only appreciable distinctions being in the shorter length of the second joint of the antennæ, the absence of teeth from the palm of the hand in the second pair of gnathopoda, and in the even margin of the last (the only remaining) pair of pereiopoda, and perhaps also in the shortness of the peduncle of the ultimate pair of pleopoda.

Only one specimen of this species is in the collection; and that was taken from a sponge dredged in about ten fathoms of water in Esquimalt Harbour. It is of a brownish colour.

JŒRA WAKISHIANA, n. s.

Anterior margin of the cephalon nearly straight; pereion having the sides subparallel, the greatest width being at the sixth segment. Pleon having a double excavation on the posterior margin, the central point not extending beyond the extremity of the sides. Superior antennæ reaching to the extremity of the fourth segment of the inferior. Inferior antennæ nearly two-thirds the length of the animal. Posterior pair of pleopoda as long as the posterior margin of the pleon, terminating in two styliform rami, each of which is tipped with a few short hairs.

This species was taken from a sponge dredged in about eight fathoms of water in Esquimalt Harbour.

The specific name is derived from the circumstance of the animal having been found on the territory of the tribe of Wakish Indians.

TANAIS LORICATUS, n. s.

The only specimen in the collection is imperfect. The first segment of the pereion appears to be imperfectly fused with the cephalon. Inferior antennæ scarcely half the length of the superior. First pair of gnathopoda having the propodos ovate; dactylos short and tumid, shorter and less pointed than the digital process of the propodos. Pereiopoda having the first three joints short and broad, being affixed to the side of the pereion like plates of mail (hence the specific name); they terminate in short pointed dactyli, and have the propodi armed with two lateral rows of strong, black, pointed teeth.

This species was taken from the hollow of a sponge dredged in Esquimalt Harbour, at the depth of about ten fathoms.

IONE CORNUTA, n. s., Bate.

The male differs from the description of the European species chiefly in having the caudal extremity terminating obtusely, and in having shorter antennæ.

The female has the antero-lateral hornlike process of the cephalon curved posteriorly. The pereion is not quite equilaterally developed. The coxæ of the four anterior pairs of pereiopoda are round, and all attached to the antero-lateral margin of the segments of the pereion. The coxæ of the three posterior are the larger, and produced posteriorly to a point. The pleopoda are long, and fringed with arborescent branchiæ.

This is the only species known, besides that taken by Colonel Montagu on the southern coast of England.

Length, male $\frac{1}{4}$, female $\frac{3}{4}$ of an inch.

Taken attached to the branchia of *Callianassa longimana*.

J. Kingsley from Author recd Dec 17 77

On a new Genus, with four new Species, of Freshwater Prawns. By C. Spence Bate, F.R.S.

3

(Plates XXX. & XXXI.)

Macrobrachium, gen. nov.

Carapace armed anteriorly with a vertically projecting rostrum.

Eyes with short peduncles, not concealed beneath the carapace.

Superior antennæ having the first joint of the peduncle caved upon the upper surface; second and third joints cylindrical. Flagella three-branched, the smallest branch united to the largest.

Inferior antennæ furnished with a large scale; flagellum long and slender.

Mandibles having a molar and an incisive process, and furnished with a triarticular appendage.

Gnathopoda pediform.

First pair of pereiopoda slender, about as long as the carapace, didactyle; second pair immensely developed (in the male), longer than the entire length of the animal from the extremity of the rostrum to that of the telson.

Posterior three pairs simple, robust. Posterior pair of pleopoda longer than the telson. Telson triangular, terminating in a single point.

Macrobrachium americanum, sp. nov. (Plate XXX.)

Carapace nearly half the length of the animal.

Rostrum short, armed above with eleven anteriorly projecting dental processes, of which the last four are posterior to the orbital margin of the carapace, and furnished with short, stiff hairs in the depressions between the teeth; below with three simple teeth. The rostrum has the anterior portion depressed, the apex being slightly elevated. Behind the margin, at the lower extremity of the orbit, is a single, sharply pointed tooth, behind and below which is a sharp spine or tooth that is surrounded at the base by a suture that passes from it on the anterior side to the anterior margin of the carapace.

Pleon deep, scarcely longer than the carapace.

Eyes globular. Superior antennæ having the peduncle scarcely longer than the rostrum; first joint half the length of the peduncle, inner surface flat, perpendicular, furnished with a single tooth near the centre of the lower edge, superior surface concave (for the lodgment of the eye); outer margin thinned out to a fine edge, furnished with a sharp, anteriorly directed tooth near the centre, and another at the distal extremity; the next two joints are short. The smallest flagellum united to the largest for about one-fourth of an inch from the base. Inferior antennæ having the peduncle about half the length of the superior. The large squamiform process nearly half as long again as the rostrum, furnished with an external subapical tooth. Flagellum about as long as the second pair of pereiopoda. Mandible having the incisive margin tridentate, the molar tubercle strong, prominent, and quadrate, and the triarticulate appendage not longer than the incisive process. Gnathopoda subequal, short, robust. First pair of pereiopoda slender, having the carpus longer then the meros, and nearly four times as long as the propodos, smooth. Second pair of pereiopoda half as long again as the entire animal, having the carpus shorter than the meros, and not half as long as the propodos; digital process turned inwards, armed within the centre with a large dental tubercle; dactylus meeting the digital process of the propodos at the extremity only, and armed near the centre with a large dental tubercle. The entire appendage covered with short spinous denticles, that are strongest on the inner surface and thickest on the digital process of the propodos, the dactylus, as well as the carpus, meros, and basal joints. Last three pairs of pereiopoda robust, spinous along the surface of the carpus, propodos, and dactylus. Posterior pair of pleopoda having the outer ramus biarticulate, the margins round and smooth. Telson shorter than the posterior pair of pleopoda, furnished with a fasciculus of hairs near the base, and two sublateral dorsal spines beyond the centre.

This very interesting and, from its great size, valuable Prawn, was obtained by Mr. Osbert Salvin from the Lake of Amatitlan, whence a considerable number are procured and brought to the markets in Guatemala. Its length, from the tip of the rostrum to the extremity of the telson, is about 9 inches; and in diameter it is about 5 inches. The length of the great claws is a feature that must separate this from the genus *Palæmon*, from which it is also distinguished by its less slender and graceful proportions. The colour of the specimen, as we have it dead, is of a brimstone-yellow, longitudinally striped with dark blue along the dorsal surface and on the sides of the pleon. ? P. ornatus

Macrobrachium formosense, sp. nov. (Plate XXXI. fig. 1.)

Carapace about one-third the length of the animal, having a rostrum nearly half the length of the carapace, armed above with eleven teeth, two of which are behind the orbital margin of the carapace, and furnished with short, stiff hairs between the teeth. Inferior margin smooth, fringed with short hairs. Behind the margin of the lower angle of the orbit is a sharp anteriorly pointed tooth, and obliquely behind and below is a second similar tooth. First pair of antennæ having the peduncle rather shorter than the rostrum, the first joint of which is about half the length of the peduncle, concave upon the upper surface, and furnished with a sharp distal tooth on the distal outer angle, and a row of hairs along the outer margin. The smallest branch of the flagella is united to the largest for about one-tenth of an inch. Second pair of antennæ having the squamiform appendage reaching beyond the rostrum, and armed subapically on the outer side with a short, sharp tooth. First pair of pereiopoda slender, long, having the carpus longer than the meros, and three times as long as the propodos. Second pair of pereiopoda half as long again as the animal, having the carpus longer than the meros and as long as the propodos, excepting the digital process; digital process curved slightly inwards, fringed with a row of hairs, and furnished with two dental tubercles within the centre. Dactylus curved; the apex crossing the extremity of the digital process of the propodos, and impinging against it through the entire length, fringed with a row of hairs and with a single tubercle. The entire appendage covered with small, yellow, transparent, spinous denticles. Last three pairs of pereiopoda moderately robust, and furnished with numerous small denticles along the inferior margin. Posterior pair of pleopoda roughened with small spines, as also the telson, which carries a small fasciculus of hairs near the base, and two small sublateral spines beyond the middle.

The length of this species is about 4 inches. It has recently been taken and brought home by Dr. Collingwood, who procured it from the River Tamsuy, in the Island of Formosa.

Macrobrachium gangeticum, sp. nov. (The Chingra.)

This species appears closely to resemble the preceding. I only know it through a drawing given to me by the late Colonel Hamilton Smith, who obtained it from a friend at Patna, a distance of 250 miles from Calcutta, where it was used as food, and was known under the name of "Chingra," the Hindostanee, I believe of "shrimp." Its length is about 6 inches, and the colour a bluish grey.

Macrobrachium longidigitum, sp. nov. (Plate XXXI. fig. 2.)

Carapace, including rostrum, nearly half as long as the animal. Rostrum about half as long as the carapace; upper surface armed with eight teeth, two only of which are behind the orbital margin. The teeth are widely separated from each other, and a few hairs are situated immediately anterior to each denticle. The lower margin armed with five teeth and a copious fringe of hair.

First pair of antennæ having the peduncle one-third shorter than the rostrum, the first joint of which is about half the length of the peduncle, concave upon the upper surface, and armed with a sharp distal tooth on the outer angle, and without conspicuous cilia along the margin. The smallest branch of the flagella attached to the largest for about one-fourth of an inch from the base. Second pair of antennæ as long as the animal, the peduncle being about half the length of the peduncle of the upper pair. Squamiform appendage not reaching to the extremity of the rostrum, and armed subapically with a small, sharp tooth, that does not reach beyond the cilia that thickly fringe the distal and internal margin.

First pair of pereiopoda long and slender, having the carpus longer than the meros, and three times as long as the propodos. Second pair of pereiopoda not quite as long as the animal, having the carpus a little longer than the meros, and the propodos, inclusive of the digital process, as long again as the carpus, the dactylus being half the length of the propodos, being pointed and curved at the apex, crossing when impinged against the curved margins of the digital process of the propodos, the entire appendage being thickly studded with small tubercles that appear generally to be ranged in longitudinal rows, of which those on the inner and lower sides are considerably the more prominent. Last three pairs of pereiopoda moderately robust, and furnished on the posterior margin of the propodos with a few equidistant solitary spines, and interspaced with hairs. Posterior pair of pleopoda having the denticle of the external plate not produced beyond the margin of the distal articulation. Telson smooth, slightly compressed, furnished with a depression and small fasciculus of hairs near the base, and two sublateral spines on each side beyond the middle.

The length of this species is about 5 inches. It has been in the collection of the Plymouth Athenæum for many years; but no habitat is recorded with it.

P. Gaudichaudi

MACROBRACHIUM AFRICANUM. (Plate XXXI. fig. 3.)

Carapace half the length of the animal, rostrum depressed; apex slightly elevated, surmounted by nine small teeth, of which the anterior are the smaller, and only the posterior one behind the orbital arch; the interspaces furnished with short, stout cilia on the underside of the rostrum; near the apex are three small teeth; at the inferior angle of the orbit is a small, sharp tooth, between which and the infero-anterior angle of the carapace is a suture that passes to a considerable depth into the carapace, but its limit is not defined by a spine as is very generally the case in this genus. The superior antennæ have the peduncle nearly as long again as the rostrum, having the first joint as long as the other two, concave upon the upper surface, and produced into a strong spine upon the outer distal extremity. The smallest flagellum united with the largest to about one-eighth of an inch from the base. Inferior antennæ one-fourth longer than the animal; squamous process internally distended near the middle, receding towards the apex, which reaches nearly for one-half its length beyond the peduncle of the superior antennæ, and subapically armed with a tooth on the upper and outer side. First pair of pereiopoda are slender, and have the carpus longer than the meros, and four or five times as long as the propodos. Second pair of pereiopoda unequal, the right being considerably more long and robust than the left; but otherwise they resemble each other. The right leg as long as the animal, the left about one-third shorter; carpus about half the length of the propodos, minus the digital process, in the right, but nearly as long as the propodos in the left. Meros longer than the carpus, and both right and left thickly covered with sharp anteriorly directed spinous tubercles. Dactylus and digital process long and slender, armed at the extremity with a distinct spine, and along the inner margins with three corresponding tubercles. Posterior three pairs of pereiopoda robust, and furnished with numerous small spines on the dactylus and posterior margin of the propodos. Posterior pair of pleopoda having the articulation of the outer plate waved, and the denticulated process continuous with the outer margin of the second articulate margin ciliated, extremity of both plates round. Telson smooth, laterally slightly compressed; near the base on the central dorsal surface is a depression occupied by a small tuft of hair, and beyond the middle, on each side, are two short spines and a fasciculus of short hair.

Hab. Tambo River. is in Peru

The near resemblance that these species bear to those of the genus *Palæmon* may induce some carcinologists to reconsider the propriety of making these species a genus by themselves. I am not aware that any structural distinction separates them from the genus *Palæmon*. There is, I think, however, in the enormous length of the second pair of pereiopoda, when compared with the same appendage in *Palæmon*, a strong *primâ facie* evidence that a separate generic distinction would form a very natural classification. I had, I must admit, some doubts upon the question, and hesitated in my opinion until I found that others, though closely allied in general form, yet specifically distinct in character, enabled me to see that the peculiarly distinguishing features that separated the species of this genus from *Palæmon* were sufficiently constant to warrant the adoption of the new genus. The convenience of this arrangement may also be seen in the peculiar and distinct habitat of *Macrobrachium*, the whole of the speeies yet known being lacustrine or fluviatile. I have only seen one or two specimens of each species, and these are all males. The development of the chelopods is so great in length that it must be difficult, if not impossible, for the animal to reach its own mouth with them; so that they can be of no use in feeding, for which purpose the first pair, being shorter, are more efficient. I believe it probable, but have not been informed, that in the females the chelopods are less monstrously developed.

It is something very remarkable that these Prawns, all of them so very large, living in freshwater lakes and rivers, in localities so very distant from each other as Central America and Central India, should bear so near a resemblance.

We are not aware that the same rivers or lakes have any other species of Prawn; and it would appear that the several species must have come from one common origin; for even the position and number of the spines on the telson, as well as the fasciculus of hair in the small depression at the base of the same, are common to all the species.

Whether or not there is anything remarkable in the form of their young or in the development of their larvæ I know not. The freshwater *Astaci* differ from their marine congeners in producing the young in a more advanced stage of development; but this appears not to be a constant law in freshwater Crustacea. In a small freshwater Prawn from the rivers of the island of Mauritius, that has been sent to me by Dr. Power, the young undergoes a change of form similar to that of the marine species.

I look upon the discovery of these edible Crustacea as being among the most fortunate of recent carcinological observations. Their great size would well adapt either of the species for culinary purposes if any one could be induced to acclimatize the species to our own lakes and streams. This appears to be the more easy in regard to the species from America, since the Lake Amatitlan is at so lofty an elevation as to be of a very low temperature.

DESCRIPTION OF PLATES XXX. & XXXI.

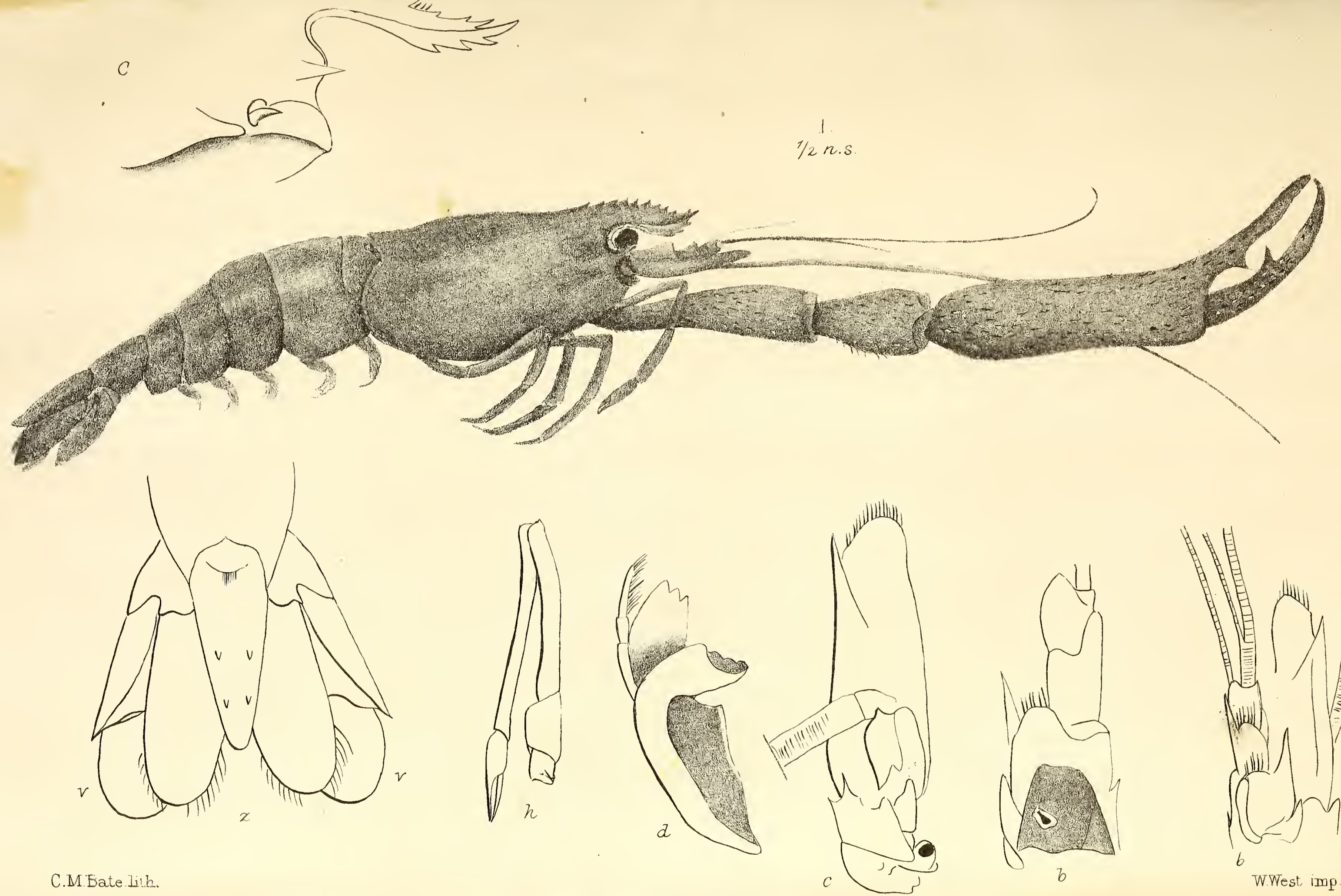
Plate XXX.

Macrobrachium americanum. c. Rostrum. *b.* Superior antennæ. *c.* Inferior antennæ. *d.* Mandible. *h.* First pair of pereiopoda. *v.* Posterior pair of pleopoda. z. telson.

Plate XXXI.

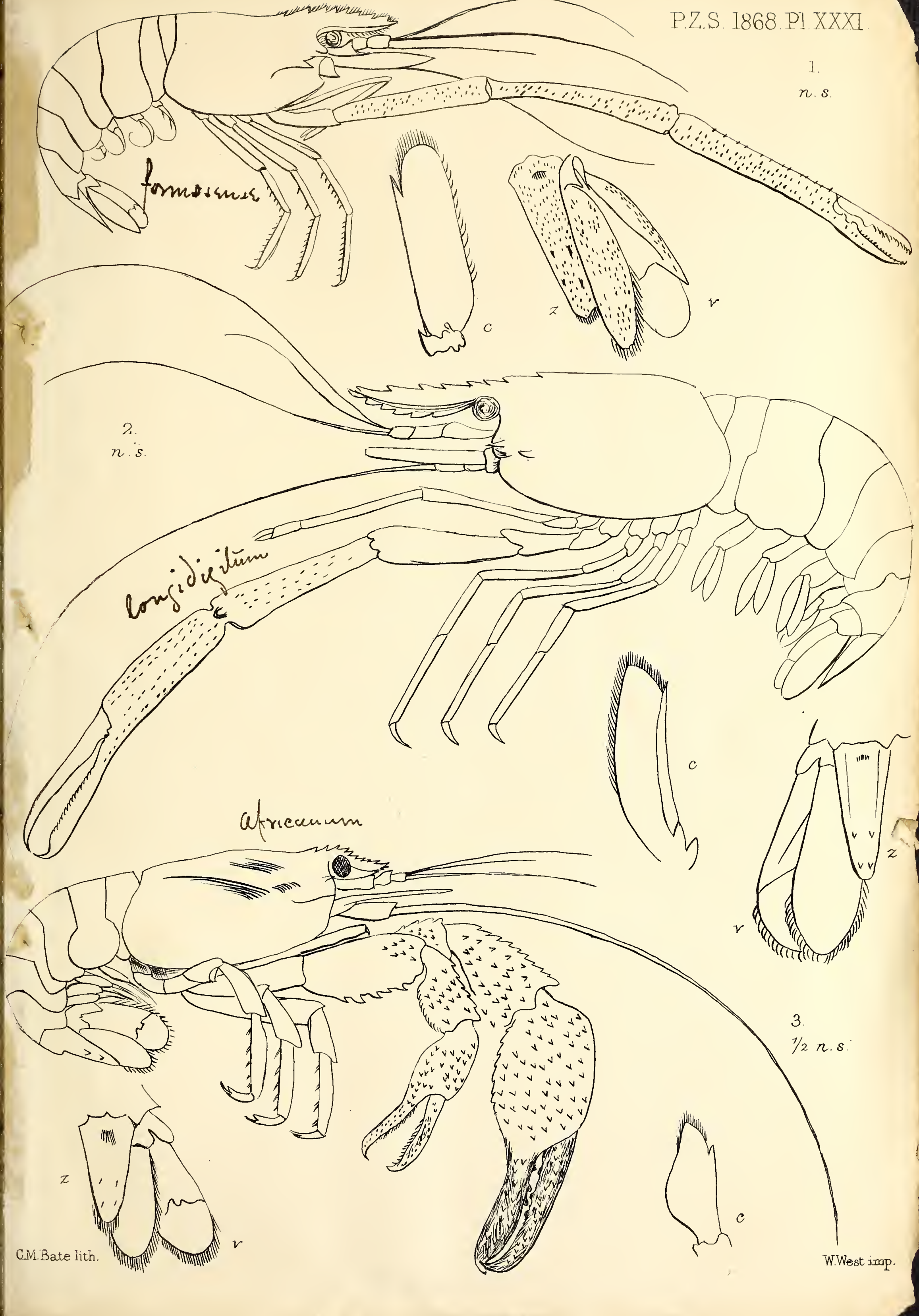
Fig. 1. *M. formosense.* *c.* Scale of inferior antennæ. *v.* Posterior pair of pleopoda. z. Telson.
2. *M. longidigitum.* *c.* Scale of inferior antennæ. *v.* Posterior pair of pleopoda. z. Telson.
3. *M. africanum.* *c.* Scale of inferior antennæ. *v.* Posterior pair of pleopoda. z. Telson.

[*From the* Proceedings of the Zoological Society of London, May 28, 1868.]



C.M.Bate lith.

W.West imp.



C.M. Bate lith.

W. West imp.

J S Kingsley

[*From the* REPORT *of the* BRITISH ASSOCIATION *for the* ADVANCEMENT *of* SCIENCE *for* 1875.]

from the Author

rcd Dec 17 '77

REPORT

ON THE

PRESENT STATE OF OUR KNOWLEDGE OF THE CRUSTACEA.

PART I. ON THE HOMOLOGIES OF THE DERMAL SKELETON.

BY

C. SPENCE BATE, F.R.S. ETC.

[PLATES I. & II.]

IN presenting a Report on the present state of our knowledge of the Crustacea, I do not think that I should fulfil the object in view without drawing attention to what must be one of the greatest hindrances to the progress of any study in an exact or scientific manner. I allude to the want of a uniformity in scientific nomenclature.

The names of the several groups and families, as well as those of the structure of the animals, given by the earliest carcinologists, having been based on a limited knowledge both of the forms and the variation to which this great subkingdom is liable, make them inapplicable to the knowledge of the period. Leach named one great group of Crustacea *Decapoda*, from the number of legs that it possesses; and Dana more recently named another group *Tetradecapoda*, from the fourteen legs that belongs to its most normal forms.

Observation has demonstrated that in this latter group some genera, as *Anceus*, have but eight legs; while in the Decapoda it is only a conventional rule that prevents the genus *Palæmon* and its allies from having the appendages of the pereion anterior to the last five pairs counted as legs.

But a greater difficulty still exists where the names given to any parts of the animal carry any significance with them that precludes their being accepted in their universally correct sense. Thus the third pair of maxillipedes in the Brachyurous Crustacea are identical with the first pair of walking-legs in the Stomapoda, Amphipoda, and most of the Isopoda.

It is now exactly twenty years (1855) since I presented to the Association a Report on the British Edriophthalmia, in which the same difficulty was pointed out and a nomenclature suggested which, it was hoped, would to a large extent overcome the great difficulty in the study of this branch of natural history.

But although many of the terms there given have become very general in use, yet the custom of some writers of applying different ones at separate times for the same parts is significant of a confusion of ideas that precludes the student from a just appreciation of the labours of others.

I do not think that this difficulty will be overcome for some long period unless a committee is appointed by this Association, consisting of all the best known authors of carcinological works, who shall determine upon a systematic nomenclature for the structure and classification of the Crustacea to which all future writers shall conform.

In this Report I purpose provisionally, except when quoting from others, to make use of the same terminology as that adopted in the previous Report, and confine each term to that which has homologically the same signification.

In the classification of Crustacea in his great work*, Dana states that "in the crustacean type there are normally twenty-one segments, and correspondingly twenty-one pairs of members, as laid down by Milne-Edwards, the last seven of which pertain to the abdomen (pleon) and the first fourteen to the cephalothorax (cephalon and pereion). Now we may gather from an examination of the crab, or macrural decapod, acknowledged to be first in rank, what condition of the system is connected with the highest centralization in Crustacea.

"In these highest species, *nine* segments and nine pairs of appendages out of the fourteen *cephalothoracic* belong to the senses and mouth, and five pairs are for locomotion. Of these *nine*, three are organs of senses, six are mandibles and maxillæ."

M. Milne-Edwards, in his standard work 'Histoire Naturelle des Crustacés,' says, "We can generally distinguish among these animals a head, a thorax, and an abdomen; but the limit of these regions is not always naturally well defined; and it is not well to attach too much importance to these distinctions, for they do not correspond with the same parts among mammals, birds, &c. . . . ." And in a note to the above he says, "Guided by the principal viscera some authors have given the name of abdomen to the thorax, and that of postabdomen to that which we call abdomen; but after this principle we must consider the head to be a preabdomen, because it contains the same viscera as the thorax and abdomen."

The twenty-one somites of the typical Crustacea M. Milne-Edwards has thus divided—the anterior seven to the head, the next seven to the thorax, and the posterior seven to the abdomen. But in his nomenclature of the appendages the terms used are suggestive of the anterior two pairs of the thorax being attached to the head. In his "Observations sur le Squelette tégumentaire des Crustacés décapodes," Ann. des Sciences, 1854, the same author states that "he has often been convinced that in many branches of zoology the difficulties of the study are considerably augmented by the imperfection of the language by which we attempt to formulate the results of our observations. The employment of expressions that are vague in the determination of zoological characters and the description of the parts that constitute an organism convey naturally the superficial observation with which the observer was content, leaving in the mind of the reader an amount of doubt which retards his desire for distinct information . . . . The terms," he continues, "of zoology are far, at present, from that degree of precision . . . . . These considerations have determined me to make a general revision of the

* United States' Exploring Expedition, p. 1397.

'carcinological terminology' before presenting to zoologists the work that has engaged me for some time on the natural distribution of Crustacea from the collection in the natural-history museum."

Even after this M. Milne-Edwards uses the terms head, thorax, and abdomen, which he had previously stated to be "regions not naturally defined," and gives the appellation of *pemptognathe* and *hectognathe* to the first and second pair of appendages attached to the thorax (or pereion). Dana made his researches on the highest form in crustacean life; so also has M. Milne-Edwards in his later observations. But the two appendages which this latter author determines as the seventh and eighth pairs of gnathes are invariably, according to his own showing, the anterior two pairs of the thorax. It is only in the highest and most consolidated form of crustacean life that we find them variated from their typical character so as to make them appear organs attached to the mouth; whereas in a very considerable proportion of the various forms of Crustacea they never act as attendants on the mouth, but are simply prehensile in their character or locomotive in their power: but almost universally throughout Crustacea they are connected with a pair of branchial appendages; and in this they fulfil most efficient work, so that in the highest types their connexion with the mouth is one of secondary importance only.

The first two pairs of appendages belonging to the pereion (or thorax), through nearly all the orders, of the typical crustacean exhibit a variation that distinguishes them from those posterior to them; and it may be convenient to define them, but certainly not by a term that confuses them with appendages that are only connected with secondary duties.

Taking into consideration the many and various forms of Crustacea, the great and numerous changes they undergo, it is desirable not only to be sure that the nomenclature shall be scientifically correct in its determination and homological signification, but that it is convenient and applicable to a very considerable proportion of the animals it has to define.

A typical crustacean in any of the well-defined orders can readily be divided into three parts, each part to consist of seven somites.

The *first division* we call the CEPHALON*. It consists of the anterior seven somites, and supports the organs of sense and appendages adapted to be attendants on the mouth.

The *second division* we call the PEREION. The seven somites that form this division support appendages that are more or less adapted for walking in their most normal condition.

The *third division* we name the PLEON. This consists of the posterior seven somites; these support the appendages which, when developed, are always more or less perfectly adapted for swimming.

The last somite of the pleon is almost universally variated from the others, and is developed much to resemble an appendage itself. It is, however, the posterior somite, and as such we designate it by the name of the *telson*.

The appendages that are attached to these several divisions are known by their relation to them. Those that are connected with the senses are determined by their character—such as the eyes, antennæ, and oral appendages.

The antennæ may be distinguished as the anterior and posterior pair, or as the auditory or olfactory respectively, in preference to that of the inner and outer or upper and lower, which is liable to vary. So the fourth pair of appendages, or the first belonging to the oral group, may be known (from their mandibular power) as the *mandibles*, while the three following may be deter-

* For the derivation of these terms see Report of the British Edriophthalmia, 1855.

mined by their relationship as the first, second, and third pair of *maxillæ*, or, as Professor Westwood has suggested, *siagnopoda*.

The appendages of the second division, or seven pairs of legs attached to the pereion, may be readily denominated the *pereiopoda*; but the anterior two pairs are commonly variated for different purposes. In Brachyura they fulfil the purposes of opercula to the mouth; in the Squillidæ and Edriophthalmic Crustacea they are adapted for prehensile and ambulatory purposes; so that it may be found convenient to recognize them by a distinctive name, as *gnathopoda*.

The appendages of the third division, or pleon, are never developed for walking or prehension, but almost universally are formed for swimming; and even in the Isopoda, where these are utilized as branchial organs, they occasionally fulfil the office of swimming-appendages. Not unfrequently the last two, as in the Macrura, and the last three, as in Amphipoda, are variated in form so as to enable the animal to spring when on land or dart a considerable distance in the water; and the term *uropoda* has been applied to them; but their variation is so inconstant that the advantage of defining them by any special name will be less than the convenience arising from the distinction.

The integumentary structure is one of the most important in the Crustacea, and a knowledge of the variations of its several parts is of much assistance, not only to the student of the history of these animals, but also for elucidating the knowledge of those forms that have passed away and can be studied only through the impressions left imbedded in the rocks.

The external skeleton of a crustaceous animal consists of series of rings, that appear to repeat each other, differing only in modification according to the necessity of the various portions of the animal. These rings represent and protect externally various segments of the body, each division supporting one pair of appendages only and the internal structure that relates to them. Each of these several divisions we call a "somite," a term suggested, I believe, by Professor Huxley in his lectures at the Royal College of Surgeons. Of these there are never more than twenty-one; and this may be considered as being the normal number in all Crustacea above those known as the Entomostraca, in some few of which, as in the genera *Apus* and *Stegocephalus*, the number of somites appear to be much more numerous; but there the somites appear to be repeated without having any function to fulfil or appendage to support—a numerical repetition only, the result of an enfeebled force.

The first somite supports and carries the organs of vision. In some of the most condensed forms the eyes are implanted on the outer side of the two pairs of antennæ; but the internal structure invariably shows that the most anterior pair of nerves are those that are connected with these organs. The progress of development which we purpose alluding to in its proper place clearly demonstrates the eyes to be the most anterior of all the organs.

The second somite bears the first pair of antennæ, which, from its position in the higher Crustacea, is generally called the inner pair, and from its position in the lower forms is called the upper pair of antennæ.

The third somite supports the second or posterior pair of antennæ; this, from its relative position to the other antennæ in the higher and lower forms of Crustacea, has been called respectively the outer and lower antennæ. This somite is so closely associated with the fourth that it is not certain that they exist distinct in any species of Crustacea.

The three anterior somites are generally closely blended together. In the earlier forms of development they are invariably so; but in *Squilla* and its congeners the two anterior somites are distinctly separated from each other and the third. In *Palinurus* the first is distinct from the second; but in the greater portion of Brachyurous and Macrurous Crustacea the three first somites, and perhaps the fourth, are strongly soldered into one piece.

This piece in most Crustacea, but more conspicuously so in the more condensed forms, is developed to a greater or less extent, and is recognized under the name of the carapace or shield.

In the lower forms, such as the Amphipoda and Isopoda, it is developed sufficiently to cover only the four succeeding somites; while in the higher forms, such as the Brachyura, it is developed so as to protect the whole of the animal.

The carapace varies very much in shape, both in width and length, and generally covers the whole of the somites of the pereion; but not universally so. In the Anomura several genera have the posterior somite of the pereion exposed; in the Diastylidæ there are three or four somites not covered, and in the Edriophthalmic Crustacea all seven are unprotected and developed into perfect somites.

It is one of the earliest features present in the development of the embryo, and is distinctly defined in the *Nauplius* form. Even in this early stage of development, as in later existence, the form of the carapace varies considerably, and is an easy mark of distinction between genera. It is desirable as well as important, in an anatomical point of view, that a clear idea should be obtained of the homological relation of this large and conspicuous portion of the highly developed crustacean. This can be done only after an examination and comparison of a large number of various forms and types of animals, as well as a close investigation and study of the parts during their progressive development.

Milne-Edwards, as far back as 1834, arrived at the conclusion that the carapace in the higher types of Crustacea is "the result of an excessive development of the superior arch of the cephalic antenno-maxillary segment. . . . But (Hist. des Crust. vol. i. p. 26) among certain Stomapods, such as *Squilla*, the head is divided into many distinct segments; the first two, the ophthalmic and antennular rings, are movable and little developed. The third and fourth rings are, on the contrary, very large and compose between them a single segment that we call the antenno-maxillary. The carapace occupies the dorsal portion of the *tronçon* formed by this union, and is prolonged above the six following rings."

"In studying (*l. c.* p. 28) the carapace as a whole as well as in its parts, we must examine into the rules of the normal organization of Crustacea, not only in the later, more or less, remarkable modification, but also the very curious structure of certain Entomostraca, where all the animal is enclosed in a kind of bivalve shell."

These views receive general support from Mr. Dana, who, however, takes exception to the assertion that the ventral piece of the carapace is formed out of what M. Milne-Edwards calls the epimera (*l. c.* p. 32), but contends that they "are in fact the posterior extension of the mandibular segment;" and he continues, "excepting that we consider what is here called epimeral, the mandibular segment, we agree with Milne-Edwards, for the most part, in the above-mentioned deduction; so that while the mandibular segment is confined to the ventral pieces of the Brachyural carapax, it constitutes its posterior half in Macrura."

In 1855 the author of this Report communicated to the 'Annals of Natural History' a memoir on this subject, supporting the opinion of Milne-Edwards as to the homology of the carapace, but denying the existence of epimera in the theory of the somite, and corroborating the assertion of Dana that the antennal segment constitutes the anterior and upper portion, and the mandibular segment the posterior and lower portion of the carapace in the Macrura and Brachyura; and affirmed that the suture which traverses the lower surface forms a line of demarcation between the third and fourth somites; it homologizes with the cervical suture in the Macrura, as also with that which traverses the dorsal surface of the cephalon in several genera of Trilobites (Pl. I. fig. 5).

If we wish to judge of the relation of these parts in the several forms of Crustacea, we must make a careful investigation during the immature stages of the animal.

In the *Megalopa* stage the inferior antennæ are attached to the anterior external horns of the carapace; these horns are folded beneath the animal, and it is this inflection that forms the orbit in which the eye is lodged. Through this inversion, consequent upon the monstrous development of the hepatic region, this suture lies upon the inferior surface of the carapace in Brachyurous Crustacea, extending posteriorly to the extreme limits of the carapace.

The author concluded his paper by saying, "But we have seen in the descending scale of nervous force the rings which carry the organs of consciousness degenerate in importance, and yield to a corresponding development of the mandibular ring: this law appears to be in force in the Amphipoda, the lowest type of the Macrura form, in which I am inclined to believe that the mandibular ring represents the whole of the upper portion of the cephalic articulation—the anterior three being so diminished in importance, that they are to be found only in the perpendicular wall of the head, or perhaps represented by their appendages only" (Ann. Nat. Hist., July 1855).

It would scarcely perhaps be necessary to enter further into the evidence that supports the homological relations of the carapace, had not Professor Huxley, in his Hunterian Lectures at the Royal College of Surgeons, expressed an opinion opposed to the above statements.

In his twelfth lecture Prof. Huxley says:—"In all the Brachyura and ordinary Macrura it appears to me to be obvious that the carapace is continuous with, and part of, all the somites of the cephalothorax—that it is composed, in fact, of their connate terga, the branchiostegite being nothing more than their connate and highly developed pleura; the cervical suture, placed immediately behind the attachment of the mandibular muscles and in front of the heart, corresponds in these respects precisely with the posterior boundary of the head of a *Squilla* and of a Branchiopod, or of an Edriophthalmian. The cephalic arc roofs over the stomach, as does the tergal region of the head in these last-named Crustacea. Anatomically, then, it seems to be demonstrable that the scapular arc of the carapace in the ordinary Podophthalmia is the equivalent of the terga of the thorax, that the cephalic arc is the homologue of the terga of the head, and that the carapace is formed by all the cephalothoracic somites."

Before the Reporter can proceed with any fresh evidence to support the argument demonstrative of the homological character of the carapace, it is desirable that a clear idea should be given of the theory of a somite or segment as it exists in Crustacea.

Prof. Milne-Edwards, in his 'Histoire des Crustacés,' vol. i. p. 16, says:—"Each of the rings of the skeleton appears to be composed of two lateral moieties, resembling each other. We can distinguish moreover two arcs, the one superior, the other inferior, as shown in the accompanying diagram [pl. 1. fig. 3 of his work]. The former results from the assemblage of four pieces more or less intimately connected together, and arranged in pairs on each side of the median line. The central pieces are called by the name of the *tergum*, and the lateral are called the *flancs* or epimeral pieces. The inferior arc is composed of the same number of pieces. The two median pieces unite to form the *sternum*; and the latter are known by the name of the *episternum*, by reason of their analogy with those that M. Audouin has designated by the same name among insects. They are united always at the sternum; but there generally exists, between the inferior arc and the epimera situated above, a wide space destined for the articulation of the corresponding member."

"We know of no example," he continues, "of a ring where we are able to distinguish at the same time all the pieces that we desire to enumerate. Sometimes there is an absence of some of the pieces from the place they should occupy, and sometimes they are very intimately soldered together, so that we cannot see even a trace of separation; but in studying each of them separately, where it is most distinct, we shall be able to form a clear idea, and recognize its character in spite of its union with its neighbouring pieces. Moreover, although this analysis of the ring may not be always practicable, it is not the least true that it facilitates much the study of the exterior skeleton of articulated animals, and that it will permit us often to establish analogies where there would first appear to exist the greatest difference."

"To terminate the enumeration of the constituent parts of the tegumentary rings of the Crustacea, there only remains for us to speak of the plates that we often see elevated from the internal surface and arrange themselves into cells and canals. These processes are always developed at the points of union of two rings or of two neighbouring pieces of the same segment; and this disposition has obtained for them the name of apodemes (from M. Audouin). They are the result of a fold of the integumentary membrane which penetrates more or less deeply between the organs, and which is strengthened with calcareous matter like the rest of the structure, and are always formed of two thin plates soldered together."

These views have long been accepted as the acknowledged theory. Nor am I aware that any one (except the authors above quoted) has attempted upon original investigation to analyze the evidence upon which M. Milne-Edwards has formed his theory.

That the author of this Report has long held views not consistent with M. Milne-Edwards's theory, is known to those carcinologists who have read his Report on the British Edriophthalmia, which was communicated to this Association and published in its Transactions for 1855, wherein he trusts that he clearly demonstrated that the pieces to which M. Milne-Edwards gave the name of *epimera*, and selected by him as typical of his theory, were parts attached to the legs, and not pieces of the dorsal arc of the crustacean somite.

He is moreover desirous in this Report to show:—that the epimera, as sectional pieces in a theoretical construction of a somite, cannot exist; that the so-called epimera are portions only of the integumentary structure of the appendages of the animal, and that the apodema are formed out of this structure, more or less thinned out by lateral pressure and internal arrangement; and that the head of the lower types and carapace of the higher are homologically the same, the carapace being a monstrous development intended for the covering and protection of the more complicated branchial appendages of the higher types.

But this portion will be discussed more fully when the structure of the appendages is treated of.

The earliest stage in the life of a crustaceous animal, in which the dorsal shield known as the carapace is observable, is that of the young as it exists fresh from the ovum of a cirriped (Pl. I. fig. 1). This, which has been named the *Nauplius* form of the Crustacea by Fritz Müller, exists as a small animal with three pairs of appendages only. The eyes are not developed, the ocular spot not being homologous with the permanent organs; but since we see that material does enter into the stomach, we can have no great effort in accepting the proposition that this incipient animal has a mouth; and such being the case, we must assume that the anterior four somites are present in the construction of the head of the *Nauplius* stage of Crustacea. The oral apparatus is still in an embryonic condition.

The next stage of living types in which we can observe the carapace to exist in the progressive condition is in that known as the *Zoëa* form of Crustacea (Pl. I. fig. 2). This is the early life of the young of the higher Podophthalmous Crustacea. That of the Brachyura is most known and most instructive. Some of the appendages are beginning to assume a permanent form. The eyes are developed, the antennæ (though in an immature condition) are in existence, and so are all the appendages of the head except the last. The first two pairs of appendages connected with the pereion are present in an immature condition, and the posterior pairs are represented by small bud-like appendages. Dissection readily demonstrates that the carapace in this stage only covers, but has no associated connexion with, the appendages of the pereion; and a closer study shows that the heart is connected with and partly exists in the great dorsal spine. The relative position of this process, therefore, enables us to determine that the future growth of the carapace takes place and is connected with the anterior portion of this structure, and not with the posterior. In the young of *Palinurus*, as well as in the larger forms known as *Phyllosoma*, which appears to be the young of *Palinurus* older in age and larger in size, the carapace is developed largely in advance of the oral apparatus; it is produced posteriorly so far as to project over the anterior two somites of the pereion, but is not attached to any portion beyond the posterior oral appendages. An examination of the *Zoëa* of the various types of Podophthalmous Crustacea supports this observation; and we can trace the same facts from the *Zoëa*, through the *Megalopa*, to the adult Brachyurous Crustacea (Pl. I. fig. 3). It is therefore desirable that we should see how far the study of an adult crustacean will assist us in demonstrating the true relation of the carapace to the general structure of the animal.

In *Squilla* and allied forms of the same type the two anterior somites (the first of which supports the eyes, the second the anterior pair of antennæ) exist as distinct and perfect, though small somites; whereas the two succeeding are closely associated together, and appear as a large dorsal plate supporting the posterior pair of antennæ and mandibles. The posterior three somites belonging to the cephalon and the first two belonging to the pereion are represented by the sternal plates only. In the young forms the anterior two somites belonging to the pereion are in a membranous condition dorsally complete.

According to the theory of Professor Huxley, the carapace represents the dorsal arc of all the somites that it protects and have not a distinct roof of their own.

It is therefore desirable that we should learn what may be the distinct useful value of the carapace, and why each somite would not serve the same purpose by being perfect in its own arc.

The branchial organs, that are so essential to the aeration of the blood in all aquatic animals, are in the Crustacea appendages attached to the members belonging either to the pereion or pleon or both. In the lower and terrestrial types, such as the Isopoda, they are connected with the pleon only. In some Stomapods, as *Squilla* and its allies, we find them attached to the pleopoda as well as the pereiopoda; but in the higher groups they are invariably attached to the pereiopoda only. In the most simple form the branchiæ exist as mere saccular attachments, whereas in the higher types they become more complicated and voluminous. In the saccular condition they are held by a small neck pendent from the joint, and are exposed in the water without protection; but in the higher Podophthalmous types they are formed of very numerous plates folded close together upon a central stalk, and would be very liable to injury if not protected by some means.

The branchiæ, therefore, being in their very nature external organs, and attached to the first joints of the several appendages of the pereion, it is self-evident that they could not be covered or protected by their own somite, inasmuch as if it had passed over them the branchial appendages would become internal. Their character and constitution would therefore be changed; they would cease to be external; in fact they would cease to be branchiæ.

But since the appendages exist as branchiæ and are covered and protected, it must follow that if the protection cannot be evolved from the somites to which they are secondarily attached, the covering must be the result of the development of some other somite.

The somites in their simple conditions have a tendency to overlap one another to an extent that precludes them from permitting any portion of the intermediate structure being exposed.

That the somites have a tendency to extend in every direction, is very evident from the different proportions and forms they severally undergo in various genera, and those which compose the carapace exist in all proportions.

In the Isopoda the cephalon is reduced to the smallest extent in a typical form of Crustacea. In the Amphipoda the cephalon is much larger than in the Isopoda; but in neither of these is the integumentary covering produced to cover or protect any somite that is not included within its anatomical bounds. In the Diastylidæ, one of the lowest forms of the Schizopod type (where the branchiæ consist of but one or two pairs of a multicellular form), the tergal projection of the cephalon extends posteriorly over half the pereion; whereas the lateral walls are anteriorly produced, so as to protect and cover the anterior cephalic appendages. These animals burrow and live in the mud and sand; and no doubt this development of the carapace forms a good protection to the eyes and antennal organs. Thus we can readily interpret the origin and homologue of the shell-covering in *Limnadia*, *Cypris*, &c., by supposing a monstrous development of the carapace in every direction, induced as a protection to a feeble animal that but for this protection must perish in its destructive habitat.

In *Squilla* and its allies (the typical form on which Milne-Edwards has based his researches) the carapace does not extend posteriorly beyond its anatomical bounds; laterally it projects interiorly more so; but the great size of this plate arises from the large amount of space that exists between the mandibles and the antennæ; and as a carapace it is scarcely more important than the tergal surface of the cephalon in the Amphipoda. The branchial organs in this type of animals are saccular, or more rudimentary in their condition than the same organs attached to the pleon. The carapace as a covering is not required to protect these branchial organs, which are not more important than the same in the Amphipoda. Gradually, as the branchiæ assume a more complicated or multicellular condition, the carapace increases in dimensions both laterally and dorsally, until we perceive it reaches the important feature we find in the Brachyurous Crustacea.

In *Squilla* the eyes are borne on a distinct somite; in *Palinurus* the same is distinctly visible; in *Cancer* the ophthalmic somite is likewise distinct and separated from the next succeeding, but it is wrapt over and enclosed by the next or anterior antennal somite. In *Squilla* also the first pair of antennæ are borne on a somite distinct from the succeeding. In the Macrura and Brachyura this and the succeeding somites are closely blended together; but in *Squilla* the fifth, sixth, and seventh somites are capable of being determined by their sternal pieces only. As we perceive the tergal pieces of the somites of the pereion are wanting in the Brachyura, so we may assume that they are not developed in the posterior somites of the head in *Squilla* under similar conditions. There therefore is every reason to believe in the theory, that the monstrous development of the mandibular and posterior antennal somites, incorporated together, unite to form the perfect carapace that is so characteristic of the typical Crustacea.

But whatever may be correct in a theoretical or transcendental point of view, for all anatomical and practical requirements the carapace represents the tergal surface of the cephalon, so largely developed as to cover and protect not only the pereion, but, as in *Cryptolithodes*, the entire animal.

In the development of the Crustacea the gradual progress of the carapace may be traced through all its stages.

In the ovum the members are first represented by small gemmiparous sacs, and precede the formation of the dorsal or ventral arcs in the small *Nauplius*. The carapace covers and protects all the animal except the pleon; but this represents only the four anterior somites and their appendages. In the *Zoëa* stage the carapace is perfect and folded downwards laterally, and is capable of covering and protecting all the appendages of the cephalon and the anterior two of the pereion. At this period no branchial organs exist, but saccular appendages in an embryonic condition are budding in their places: in a short time the pereiopoda are seen to form, and the branchial organs assume a definite character; and with their appearance a change takes place in the form of the carapace.

In a large number of Brachyural *Zoëæ* a more or less conspicuous spine or tooth-like process may be seen to occupy a position on the lateral walls. This spine, from observation during the progressive growth of the animal, is seen to correspond with the angle in the adult that defines the demarcation between the branchial and hepatic regions. The deflection of the carapace anteriorly bends over the hepatic lobes, the line of the greatest curvature being frequently surmounted by a series of well-defined tooth-like cusps; and posteriorly bends over the branchial organs, the curvature here being less abrupt and seldom surmounted by any cusp or process.

Externally the carapace covers and protects both the hepatic and branchial organs; but internally a calcareous wall of demarcation exists.

This wall, which Milne-Edwards terms the apodema, is continued into a thin membranous tissue that makes a distinct and well-defined separation between the branchial appendages and the internal system; so that the aqueous element, so necessary for the aeration of the blood as it passes through the branchiæ, may have full power to play upon the gills without having any passage that would admit it to the internal viscera and derange the general economy of the animal.

Not only does the carapace vary in external form, but also in the configuration of its surface. The relation that it holds to the internal viscera is to afford protection and means of support.

When the former only is required, the structure is generally smooth and even; where the tissues are internally thicker and irregular, it gives to the external surface an indented and irregular aspect, which is common, particularly in the flat and short-tailed Crustacea, where the markings are so persistent as to afford a very valuable assistance for the determination of species.

These markings are generally induced by the attachments of the tissues that secure certain viscera in their positions; these form generally points of depression; but where any organ (such as the liver, stomach, or branchial appendages) is protected, the corresponding points in the carapace are elevations, sometimes crowned with a pointed spine or process. The branchial appendages are external in relation to the body of the animal, but covered over and protected by the lateral walls of the carapace. To complete this so as effectually to protect those organs without pressing on or interfering with their functions, a very considerable amount of lateral development has taken place, and a peculiar reflection so as to bring the margin of the carapace below the branchial appendages and to protect them from rude contact with the limbs. The angle which is induced by this inflection of the carapace over the hepatic lobes and enclosing the branchiæ is generally well defined and ornamented with points or processes more or less numerous. These processes define the dorsal limits of the carapace.

Desmarest, half a century since, mapped out the dorsal surface of the carapace into regions coinciding with the limits of the internal viscera.

Milne-Edwards, in his 'Histoire des Crustacés,' published in 1839, adopted the same views, supporting it by illustrations from several genera.

Professor Dana more recently, in his great work on Crustacea, has divided the dorsal surface into many more regions, taking the numerous areolites that are present in some genera (as *Zozymus*).

He divides the carapace by a transverse line that extends from just anterior to the last of the normal lateral teeth to the same on the opposite side, and separates it into anterior and posterior portions.

The anterior he again divides into three parts, defined by lines of depression, and names them the median region and two antero-lateral regions.

The median region covers the stomach, and includes the gastric and genital regions of Desmarest.

The space anterior to the median region he calls the frontal, and on either side the orbits form another, which may be called the orbital region.

The posterior portion of the carapace he likewise divides into a posterior and two postero-lateral regions.

Professor Milne-Edwards in 1854 readdressed himself to this subject and further elaborated it. In the 'Annales des Sciences Naturelles' he communicated his researches with illustrations from several genera, and divided the dorsal surface of the carapace into regions corresponding with the names of the internal viscera. But it appears to me that the correspondence in many parts exists in the name only; as, for instance, in the gastric region, which he subdivides into epigastric or anterior lobes of the gastric region, protogastric or latero-anterior lobes, mesogastric or median lobe, metagastric or latero-posterior lobes, and urogastric or medio-posterior lobe of the gastric region.

It is quite within the power of demonstration to prove that it is more in accordance with the correct anatomical details of the animal's structure if the lobes that he named metagastric, or latero-posterior lobes, were called, according to Desmarest, the genital regions after the viscera they protect. And no advantage appears to me to be derived from dividing a region into parts that are not constant, and when present do not represent any internal organization, as he has done in dividing the branchial region into:—epibranchial, or anterior division of the branchial region; the mesobranchial and metabranchial divisions, which consist of lobes variable in form, but represented in most genera by a smooth surface.

The cardiac region he divides into an anterior and posterior portion. The anterior alone represents the position of the heart; the posterior represents the part that lies between the heart and the posterior margin of the carapace.

The hepatic regions he does not subdivide, but circumscribes their limits within the extent of the internal organ—an object of consideration, as it appears that the extent of this organ is one of the most important features in the moulding of generic forms. The other regions are those situated on the ventral surface, and which will be considered in a future Report.

The value of a clearly defined knowledge of the various markings that are represented on the dorsal surface of the carapace of Crustacea is best appreciated in the study of fossil specimens, where the remains of animals, however well preserved, can be read by their external features only.

It is therefore with a view to accelerate this that I have in this Report endeavoured to lay down the several regions that are represented by the markings exhibited on the surface of the carapace.

Taking advantage of the information conveyed by studying the labours of the previously mentioned eminent carcinologists, I have laid it down as a rule for guidance, that the external markings must define the internal structure; and where this is not the case the lobe or projection exists as an excrescence.

The most important and constant divisions are:—

The anterior, which lies immediately above the antero-œsophageal ganglion. This may readily be subdivided into the orbital and antennal portions. The entire region, from its relation to those organs from which alone intelligence is derived, may be termed the cephalic region.

Directly posterior to the cephalic region is the gastric; this is generally very conspicuous, the intensity of the postero-lateral markings being rendered more distinguishable by the inner surface of the carapace being adapted for the attachment of the anterior tendon of the mandibles.

The stomach consists, in the more perfectly developed types, of a large central chamber, the form of which not only varies in genera, but is capable of extension and of being collapsed in the same individual. It has also antero-lateral cavities and a posterior or pyloric extension; but these are produced at a lower line, and therefore liable to be less conspicuously represented on the dorsal surface.

The lobe which M. Milne-Edwards has termed the mesogastric, corresponds with that portion of the stomach that is projected above the gizzard-like plates that stand at the entrance of the pyloric chamber.

On each side of the pyloric or mesogastric lobe are two generally well-defined lobes that correspond, and are probably induced by the presence beneath of the genital apparatus in the male and the commencement of the ovaries in the female. I think, therefore, that it is desirable to retain for these lobes the name that was first bestowed upon them by Desmarest, and call them the genital regions.

Posterior to these comes the cardiac region, which corresponds very closely with that of the heart, which lies immediately beneath it.

Posterior to the heart the carapace protects no distinct viscera; but the posterior margin covers the anterior half of the first somite of the pleon. The muscular system which moves the pleon is attached to the apodema that divides the cardiac from the branchial cavities, which also affords attachment to the extensive membrane that protects the internal viscera from the introduction of the water. This membrane is continuous with and attached to the inner surface of the posterior margin, and is represented generally by a lobe that runs parallel with the posterior margin. This portion may conveniently be known as the postcardiac region.

The hepatic regions extend on either side from the orbital region anteriorly to the posterior tooth of the hepatic crest, and are bounded by the gastric and branchial regions. This is a larger portion than is admitted by Milne-Edwards, but it is one that corresponds with the extent of the hepatic viscera.

The branchial region reaches from the posterior tooth of the hepatic crest to the posterior margin, along which it traverses nearly to the median line on either side, and is bounded on the inner side by the cardiac and genital regions, and anteriorly by the hepatic regions, from which internally it is separated by a thin membranous partition.

These several divisions appear to me to be based upon strictly anatomical grounds, and as such may be regarded as natural divisions, the variation of which must depend upon that of structure, and therefore may be relied upon as affording characteristic distinctions.

The great consolidation of the anterior somites of the skeleton has led Prof. Dana to pronounce the centralization to amount to a cephalization of the forces; but this opens a subject of considerable extent and interest, which, if permitted, I hope to present in a continuation of this Report at the next Meeting of the Association.

EXPLANATION OF THE PLATES.

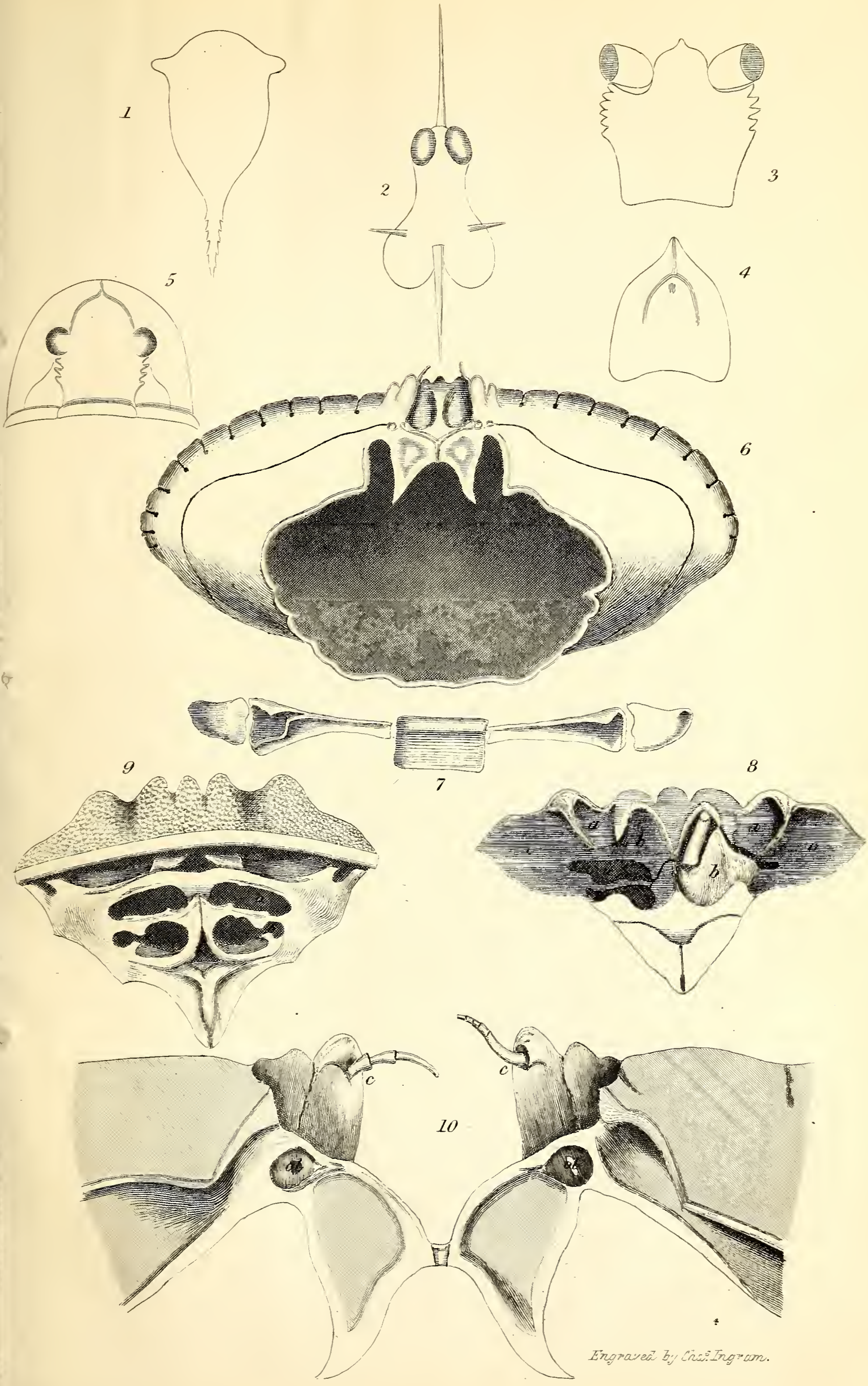
References in each Plate the same:—*C*, Cephalic region; *O O*, Orbital region; *S S*, Stomachic region; *P*, Pyloric region; *H H*, Hepatic region; *Gtl Gtl*, Genital region; *Car*, Cardiac region; *Post-Car*, Post-Cardiac region; *M*, Muscles connecting the pereion with the pleon.

Plate I.

Fig. 1. Carapace of *Nauplius*, or earliest larval form of Crustacea.
2. Carapace of *Zoëa*, or second larval form.
3. Carapace of *Megalopa*, or third larval form.
4. Carapace of *Diastylis*.
5. Carapace of *Trilobita*, with that of *Megalopa* displayed on it, to demonstrate the homological relation of the fissure on the ventral surface of the latter with that on the dorsal surface of the former.
6. Carapace of *Cancer pagurus*.
7. First or ophthalmic somite of *Cancer*, with ophthalmic appendages and eyes attached.
8. Second or anterior antennal somite, showing external or anterior surface: *a a a*, ophthalmic cavity and foramen; *b b b*, anterior antenna, cavity, and foramen.
9. Same, showing internal or posterior surface: *a*, ophthalmic foramen; *b b*, anterior antenna and foramen.
10. Posterior antennal somite, dorsal aspect; carapace removed to show the internal surface of the ventral portion of the somite: *c c*, posterior antennæ; *ol ol*, olfactory foramen.

Plate II.

Fig. 11. Diagram showing the connexion of the branchiæ with the legs and the external character of the branchial chamber in relation to the internal viscera: *B B*, branchial chambers; *Ap Ap*, apodema.
12. Dorsal surface of carapace, showing the natural portions into which it is divided.
13. The carapace removed to show the internal structure and the relation of the viscera to the external marking in fig. 12.



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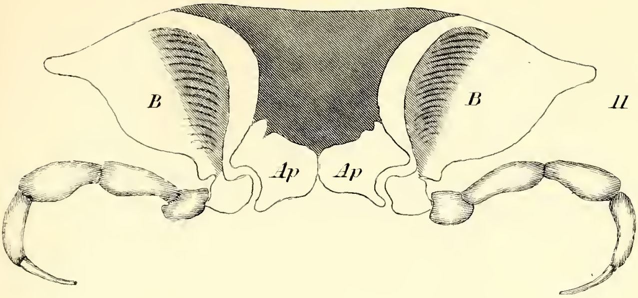

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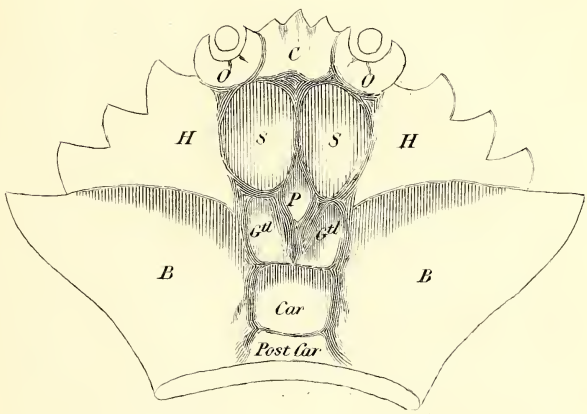

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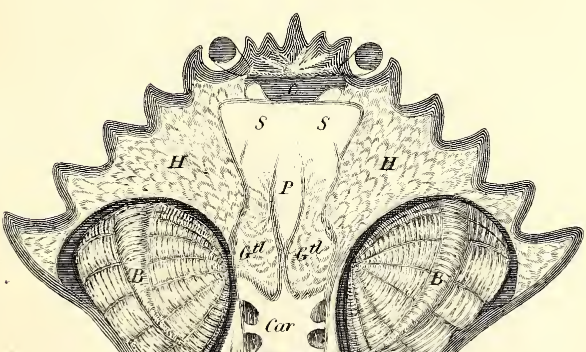

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REPORT

ON THE

PRESENT STATE OF OUR KNOWLEDGE OF THE CRUSTACEA.

PART I. ON THE HOMOLOGIES OF THE DERMAL SKELETON (*continued*).

BY

C. SPENCE BATE, F.R.S. ETC.

[*From the* REPORT *of the* BRITISH ASSOCIATION *for the* ADVANCEMENT *of* SCIENCE *for* 1876.]

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1877.

Report on the Present State of our Knowledge of the Crustacea.— Part II. *On the Homologies of the Dermal Skeleton* (*continued*). *By* C. Spence Bate, *F.R.S.* &c.

[Plates II., III.]

As in the first part of this Report the carapace or dorsal surface of the Crustacea was considered, it is now intended to examine the plastron or ventral surface, and so complete our inquiry into the form and structure of the dermal skeleton, previous to a consideration of the internal viscera and development of the animals of the various forms in the class.

The head, or cephalon, is more clearly defined in Edriophthalmous Crustacea than in any other order; but even here the somites posterior to the mandibular ring have the dorsal surface wanting; but a clearly defined character distinctly separates them from the somites that pertain to the succeeding seven, which constitute the pereion.

This condition is less complete in *Squilla* (which M. Milne-Edwards has selected as being "of all Crustacea that in which the 21 segments of the body are the most distinct"), where the posterior somites of the cephalon as well as the anterior two of the pereion are only represented by their ventral surfaces.

This apparent incompleteness of structure, which is due rather to an economy of material, has led carcinologists to consider generally that the cephalon and pereion should be treated anatomically as one portion of the animal under the general name of cephalothorax.

Thus Dana, in writing on the "Classification of Crustacea," in his 'Report on Crustacea of the United-States Exploring Expedition under Capt. Chas. Wilkes, U.S.N.,' p. 1397, says, "In these highest species, *nine* segments and nine pairs of appendages out of the *fourteen* cephalothoracic belong to the senses and mouth, and only *five* pairs are for locomotion."

This he has taken from the Brachyural or Macrural decapod, as being the highest types of the order; but if we are to report our experiences and define the names and conditions of things according as they are represented in a single type or group, every student of any special form will draw his own conclusions from that which he has alone closely considered, and the study of Crustacea as a class in the animal kingdom must be retarded, if not misrepresented.

In studying scientifically the Crustacea as a whole, it will be found not only more correct but more convenient to describe and name the several parts of the animal by their homologous certainty rather than by their adaptation to fulfil different functions which demand a variation of form with the greater or less importance of their requirements.

The seven somites that form the cephalon are most closely associated, and difficult to be separated from those that follow, in the Brachyural type. This circumstance appears to be largely due to the powerful character of the mandibular appendages. The great strength of these organs requires such an internal development of parts that they appear to preclude the posterior somites from the power of growth; consequently they become merely sufficient to support appendages of a supplementary character.

This is very apparent in the Macrural order. In *Palinurus* the mandibles are so broad and large that their removal is almost a complete decapitation. It is therefore a structural necessity that the posterior two somites of the cephalon should be supported by those to which they are most closely approximate; consequently they are frequently found fused with the anterior somites of the pereion.

Yet in this very genus, in a young state, we have the most complete evidence of the limits that define the cephalon from the pereion, and this again from the pleon.

In the larva of *Palinurus*, as well as in the animal known as *Phyllosoma*, which is now generally accepted as being the young of *Palinurus* after some weeks' growth, the cephalon is seen to coincide with the limits of the carapace and terminates anteriorly to the seven somites of the pereion. It therefore appears that it is desirable to identify these first seven somites as belonging to the head or cephalon and that only.

The pereion, or thorax, is also composed of seven somites or segments; and this number is never departed from, even in the most depauperized condition of the animal. These several somites Prof. Milne-Edwards, in his "Observations sur le Squelette tégumentaire des Crustacés décapodes, et sur la Morphologie de ces animaux," Ann. des Sciences Nat. p. 268, 1854, says:—"In order to determine easily each of these anatomical elements of the integumentary skeleton, it is desirable to define them by a name; and I shall call them *protosomite, deutosomite, mesosomite*, or *tritosomite, tetartosomite, pemptosomite, hectosomite*, and *hebdosomite*, following the order which they occupy from before to behind."

In the lower types they form, as in the Amphipoda, separate and distinct segments; but in the higher groups, as we see the dorsal surface of the somites of the cephalon developed and produced posteriorly so as to cover and protect the upper part of the pereion, so we find the somites of this latter division coalesce ventrally more or less perfectly until in the Macrura and Brachyura they reach the highest degree of consolidation and are much more dense and strong than is the structure of the carapace.

This condition is gradually seen to be approached through different stages from the Edriophthalmia upwards. In the genus *Squilla* (which has many analogies with the sessile-eyed Crustacea, and appears like an enormous stalk-eyed Amphipod) three or four of the posterior somites are exposed beyond the carapace and have the dorsal arc complete and separately perfect. In the Diastylidæ we see the same; and ultimately in the genus *Pagurus*, among the Anomurous Crustacea, there is but a single somite that is not embraced within the limits of the carapace, and that is reduced to a very slender ring.

With the deterioration of the dorsal arc of each somite of the pereion the ventral arc increases in density and coalesces the more perfectly with its neighbours. This appears much to depend upon the habits and character of the animal. If it be one whose habits are perambulatory, as in *Palinurus*, the somites are strongly fused together into a strong broad sternum; whereas in such animals as *Palæmon* and *Homarus* the sternum is less strongly developed, and apparently of a more feeble character.

This depreciation of the sternum gradually goes on as we approximate the short-tailed orders, and arises from the absorption of the first joint or coxa of the leg into the general system of the animal.

In *Palinurus* the sternum (Pl. II. fig. 1), corresponding to the posterior five somites, is very broad, and the legs are very widely separated from those on the opposite side; in *Homarus*, *Nephrops*, and *Astacus* (Pl. II. fig. 2) they approximate each other so nearly that the sternum consists of a small calcareous longitudinal cord, to which the apodema are attached and receive their support.

In the Anomura, of which we may take *Lithodes* (Pl. II. fig. 3) as an example, the coxæ of the legs are so closely compressed together laterally that, without coalescing or being fused together, they are apparently united, while the inferior part of each coxa is completely fused with its neighbour for about half its extent.

This is carried still further in the true Brachyura (Pl. II. fig. 4), where the first joints of the legs are all consolidated into a tolerably perfect mass of calcareous structure, and resemble the nature and character of a sternum.

The ventral plastron, therefore, is formed of the first joint of the leg, and the inferior arc of these sevesn somites is wanting in the true Brachyura in the adult stage, the inferior urface of the legs fulfilling the duty of the sternal plate. As I have already observed, this state can be traced gradually from the Macrura to the Brachyura ; and it may also be observed gradually to assume this condition by following the development of the young, in which the coxal joints may be distinguished separate and individually present, and gradually coalescing as the animal increases in dimensions with age. I am aware that this assertion is not in accordance with the teachings of previous carcinological anatomists ; but it is one that can be proved to demonstration.

Milne-Edwards, "Observations sur le Squelette tégumentaire des Crustacés décapodes," Ann. des Sc. Nat. p. 269, 1854, says, "These rings exhibit all the tergal pieces, and are closed above by a carapace, except among a small number of Anomura, as the *Cenobitis*, where the seventh ring is complete. We an distinguish always a ventral arc, constituted normally by two sternal and wo episternal pieces, and a dorsal arc, represented upon the sides of the epimeral pieces of the sclerodermic prolongations extending between the ventral and dorsal arcs of each ring, so as to enclose between them each side of the body, and to circumscribe before and behind the articular cavities destined for the insertion of the corresponding members. When the rings are free, each of these arcs' extremities I shall call *arthrodials,* for the sake of being distinct; but when the zones are soldered together it is different. The anterior arthrodial of each thoracic ring is united to the posterior arthrodial of the preceding zone, and is more or less completely united with it, so that the interarticular space situated between two such legs, instead of presenting two sclerodermic rings, lodges only a single arthrodial prolongation, which becomes common to the two approximating frames, so that it appears to depend more especially upon the last of the two rings so united. To simplify the description, I shall consider these complex arthrodials as if they were formed only by their most important parts, and shall neglect consequently their anterior plate; but it should be observed that we can nearly always recognize its existence. There is also an interannular symphysis which results from the formation of an interior fold of the sclerodermic lamella, a fold the two plates intimately sustain between them. These processes must be looked upon as if they were produced by the simple lamella of the posterior border of one of the segments so united by symphysis.

"It is always in the anterior portion of the thorax of the decapods that consolidation of the integumentary skeleton is carried to the furthest limit by the soldering or fusion of the anatomical elements."

Now what I contend is, that the structure of the somite has, as a part of the dermal skeleton, ventrally disappeared in the Brachyura, and its place has been taken by the dermal tissues of the first joint of the several legs of the pereion, and the apodema is formed in the various families of Crustacea out of parts that are homologically distinct.

In the Anomura, of which *Lithodes* may form the best example, the coxæ may best be dissected out; and it does not require any very extreme care to separate the frame of one appendage from those by which it is compressed both anteriorly and posteriorly, by which compression the joint partakes of a quadrilateral form. The plates are in many places reduced to an extreme tenuity, and practically fulfil the office of a single wall, although in reality they are produced by two lamellæ closely compressed but not united. The inferior or ventral wall, that forms the sternum, is very much more strong, and extends until it meets the corresponding plate upon the opposite side. In *Lithodes* this simple condition extends from the anterior to the posterior extremity of the pereion.

In the Brachyura, of which we may take *Cancer* as the type, the walls of the coxal joint form the floor of the pereion from the anterior extremity to the fourth or tetartosomite, from which posteriorly an upright wall in the median line separates the right side from the left, and encloses the muscles of the four posterior pereiopoda within as many corresponding chambers, forming a strong arch that supports the internal viscera and precludes their sinking into the ventral cavity.

If, as I contend, this condition of the structure may be demonstrated beyond doubt, it follows that the episternal pieces lose their homological signification, as defined by Prof. Milne-Edwards, in the same way as the epimera of the dorsal arc.

The episternal plates are parts of the first or coxal joint of the legs produced as plates, valuable as supporting the articulations of the next succeeding joint with the first. It is interesting to observe that these so-called episternal plates can be traced back to large spinal processes in the young animal, and to less important processes in the pupal or third stage in the process of the development, where they can be distinctly seen as parts of the coxæ of the appendages attached to the pereion (fig. 7).

This appears to be the anatomical condition in the Brachyura, and also in some of the Anomural groups.

But in the Macrural type the ventral surface of the pereion is formed of the lower arc of the several somites which belong to this division of the animal. Some slight variations of form and appearance exist in separate genera. In *Palinurus* the anterior part of the sternum is narrow and longitudinally longer than broad, while the posterior part gradually increases in width from the anterior to the posterior extremity. Each somite is completely fused with those with which it is in contact at the centre, while deep lines of fissure define their separation on each side, the posterior process of which somites corresponds analogically with the so-called episternal plates in the Brachyura, but homologically they are distinct, being, in this form, parts of the true somite, and not a portion of the coxa of the leg incorporated with it (Pl. II. fig. 1).

In the genus *Astacus* the sternal plates are all narrow, being scarcely broader posteriorly than they are anteriorly, while in the genus *Homarus* the sternal plates are still more narrow and less important. This appears to be the general characteristic of the ventral plates in *Nephrops*, *Palæmon*, *Crangon*, &c., but more delicately and feebly constructed, so far as the external conditions; but in the lower forms of Crustacea, such as the Amphipoda and the Isopoda, the sternal plates are broader than they are long, and consequently the several pairs of appendages are widely separated from each other, correspondingly so throughout the entire length of the pereion.

The internal structure in the Podophthalmous types is more complex than the same parts in the lower or sessile-eyed forms.

In *Astacus*, where the structure is perhaps more distinct, the margins of the approximating somites are seen to be compressed together, the anterior margin of one with the posterior of the next, and to thin out and ultimately combine together into a thin wall or plate of partition, separating the several sets of muscles connected with appendages belonging to one somite from those belonging to adjoining ones. Independently of being walls of separation they are points of attachment on which some of the muscles are securely fixed. Not only do they exist near the lateral margin, but continue inwards and extend forwards until they reach the corresponding processes on the opposite side of the pereion, and also anteriorly until they unite with a similar system of osseous plates in the adjoining somite. Each plate appears to form a basis on which a strong muscle may take root on either side, thus forming a fulcrum for muscular power and a means of separating one set of muscles from another. In *Palinurus* these plates, when they approximate the median line, turn over and lie horizontally with the longitudinal axis of the animal. These plates thus displayed form a perforated floor on which the larger and more important internal viscera rest. This osseous system continues from the postmandibular somite persistently to the penultimate somite of the pereion, where it is united with the floor of the pereion by a central and lateral point of contact.

The anterior margins of the two halves of the first somite of the pereion meet together in the centre and form an oblique and prominent bridge that supports the posterior portion of the stomachic viscera, while the internal processes of the apodema, as they are termed by M. Milne-Edwards, that spring from the posterior two somites of the cephalon, are closely attached to, and at their extremities are perfectly ossified with, the lateral and central parts of the apodema of the anterior somite of the pereion, a point of union that the structure of the animal requires to be of considerable strength, as the enormous processes of the internal movable mandibular plates occupy so large a space that their points of attachment necessitate a structure of greater resistance and strength than the impoverished character and condition of the two posterior somites of the cephalon are capable of securing to them, without the additional support which they receive from a union of a more or less perfect character with the anterior somite of the pereion.

The apodema that support the internal viscera are perforated by a series of foramina that, while they correspond in form on each side of the central line, yet differ in size and shape according to the relative proportions of the organism that are connected with them. The dimensions of the foramina, through which the muscles move the large and more important appendages, are larger and more conspicuous than they that relate to those that move the less efficient and smaller organs of the body. Thus we find that, generally, the largest and most conspicuous foramina correspond with the third somite of the pereion in *Palinurus, Astacus,* &c., whereas in those genera where the great prehensile hand is produced by the increased growth and proportions of any other pair of appendages, the foramina in the apodemal plate correspond with the increase of their dimensions.

In the Anomura, of which we will take *Lithodes* as the type, the internal and apodemal plates do not project so as to reach the corresponding processes on the opposite side. There are only six somites fused together on the ventral surface, or, I should rather say, contributing to the formation of the sternal plastron; the seventh somite exists as a separate and distinct ring, both dorsally and ventrally free from ossified union with the anterior somites of the pereion.

In this genus the sternal plate, as an anatomical part of the animal, is wanting, or represented only in a theoretical character by the median line of fusion.

The coxæ are existent without fusion with each other for some extent, visible on the ventral surface before their close contact reaches ossification so perfect that their line of union is represented by marks of depression only on the external surface, and corresponding crests or ridges on the internal surface. Dorsally this appears to be similarly repeated, and the lines of contact are imperfect in their fusion until the plates have thinned out into a membrane. Laterally the walls of the coxæ of the several pairs of appendages are so closely compressed that their lines of union are with difficulty determined not to be fused together. That they exist for some distance as thin plates in close contact is certain; but they ultimately reach a point where the distinction is lost in perfect ossification. The internal plates approach the corresponding ones on the opposite side in the first two somites only, which form a bridge that supports the posterior extremity of the stomachic region; behind this the ventral surface rapidly widens, but the apodema or internal plates abruptly terminate, leaving a large expansion for the internal viscera to occupy.

In the Brachyura the central fusion of the sternal plates is still more perfect, and the ventral portion of the somites appears to be covered entirely; this exists in a vertical plate that appears to be formed by being compressed between the coxæ of the corresponding pairs of appendages, the external surface of which may be traced to a sinus (Pl. II. fig. 6 *a*) that opens in the median line between the third and fourth somites. The segments of the pereion in this order of Crustacea, as may be seen in the genus *Cancer*, are very closely compressed, and apparently overlap each other dorsally, while ventrally the several appendages, from their proportionate dimensions, preclude the possibility of too close a contact. The consequence is that the general arrangement of the entire muscular system that moves the appendages or the pereion, together with the osseous structure that supports them, is arranged in a circular form, the superior or extensor muscles forming the upper or dorsal arc, and the inferior or flexor muscles forming the lower or ventral arc. The plate, therefore, that is produced internally in the median line is in continuation with the anterior portion of the ventral floor of the pereion, and is the homologue of the sternal plate. This tendency of the muscles to form round a common osseous centre appears to give a similar relation of the several somites to one another. Thus we find that the apodema narrows the dorsal extremity corresponding to each somite to such a degree that a deep notch or fold takes place over the fourth pair of appendages, at which point the curvature is greatest (fig. 5). It is this circular portion of the muscles that facilitates that peculiar arrangement by which the posterior two pairs of legs in *Dromia*, *Doripe*, &c. appear to be attached to the dorsal surface of the animal, which enables them to adhere to floating pieces of wood or weed, or securely attach themselves to univalve shells by means of these appendages.

The *pleon*, or that portion of the animal to which the appendages are attached which, in their most perfect condition, are adapted for swimming, undergoes a great variety of forms. It is perhaps most perfectly developed, in accordance with the value and usefulness of its parts, in the Macrurous division of Crustacea.

In the Edriophthalmia it is perhaps more simple in character; but it is in the Anisopoda, or that intermediate stage that unites the Isopoda and the

Amphipoda, that we are enabled to determine the true homological relation of one part to the other.

In all Crustacea above the Entomostracous forms the several somites are distinguished by a dorsal and a ventral arc. The dorsal is invariably a hard, strong, and osseous plate. The ventral arc is mostly represented by an osseous band that reaches across the animal, and is united anteriorly and posteriorly to the contiguous somites by large and flexible membranous tissues. The dorsal arc is wide, and dips under the adjoining one anteriorly in all except the second somite in the Macrura, which overrides the plates of the adjoining somites both anteriorly and posteriorly. This arrangement does not exist in the Edriophthalmia, because, there being no dorsal carapace protecting the pereion, all the somites have a separate and distinct dorsal arc. The consequence is that each somite posteriorly overlaps the anterior margin of the next succeeding ring, except the first or anterior somite of the pereion, which overlaps anteriorly the posterior margin of the cephalon and posteriorly the anterior margin of the second somite of the pereion. In each of these orders of Crustacea we find that the greatest power of flexion is given to the animal at these points.

In all the distinguishable somites of the Edriophthalmia, from one extremity of the animal to the other, each separate one is observed to support laterally a large plate. These, in the pereion, are firmly attached to their respective somites, but not ossified to them; in the pleon they are so united by ossific matter that one part is not capable of being separated anatomically or distinguished in structure from the other. It is these parts in this particular division of Crustacea that originated the idea of the theory of the Crustacean somite as enunciated in 1830 by Prof. Milne-Edwards. The fact that the supposed side-plates, or epimera, were merely the first joint of the normal legs or appendages has been satisfactorily demonstrated in the Edriophthalmia, as far as relates to the somites of the pereion; but hitherto the relation of the side-plates of the pleon to the normal condition of the mobile appendages had not been demonstrated until the structure of the dermal anatomy of the genus *Apseudes* had been made out*; that "one interesting and, as far as we know, unique feature in these Crustacea yet remains to be noticed. ' The segments of the pleon have the lateral walls (long known as the epimera of Milne-Edwards, called also the pleura by many authors) existing as articulated appendages, demonstrating two important features in the homologies of these parts: 1st, that they are all really portions of the appendages, being the first joint or coxæ of the pleopod . . . and 2nd, that, since the peduncle consists of three joints, the second branch in the appendages of the pleon, as in other parts, is shown to take place invariably at the extremity of the third joint." In the Macrura and higher Stomapods the coxal joint of the several appendages is united to the dorsal arc in a very perfect and complete state of ossification, with the exception of the first somite, where there are no appendages, and the sixth, where the coxa is free and articulates, with small lateral motions, with the dorsal arc of the respective somite. The seventh somite (*telson*) is reduced in character and altered in form; it universally covers and holds the terminal exit of the alimentary canal, the inferior arc of which is represented by a membranous tissue. In the Amphipodous order of Crustacea the fifth and sixth somites carry their appendages with free coxæ, and the terminal somite exists only in the form of a scale very liable to vary in shape, or separated into two of minute

* Hist. Brit. Sessile-eyed Crust. vol. ii. p. 146 (*Apseudes*).

dimensions. In the Isopoda the sixth somite only has the coxæ free, and the appendages attached to them bear no very distant analogy to the homologous pair as they exist in the Macrura. In numerous genera of Isopods the sixth somite is developed to a very large size, and either absorbs or displaces the terminal somite or telson altogether, which in some genera is represented by a notch or cavity only, while in many others it is produced to a point or terminates in a smooth and even margin; with the exception of some of the *Anisopod* genera, the telson probably is absent throughout the order of Isopods.

The form of the pleon in the Brachyura bears as close a resemblance to that of the Isopoda belonging to the tribe *Liberatica* as that of the Macrura resembles *Parasitica* in the same order.

The coxæ or side-pieces, as they have been very commonly supposed to be, are, in the Brachyura, very densely ossified with the dorsal arc, and this to such an extent in the male animals that it is very difficult to determine their presence. In the female, where the lateral development assumes a greater extent, the line of union is capable of being determined by a marked depression that defines the limit of the somites and the altered position of the appendages; but that they are homologically present in both sexes there can be no reasonable cause of doubt. This, I think, may be generally depended on—that the more the coxa departs from the normal type of the joint, as we see in the Macrurous Crustacea, and becomes associated with the dorsal arc of the theoretical somite, the more the character of the appendage becomes simplified or depreciated; but, on the other hand, the more intimately it becomes associated with the ventral arc, the more it becomes developed in its connexion with the requirements of the animal, and any variation of form is dependant on the value of its position and the habits and necessities of the creature. Thus we find that all the appendages of the cephalon and pereion are associated with the ventral arc in the Brachyura and Macrura, but in the Edriophthalmia those of the pereion are associated with the dorsal arc; whereas the appendages of the pleon are, in all divisions of Crustacea, so intimately associated with the dorsal arc that in most cases the coxa is incorporated with the somite, and generally the remainder of the appendages disappear or are reduced to merely a rudimentary condition, useful in some females for the attachment of ova; while in the males they disappear more or less completely, or in the general conditions of life become variated so as to fulfil special requirements or peculiar functions.

Thus the 21 somites of which the typical Crustacean consists each supports in its most simple condition a single pair of appendages; and if we were to suppose every segment of the animal to be reduced to its most simple character, and the appendages attached to each segment reduced to the most simple form of articulated limbs, and all of them uniform in size, the animal would bear a close analogy to a segmented annelid.

This we must take as the archetype of a crustaceous animal, and assume that the appendages are attached to the spaces that exist between the dorsal and the ventral arcs of each somite. Thus when we observe any extreme variation of form, we must consider the earliest and most simple condition of the appendage in the archetype; and it is not at variance with our idea of progression to assume that any great departure from the most simple type that appears to be common to the entire or a large portion of the subkingdom of Crustacea had its origin at an earlier period in the history of its evolution.

The organs of vision are common to all the Crustacea; and in those species that are blind in their adult condition, the eyes are generally well developed in the younger stages.

The eyes are, independent of their value as organs of vision, of great importance in the study of the natural arrangement of the various forms of animals in the subkingdom. They vary in form and character from the most incipient ophthalmic spot to the compound eye erected on pedestals; but whether single or compound, solitary or in pairs, their form and composition is generally so persistent with certain forms and characteristics of the life and habits of the animals that the few exceptions to the general rule do not preclude them from being an important and valuable means of arranging Crustacea.

This was first appreciated by Leach, in 1815, in his Classification of the two great divisions of these animals. He arranged them under the two great heads of PODOPHTHALMIA and EDRIOPHTHALMIA—or those Crustacea that in their adult stage have the eyes elevated on peduncles or footstalks, and those which have them sessile or without any footstalk. To this general observation the exceptions are very few. Among some genera that inhabit subterranean passages and live in the dark, the footstalks are so reduced in size that they can only be said to exist theoretically, inasmuch as we find them well exhibited in their young and early stage. We must therefore assume that they have depreciated from their normal condition through adverse circumstances. On the other hand, among the Edriophthalmia we have the genus *Tanais* with its compound eyes elevated on their own pedestals, differing from the pedunculated form only in being rigid and incapable of movement.

In the Podophthalmia the eyes are implanted at the extremities of appendages that are supported upon a separate and distinct somite.

In 1837 Prof. Milne-Edwards demonstrated this to be the case in the genus *Squilla*; in 1854 he states, in his "Observations sur le Squelette tégumentaire des Crustacés décapodes," Ann. des Sciences Nat. p. 254, which I have since confirmed (fig. 7), that in the genus *Palinurus* (the Langouste) "l'anneau ophthalmique est parfaitement distinct, et se présente sous la forme d'une pièce sclérodermique impaire, courte et large, située en avant du bord frontal de la carapace, et au-dessus de l'anneau antennulaire. Les appendices ophthalmiques, ou tiges oculaires, naissent des deux extrémités de ce segment, et se composent chacun de deux articles: une pièce que j'appellerai *basophthalmite*, et une seconde, qui porte à son extrémité la cornée transparente, et qu'on peut nommer *podophthalmite*."

Milne-Edwards in the same manner shows how in several species of *Palinurus* the antero-median portions of the carapace project more or less completely over the ophthalmic ring, and so (*l. c.* p. 255) "par conséquent, ouvert à ses deux extrémités latérales pour le passage des tiges oculaires, et l'espèce de cadre ainsi constitué autour de la base de ces tiges forme la portion fondamentale de l'orbite ou *trou orbitaire*."

Thus the orbit in Crustacea is formed by the third or second antennal somite reaching over and coming into contact more or less perfectly with the first antennal somite. The greater or less in degree the separation between the second and third somite above the ophthalmic somite the more or less complete is the orbit in which the eye is protected. This varies in different genera, and is very complete in the genus *Cancer* (Pl. II. fig. 9), where the ophthalmic somite is enclosed entirely by the union without fusion of the antero-dorsal projection of the posterior antennal somite with the anterior antennal somite; but, according to Milne-Edwards, in the genus *Palinurus* this perfection of the orbit varies. In *P. vulgaris* (fig. 8) the ophthalmic somite is naked, in *P. frontalis* it is covered, and in *P. verreauxii* it is enclosed; and Milne-Edwards observes that many other Crustacea offer examples of these three organic forms. For instance *Pagurus cœnobites* and *Calianassa* have the ophthalmic somite exposed as in *Palinurus vulgaris*; *Homarus, Crangon, Palæmon, Galathea, Lithodes, Ranina,* &c. have this somite covered as in *Palinurus frontalis*; and *Homola* has the ophthalmic somite enclosed.

In *Astacus* the ophthalmic somite is reduced to a minimum extent, and it is only partially protected by the anterior projection of the rostrum of the carapace.

Milne-Edwards says that, independently of the somite, the ocular appendages are formed of three "articles" or joints, a coxophthalmite, a basophthalmite, and a podophthalmite, but that ordinarily the coxophthalmite is rudimentary or obsolete.

In the genus *Alphæus* (fig. 10) and other fossorial marine forms the ocular appendage is reduced to an extent that allows the carapace to cover it entirely; but in the larval form the organ (fig. 11) is seen to be as well developed and as prominent as that of any aquatic species. It is in this way we may assume that the sessile condition of the organ in the Edriophthalmia (fig. 12) has been attained, first by the contraction or reduction in extent of the ocular appendage, so that the anterior wall of the carapace shall cover it, and then by the more intimate connexion of the organs with the structure of the parts that protect them, and ultimately with entire absorption of the ocular appendage; the eye receives its support from the walls of the carapace alone.

Even here the organs are themselves still liable to depreciation; thus those that exist where light is absent (which inhabit deep wells, subterranean caves, and excavations in the depths of the ocean) first lose the dark colour of the reflecting pigments, which is soon followed by a degeneration of the character and appearance of the lens. In *Ampelisca*, an Amphipod that lives in muddy bottoms, all the lenses but two have disappeared, and the pigment has become red; in the well-shrimp (*Niphargus*) the only trace of an eye exists in some yellow-looking pigment; while in the Podophthalmia we find that *Polycheles* (Heller), a prawn from the Adriatic closely allied to (if not identical with) *Didamia* from the deep-sea dredging of the 'Challenger' expedition, and another from the Mammoth Caves of America, as well as *Nephrops Stewarti* (Wood-Mason) from Formosa, have the eyes wanting as organs of vision, while they retain them as obsolete appendages.

The second pair of appendages is the first pair of antennæ. These M. Milne-Edwards has named (for the sake of convenience in distinguishing them from the second pair) the *antennules*. But as this term is one, in itself, that is suggestive of diminutiveness and inferiority, I think that it had better be employed as little as possible. Generally speaking, this pair is smaller in proportion than the second; but usually it is of a more highly organized structure, and diminishes in dimensions as it becomes important in its functional properties.

The appendage consists, in its normal condition, of three joints, homotypical of the coxa, the basos, and ischium of the true legs in Crustacea. These three joints support an extremity that is very liable to vary in form, number of branches, and general appearance; but one of them must be regarded as the primary branch, inasmuch as it is invariably furnished with a set of organs peculiar to it, and found on no other part of the animal. These are slender, delicate, membranous, thread-like processes, that are liable to vary somewhat in form and size, but are all but universally present in aquatic Crustacea, and which, from their supposed connexion with the sense of hearing, I have elsewhere denominated *aural cilia*. The secondary branch is less important, and frequently divides into two or more rami. Sometimes these flagelliform branches are reduced in size to a minimum amount, and this generally corresponds with the highest character of the organ; for it appears to be in inverse ratio—the longer and more extensive the character of the terminal flagella, the less developed is the structural condition of the organ of sense contained within the peduncle; and, on the other hand, the more developed the sensational organ, the feebler and less numerous is the organism and less antenna-like is the general character of the distal portions of the appendage. To this very constant condition in the aquatic forms of Crustacea we have a variation in the terrestrial species. In the genus *Oniscus* and allied forms of Isopoda, as well as in the littoral varieties of Amphipoda, such as *Talitrus*, *Orchestia*, &c., the first pair of antennæ are reduced to a minimum proportion consistent with their presence, without any increased importance in the structural condition of the peduncular joints, as far as I have been able to ascertain.

In the highest types of Crustacea the coxal joint is considerably enlarged (*vide* pl. i. fig. 8 *b*, Report for 1875), and contains within it a complicated chamber and highly developed organ of sense; while in the Macrurous forms a less complicated chamber exists, with an external opening into which small grains of sand find their way: in others, as first shown by Professor Huxley in a species of Stomapod, well-developed forms resembling otolithes are present; this Dana has observed, and I have been enabled to confirm in a species of *Anchistia* from Australia (Pl. II. figs. 13 & 14).

In some genera, as *Mysis* among the Stomapoda, they vary in form according to sexual distinction. The male animal has the two terminal flagella feeble and slender, while a fasciculus of strong hook-formed hairs are planted on the inner and lower angle of the most distal extremity of the second joint of the peduncle, while a similar but less powerful group of spine-like hairs are planted on a strongly projecting process on the inferior distal extremity of the first joint (Pl. II. fig. 15). There are other hairs implanted on the lower margin of this joint of a very delicate ciliated character. The peduncle of this antenna is very powerful, and there can be little doubt but that it is useful as an organ of prehension, most probably employed in securing the mate. These several facts are demonstrative evidence that the first pair of antennæ are connected with the acoustic properties.

Of this I purpose treating, as well as discussing the observations made by Dr. Hesen in his researches (published in 1864) on the auditory organs of the Decapod Crustacea, when I report on the internal structure of the animal.

Contrary to a possible condition of all other appendages, the coxal joint of the first pair of antennæ is never absorbed into or fused with the sternal portion or ventral arc of the somite to which it belongs.

The third pair of appendages consists of the second pair of antennæ. These are often very large and powerful organs, frequently adapted as weapons of offence and prehension. They consist of two divisions similar to the first pair, that is, a peduncular and flagelliform part. Of these the peduncular consists of five joints, the flagelliform extremity of a strong, solitary, multiarticulate rod in its most normal condition; but it very frequently varies in form, but never increases in the number of its branches.

In the Macrura generally the flagellum is produced, on an average, to about the length of the animal, and is mostly multiarticulate in its character, the small *articuli* varying in number and length. Sometimes, as in *Scyllarus* (fig. 16), it consists of a single disk-like plate. But the greatest tendency to variation in form exists in the Amphipod and Isopod Crustacea. In some of these it reaches to a very considerable length and is multiarticulate, but in others it is reduced sometimes in length, sometimes in form. In *Talitrus* it is reduced without alteration of character to a very small size; so it is in *Hyperia*; but while in the former it stands on a long and powerful peduncle, in the latter the peduncle is short and feeble. In *Chelura* the flagellum is broad, flat, and uniarticulate, and fringed with a dense mass of soft hairs. In *Podocerus* and a few closely allied genera the flagellum is formed of one or two large articuli or joints, and the hairs are reduced in number but increased in strength, and become hook-like spines. In *Corophium* the whole antenna bears a near resemblance to a true walking-appendage, and is no doubt used to assist in progression, as is mostly the case with Crustacea that inhabit tubes and hollows of their own excavation or building.

The peduncle of this antenna is invariably formed of five joints. These are:—

The first, for which Professor Milne-Edwards has suggested, in the memoir quoted, the name of *coxocerite*. This contains within it an organ of sense which Milne-Edwards believes to be connected with that of hearing; but I think there will be little difficulty, when reporting on the internal anatomy, in showing that it is connected with the olfactory sense. In the Amphipoda and Isopoda, with but few exceptions, such as *Talitrus*, *Orchestia*, &c., the first joint is free; but so it is in many of the Macrurous forms, such as *Astacus*, *Homarus*, &c. But in *Palinurus* it is strongly built into and fused with the ventral arc of the fourth or next approximating somite. These parts are still more closely associated in the Brachyurous form, so that it is difficult to determine where the antennæ end and the region named by Latreille the *epistome* commences.

The second joint, named by Milne-Edwards the *basocerite*, is generally short and supports at its extremity a movable squamiform appendage, to which the same carcinologist has given the name of *scaphocerite*. This appendage is constant in all Macrurous forms of Crustacea. It appears to be wanting in the genus *Palinurus* only; but even here it is represented, as I had the opportunity of showing, in the Report on "The Marine Fauna of Devon and Cornwall," by a figure of it incorporated in the integument of the succeeding joint, as if it were absorbed by pressure against it.

This appendage (scaphocerite) does not exist in any of the forms higher or lower than the Macrura, except *Pontia* (Pl. II. fig. 18) in the Entomostracous forms, and that peculiarly interesting little Isopod *Apseudes*, in which genus we find a small squamiform plate resembling and probably homologous with it.

The third joint the above author has named the *ischiocerite*, and the two following the *mesocerite* and the *carpocerite*, while the multiarticulate flagellum, which corresponds "to the penultimate joint of the thoracic member," he calls the *procerite*. It is rather a curious oversight that, while Milne-Edwards has been most particular in identifying the several parts of the second antennæ by an especial name, he has omitted to give any to those of the first pair of antennæ, the three joints of the peduncle of which are homotypical of the coxocerite, the basocerite, and the ischiocerite of the second pair of antennæ; but the flagellum, instead of being homotypical of the procerite, represents the mesocerite and the successive articulations.

In the Macrura generally the joints of the peduncle are distinctly separated from one another; but in some of the higher forms, such as *Astacus*, *Homarus*, and *Palinurus*, they exhibit a tendency to crowd and coalesce with each other, that is increased in the Anomura, and carried to such a degree in the Brachyura, that in some, as in *Menethœus*, *Leptopodus*, *Maia*, &c., the first two or three articulations are not to be distinguished from the surrounding structure except by the position of the olfactory opening.

In the Canceridæ all the joints of the peduncle (Pl. II. fig. 17) are fused together and are so closely implanted in the structure of the facial portion of the two first somites that they assist more or less perfectly in forming the walls of the ocular orbit, the several variations of which are made use of by Alphonse Milne-Edwards as a means of assisting him to distinguish the several genera of the Cancerides from each other, and which, from their easily accessible position, might be found a convenient aid in assisting to determine genera among fossil forms.

Among the Amphipoda all the several articulations are distinct from one another and from the body of the animal, and the olfactory organ is carried in a long tooth-like process that is open at the extremity. This arrangement is not so distinct in the Isopoda and the terrestrial Amphipoda. It also disappears in certain abnormal forms of aberrant and parasitic Isopoda.

The next succeeding, or fourth pair of appendages is among the most constant in the subkingdom. Within certain limits the mandibles vary with every genus, and would form when detached a very certain means of generic diagnosis. In the most simple condition, where they approximate in form to that of the peduncular portion of the second pair of antennæ, they exist in *Nebalia* (Pl. III. fig. 19). But, as stated by Milne-Edwards (" Squelette tégumentaire des Crustacés décapodes," p. 256, Ann. des Sc. Nat. 1854), the mandibles are not appendages simply applied against the mouth, but occupy of themselves a special cavity, flanking on either side the entrance to the alimentary canal, which, when the two are brought into juxtaposition in the median line, they generally close. The mandible in *Nebalia* (Pl. III. fig. 19) is formed of a long osseous process that projects internally, and is secured by muscular attachments to the internal dorsal surface of the carapace; a large obtuse-pointed process is projected inwards across the mouth, and antagonizes with a corresponding process on the one opposite. This process is very liable to vary in form in different genera. Beyond this process, at the root of it, springs a cylindrical osseous continuation, at the apex of which are articulated two equally long and important joints. These two joints are homologically the same that form the small appendicular appendage attached to the mandible of all Crustacea (Pl. III. fig. 21) so persistently that their absence is a fact to be recorded in the structure of special genera, such as *Talitrus* and *Orchestia* among the Amphipoda. In a scientific point of view, this appendage must be part of the primary portion of the theoretical limb. This idea also receives confirmation in the form of the mandibles of the genus *Pontia* of Milne-Edwards, where may be observed a secondary ramus attached to the extremity of the first joint of the appendicular branch (Pl. III. fig. 20).

This appendage M. Milne-Edwards, in the nomenclature that he has given, proposes to name the *protognath*; but the first joint, or true mandibular portion, he calls the *proto-coxognathite*, and the second joint the *proto-basognathite*, and the other joints in succession after the names of the respective joints in the ideal appendage which they homologically represent. While wishing to give all honour to that distinguished carcinologist for the care and exactitude in determining the several parts of the structure of a crustacean by means of a distinct nomenclature, it is with regret that I am compelled to admit that they would be more practically useful, and consequently more generally adopted, if the terms were less lengthy, and with a less redundancy of expression. I shall therefore in this report, as far as possible, adopt the terms of definition proposed by Milne-Edwards, but omit generally the appendicular term so constantly repeated by him. Thus the terms coxa, basos, ischium, mesos, carpus, propodos, and dactylos will be sufficient for whatever appendage I may be writing about, without repeating the name of the appendage, whether *gnathite, podite, cerite,* or other, after that of each individual joint.

But it is only just that Professor Milne-Edwards's reasons for adopting these terms should be reported in his own words. Writing of the appendages of the mouth, he says:—

"Depuis les beaux travaux de Savigny sur la bouche des animaux articulés, on s'accorde généralement à considérer tous ces organes comme étant des homologues des pattes, mais on les distingue presque toujours entre eux sous les noms particuliers de mandibules, mâchoires proprement dites et mâchoires auxiliaires ou pattes-mâchoires; ces désignations spéciales sont quelquefois utiles; mais, dans la plupart des cas, il est préférable de considérer tous ces appendices masticateurs comme des membres d'un seul et même groupe organique, de leur donner un nom commun, et de spécialiser ce nom par l'adjonction d'une racine adjective; on pourrait de la sorte les appeler protognathe, deutognathe, etc. et faire entrer le mot gnathite, comme racine constant, dans la composition des noms appliqués à chacun des articles, ou éléments sclérodermiques, dont ils sont formés. Ces gnathites seraient différenciés à l'aide d'un certain nombre de racines adjectives indiquant leur position dans le membre, et lorsque dans les descriptions zoologiques on aurait à en parler, on pourrait se borner à ajouter aux noms composés, qui appartiendraient en commun à tous les termes de chaque série des pièces homologues, un numéro d'ordre pour indiquer leur position dans cette série organique, c'est-à-dire les appendices auxquels ils appartiennent. Ainsi je proposerai d'appeler *coxognathite, basignathite, mésognathite,* etc. les articles qui, dans la série des appendices maxillaires correspondent au *coxite,* au *basite,* etc. dans les autres membres, et d'appeler premier *coxognathite* la pièce de cet ordre qui appartient au *protognathite,* deuxième *coxognathite* celle qui appartient au *deutognathite,* etc. Ce système de nomenclature est à la fois si bref, si commode et si éminemment significatif, que je demande aux carcinologistes la permission d'en faire usage non seulement dans les considérations morphologiques dont je m'occupe ici, mais aussi dans les travaux taxologiques que je me propose de publier prochainement."—"*Squelette tégumentaire des Crustacés décapodes,*" *Ann. Sc. Nat.* 1854, p. 267.

The mandible or protognathe is sometimes very large, and at others reduced to a rudimentary condition. In *Palinurus* it occupies on each side one half of the breadth of the animal, and to remove the two mandibles is almost to decapitate the animal. In some of the parasitic forms it is reduced to a rudimentary condition. In the female of *Anceus* (*Pranisa*) it, with other appendages, coalesces to form a probing or lancing instrument that projects like a proboscis beyond the head; while in the male of the same genus the mandibles are situated on the anterior margin of the head, and stand projecting like a pair of rude irregular antennæ. But in this animal the mouth is closed, or at most represented by a microscopic aperture, as it, in this stage, exists without eating.

In most forms of Crustacea the space that exists between the anterior margin of the protognathe or mandible and the posterior margin of the epistome is occupied by a fold of the membranous tissue that encloses the oral cavity. This fold is frequently ossified and projected into a strong labium or movable lip. It is very conspicuous in young animals, and frequently in adult forms, particularly among the Amphipoda. It is represented by two small osseous disks in *Palinurus*, and a single small triangular plate in *Cancer*. Corresponding with this labium posteriorly is another that protects the opening between the mandibles in this direction. This is also supported frequently by osseous plates; but this organ is not constantly developed beyond a limited extent, except in a few instances. In *Palinurus* it consists of a central osseous plate, having a suture through the median line; from this base it projects in two long membranous sacs, supported on the outer or posterior surface by one or two osseous plates (Pl. III. fig. 22). It is this organ, it appears to me, that represents and is homologous with the lip-plate or metastoma in *Eurypterus*, *Pterygotus*, &c., that has been so fully described by Huxley, Woodward, and Salter.

The fifth or next succeeding pair of appendages is that which Prof. Milne-Edwards has called the deutognathe. It is what has been known in popular carcinology as the first pair of foot-jaws, and first maxilla or siagnopoda in the 'History of the British Sessile-eyed Crustacea,' the latter name being suggested by Prof. Westwood "as the Greek equivalent for the Latin name of the five pairs of appendages succeeding the mandibles, which were collectively termed *pattes-mâchoires* by Cuvier, Savigny," &c.

The deutognathe in all known forms of Crustacea exists in the adult stage in an embryonic condition; it is small in size, feeble in power, and consists, in different genera and families, of a varying number of thin squamiform plates. Each joint of the typical limb, as far as present in the adult condition (Pl. III. fig. 23), offers no very exceptional distinction from the same in the embryonic stage (fig. 24).

The *tritognathe*, or sixth pair of appendages, supports the idea of the adult form bearing a close resemblance to that of the zoëa or embryonic condition still more decidedly (Pl. III. figs. 25 & 26).

The seventh pair of appendages, the *tetartognathe* of Milne-Edwards's nomenclature, is the first pair of *mâchoires auxiliaires* of Savigny, or the anterior *mâchoires* or foot-jaws of most authors.

These, in the adult Brachyura, are still more embryonic in appearance. In *Maia* and *Cancer* they are very reduced in size and apparent importance (Pl. III. fig. 27); but in some less highly developed types, such as the Amphipoda and Isopoda, where they are generally recognized under the name of *maxillipeds* (Pl. III. fig. 28), they assume a more important feature, and bear a not very distant resemblance to the typical form from which they are supposed to depart. In *Nebalia* they closely resemble the posteriorly succeeding pairs of limbs; but in this genus the whole of these gradually degenerate to the embryonic condition as they recede from this point.

In the larval or zoëa stage of Crustacea they are wanting in the higher forms.

These three pairs of limbs appear to me to offer an interesting and valuable example of the manner in which any great changes in the variation of the structure of an animal takes place. The crowding together so to speak of the three posterior somites of the cephalon, so as to bring, as much as possible, the several pairs of appendages within the limits of the oral region, so crushes them in their position, that their usefulness as separate organs must be much impeded. It would therefore appear that the crowding of appendages together interferes with and arrests the progress of their development, while they are best suited to exist under the altered conditions where they are the least inconvenient. That they are of little or no importance in the economy of the animal can, I think, be demonstrated in the habits of their life—a circumstance which, I think, can be shown in the slight variation of their structure in the adult stage from that of the larval form, to depart in the anterior members towards the mandibular form, and posteriorly to put on conditions most consonant with the usefulness of the succeeding appendage; that is, while the anterior ones feebly approximate the mandibular form, the posterior have attached to them parts resembling immature branchial organs.

These seven pairs of appendages are all that belong to the cephalon or head; and it appears to me that, however closely any of those that succeed may be associated with them in functional purposes, they are homologically distinct, and, as members of separate portions of the body, they should be named and distinguished in a scientific nomenclature more in accordance with their homological relationship than with their functional power.

The next pair of appendages is the first that belongs to the pereion or thorax in the Crustacean type of animals. It is the eighth pair in posterior rotation, but is generally named by authors according to its relation to the mouth. It is the *pemptognathe* of Milne-Edwards's more recent nomenclature, the second pair of *mâchoires auxiliaires* of Savigny, and the second pair of *maxillipeds* or foot-jaws of most carcinologists. It is the fourth *siagnopodos* according to Professor Westwood's suggestion, and the first pair of *gnathopoda* of the 'History of British Sessile-eyed Crustacea,' according to the nomenclature of the author of this report.

This multiplication of names for a single appendage, signifying, as they severally do, various affinities, is by no means flattering to the students of Crustacea; but, to a large extent, it occurs from the circumstance that while one anatomist has contemplated the animal in the adult and higher concentrated forms, others have contemplated it in the more imperfect types. It is therefore the object in this report to bring together these several and various discrepancies, and demonstrate the relationship of parts through their various degrees of growth and change, and retain by one fixed name the same part however it may vary in structure or functional conditions through all stages of variation in Crustacean life.

In Crustacea the eighth pair of appendages in the structure of the animal is the first pair that belongs to the body. In the Brachyura it exists in the same type as is found in the zoëa or larva form (fig. 29), from which it varies only in the more robust character of some of the joints of which it is constructed (Pl. III. fig. 30). In this state it varies in form and degree only within a limited range, gradually becoming more pediform in character as we examine it through the Macrura (Pl. III. fig. 31) in the descending order until we reach *Squilla* (Pl. III. fig. 32), where we find it developed as a large and important organ that gives a decided and distinguishing feature to the animal. Through this genus we are led to the Eriophthalmia (Pl. III. fig. 33), among which we find that in the Amphipoda it is formed on the same type as in *Squilla*, but gradually approaching in its general characteristics and appearance those of the succeeding pairs of legs, until in the Isopoda it is in most families uniform with them.

Thus we see that not only in their relation to the body of the animal, but also in their most general appearance and affinities they are part of the same system of appendages as those posterior to them, and that their relation to those anterior arises from that crowding together of parts in the higher types of Crustacea that forces an abnormal form as the result.

This pair of appendages, as being the first attached to the "pereion" or body of the animal, may with consistency be called, as it really is, the first pair of *pereiopoda*. But throughout the higher Crustacean forms the first two pairs of appendages are functionally utilized as attendants upon the mouth; and where this is not the case they are formed as organs of prehension, more especially among the male animals. This is exemplified even in those species, as among the terrestrial Isopods, where the outward form is less striking, but the whole appendage is strengthened for grasping purposes.

The next or ninth pair of appendages is almost if not universally formed upon the same type as the preceding. There is a departure in degree to be found, more pronounced in the Brachyura, in consequence of the appendages crowding so much on one another. Thus, while those that experience most the pressure of those that overlap them are precluded from attaining their fully developed forms, the external ones, or they that overlap the preceding, have, in order the more perfectly to fulfil their duties, extended their own surfaces, so as more effectually to protect the oral cavity, as an operculum covering the mouth.

These two pairs are variated so constantly from the other appendages of the pereion that I think it will be found convenient in most cases to designate them by distinguishing names. The Reporter has, in the Report on the Amphipoda in 1865 and elsewhere, called them gnathopoda, as feet or appendages connected with the mouth; and I see every reason why this name should be adopted throughout the whole subkingdom, as one better adapted, both functionally and homologically, than those proposed either by Milne-Edwards's latest nomenclature, or the still less correct ones in popular use of previous authors.

In the larval form the second gnathopod is less advanced than the first, but in the adult stage it is larger and more efficient. An exception to this exists in *Nebalia*, where all the appendages of the pereion are developed upon an immature or embryonic type. These gradually decrease in power and form the more they recede posteriorly. All these appendages exhibit the seven joints that are present in the formation of a single limb; and in those instances where there is a decrease in that number, the joint that is wanting is lost at the extremity. This appears to be very general through all the Brachyural and Macrural divisions.

In the higher forms both pairs of gnathopoda carry a secondary branch as well as another that has generally been known as the "flabelliform appenage." For these Milne-Edwards has proposed the name of *endognathe* for the primary or internal ramus, *exognathe* for the external or second ramus, and *epignathe* for that which is generally known as the "flabelliform appendage," and *mesognathe* for the fourth. But as the representatives or homotypes of these same appendages occur in different grades of Crustacean form, and whenever they do occur they bear the same relation to the limb from which they spring, it would be better that they should consistently be known by their homotypical character, rather than vary their name with every succeeding appendage. Thus the flabelliform appendage invariably springs from the *coxa* or first joint, and is homotypical of the branchial organs in other pairs of limbs; another is invariably connected with the *basos* or second joint, and the third has its origin in the *ischium* or third joint. One or all may be suppressed; but whenever either the one or the other is present it has its origin in its own peculiar joint, and as such should be identified in any scientific nomenclature. I therefore suggest the names of *coxecphysis*, *basecphysis*, and *ischiecphysis* for the several parts*, as branches springing from those joints, in whatever appendage they may be found. Thus the secondary branch that exists attached to the legs in *Phyllosoma* or the young of *Palinurus* is an ischiecphysis; in

* The name of the joint being compounded with the word ἔκφυσις, *sprout* or *branch*.

Mysis a very similar appendage is the basecphysis, while the branchiæ are, in all cases when present, the homologues of the coxecphysis.

The next five succeeding pairs of appendages are the true legs as they exist in the typical forms of Crustacea, and it is from the general appearance of them that the higher forms are known as Decapoda, or Ten-footed Crustacea. In a scientific point of view the name is incorrect and misleading; for in many of the Macrura and the Edriophthalmia they are twelve or fourteen in number, while in the Anomura the departure of the last two pairs of pereiopoda from the typical form is as great as the two first in many other forms; consequently the name of *Decapoda*, as well as Dana's name of *Tetradecapoda*, is both incorrect and homologically untrue. These five pairs constitute the tenth to the fourteenth pairs of appendages; but as they are limbs attached to the pereion, I have elsewhere suggested that they should be known as pereiopoda. Milne-Edwards, in his nomenclature, has not identified them with any distinguishing name; he merely calls the anterior pair, which is cheliform in many genera, by the name of *bras* (arms), and the rest *pattes* (feet), and it is remarkable that he should identify each one of the seven joints that is present in its construction by a distinguishing term; but the entire member he defines by an unscientific but popular phrase that is inconvenient, as it is found that the prehensile power is not confined to a single pair, but, as in *Astacus* and *Homarus*, is the property of other limbs, while in some, as in *Scyllarus*, it does not exist in any. Carrying this observation into other forms, we find that in certain Amphipoda the great chelate or arm-like organ exists in the fifth pair of pereiopoda, as in *Phronima*. Thus we see that the power of being developed into a grasping forceps or hand exists in each or all the pereiopoda in succession; therefore the term of arm, or *bras*, is inadmissible in a scientific nomenclature. I therefore propose to call these five pairs of appendages the pereiopoda, in accordance with the terms used in the 'History of the British Sessile-eyed Crustacea.'

They invariably consist of seven joints; these are most distinguishable in the Macrura and the lower forms. In the Report on the Sessile-eyed Crustacea, 1855, the author clearly demonstrated the several joints respectively in the Amphipoda. This required no effort on his part to interpret in the Macrura, since in *Homarus*, *Astacus*, and *Palinurus* the general points are very distinguishable; but as we examine higher in the scale of animals, we find that in the Anomura the *coxæ* of the several pairs of legs are gradually becoming absorbed and becoming part of the ventral surface of the body; and this in the Brachyura is carried still further, inasmuch as it is difficult to define how much of the structure is due to the legs and how much to the body, and it is not improbable that the appendages have encroached upon and absorbed the generally more important structure.

The coxa or first joint appears to be essential to the existence of the animal, inasmuch as it is the seat of all the more important organs connected with the vital existence. The auditory and olfactory senses are situated in the coxæ of the antennæ, and all the branchial appendages have their origin in the coxæ of the pereiopoda, while the sexual organs, both male and female, are implanted in the coxæ of the seventh and fifth pairs respectively. The next two joints of the limbs may, and in some of the Stomapoda do, carry appendages attached to them; but none of the joints beyond the ischium are ever so furnished.

The anterior pair is the one most commonly developed in the higher forms into large chelæ or hands. It is the more general in the male than in the female, and I have commonly observed that the female chela generally corresponds more closely with the less-developed chela in males than with the greater. Sometimes the male appendage is developed so monstrously that they appear inconvenient and burdensome, and are occasionally so long that they are useless in an attempt to reach the mouth. Thus in *Homarus* the animal feeds itself with the small posterior pair. In *Gelassimus* no ingenuity on the part of the animal would enable it to reach the mouth with the extremities of the large chelate organ. In the process of feeding they are useful only as holding food while the animal carries it to the mouth with the smaller but more convenient organs. The chela is always formed by the greater or less amount of development that is given to the inferior angle of the distal extremity of the antepenultimate joint. This power of production appears to be dormant in every limb, since we see it occasionally exhibited in all. Thus in *Palinurus* it is rudimentarily present in the posterior pair of pereiopoda, and in the genus *Pagurus* it is developed into a small but efficient organ, by which the animal cleanses out and removes obstructive objects that may have found their way into the branchial chamber, and so fulfils the same duties as those performed by the *flabella* attached to the gnathopoda, and which are wanting in the Anomura.

The fact that the coxæ of all the legs attached to the pereion are in some orders absorbed into the sternal plastron, while they are not so in others, offers a ready and safe means by which palæontologists may determine the order to which a fossil Crustacean might belong by the evidence of a single leg. Thus it will be seen invariably that seven distinct and free joints are visible in the Macrura, while only six are free in the Brachyura; whereas in the Anomura there are six free and one partially so. This evidence might be carried still further, inasmuch as in *Astacus* and *Homarus* the coxæ are seen to approximate to each other on the opposite sides closely, while in *Palinurus* they are near anteriorly and broadly separated posteriorly.

The appendages that follow are those that are modified for swimming. When exhibited in the most normal condition, they consist of a long peduncular stalk supporting two oblong leaf-like plates, surrounded by a fringe of small hairs. Sometimes they consist of a series of multiarticulations, as in Amphipoda; sometimes of long cylindrical uniarticular branches, as in *Cancer*. In some instances, as in *Squilla*, there is a third branch that springs from the side of the peduncle near the base; this is so membranous in character and ramified in construction, that it is evidently formed for the purpose of assisting in aeration of the blood.

The pleopoda are utilized, according to the habits of the animal, for various purposes, and throughout them all their adaptation to propulsion through the water is not only the most constant but also very generally associated with other offices.

In the Isopoda they appear to be the only organs adapted for respiration that the animal possesses. Yet their rapid motion is the only means which they possess of swimming.

In the Amphipoda, it is this latter use alone for which these organs are adapted, while respiration is fulfilled by other means. But here only the anterior three pairs are adapted for swimming purposes, while the posterior three are utilized for leaping when on land, or forcibly dashing through the water. The Isopoda have only the posterior pair so variated, and the Macrura have two pairs; but in this latter order they are more adapted for producing a retrograde motion, darting backwards as they frequently do to avoid unexpected and sudden danger. In the Macrurous forms they are also available for the purpose of retaining connexion with the ova, and supporting the life of the embryo until it is matured. Throughout most of the Macrurous forms the pleopoda fulfil this double purpose in the female.

In the Anomura they are only adapted for swimming in the long-tailed forms; but in Brachyura they are only utilized for the suspension of ova in the female, and never used for swimming except in very young animals, and reduced to two pairs only in the male, where they are interlocked in each other and adapted as organs aiding intromission.

I cannot close this portion of the report without expressing great admiration of the valuable memoir of Milne-Edwards, so frequently quoted in these pages. With the exception of Professor Huxley's Hunterian Lectures, St. George Mivart's Memoir on the Lobster in the 'Popular Science Review,' and a Memoir on the same subject by J. S. Kingsley, recently published in the 'American Naturalist' (Aug. 1876), little has been written on this subject of late years.

It is remarkable that so large and important a class of animals should have been left so long without being anatomically studied, and it is to be hoped that the important part that they must take in the great history of progressive evolution will gradually induce naturalists to give them the attention that their importance deserves.

EXPLANATION OF THE PLATES.

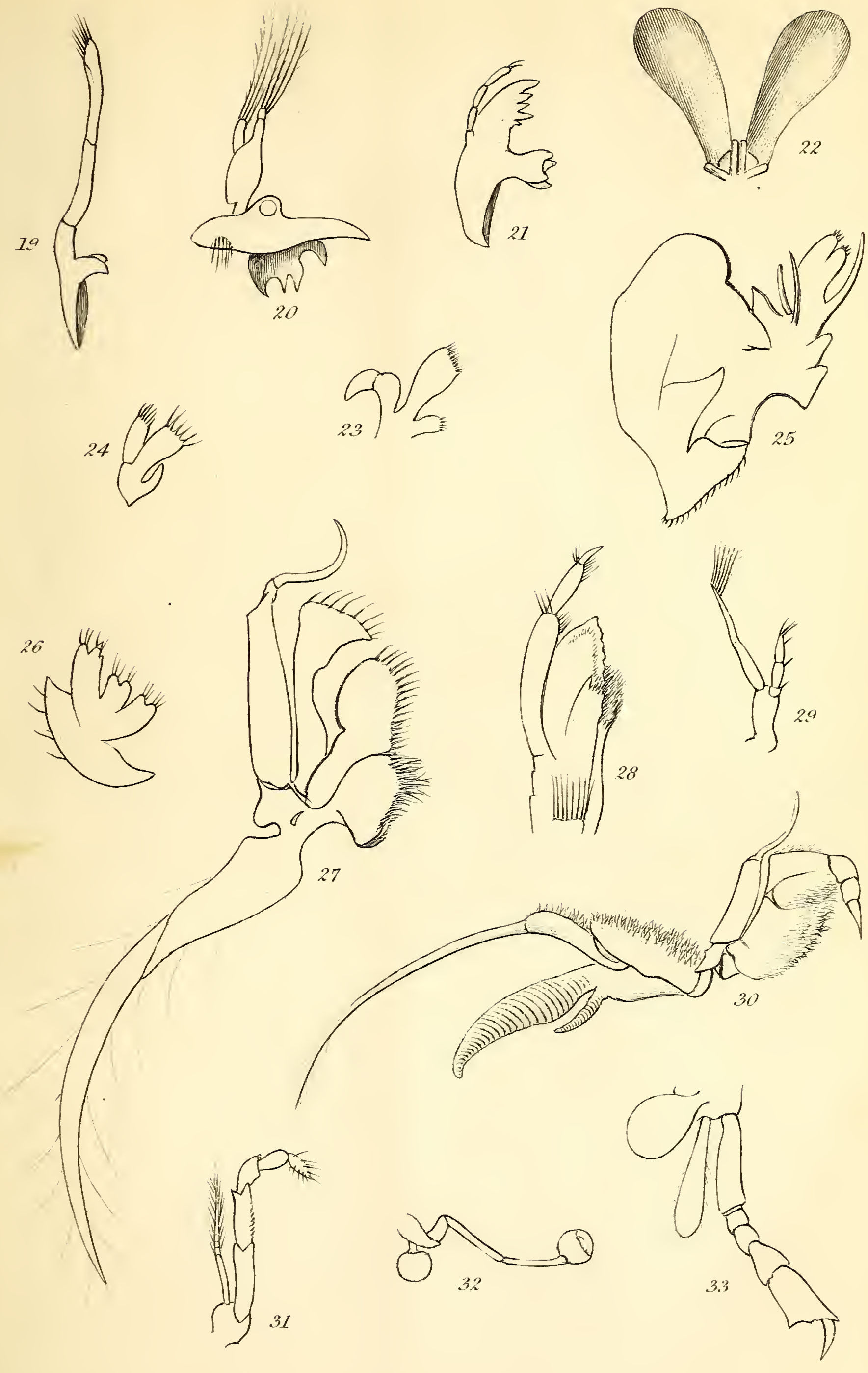
Plate II.

Fig. 1. Sternum from *Palinurus*.
2. Sternum from *Nephrops*.
3. Sternum from *Lithodes*.
4. Sternum from *Cancer*.
5. Sternum from *Cancer*, lat. ext. aspect. † Dorsal notch.
6. Sternum from *Cancer*, longitudinal section. * Ventral sinus.
7. Spinal processes attached to legs in *Megalopa*.
8. Eyes from *Palinurus*.
9. Eyes from *Cancer*.
10. Eyes from *Alphæus*, adult.
11. Eyes from *Alphæus*, young.
12. Eyes from Amphipoda.
13. Antenna, first, from *Anchistia*.
14. Otolith from same.
15. Antenna, first, *Mysis*, male.
16. Antenna, second, *Scyllarus*.
17. Antenna, second, *Cancer*.
18. Antenna, second, *Pontia*.

Plate III.

19. Mandible from *Nebalia*.
20. Mandible from *Pontia*.
21. Mandible from *Palæmon*.
22. Labium, posterior, from *Palinurus*.
23. Deutognathe from *Cancer*, adult.
24. Deutognathe from *Cancer*, young.
25. Tritognathe from *Cancer*, adult.
26. Tritognathe from *Cancer*, young.
27. Tetartognathe, or maxilliped of authors, *Cancer*.
28. Tetartognathe, or maxilliped, of Amphipod.
29. Gnathopoda from *Cancer*, young.
30. Gnathopoda from *Cancer*, adult.
31. Gnathopoda from Macrura.
32. Gnathopoda from *Squilla*.
33. Gnathopoda from Amphipoda.

Engraved by W. Fairhorn.



Engraved by W. Fairhorn.

J. S. Knipley
Salem
Map:
U.S.

d 79

[*From the* ANNALS AND MAGAZINE *of* NATURAL NISTORY *for July* 1878.]

On the Nauplius *Stage of Prawns.*

5

By C. SPENCE BATE, F.R.S.

IT is now fifteen years since Fritz Müller published his memoir "Die Verwandlung der Garneelen," in the Archiv f. Naturg. 1863. In this he announced that he had discovered that the prawns, more especially mentioning *Penœus*, commenced life in a stage closely approximating to that in which the Cirripedes and some entomostracous Crustacea did, in that which is now known as the *Nauplius* form. Fritz Müller's high reputation as an accurate observer and philosophic naturalist induced carcinologists to accept his statement, although, as I stated when reporting on his memoir in the 'Zoological Record' for 1864, "in the chain there are one or two links wanting to make the connexion perfect," adding, in a note, that "since this passage has been in type, Dr. Müller informs us that the several links in the progressive development have been established by him, closer than, for want of space, he has been able to demonstrate in his work;" and I further added, at page 283 of the same 'Record,' "The difficulty of preserving the life of these delicate creatures has not yet been overcome. The newly hatched larva from the commonest and, we might assume, the hardiest crabs has not been preserved beyond the second stage. . . . . It is therefore not to be demanded that Dr. Müller should succeed beyond the step at which others have stopped. It is only necessary for him to show assimilation of conditions to enable us to accept his conclusions."

Knowing that Captain Du Cane had, as far back as 1839, published, in the second volume of the 'Annals and Magazine of Natural History,' p. 168, pls. vi. & vii., the character and form of the young of *Palœmon*, and having also myself observed that the prawns on our coast, as far as I had examined them, exhibited no such character of metamorphosis, I, during my correspondence with Fritz Müller, suggested that the important link wanting was the connexion of the *Nauplius* with the parent, not, as he says, "the relation of the *Nauplius* with the *Zoëa*," and that until this was done the chain of evidence was not sufficient to compel acceptance, in the full sense that he proposed, of the opinion "that the *Nauplius* stage was the earliest form of the larval condition of prawns;" for, as he remarks in the paper translated in the 'Annals' for last month, his *Nauplius*, having been taken swimming freely in the sea, may not be the larva of *Penœus* at all.

In the important advance which the study of the Crustacea has of late taken, it is highly necessary that statements that are to be accepted as facts should be established on observations that can leave us no doubt.

Unfortunately, on our coasts there is but one species of *Penœus* (*P. caramote*), and this appears to be rather a Mediterranean form that occasionally strays as far as our southern shores than a local species.

We might have supposed, as in the warmer seas several species are abundant, that some one would have been able during these last fifteen years to capture a specimen that was carrying ova so nearly approaching the period of hatching that Fritz Müller's conclusions might have been demonstrated: he would then not have had occasion to say, "if my *Nauplius* be not derived from a *Penœus*, and is not to become a *Penœus*, let my opponents tell me what possibly it can be."

Certainly exception should be taken to the word "opponent;" the only object that any truly sincere observer can have is to establish the truth. If the *Nauplius* form be that of a young of *Penœus* or any other prawn, it is only a question of time for us to know the fact. As yet the young of *Penœus* is not known; and Fritz Müller says that they who wish it demonstrated should tell him what his *Nauplius* is the young of. This can only be done when the larval forms of all prawns, including *Penœus*, are known by direct evidence. We shall therefore be approximating to the knowledge of this by showing what forms do not quit the ovum as larvæ in the *Nauplius* condition.

Some few years since, Dr. Power was attached to a regiment stationed in the Mauritius. During his period of residence in that island he occupied himself with collecting the various forms of Crustacea, and hatched many. These specimens he preserved, both adults and larvæ, and forwarded them to me. It formed the basis of a paper to the Royal Society, a short abstract of which appeared in the 'Proceedings' (No. 168, March 9th, 1876, p. 375*). Of the Macrurous forms we can say with confidence that neither the young of *Palœmon*, of which there is a freshwater species on the Island of Mauritius, as well as our European form, nor *Hippolyte*, *Caradina*, *Crangon*, *Alphœus*, *Homaralphœus*, n. g., *Homarus*, *Stenopus*, *Hymenocera*, *Palinurus*, *Squilla*, nor *Astacus* quits the ovum in the *Nauplius* condition. To these I can now add some of the deep-sea forms, including *Willemoësia*, that were taken during the 'Challenger' expedition. But this still leaves the ques-

* A year previous to the publication of Prof. Claus's memoir 'Untersuchungen zur Erforschung der genealogischen Grundlage des Crustaceen-Systems.'

tion unanswered, What can be the parent of Fritz Müller's *Nauplius?*

Why may it not be the larva of a Schizopod or of one of the parasitic Suctoria? The history of the development of neither of these has been worked out.

Metschnikoff states that *Euphausia* belongs to those Podophthalma that pass through a *Nauplius* condition. He says (Zeitschr. f. wissensch. Zoologie, vol. xix. p. 479), "that this Schizopod, in one stage of metamorphosis, has two pairs of swimming-feet, a peculiar carapace characteristic of *Euphausia*, and only the rudiments of the oral appendages and pleon. Although I knew but this single stage in the development of *Euphausia*, I was yet convinced that it by no means represented the earliest form of larva as it quits the ovum. I could, however, only hypothetically point to a six-legged transparent *Nauplius* as being the earlier larval condition of *Euphausia*."

This supposition he confirmed in a paper in the same journal in 1871, where he stated "that the year previously, being at Villafranca, he had the opportunity of examining a considerable number of freely-swimming *Euphausia*-larvæ;" and he further adds, "besides the larvæ which were in various stages, I fished up with Müller's net ova from which the larvæ were just ready to escape." The statement that he caught the *Nauplii* as free-swimming animals, and captured the ova with a net, raises a question in the mind yet as to the relation of the ova and freely-swimming *Nauplius* with their parent. But as I presume that *Euphausia* must have been present or Metschnikoff would not so positively have asserted their connexion, and as we are not aware of any Crustacea that deposit their ova until they have liberated the larvæ, we must suppose that in taking the one he captured the other. The ova of the Schizopoda being carried in a sac-like pouch and not attached to the pleopoda, as in the prawns, larvæ might be liberated in unequal degrees of development—although he says that, when the larvæ pass into an older stage, "all the larvæ of this last stage examined by me have lost with their moulting the indented margin to the carapace, which shows that I had to do with another species than *Euphausia Mülleri* (Claus)."

As far as the observations of all carcinologists enable us to decide, the form of larvæ, within generic relationship of their parents, is identical in all species. It may be fairly assumed that Claus's specimens, which were captured independently in the Atlantic, may be the young of some other nearly related Schizopod.

That *Euphausia* and its allies may pass through an immature stage like *Nauplius* is what might, though not generally anticipated, have been thought probable since our knowledge of the development of *Mysis*.

The desirability of our knowing the form, structure, progressive growth, and parentage of these young forms is clearly demonstrated in Claus's recent beautiful work on the Genealogical Foundation of the Crustacean System, p. 54, in which he says, "In relation to the transformation of *Galathea*, which, on account of the half-bent tail, was placed with the Anomura, but, however, belongs decidedly to the long-tailed crawfish, unfortunately but little hitherto has become known to us. Couch has given an illustration, which has been reproduced by Bell, of a young recently hatched *Galathea*-larva, which confirmed the observation previously made by Rathke (Archiv f. Nat. 1848, p. 241), that it, as well as the larva of *Pagurus*, represents a higher degree of development than does the *Zoëa* of *Carcinus mœnas*, since, besides the two anterior double-branched pairs of legs, there is also a third jaw-foot present in the form of a still simple numerously jointed appendage—in contrast to the crab-*Zoëa*, which, as far as known in all groups and families of the Brachyura, want the posterior jaw-foot as an acting limb. There appears consequently the character of the prawn-*Zoëa* in the *Galathea*-larva, though in a weakened form, which, taken altogether, according to bodily structure, formation of antennæ, and jaws, might be placed among the long-tailed crawfish."

I do not know Rathke's figure of *Galathea* alluded to by Claus; but if it be not more clearly determined than the one referred to of Couch, it cannot be relied on for guidance as to the form of the animal, and is therefore valueless for general classification.

I have examined, and have in my possession, the young of both British and exotic *Galatheæ*, taken from the parent immediately after being hatched, which show that the larva of *Galathea* in its stage of development resembles *Porcellana* and *Pagurus* in having conditions which, as far as my own observation goes, are common to the Anomurous group. In development they are in advance of the *Zoëæ* of the Brachyura, but not so far as those of the Macrura. The *Zoëæ* of *Latreillia*, *Homola*, *Doripe*, and even *Dromia* have not been determined. I include *Dromia* among the undetermined forms; for the figure that Claus has given with a query as the young of *Dromia* approaches, according to my experience, nearer to the larva of *Gelasimus* than to any of the Anomurous group, while the larva of *Trichia*, a genus nearly allied to *Dromia*, assimilates to the Anomuran stage.

It appears scarcely desirable that any classification of a general character should be attempted upon larvæ that have been so imperfectly made known as that of *Galathea*. And, further, it appears to me that we have the forms of many types yet to determine before we dare hope to establish any permanent classification based on our knowledge of development.

Even so small a generalization as that which Claus has made, that the development of the cephalon and the pleon, with their respective appendages, anticipates that of the pereion with its limbs, is upset in the development of the common lobster, where the pereion and all the pereiopoda are well formed before a single appendage belonging to the pleon is seen. This is shown in the figure of the larva of *Homarus* which accompanied my paper read at the Royal Society in March 1876, as well as by the researches of Erdl, 1843, and the excellent memoir and illustrations of Mr. Sydney ~~Y~~. Smith I
on the American lobster (*Homarus americanus*, Edw.), 1872, Amer. Journ. Sci.

To return to the *Nauplius*, Fritz Müller says, "The child must surely have a father." True; but let it be the legitimate one. The young of *Penæus* is not known. It appears to me rather remarkable that, among the numerous specimens of several species that have been brought home in the 'Challenger,' I have not been able to find one with ova attached.

There are conditions in some of the Peneids which show a variation in the structure of the reproductive apparatus from that of the more-known prawns that is suggestive of different habits; and I stoutly maintain that it is the duty of every embryologist, and of Fritz Müller in particular, to determine the larva of *Penæus* before we can assert that the young of this genus or any of the prawn-groups can be said to be known to pass through a *Nauplius*-form.

Fritz Müller says that it cannot be the young of a Cirripede or rhizocephalous Crustacean. He bases this opinion on the formation of the heart, liver, and mandibles. All observation strongly supports the conclusion, arrived at long since by Milne-Edwards, that the structural detail of animals in their earliest stages corresponds more with their order than in their generic features. What do we know of the development of the Rhizocephala? What do we know of the development of *Sacculina*, *Cleistosoma*, *Peltogaster*, or any of the parasitic Suctoria? or as to what changes these undergo after the *Nauplius*-stage before they attach themselves as parasites to other Crustacea?

Dr. Power has shown us that in one of these (*Carcino-*

cystus *) the larva undergoes a metamorphosis as far as the cirripede pupa-stage before it is expelled from the ovisac of the parent; and this probably (either in the ovisac or after it has been liberated from it) is a stage in the progressive development of all the Suctorian tribe.

Metschnikoff says, in the paper already alluded to, "In conclusion, I must draw attention to a phenomenon which is common to the *Nauplius*-stage of *Euphausia* and *Penœus*; I mean the contemporaneous formation of several extremities succeeding the larval swimming-feet. It is remarkable that such a mode of formation is not observed in any Entomostraca which have been developed through a *Nauplius*-metamorphosis. I have examined in this relation the Cirripedes and Branchiopoda; and I became convinced that in these Crustacea the oral appendages are developed apart from the other extremities, as has been shown by Claus for the Copepodes."

If the oral appendages be not developed in direct sequence with the anterior appendages of the head, the evidence that the third pair of appendages in the *Nauplius* is the homologue of the adult mandible becomes vitiated.

Darwin has stated (p. 18, vol. i. 'Monograph of the Cirripedia') that the cirripede in the pupa stage has no mouth. "It may be called," he says, "a *locomotive pupa*; its whole organization is apparently adapted for the one great end of finding a proper site for its attachment and final metamorphosis." But Mr. Darwin, "underneath this slightly prominent and closed mouth, found all the masticatory organs of a cirripede in an immature condition." Later, when the animal arrives at its adult stage, it is furnished with oral appendages and uses them in eating.

If we compare the adult Cirripede with the adult Suctorian, the former, though attached to a foreign substance, has all the appendages of an animal in active existence. The latter is scarcely more than a sac, retaining its life apparently through its parasitic union with another. Its only capability appears to be the retention of a number of ova until they become matured. It has no appendage, oral or otherwise. The history of the development of this animal is unknown to us. Of what form is the male? and when does the female become impregnated? Is it before or after it has become attached to another animal? If after, the male must be a free-swimming animal; if before, then we must assume that there is some variation in its pupal condition from that of the normal cirri-

* Proc. Roy. Soc. vol. xxiv. p. 378.

pede; and in this I am inclined to believe. Dr. Power in his drawing has figured the pupa of *Carcinocystus* so that it appears to have a long proboscidiform mouth that is capable of being extended beyond the margin of the walls of the carapace, and so, we may presume, enabling it to feed; and it is difficult to imagine that an animal can grow to so large a size as this is in its adult condition if it had not the existence of an animal, both in feeding and selection, after it had passed beyond the *Nauplius*-condition.

Metschnikoff appears to me altogether to beg the question when he asserts that *Nauplius* is the larval form of *Penæus*, because it resembles that of *Euphausia* in certain conditions of development. After fully considering the subject, it appears to me that Fritz Müller's *Nauplius* may be the larval condition of a Schizopod, more or less related to *Euphausia*, or it may be the young of one of the Suctorian parasites, but that there is every reason to believe that it is not the young of any known prawn, and there is no evidence to determine its relation to *Penæus*.

[*From the* ANNALS AND MAGAZINE OF NATURAL HISTORY *for* October 1878.] 273
V Series Vol ii

J S Kingsley
Re. Oct 30

From the author

On the Willemoesia *Group of Crustacea.* 6

By C. SPENCE BATE, F.R.S.*

See Norman in Ann & Mag for Nov '78

[Plate XIII.]

AMONG the many objects of interest taken from the depths of the ocean during the cruise of the 'Challenger,' there were few that attracted more attention than the so-called blind Crustacea.

These were described by Mr. Willemoes-Suhm rather fully both in 'Nature' and in the 'Transactions of the Linnean Society,'—in the pages of the former under the name of *Deidamia*; but in the latter Mr. Grote, having discovered that this name had been in use for a genus of Sphingidæ, changed it to *Willemoesia*, in compliment to the unfortunate marine zoologist of the expedition.

Soon after it had been published it was recognized by those who had given attention to the subject to resemble a small crustacean that Dr. Heller had described among the "Crustaceen des südlichen Europa," from a single male specimen in the collection of the museum at Vienna, to which he gave the name of *Polycheles typhlops*, belonging to the same group. I believe that I am correct in stating that Mr. Wood-Mason was the first, in the 'Journal of the Asiatic Society' for 1875, to point out the resemblance between of *Polycheles* of Heller and *Willemoesia* of the 'Challenger' expedition.

* Read at the Meeting of the British Association at Dublin, on Monday, Aug. 19, 1878.

Each of these zoologists has described the animal as being blind; and it is supposed that on this character Heller founded the specific name of his species, the eyes of which, he says, are rudimentary; and Willemoes-Suhm says that "*the eyes are entirely wanting*, nor is there any place left open where you might expect to find them."

Both these observant naturalists have passed over the peculiar character of the organ of vision that belongs to this group of animals. Heller has classified it with the family Astacidæ in a division by itself; and they have both asserted that it closely corresponds with the fossil genus *Eryon*.

Dr. Camil Heller, moreover, says that it bears a strong resemblance in the form of the body to the Scyllaridæ, from which it differs essentially by the structure of the antennæ, the form of the chelæ, and the narrow sternum. With the Astacidæ it has in common the possession of the leaf-like appendage at the base of the second antennæ and the chelate character of the pereiopoda; in all other respects it differs from *Astacus*.

Willemoes-Suhm says, "Among the living Decapoda Macrura there is hardly a group with which *Willemoesia* could be said to be very closely allied. Nearest to it are undoubtedly the Scyllarinæ; but these, like all the genera of the family Palinuridæ, differ from it in the absence of the lamellar appendage of the second antennæ, and in the presence of palpi at the base of the gnathopoda, which, as we have seen, are wanting in this new genus. Nor can it, for this latter reason, be referred to the Astacidæ, with which it has in common the presence of the antennal scale."

"The genus," says Heller, "corresponds greatly with the fossil crustacean described by Deshayes from the slate-quarries of Solenhofen (*Eryon Cuvieri*), since also in this are found a flattened carapace and similarly formed antennæ and pereiopoda. The hinder part of the body is much narrower than the anterior; and the leaf-like appendage of the second pair of antennæ is much enlarged. It forms a link between the Scyllaridæ on the one hand, and the Astacidæ on the other."

"It is very astonishing, indeed," says Willemoes-Suhm, "that, among all the crustaceans known to us, *Willemoesia* approaches most closely the fossil Eryontidæ. If we compare, for example, our figure of *W. crucifera* with the figure of *Eryon arctiformis*, and the description of the 'Tribu des Eryons' given by Milne-Edwards (and probably taken especially from Desmarest's 'Crustacés Fossiles'), we find most striking resemblances between the two forms. In *W. crucifera* as well as in *Eryon* the carapace has nearly half the length of the whole body; and in both forms its lateral borders are wing-like expansions which are divided by two deep incisions into three portions. The anterior border of the carapace is nearly straight in both forms.

"*Eryon* was probably not blind; for the eye-stalks have been found in several specimens. Its antennæ seem to be somewhat more reduced than in *Willemoesia*; but the second pair of them has, according to Desmarest, 'une écaille assez large, ovoïde et fortement échancrée.' This is the chief difference between *Eryon* and the Palinuridæ, and the same in which *Willemoesia* also differs from that group."

So much do the fossil and recent animals resemble each other that the discoverer of the recent species says, "If the last pair of pereiopoda and the pleon of *Eryon* were presented to me I should undoubtedly declare them to be parts of the genus *Willemoesia.* There are the same line of spines at the top of the rings, the same wing-like expansions on both sides, and that characteristic 'caudal apparatus.' Also the fine fringe of hairs which distinguishes the caudal fin of *Willemoesia* is to be seen in the fossil crustacean."

"*Eryon*," continues the same author, "differs from the living genus chiefly by the presence of eye-stalks and of palpi at the base of the gnathopoda. According to Quenstedt the latter were observed only with difficulty; and their presence seems not to be beyond all doubt." And the lamented carcinologist of the expedition looked forward to his return, when he would look over the original specimens and satisfy himself, so as to enable him to give a more detailed account of the relations of *Willemoesia* to *Eryon.* That they must be very close he had no doubt, and considered that among the Eryontidæ this new genus must take its place, between the Astacidæ and Palinuridæ.

It will be desirable that we should examine the animals and see how far the conclusions arrived at by two independent observers can be supported by extended inquiry.

Heller describes *Polycheles* as having a thin dermal structure, *rudimentary* eyes, antennæ like those of *Willemoesia*, and four pairs of pereiopoda chelate, and one (the fifth pair) simple.

Willemoes-Suhm describes *Willemoesia* as having the eyes and eye-stalks *entirely wanting*; four or five pairs of pereiopoda chelate in distinct species.

In all other respects the descriptions of the two authors agree.

The 'Challenger' collection contains specimens of this group from thirteen different places; and in every one I was able, upon close examination, to find the eyes very distinct, though singularly situated. Moreover there is a variation in form and position that gives them a value in classification, particularly when taken into consideration with the relative forms of the several pairs of pereiopoda.

The dorsal surface of the several species of this group is flattened and depressed, and the anterior margin is tolerably straight; the central tooth, which is sometimes single and sometimes double, is never directed forwards in the form of a rostrum, but upwards and obliquely forwards. In the anterior margin on each side there is a deep cleft in the dorsal surface, in which the eye with its peduncule is lodged; the anterior extremity being directed forwards, outwards, and downwards, is covered over by the lateral projecting wings of the carapace. It appears to have two points of vision, the one upwards by the dorsal surface, the other downwards and outwards by the lens at the extremity of the peduncle. But these several points are liable to vary in degree. In some the dorsal notch is almost non-existent, in others it is very deep; and it is by this variation, taken in connexion with the power of change in the form of the pereiopoda, that I purpose classifying the several species of this interesting group.

POLYCHELES, Heller.

(Crust. des südl. Europa.)

In this genus I accept the author's definition, that it has the anterior four pairs of pereiopoda chelate and the fifth simple. But instead of saying that the eyes are rudimentary, I assert that they are immovably lodged in a notch in the dorsal surface of the carapace, with the anterior extremity projecting beneath the antero-lateral wing of the carapace.

PENTACHELES, n. g.

All the pereiopoda are chelate, and the eyes are lodged immovably in a notch in the antero-dorsal surface of the carapace, with the anterior extremity projected beneath the antero-lateral wing-like extremity of the carapace.

WILLEMOESIA, Grote.

(Nature, October 1873.)

All the pereiopoda chelate, and the eyes immovably situated in the anterior or frontal surface of the cephalon, and neither lodged in a notch in the dorsal surface of the carapace nor covered by the antero-lateral wing of the carapace. Eyes small, directed outwards and forwards.

Of the genus *Polycheles* there are three species in the collection of the 'Challenger' expedition; and of these I take as the type of the group the specimen that has been named by Willemoes-Suhm *W. crucifera*. It agrees with Heller's figure in having but a single rostriform tooth, but differs from it in general form; but it stands, according to its general structure, at the opposite extremity of a series of intermediate forms to *Willemoesia leptodactyla*.

Polycheles crucifer (Willemoes-Suhm).

Willemoesia crucifera, Willemoes-Suhm, Linn. Trans. vol. i. 2nd series, p. 52, pl. xii. fig. 10, pl. xiii. figs. 10, 11.

Carapace ovate, margins fringed with large teeth; frontal margin armed with a single rostriform tooth and two sharp smaller teeth at the inner angle of the orbital notch; dorsal ridge without teeth, but nodulated, as well as the dorsal surface, where the nodules run in lines corresponding with the limits of the internal osseous formation. Pleon with a spinous carina traversing the median line, each somite being armed with two strong teeth. The eye is lodged in a narrow cleft of the carapace, and projected beneath the antero-lateral wing in the form of a long obtuse point.

This species was taken in the West Indies, off Sombrero Island, at a depth of 450 fathoms, on a bottom of *Globigerina*-ooze. Length $1\frac{1}{2}$ inch.

Polycheles Helleri, n. sp.

Lateral margins of the carapace subparallel; anterior division armed with seven teeth, median with four, and posterior with many, decreasing in size posteriorly; dorsal central ridge armed with two rostral teeth, two median, and two on the posterior margin, with a few intermediate. The pleon is carinated on the five anterior somites, the anterior median portion of each somite culminating in an anteriorly directed point. Eye lodged in a deep notch, with the inner and outer canthus smooth. Meros of the first pair of pereiopoda armed on the outer side with two teeth, and on the inner with one or two smaller ones.

This species was first taken in lat. 29° 55′ S., long. 178° 14′ W., near Kermadec Island, three or four degrees north of

New Zealand, at a depth of 520 fathoms, on hard ground, where the sea-temperature at the bottom was 6° C.

A fine specimen was also taken 2000 miles from the last place, in lat. 2° 33′ S., and long. 144° 4′ E., north of New Guinea, at a depth of 1070 fathoms, on *Globigerina*-ooze, with a bottom-temperature of 2°·1 C.

Polycheles baccatus, n. sp.

Lateral margins of the carapace subparallel; anterior division armed with twelve teeth, median with five, and posterior with many, extending to the posterior margin; anterior margin serrated and armed with teeth on the inner side of the antero-lateral angle; central ridge projected into a rostriform tooth supported by two small teeth; median dorsal ridge without teeth or spines; but a few bead-like points fringe the posterior part of the median line and the posterior margin. Pleon carinated on each of the four anterior somites and projected into an anteriorly pointed tooth. Eye lodged in a deep notch in the antero-dorsal surface of the carapace. Meros of the first pair of pereiopoda smooth, except a small tooth on the outer distal angle.

This species was taken in lat. 19° 10′ S., long. 179° 40′ E., near the Fiji Islands, at a depth of 310–315 fathoms, on a bottom that is marked "r.c." in the plans.

Pentacheles differs from *Polycheles* in having the last pair of pereiopoda always more or less perfectly chelate.

Pentacheles lævis, n. sp.

Carapace ovate; lateral margins serrated conspicuously at the anterior extremity, the serration gradually decreasing in importance posteriorly; frontal surface having the inner canthus of the orbit produced to a prominent tooth, and two rostral teeth in the median line, behind which, on the median ridge, there are two small teeth; the rest of the dorsal surface is smooth. Pleon slightly carinated, but not very distinctly so. Posterior pair of pereiopoda imperfectly chelate.

Taken in lat. 4° 33′ N., long. 127° 6′ E., at a depth of 500 fathoms, on a bottom of *Globigerina*-ooze with a temperature of 5°·3 C., south of the Philippine Islands.

Pentacheles Suhmi, n. sp.

Carapace with lateral margins subparallel; anterior division armed with five strong teeth, median with two, and posterior with eight or nine strong teeth that are continuous to the posterior margin; frontal margin having a single sharp tooth on the inner side of the orbital angle, and two central rostral teeth, posterior to which are two single and two double teeth on the central dorsal ridge of the anterior portion of the carapace; two teeth closely set are situated on the anterior and posterior extremities of the central ridge. The pleon is carinated, each somite being formed into two unequal teeth, the anterior being the longer and most anteriorly projecting.

Taken in lat. 47° 48′ S., long. 74° 48′ W., on the west coast of Patagonia, 120 fathoms, in mud.

Pentacheles gracilis, n sp.

Carapace long, ovate; lateral margins evenly denticulated from the anterior to the posterior extremities; anterior division armed with nine teeth, the median with three, and the posterior with fifteen; the frontal margin has two rostriform teeth, and one still more prominent at the inner canthus of each orbit. The median longitudinal dorsal ridge armed through the entire length with a single row of sharp teeth, of which the anterior are the more prominent. Pleon carinated, but only the three anterior somites are armed with sharp cusps. Anterior pair of pereiopoda having several small spines on the inner margin of the meros; posterior pair unequally chelate.

Taken in lat. 19° 10′ S., long. 179° 10′ E., off the Fiji Islands, at a depth of from 210 to 610 fathoms, on a bottom of *Globigerina*-ooze, with a temperature of the sea-bottom of 3°·7 C.

Pentacheles obscurus, n. sp.

Carapace with the lateral margins parallel and unevenly denticulated; frontal margin with two central rostriform teeth; divisions of the carapace not well-defined, anterior with three or four small teeth separated from each other, median with three similar teeth, and the posterior with five or six. Anterior pair of pereiopoda with the meros short and smooth; posterior pair unequally chelate. Pleon carinated, tuberculous in the median line.

Taken in lat. 2° 33′ S., long. 144° 4′ E., north of New Guinea, at a depth of 1070 fathoms, at a temperature of 2°·1 C., on a bottom of *Globigerina*-ooze.

The only specimen of this species was in a very imperfect condition, being apparently an animal that had but recently shed its skin.

Pentacheles auriculatus, n. sp.

Carapace with the lateral margins nearly parallel; anterior division with five teeth, median with three, and posterior with five or six; frontal margin with two long rostriform teeth near the centre, and one small one above the inner angle of the orbit. Median dorsal ridge strongly denticulated on the anterior portion, and having two double spines on the posterior, and a single tooth on each side of the median line on the posterior margin. Pleon carinated, with the ridge on the third and fourth somite produced to a long anteriorly curved sharp point. Anterior pair of pereiopoda with meros smooth on the inner surface and one tooth on the outer near the base, and one near the apex; posterior pair chelate, with unequal dactyla. Coxal plates ridged with markings like small ears.

Taken in lat. 19° 10′ S., long. 178° 10′ E., at a depth of 610 fathoms, off Fiji, on a bottom of *Globigerina*-ooze.

Pentacheles enthrix (Willemoes-Suhm, MS.).

Carapace with lateral margins slightly convex; anterior division with eight teeth, median with four, and posterior with twelve or fourteen. Frontal margin with two rostriform teeth, and a few unequally small teeth between them and the orbital notch; a few single and double teeth along the median dorsal ridge, two on the central median ridge, and three on each side of the median ridge on the posterior margin. Pleon dorsally carinated and evenly cusped. Anterior pair of pereiopoda with two spines on the outer side of the meros; posterior pereiopoda evenly chelate.

Taken in lat. 29° 55′ S., long. 178° 14′ W., on hard bottom, at a depth of 520 fathoms, and in lat. 19° 10′ S., long. 179° 40′ E., at a depth of 315 fathoms.

Willemoesia leptodactyla.

Willemoesia leptodactyla, Willemoes-Suhm, Linn. Soc. Trans. vol. i. 2nd ser. p. 50, pl. xiii. figs. 1–9.

Carapace with the lateral margins subparallel or slightly convex; anterior division with six teeth, median with four, and the posterior with fifteen. Frontal margin with slight orbital notches, and a single rostriform tooth in the centre. Median dorsal ridge armed with a few sharp teeth. Pleon carinated, each of the five outer somites having a sharp anteriorly directed tooth. Anterior pair of pereiopoda having the outer margin of the meros smooth, and the inner fringed with small spines, and a large anteriorly directed tooth on the inner surface of the dactyloid process of the propodos. Pleon carinated, the five anterior somites produced into sharp, anteriorly pointed cusps.

Taken in lat. 21° 38′ N., long. 44° 39′ W., at a depth of 1900 fathoms, in the middle of the North-Atlantic Ocean, on a bottom of *Globigerina*-ooze, with a bottom-temperature of 1°·9 C., and near the island of Juan Fernandez, at a depth of 1375 fathoms on *Globigerina*-ooze, 1°·8 C.

		fathoms.	Temp.	
POLYCHELES.				
crucifer	West Indies.	450	..	*Glob.*-ooze.
Helleri	Kermadec Isl.	520	6°	Hard.
„	New Guinea.	1070	2°·1	*Glob.*-ooze.
baccatus	Fiji.	310	..	r.c.
typhlops	Mediterranean.			
PENTACHELES.				
lævis	Philippine Isl.	500	5°·3	*Glob.*-ooze.
Suhmi	Patagonia.	120	..	Mud.
gracilis	Fiji.	610	3°·7	*Glob.*-ooze.
obscurus	New Guinea.	1070	2°·1	*Glob.*-ooze.
auriculatus	Fiji.	610	..	*Glob.*-ooze.
enthrix	New Hebrides.	315	..	r.c.
WILLEMOESIA.				
leptodactyla	North Atlantic.	1900	1°·9	*Glob.*-ooze.
„	Juan Fernandez.	1375	1°·8	*Glob.*-ooze.

The eyes of the several genera although they may differ from each other in structural detail, yet correspond throughout the group in a common characteristic. The peduncle is reduced to a minimum and fixed as a rigid part of the dermal structure, over which a portion of the carapace is projected.

If we turn to the animal while it is yet embryonic (and our only opportunity is its observation before it has quitted the egg) although in an advanced condition, we see that previously to the eruption from the ovum it attains at least the zoëa stage of development, and that the eyes are large and distinctly pedunculated, just in the same way as the zoëa of *Alpheus* in the embryonic condition has eyes considerably larger and more like the permanent organ in other genera than the adult parent from which it springs.

The alteration from the original type to a depauperized condition is therefore due to a cause acting through the habits of the animal after it has passed through its zoëa stage. This is precisely the way that *Alpheus* has passed; and as the result has been somewhat similar, it is highly probable that the conditions have been parallel.

Alpheus in the young stage is a free-swimming animal with powerful organs of vision; but in its adult condition it burrows in the mud of the sea-bottom, where the eye is of little use, except to see things in close proximity, and where it is liable to injury from rough accidents, unless it were protected, as it is, by the strength of the overlying carapace.

The history of *Willemoesia* and its allies I believe to be very parallel with that of *Alpheus*. In its young stage it has well-developed eyes, which it loses when it has arrived at its adult condition. This I believe to be attributable to a similar cause, viz. that it burrows in the soft mud of the deep-sea bottom.

This is borne out by an examination of the contents of the stomach, which I found to be full of the remains of the structures found in the *Globigerina*-ooze.

That the depauperized state of the organs of vision is not due to the loss of light from the great depth at which *Willemoesia* is taken is evident from the fact that *Thalascaris*, n. g. (Crangonidæ), is taken at depths equally great, and is remarkable for the large size of its eyes.

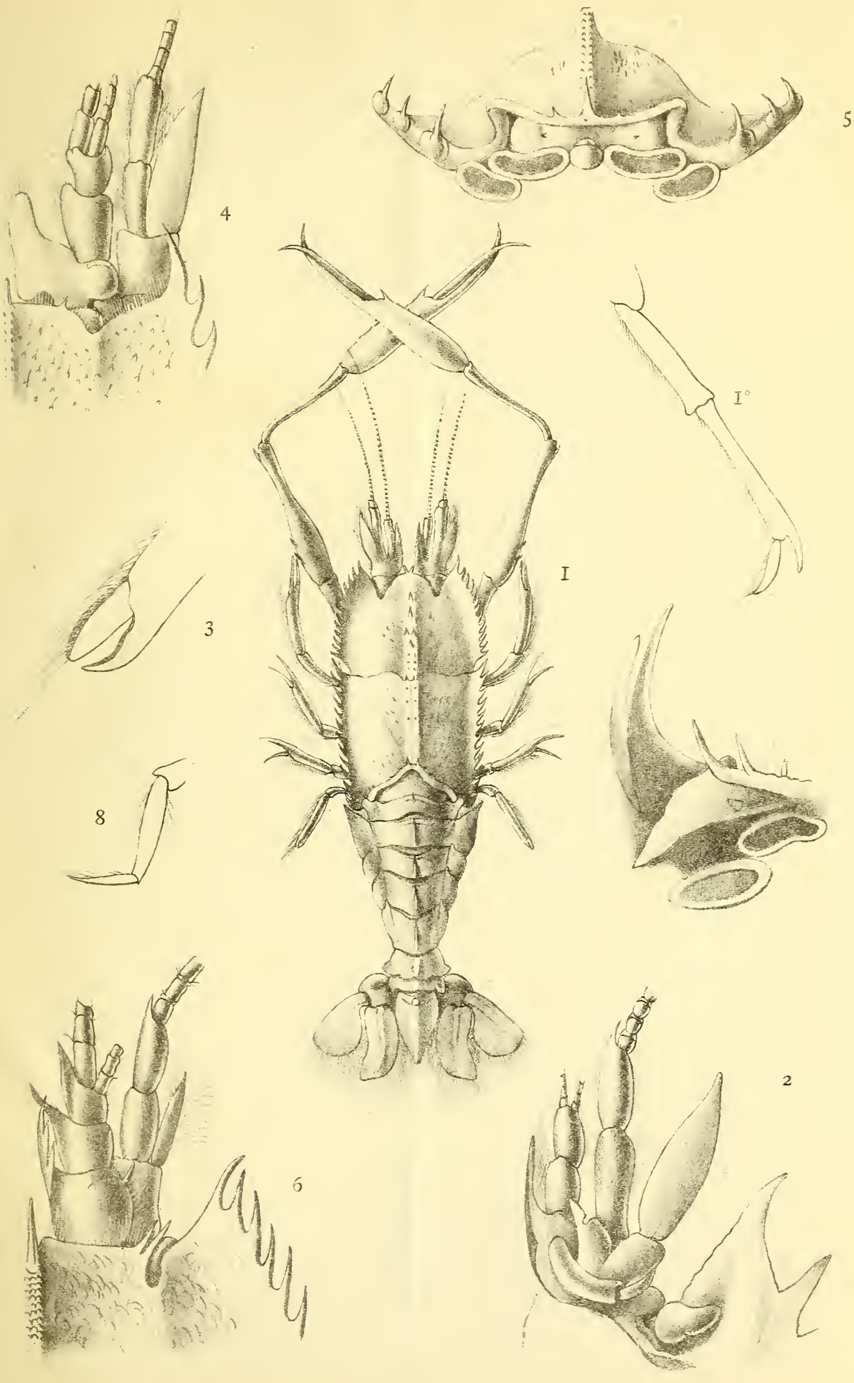
Willemoesia, moreover, is not one of our deepest sea inhabitants. *Willemoesia leptodactyla* was taken both in the Atlantic and Pacific at a depth of 1900 and 1375, while *Polycheles Helleri* and *Pentacheles obscurus* were taken north of New Guinea at a depth of 1070; yet most of the other species, even including *Polycheles Helleri*, were taken at depths between 610 and 120 fathoms.

The bottom temperature has only been recorded in seven of the stations at which the species were taken—that is, only from the deeper soundings; these, however, vary from 6° to 1°·8 C. I am therefore inclined to think that temperature can only be second to that of the character of the sea-bottom itself.

Out of the thirteen stations from which specimens of this group have been recorded, the bottom consists of what has been named *Globigerina*-ooze in eight, one is recorded of mud, and two "r.c." (which, I suppose, means red clay), and one only on hard ground; but as this occurs only once, and that with an animal (*Polycheles Helleri*) that is also recorded from another station where *Globigerina*-ooze exists, I think that we may safely infer that the whole group are inhabitants of a soft bottom, preferring that in which animal life suitable for their existence abounds, and that their general structure and form are in accord with their habitat.

EXPLANATION OF PLATE XIII.

Fig. 1. *Pentacheles enthrix.*
Fig. 2. The same : eye, seen from beneath.
Fig. 3. The same : chela of the posterior pair of pereiopoda.
Fig. 4. *Willemoesia leptodactyla* : anterior portion of one side of the carapace, showing eye and 1st and 2nd antennæ.
Fig. 5. The same : frontal margin of carapace, showing eyes, seen in front.
Fig. 6. *Polycheles crucifer* : anterior portion of one side of carapace, showing eyes and the 1st and 2nd antennæ, seen from above.
Fig. 7. The same : eye, seen beneath and in front.
Fig. 8. The same : fifth pair of pereiopoda.


4
5
1
1°
3
8
7
2
6

List of the Crustacea mentioned in Sunderland's "Journal of a Voyage in Baffin's Bay and Barrow Straits" London 1852 Vol II appendix

Entomostraca by Dr. Baird

ccii Arpacticus kronii Kroyer Davis Straits lat 66° 34' long 55° 8. figure (4) given

cciii Arpacticus chelifer Baird Davis Straits lat 73° 20' long 57° 16'

Cypridina brenda Baird Assistance Bay

Cyclopsina sp Davis Straits lat 73° 20 long 57° 16

Cyclops sp " " " "

Cetochilus septentrionalis Baird North Sea

Cetochilus arcticus Baird n.s. (fig 3) common in arctic seas "lat 71° 21', off Cape Desolation, in lat. 64° 19', and in Melville bay"

cciv Calanus uncinatus Baird n.s. fig 2. Assistance Bay seven to fifteen fathoms.

Decapoda & Tetradecapoda by Arthur Adams

ccv Crangon boreas Fabr Assistance Bay 12-15 faths.

? Crangon 7-carinatus Sabine " " 7-15 faths

Palaemon form specimens unidentified

Alpheus aculeatus (O Fabr) lat 66° 34'. long 55° 8' in ccv stomach of Cod taken in 40 faths

Hippolyte polaris (Sab) Assistance Bay 7 - 15 faths

Mysis flexuosus (Müll) Lamk Union Bay Beechey Is 15 f

ccvi Gammarus nugax Sab W. C. Greenland 4 - 20 faths

Acanthonotus tricuspis Kr. " " " " "

Amphithoe Edwardsii (Sabine) Assistance Bay 7 faths

Stegocephalus inflatus Kr " "

· Anonyx five specimens unidentified

Archimus baffinii (Sab) Union Bay Beechey Is 15 faths

ccvii Saduria [Idotea] Entomon (Lin) Assistance Bay 7 faths

The following by Adam White

Caprella cercopoides White n.s (fig 1) Lat 73°16 Long 57°16

W. C. Greenland 4 - 20 faths

Nymphon crassipes White n.s. (fig 5) Union Bay

ccviii Pycnogonum - near gracipes (fig 6) Union Bay

1855 (14)

J Kingsley

CATALOGUE

OF

CRUSTACEA

IN

THE COLLECTION

OF THE

BRITISH MUSEUM.

PART I.

LEUCOSIADÆ.

BY

THOMAS BELL, V.P.R.S., Pres. L.S., &c.

LONDON:

PRINTED BY ORDER OF THE TRUSTEES.

1855.

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RED LION COURT, FLEET STREET.

PREFACE.

The principal object of the present Catalogue is to give a complete List of the Crustacea, with descriptions of all the genera and species known to exist, indicating at the same time, by a B.M. in the margin, those contained in the British Museum. When the specimen is not to be seen in that Collection, a reference is made to the Cabinet from whence the description was obtained.

For fuller descriptions and figures of the new genera and species in this Part of the Catalogue, the student is referred to the Twenty-first volume of the Transactions of the Linnean Society.

JOHN EDWARD GRAY.

1 December, 1855.

CATALOGUE

OF

CRUSTACEA.

Fam. LEUCOSIADÆ.

Genus 1. LEUCOSIA.

Char. Gen.—Testa ovato-orbicularis, subglobosa, lævis, polita; fronte subproducto, fossulas antennarias tegente. Orbita fissuris tribus. Fossæ antennariæ obliquæ, apertæ. Pedipalpi externi caule exteriore lateribus parallelis, recto vel subcurvo, apice obtuso; caule interiore acutè triangulari. Pedes antici crassiores, longitudine mediocres; brachiis ad basin et ad latera tuberculatis; digitis tenuibus subinflectis; pedum paria quatuor posteriora, a secundo ad quintum sensìm breviora. Abdomen *Maris* in nonnullis speciebus segmentis omnibus, primo et ultimo exceptis, in aliis tertio cum quarto, et quinto cum sexto—*Fœminæ* a tertio ad sextum coalitis.

Leucosia, sp., *Fabr. Supp.* p. 352.
Leach, Zool. Misc. iii. p. 21.
Edw. Hist. Nat. Crust. ii. p. 121.

1. Leucosia Urania. B.M.

Testâ subglobosâ, anticè productâ, fronte rotundato; brachiis triedris, suprà ad basin tuberculis paucis; sinu thoracico usque ad latera regionis hepaticæ anticè attingente, granis suprà marginato.

Rumph. t. 10. f. A, B.
Seba, iii. t. 19. f. 4, 5.

Cancer Urania, *Herbst*, iii. t. 53. f. 3.
Leucosia Urania, *Leach, Zool. Misc.* iii. p. 21.
Edw. Règ. Anim. de Cuv., Crust. t. 25. f. 2; *Hist. Nat. des Crust.* ii. p. 122.
Bell, Trans. Linn. Soc. xxi. p. 283.

Hab. Maria orientalia.

2. LEUCOSIA CRANIOLARIS. B.M.

Testâ rhomboideâ, fronte tridentato; brachiis serie tuberculorum ad latera, et tuberculis duobus tantùm suprà ad basin.

Cancer craniolaris, *Linn. Mus. Lud. Ulr.* p. 431.
Herbst, t. 2. f. 17.
Leucosia craniolaris, *Fabr. Supp.* p. 350.
Leach, Zool. Misc. iii. p. 21.
Edw. Hist. Nat. des Crust. ii. p. 122.
Bell, Trans. Linn. Soc. xxi. p. 283.

Hab. Ad oras maris orientalis.

3. LEUCOSIA OBTUSIFRONS. B.M.

Fronte rotundato; sinu thoracico anticè circulari, tuberculis circumscripto; brachiis ad latera et ad basin tuberculatis; manibus longioribus quam latioribus, serie granulorum ad marginem interiorem.

Leucosia obtusifrons, *De Haan, Crust. Japon.* p. 133. t. 33. f. 2.
Bell, Trans. Linn. Soc. xxi. p. 284.

Hab. Ad ins. Japoniam.

4. LEUCOSIA UNIDENTATA. B.M.

Fronte unidentato; sinu thoracico anticè circulari, tuberculis perlatis circumscripto; brachiis facie superiore seriebus binis tuberculorum.

Leucosia unidentata, *De Haan, Crust. Japon.* p. 133. t. 33. f. 3.
Bell, Trans. Linn. Soc. xxi. p. 284.

Hab. Japonia, ins. Moluccenses, &c.

5. LEUCOSIA RHOMBOIDALIS. B.M.

Testâ rhomboidali, anticè productâ, multò longiore quam latiore; brachiis basi utrinque densè tomentosis, lateribus tuberculatis, suprà plerumque lævibus.

Leucosia rhomboidalis, *De Haan, Crust. Japon.* p. 132. t. 33. f. 5.
Bell, Trans. Linn. Soc. xxi. p. 284.

Hab. ——?

6. Leucosia longifrons. B.M.

Testâ subglobosâ, fronte producto, integerrimo; sinu thoracico anticè elliptico, granis non cincto; brachiis lateribus tuberculatis et granulis paucis ad basin.

Leucosia longifrons, *De Haan, Crust. Japon.* p. 132. t. 33. f. 4. *Bell, Trans. Linn. Soc.* xxi. p. 284.

Hab. ——?

7. Leucosia orbicularis. B.M.

Testâ orbiculari, fronte lato, brevissimo, bidentato; sinu thoracico nullo; sterno in utroque sexu anticè granulato.

Leucosia orbicularis, *Bell, Trans. Linn. Soc.* xxi. p. 284. t. 30. f. 1.

Hab. Ad oras Australiæ.

8. Leucosia pallida. B.M.

Fronte tridentato, ultra orbitâ producto; sinu thoracico in sulco brevi profundo anticè terminato, granulis paucis supra insertionem pedum anteriorum; manibus utrinque subcarinatis omninò lævibus; digitis inermibus.

Leucosia pallida, *Bell, Trans. Linn. Soc.* xxi. p. 285. t. 30. f. 2.

Hab. In mari orientali.

9. Leucosia obscura. B.M.

Testâ suborbiculari, rostro ultra orbitâ producto, minutè tridentato; sinu thoracico angustissimo; manibus longioribus quam latioribus, utrinque carinatis, non granulatis; digitis inermibus.

Leucosia obscura, *Bell, Trans. Linn. Soc.* xxi. p. 285. t. 30. f. 3.

Hab. Ad insulas Philippinas.

10. Leucosia marmorea. B.M.

Testâ longiore quam latiore, maculis sex albidis; sinu thoracico anticè brevi, lineâ semicirculari granulatâ terminato; fronte minutè tridentato, dente medio longiore; brachiis ad basin et ad latera tuberculatis; manibus margine interno granulato, externo rotundato.

Leucosia marmorea, *Bell, Trans. Linn. Soc.* xxi. p. 286. t. 30. f. 4.

Hab. Ad insulas Philippinas.

11. LEUCOSIA PUNCTATA. B.M.

Testâ impresso-punctatâ, fronte producto, subemarginato; brachiis suprà omninò granulatis.

Leucosia punctata, *Bell, Trans. Linn. Soc.* xxi. p. 286. t. 30. f. 5.

Hab. In mari Indico.

12. LEUCOSIA AFFINIS.

Testâ anticè angustatâ, fronte valdè producto, subemarginato; manibus longioribus quam latioribus, utrinque carinatis; brachiis anticè tumidis, lævissimis, politis.

Leucosia affinis, *Bell, Trans. Linn. Soc.* xxi. p. 287. t. 30. f. 6.

Hab. Ad insulas Philippinas. ♂ Mus. Bell.

13. LEUCOSIA BREVIMANA.

Testâ subrhomboidali, fronte emarginato, margine laterali vix granulato; manibus æquè longis ac latis, internè subcarinatis, lævibus.

Leucosia brevimana, *Bell, Trans. Linn. Soc.* xxi. p. 288. t. 30. f. 7.

Hab. Ad insulas Philippinas. Mus. Bell.

14. LEUCOSIA MARGARITACEA. B.M.

Testâ multò longiore quam latiore, lævissimâ, margaritaceâ; sinu thoracico margine lævi; brachiis suprà tuberculis albis, rubro cinctis.

Leucosia margaritacea, *Bell, Trans. Linn. Soc.* xxi. p. 288. t. 30. f. 8.

Hab. In oceano orientali.

15. LEUCOSIA OCELLATA. B.M.

Testâ rhomboidali, fronte tridentato; regione gastricâ maculis quatuor parvis rubris signatâ, quarum binæ anteriores ocellatæ.

Leucosia ocellata, *Bell, Trans. Linn. Soc.* xxi. p. 289. t. 31. f. 1.

Hab. Ad oras orientales Australiæ.

16. LEUCOSIA HÆMATOSTICTA. B.M.

"Thorace trapezoidali, suprà valdè convexo, post angulum latero-anteriorem incisurâ profundâ, maculis multis sanguineis rotundatis obsito."

Leucosia hæmatosticta, *Adams & White, Zool. Voyage of the Samarang*, p. 54. t. 12. f. 2.
Bell, Trans. Linn. Soc. xxi. p. 289.

"*Hab.* Maria orientalia."

17. Leucosia Whitei. B.M.

Testâ rhomboideâ, fronte producto, minutè tridentato; regionibus hepaticâ et branchiali granulis tribus vel quatuor; brachiis tomentosis, tuberculis magnis omninò instructis.

Leucosia Whitei, *Bell, Trans. Linn. Soc.* xxi. p. 289. t. 31. f. 2.

Hab. Ad oras Australiæ.

18. Leucosia Cumingii. B.M.

Testâ suborbiculari, margine lævi; sinu thoracico incisurâ inter regiones hepaticam et branchialem anticè terminato; regionibus branchialibus valdè tumidis.

Leucosia Cumingii, *Bell, Trans. Linn. Soc.* xxi. p. 290. t. 31. f. 3.

Hab. Ad insulas Philippinas.

19. Leucosia pulchella. B.M.

Testâ æquè longâ ac latâ, margine laterali lævi, tenui, subreflexo; brachiis suprà et infrà omninò tuberculatis; pedipalpis externis anticè paulò angustatis.

Leucosia pulchella, *Bell, Trans. Linn. Soc.* xxi. p. 290. t. 31. f. 4.

Hab. In mari Sinensi.

20. Leucosia phyllocheira. B.M.

Manibus latioribus quam longioribus, utrinque lamellatis; pedibus omnibus posterioribus articulo penultimo lato, compresso, utrinque carinato.

Leucosia phyllocheira, *Bell, Trans. Linn. Soc.* xxi. p. 291. t. 31. f. 5.

Hab. Ad insulam Borneo.

Genus 2. ILIA.

Char. Gen.—Testa subglobosa, posticè dentibus quatuor armata, quarum utrinque una compressa ad regionem intestinalem, et una conica ad branchialem; fronte bifido. Orbita suprà fissuris duabus. Pedipalpi externi caule exteriore recto, apice obtuso. Pedes antici longissimi, graciles, manibus contortis, antrorsùm angustatis.

Ilia, *Leach, Zool. Misc.* iii. p. 24.
Edw. Hist. Nat. Crust. ii. p. 123.

A 5

1. Ilia Nucleus. B.M.

Testâ minutè confertè granulosâ, granulis majoribus distantibus instructâ.

Cancer Nucleus, *Linn. Syst. Nat.* 1042. 20.
Herbst, i. p. 87. t. 2. f. 14.
Leucosia Nucleus, *Fabr. Suppl.* p. 351.
Latr. Hist. Nat. Crust. vi. p. 116.
Ilia Nucleus, *Leach, Zool. Misc.* iii. p. 24.
Roux, Crust. de la Méditerr. t. 8. f. 1–8.
Edw. Règ. Anim. de Cuv., Crust. t. 25. f. 2; *Hist. Nat. Crust.* ii. p. 124.
Bell, Trans. Linn. Soc. xxi. p. 292.

Hab. Ad oras maris Mediterranei.

2. Ilia rugulosa.

Testâ glabrâ, sparsim granulosâ, anticè lævi.

Ilia rugulosa, *Roux, Crust. de la Méditerr.* t. 8. f. 9–12.
Edw. Hist. Nat. Crust. ii. p. 125.
Bell, Trans. Linn. Soc. xxi. p. 292.

Hab. Ad oras maris Mediterranei.

Genus 3. PERSEPHONA.

Char. Gen.—Testa ovalis vel orbicularis, depressa, dentibus tribus ad partem posteriorem armata, regionibus pterygostomianis angulatis. Orbita trifissa. Fossæ antennariæ transversæ. Pedipalpi externi caule exteriore paulo dilatato, sensim angustiore, ad apicem internè truncato. Pedes antici robusti, testâ haud bis longiores; reliqui articulis ultimo et penultimo compressis. Abdomen *Maris* segmentis a tertio ad quintum,—*Fœminæ* a quarto ad sextum coalitis.

Persephona, *Leach, Zool. Misc.* iii. p. 22.
Edw. Hist. Nat. Crust. ii. p. 136.
Ilia § 2, *Edw. Hist. Nat. Crust.* ii. p. 125.
Guaia, *Edw. Hist. Nat. Crust.* ii. p. 127.

P. punctata Br.
1. Persephona Guaia. B.M.

n.a
Testâ ovatâ, sparsìm tuberculatâ, angulo pterygostomiano obtusissimo, spinâ mediâ posticâ lateralibus paulò altiore.

Cancer punctatus, *Browne, Hist. Jamaica*, i. t. 42. f. 3.
Cancrejo tortuga, *Parra, Descrip. &c.* t. 51. f. 2.
Cancer Mediterraneus, *Herbst*, ii. t. 37. f. 2.

Persephona Latreillii, *Leach, Zool. Misc.* iii. p. 22.
Desmar. Cons. sur les Crust. p. 168.
Persephona Lamarckii, *Leach, Zool. Misc.* iii. p. 23.
Desmar. Crust. p. 168.
Guaia punctata, *Edw. Hist. Nat. Crust.* ii. p. 127.
Persephona Guaia, *Bell, Trans. Linn. Soc.* xxi. p. 292.
Hab. Ad insulas Antillas.

2. Persephona Lichtensteinii. B.M.

Testâ orbiculari, angulo pterygostomiano in dente producto, margine laterali unidentato; spinis posticis æqualibus, medio cum lateralibus triangulum æquilateralem designante.

Persephona Lichtensteinii, *Leach, Zool. Misc.* iii. p. 22.
Bell, Trans. Linn. Soc. xxi. p. 293. t. 31. f. 6.
Hab. ——?

3. Persephona orbicularis.

Testâ orbiculari, angulo pterygostomiano in tuberculo abruptè producto; spinis posticis æqualibus, angulum ferè rectum designantibus.

Persephona orbicularis, *Bell, Trans. Linn. Soc.* xxi. p. 294. t. 31. f. 7.
Hab. Ad Valparaiso. Mus. Bell.

4. Persephona Edwardsii.

Testâ suborbiculari, anticè subproductâ, angulo pterygostomiano obsoleto; spinâ posticâ mediâ lateralibus multò altiore, paulò longiore. a

Persephona Edwardsii, *Bell, Trans. Linn. Soc.* xxi. p. 294. t. 31. f. 8.
Hab. Ad insulas Galapagos. Mus. Bell.

Genus 4. LEUCOSILIA.

Char. Gen.—Testa orbicularis, subglobosa, fronte dentibus binis divergentibus terminatâ; regione intestinali unidentatâ. Fossæ antennariæ obliquæ, e dentibus frontis excavatæ. Orbita fissuris tribus. Pedipalpi externi caule exteriore subcurvo apice obtuso. Pedes antici robusti, longitudine mediocres. Abdomen *Maris* segmentis tertio, quarto, quinto coalitis, penultimo unidentato,—*Fœminæ* latè ovatum, valdè convexum.

Leucosilia, *Bell, Trans. Linn. Soc.* xxi. p. 295.

1. Leucosilia Jurinii. B.M.

Guaia (Ilia) Jurinii, *Sauss.*
Leucosilia Jurinii, *Bell, Trans. Linn. Soc.* xxi. p. 295. t. 32. f. 1.
Hab. Ad insulas Galapagos.

Genus 5. MYRA.

Char. Gen.—Testa ovato-globosa, posticè tridentata. Orbita fissuris tribus profundis. Fossæ antennariæ obliquæ. Pedipalpi externi caule exteriore ad marginem exteriorem dilatato. Pedes antici longissimi, graciles, manibus rectis. Abdomen *Maris* segmentis a tertio ad sextum,—*Fœminæ* a quarto ad sextum coalitis.

Myra, *Leach, Zool. Misc.* iii. p. 24.
Edw. Hist. Nat. Crust. ii. p. 126.

1. Myra fugax. B.M.

Testâ subglobosâ, in medio elevatâ, non carinatâ, spinâ posticâ mediâ lateralibus bis longiore, spinis lateralibus compressis.

? *Rumph. Mus.* t. 10. f. C.
? *Browne, Jam.* t. 42. f. 3.
?? Cancer punctatus, *Linn. Syst. Nat.* p. 1054. 36.
? *Herbst,* i. p. 89. t. 2. f. 15, 16.
Leucosia fugax, *Fabr. Suppl.* p. 351.
Myra fugax, *Leach, Zool. Misc.* iii. p. 24.
Edw. Hist. Nat. des Crust. ii. p. 126; *Règ. Anim. Cuv., Crust.* t. 25. f. 3.
De Haan, Crust. Japon. p. 134. t. 33. f. 1.
Bell, Trans. Linn. Soc. xxi. p. 296.
Hab. In mari orientali.

2. Myra affinis. B.M.

Testâ ovato-globosâ, spinis posticis brevibus, subæqualibus; pedibus anticis thorace vix bis longioribus; manu digitis tertiâ parte longiore.

Myra affinis, *Bell, Trans. Linn. Soc.* xxi. p. 296. t. 32. f. 2.
Hab. Ad insulas Philippinas.

3. Myra carinata. B.M.

Testâ ovatâ, minutè granulatâ, carinatâ; spinâ posticâ mediâ lateralibus ter quaterve longiore, lateralibus conicis, acutis.

?? Cancer punctatus, *Herbst.*
?? Ilia punctata, *Edw. Hist. Nat. Crust.* ii. p. 125.
Myra carinata, *Bell, Trans. Linn. Soc.* xxi. p. 297. t. 32. f. 3.
Hab. Ad insulas Philippinas.

4. Myra elegans. B.M.

Testâ bis longiore quam latiore (spinâ posticâ non inclusâ), margine anteriore setoso.

Myra elegans, *Bell, Trans. Linn. Soc.* xxi. p. 297. t. 32. f. 4.
Hab. In mari orientali.

5. Myra mammillaris. B.M.

Testâ ovatâ, glabrâ, tuberculis parvis elevatis sparsìm instructâ; dentibus posticis brevissimis, rotundatis.

Myra mammillaris, *Bell, Trans. Linn. Soc.* xxi. p. 298. t. 32. f. 5.
Hab. Ad oras Australiæ.

Genus 6. MYRODES.

Char. Gen.—Testa ovata, rostro emarginato terminata, posticè dentibus tribus, quarum media longior, armata. Orbita fissuris tribus, brevibus. Fossæ antennariæ ferè longitudinales. Pedipalpi externi caule exteriore subcurvo, haud dilatato. Pedes antici testâ vix longiores; manibus pyriformibus, haud longioribus quam latioribus; digitis tenuibus valdè elongatis, curvis, apice aduncis. Abdomen *Maris* triangulare, segmentis tertio ad sextum coalitis,—*Fœminæ* —— ?

Myrodes, *Bell, Trans. Linn. Soc.* xxi. p. 299.

1. Myrodes eudactylus. B.M.

Myrodes eudactylus, *Bell, Trans. Linn. Soc.* xxi. p. 299. t. 32. f. 6.
Hab. Ad insulas Philippinas.

Genus 7. PHILYRA.

Char. Gen.—Testa orbicularis, depressa, inermis, fronte epistomate breviore. Fossæ antennariæ ferè transversales. Orbita suprà aperta, trifissa. Pedipalpi externi caule exteriore dilatato. Pedes octo posteriores tarso compresso, lamelloso. Abdomen *Maris* hastato-lanceolatum,—*Fœminæ* articulo ultimo angusto valdè producto.

Leucosia, sp., *Fabr. Supp. Ent. Syst.* p. 349.
Philyra, *Leach, Zool. Misc.* iii.
Edw. Hist. Nat. Crust. ii. p. 131.

1. PHILYRA SCABRIUSCULA. B.M.

Testâ depressâ, granuloso-scabrâ, fronte epistomate multò breviore; brachiis tuberculatis, manibus ad marginem interiorem lineis duabus granulatis.

Seba, iii. t. 19. f. 9, 10.
Leucosia scabriuscula, *Fabr. Supp. Ent. Syst.* p. 349.
Cancer cancellus?, *Latr. Hist. Nat. des Crust.* v. p. 116.
Herbst, i. p. 94. t. 2. f. 20.
Philyra scabriuscula, *Leach, Zool. Misc.* iii.
Desmar. Cons. Crust. p. 167.
Edw. Hist. Nat. Crust. ii. p. 132. t. 20. f. 9, 10.
Bell, Trans. Linn. Soc. xxi. p. 299.

Hab. In mari Indico.

2. PHILYRA GLOBULOSA. B.M.

Testâ globosâ, lævi, margine laterali granulato; fronte vix epistomate breviore, brachiis granulatis.

Cancer globosus, *Fabr. Ent. Syst.* ii. p. 441.
? *Herbst*, i. p. 90.
Leucosia globulosa, *Fabr. Supp. Ent. Syst.* p. 349.
Latr. Hist. Nat. des Crust. vi. p. 117.
Lichtenstein, p. 141.
Philyra globulosa, *Leach, Zool. Misc.* iii.
Desmar. Cons. Crust. p. 168.
Edw. in Cuv. Règne Anim. t. 24. f. 4; *Hist. Nat. Crust.* ii. p. 132.
Bell, Trans. Linn. Soc. xxi. p. 300.

Hab. ——?

3. PHILYRA PORCELLANA.

Testâ globosâ, minutè punctatâ; fronte epistomate parùm breviore; margine granulato; brachiis cylindricis tuberculatis; manibus inflatis, lævibus.

Seba, iii. t. 19. f. 9 & 19.
Cancer porcellanus, *Fabr. Ent. Syst.* ii. p. 441.
Herbst, i. p. 92. t. 2. f. 18.

Leucosia porcellana, *Fabr. Supp. Ent. Syst.* p. 350.
Latr. Hist. Nat. des Crust. iv. p. 117.
Philyra porcellana, *Edw. Hist. Nat. Crust.* ii. p. 133.
Bell, Trans. Linn. Soc. xxi. p. 300.

Hab. —— ?

A specie præcedente anne distincta ?

4. Philyra Pisum.

"Fronte epistomate parùm breviore; regionibus pterygostomianis medio angulatis; thorace granulato; chelis in maribus thoracem dimidio superantibus; digitis in longitudinem 5 sulcatis, margine interno denticulatis." Testæ longit. unc. 0·8.

Philyra Pisum, *De Haan, Crust. Japon.* p. 131. t. 33. f. 7.
Bell, Trans. Linn. Soc. xxi. p. 300.

Hab. Ad Japoniæ oras.

5. Philyra platycheira.

"Parva; regionibus pterygostomianis medio angulatis; fronte epistomate parùm breviore; chelis in maribus thorace bis longioribus, digitis valdè depressis, lævibus, margine interno integerrimis." Testæ longit. unc. 0·5.

Philyra platycheira, *De Haan, Crust. Japon.* p. 135. t. 33. f. 6.
Bell, Trans. Linn. Soc. xxi. p. 300.

Hab. Cum præcedente et ad insulas Philippinas. Mus. Bell.

6. Philyra lævis. B.M.

Testâ, corpore, pedibus omninò lævibus.

Philyra lævis, *Bell, Trans. Linn. Soc.* xxi. p. 300. t. 32. f. 7.

Hab. Ad Portum "Adelaide" Australiæ.

7. Philyra Adamsii. B.M.

Testâ glabrâ, regionibus partìm et lineâ longitudinali granulatis; margine posteriore utrinque bituberculato.

Philyra Adamsii, *Bell, Trans. Linn. Soc.* xxi. p. 301. t. 33. f. 1.

Hab. —— ?

8. Philyra punctata. B.M.

Testâ orbiculari, lævi, punctatâ; angulo pterygostomiano obsoleto; brachiis triquetris.

Philyra punctata, *Bell, Trans. Linn. Soc.* xxi. p. 301. t. 33. f. 2.

Hab. Ad oras Africæ occidentalis.

9. Philyra carinata. B.M.

Testâ partìm granulosâ, inter regiones cardiacam et branchialem lævi, medio carinatâ ; manibus lineis duabus granulosis.

Philyra carinata, *Bell, Trans. Linn. Soc.* xxi. p. 302. t. 33. f. 3.
Hab. Ad Insulam Borneo.

10. Philyra macrophthalma. B.M.

Testâ ovatâ, minutissimè granulatâ ; pedunculis oculorum elongatis ; abdomine (maris) angusto, lineari.

Philyra macrophthalma, *Bell, Trans. Linn. Soc.* xxi. p. 302. t. 33. f. 4.

Hab. In mari Indico, ad ins. " Sooloo."

Genus 8. EBALIA.

Char. Gen.—Testa rhomboidalis vel subhexagona ; fronte producto, emarginato. Orbita suprà fissuris duabus. Fossæ antennariæ tectæ, obliquæ. Pedipalpi externi ad marginem epistomatis extendentes, caule exteriore margine externo recto, interiore acuminato. Pedes antici breves, crassi ; posteriores sensìm breviores, ungue forti, styliformi terminati. Abdomen *Maris* segmentis plurimis,—*Fœminæ* a tertio ad sextum confluentibus.

Ebalia, *Leach, Malac. Brit.* t. 25.
Edw. Hist. Nat. Crust. ii. p. 128.

1. Ebalia Pennantii. B.M.

Testâ granulatâ, eminentiâ longitudinali et transversali cruciformi ; margine latero-anteriore bilobato ; abdomine maris segmentis a tertio ad sextum confluentibus.

Cancer tuberosus, *Penn. Brit. Zool.* iv. t. 9 *a*. f. 19.
Ebalia Pennantii, *Leach, Malac. Brit.* t. 25. f. 1–6.
Edw. Hist. Nat. des Crust. ii. p. 129.
Bell, Brit. Crust. p. 141 ; *Trans. Linn. Soc.* xxi. p. 303.
Hab. Ad oras Britanniæ.

2. Ebalia Bryeri. B.M.

Testâ minutè granulatâ ; margine laterali integro, subrevoluto, posteriore bilobato ; regione cardiacâ bituberculatâ, branchiali utrinque unituberculatâ ; branchio haud bis longiore quam latiore. Abdomen *Maris* segmentis a tertio ad quintum,—*Fœminæ* a tertio ad quartum coalitis.

Cancer tumefactus, *Mont. Trans. Linn. Soc.* ix. p. 86. t. 2. f. 3.
Ebalia Bryerii, *Leach, Malac. Brit.* t. 25. f. 12, 13.
Bell, Brit. Crust. p. 145 ; *Trans. Linn. Soc.* xxi. p. 303.
Ebalia Brayerii, *Edw. Hist. Nat. des Crust.* ii. p. 129.

Hab. Ad oras Britanniæ australes.

3. Ebalia Cranchii. B.M.

Testâ granulatâ, carinatâ, tuberculis quinque; margine latero-anteriore ferè integro ; brachio ter longiore quam latiore.

Ebalia Cranchii, *Leach, Malac. Brit.* t. 25. f. 7–11.
Edw. Hist. Nat. des Crust. p. 129.
Bell, Brit. Crust. p. 148 ; *Trans. Linn. Soc.* xxi. p. 303.

Hab. Ad oras Britanniæ rarissimè.

4. Ebalia granulosa. B.M.

Testâ granulatâ, tuberculis sex ; margine latero-anteriore bilobo.

Ebalia granulosa, *Edw. Hist. Nat. des Crust.* p. 130.
Bell, Trans. Linn. Soc. xxi. p. 303. t. 33. f. 5.

Hab. Ad insulam Corcyram.

Genus 9. PHLYXIA.

Char. Gen.—Testa rhomboidea, tuberculis tribus posticè instructa. Orbita suprà emarginata, fissuris duabus. Fossæ antennariæ cum orbitis communicantes. Antennulæ elongatæ. Pedipalpi externi caule exteriore lato, margine externo curvo, anticè angustato; caule interiore segmento penultimo lateribus parallelis, ultimo triangulari. Abdomen in utroque sexu segmentis a tertio ad sextum coalitis.

Phlyxia, *Bell, Trans. Linn. Soc.* xxi. p. 304.

1. Phlyxia crassipes. B.M.

Testâ subcarinatâ, rostro quadrato, quadridentato ; pedibus anticis testâ plus quam duplo longioribus ; brachiis rotundis medio tumescentibus.

Phlyxia crassipes, *Bell, Trans. Linn. Soc.* xxi. p. 304. t. 34. f. 2.
Hab. Ad oras Australiæ orientales.

2. Phlyxia lambriformis. B.M.

Testâ carinatâ, rostro triangulari emarginato, margine latero-anteriore inciso, latero-posteriore acutè carinato.

Phlyxia lambriformis, *Bell, Trans. Linn. Soc.* xxi. p. 304. t. 34. f. 1.

Hab. Ad oras Australiæ orientales.

3. Phlyxia lævis. B.M.

Brachiis triedris; testâ lævi, margine laterali unidentato.

Phlyxia lævis, *Bell, Trans. Linn. Soc.* xxi. p. 305. t. 34. f. 3.

Hab. Ad Novam Zealandiam.

It may be considered perhaps as osculant between this genus and *Ebalia*.

Genus 10. LITHADIA.

Testa rhomboidea, rudis, regionibus gibbosis, rostro bifido, resupinato terminata. Orbita suprà et extrorsùm aperta. Fossæ antennariæ obliquæ. Pedipalpi externi caule exteriore ensiformi, anticè obtuso; interiore lanceolato, exteriore longiore. Pedes antici robusti, rudes; brachiis tuberculatis, ad marginem exteriorem cristatis; manibus cristatis, digitis approximatis. Abdomen *Maris* segmentis tertio, quarto et quinto coalitis; *Fœminæ* —— ?

Lithadia, *Bell, Trans. Linn. Soc.* xxi. p. 305.

1. Lithadia Cumingii.

Lithadia Cumingii, *Bell, Trans. Linn. Soc.* xxi. p. 305. t. 33. f. 6, 7.

Hab. Ad oras Americæ centralis (Puerto Portrero). Mus. Bell.

Genus 11. OREOPHORUS.

Char. Gen.—Testa tuberosa, posticè supra pedes dilatata. Fossæ antennariæ obliquæ. Pedipalpi externi caule exteriore arcuato, apicem versus sensìm angustiore. Pedes anteriores longi, robusti; octo posteriores subæquales, sub scuto dorsali reconditi. Abdomen *Maris* ?—*Fœminæ* latè ovatum, segmentis a tertio ad sextum coalitis.

Oreophorus, *Rüppell, Krab. der Roth. Meer.* p. 19.
Edw. Hist. Nat. Crust. ii. p. p. 130.

1. Oreophorus horridus.

Testâ subtriangulatâ, regionibus branchialibus fortitèr et obliquè carinatis; chelis mediocribus, manu digitis longiore.

Oreophorus horridus, *Rüppell, Krab. der Roth. Meer.* p. 19. t. 4. f. 5.
Edw. Hist. Nat. Crust. ii. p. 131.
Bell, Trans. Linn. Soc. xxi. p. 306.

Hab. In mari Rubro.

2. Oreophorus reticulatus. B.M.

Testâ subpentagonâ, reticulatâ; digitis maximis, manu bis longioribus.

Oreophorus reticulatus, *Adams & White, Crust. Voy. of the Samarang*, p. 54. t. 6. f. 1.
Bell, Trans. Linn. Soc. xxi. p. 307.

Hab. In mari orientali.

3. Oreophorus nodosus. B.M.

Testâ nodosâ, margine undato; manu tumidâ, ad margines carinatâ, bisulcatâ, digitis longiore.

Hab. ——?

Genus 12. NURSIA.

Char. Gen.—Testa polyhedra, fronte producto. Orbita extrorsùm aperta. Fossæ antennariæ transversæ. Pedipalpi externi caule exteriore curvo, dilatato, anticè et posticè obtuso; caule interiore margine interno recto, articulo penultimo quadrato, ultimo triangulari. Pedes antici digitis deflexis. Abdomen *Maris* articulo penultimo apicem prope processu dentiformi instructum.

Nursia, *Leach, Zool. Misc.* iii. p. 20.
Edw. Hist. Nat. Crust. ii. p. 137.

1. Nursia plicata. B.M.

Testâ utrinque 4-dentatâ, medio tuberculis tribus triangulum delineantibus, posticè lineâ elevatâ transversâ tuberculum gerente, fronte 4-dentato.

Cancer plicatus, *Herbst*, iii. no. 253. t. 59. f. 2.
Nursia Hardwickii, *Leach, Zool. Misc.* iii. p. 20.
Edw. Hist. Nat. Crust. ii. p. 137.
Nursia plicata, *Bell, Trans. Linn. Soc.* xxi. p. 307. t. 34. f. 4.

Hab. In oceano Indico.

2. Nursia abbreviata. B.M.

Testâ orbiculari, margine undato, lineâ elevatâ longitudinali, alterâ transversali decussatâ; fronte integro.

Nursia abbreviata, *Bell, Trans. Linn. Soc.* xxi. p. 308. t. 34. f. 5.
Hab. In oceano Indico.

Genus 13. NURSILIA.

Char. Gen.—Testa latior quam longior, margine polygono, fronte producto. Orbita bifissa, extrorsùm aperta. Fossæ antennariæ obliquæ. Pedipalpi externi epistomati superantes, caule exteriore curvo, medio dilatato; interiore elongato, margine interno arcuato. Pedes antici graciles, manu tumidâ, digitis curvis dentatis manu longioribus. Abdomen *Maris* —— ?—*Fœminæ* valdè convexum, articulo ultimo inter bases pedipalporum externorum producto.

Nursilia, *Bell, Trans. Linn. Soc.* xxi. p. 309.

1. Nursilia dentata. B.M.

Nursilia dentata, *Bell, Trans. Linn. Soc.* xxi. p. 309. t. 34. f. 6.
Hab. In oceano Indico.

Genus 14. ARCANIA.

Char. Gen.—Testa globulosa, spinis seu tuberculis elevatis plurimis armata. Orbita suprà et extrorsùm aperta. Fossæ antennariæ longitudinales. Pedipalpi externi caule exteriore recto, lineari, apice interiore emarginato-truncato; caule interiore gradatìm acuminato. Pedes antici gracillimi. Abdomen *Maris* lanceolatum, segmentis a tertio ad sextum vel ad quintum coalitis.

Arcania, *Leach, Zool. Misc.* iii. p. 24.
Edw. Hist. Nat. Crust. ii. p. 133.

1. Arcania Erinaceus. B.M.

Corpore atque membris densè spinosis, spinis spinulosis.

Cancer Erinaceus, *Herbst,* t. 20. f. 111.
Leucosia Erinaceus, *Fabr. Suppl.* p. 352.
Arcania Erinaceus, *Leach, Zool. Misc.* iii. p. 24.
Edw. Crust. ii. p. 134.
Bell, Trans. Linn. Soc. xxi. p. 309.
Hab. In mari Indico.

2. Arcania undecim-spinosa.

"Thorace spinuloso, spinulis obtusis, ambitu 11-spinoso, spinis acutis simplicibus; brachiis granulatis, digitis manibus longioribus."

De Haan, Crust. Japon. p. 135. t. 33. f. 8.
Arcania undecim-spinosa, *Bell, Trans. Linn. Soc.* xxi. p. 309.
Hab. In Japoniâ.

3. Arcania novem-spinosa. B.M.

"Thorace lævi, granuloso, marginibus latero-anterioribus spinis duabus, latero-posterioribus spinis duabus, posteriore spinâ longâ rectâ."

Iphis novem-spinosa, *Adams & White, Crust. of the Voyage of the Samarang*, p. 56. t. 13. f. 1.
Arcania novem-spinosa, *Bell, Trans. Linn. Soc.* xxi. p. 309.
Hab. —— ?

4. Arcania septem-spinosa. B.M.

Testâ globulosâ, paulò latiore quam longiore, tuberculatâ, spinis septem tuberculatis armatâ, laterali utrinque reliquis longiore.

Arcania septem-spinosa, *Bell, Trans. Linn. Soc.* xxi. p. 310. t. 34. f. 7.

Hab. —— ?

5. Arcania tuberculata. B.M.

Testâ paulò longiore quam latiore, omninò tuberculatâ, margine spinis novem tuberculatis instructo; brachiis granulatis, manibus lævibus.

Arcania tuberculata, *Bell, Trans. Linn. Soc.* xxi. p. 310. t. 34. f. 8.

Hab. Ad ins. Borneo.

6. Arcania gracilipes. B.M.

Testâ granulosâ, tuberculis quindecim suprà, et tribus ad marginem posteriorem instructâ; pedibus anticis tenuissimis.

Arcania gracilipes, *Bell, Trans. Linn. Soc.* xxi. p. 310. t. 34. f. 9.
Hab. Ad ins. Borneo.

7. ARCANIA LÆVIMANA. B.M.

Testâ granulatâ, tuberculis numerosis distinctis, ad marginem spinis novem simplicibus armatâ; manibus glabris.

Arcania lævimana, *Bell, Trans. Linn. Soc.* xxi. p. 310. t. 34. f. 10.

Hab. Ad insulas Philippinas.

Genus 15. IPHIS.

CHAR. GEN.—Testa rhomboidalis, transversa, angulis rotundatis, utrinque spinâ longissimâ horizontali armata, fronte emarginato. Orbita aperta, bifissa. Antennulæ ferè longitudinaliter inflexæ. Pedipalpi externi caule interiore sublineari, anticè paulò angustiore. Pedes filiformes, graciles.

Iphis, *Leach, Zool. Misc.* iii. p. 25.
Edw. Hist. Nat. Crust. ii. p. 138.

1. IPHIS SEPTEM-SPINOSA. B.M.

Cancer septem-spinosus, *Fabr. Mantissa,* i. p. 325.
Herbst, i. t. 20. f. 112.
Leucosia septem-spinosa, *Fabr. Suppl.* p. 351.
Iphis septem-spinosa, *Leach, Zool. Misc.* iii. p. 25.
Edw. Hist. Nat. Crust. ii. p. 139.
Bell, Trans. Linn. Soc. xxi. p. 311.

Hab. —— ?

Iphis novem-spinosa of Adams and White is referred to the genus *Arcania.*

2. "IPHIS LONGIPES.

"Carapax parcè granulosus, suborbicularis, non latior quam longus [longior], armatus spinis duabus longissimis lateralibus latitudine carapacis vix brevioribus (unâ in latere utroque) et duabus minutis antero-lateralibus, duabus parvulis postero-lateralibus, et unâ posticâ corporis dimidium longitudine ferè æquante. Frons bilobatus parcè prominens. Pedes 8 postici prælongi."

Iphis longipes, *Dana, Crust. U. S. Explor. Exped.* p. 396. t. 25. f. 4.
Bell, Trans. Linn. Soc. xxi. p. 312.

"Taken from the stomach of a Tetraodon, among the reefs of Vití Lebu, Feejee Islands."

Genus 16. IXA.

CHAR. GEN.—Testa elliptico-rhomboidalis, processu utrinque subcylindrico à regione branchiali producto; regionibus sulco profundo separatis. Orbita suprà bifissa. Pedipalpi externi caule exteriore lato, obtuso, interiore longiore. Pedes omnes filiformes, tenues. Abdomen *Fœminæ* articulo ultimo usque ad oris aperturam producto.

Ixa, *Leach, Trans. Linn. Soc.* xi. p. 334.
Edw. Hist. Nat. Crust. ii. p. 134.

1. IXA CYLINDRUS. B.M.

Cancer Cylindrus, *Fabr. Mantissa*, 251.
Herbst, i. p. 108. t. 2. f. 29, 30, 31.
Leucosia Cylindrus, *Fabr. Suppl.* 352.
Latr. Hist. Nat. Crust. vi. p. 119.
Licht. Berl. Mag. 1815, p. 143.
Ixa Cylindrus, *Leach, Trans. Linn. Soc.* xi. p. 334.
Bell, Trans. Linn. Soc. xxi. p. 311.
Ixa canaliculata, *Leach, Zool. Misc.* iii. p. 26. t. 129. f. 1.
Edw. Règ. Anim. Cuv., Crust. t. 24. f. 1; *id. Hist. Nat. Crust.* ii. p. 135.
Ixa megaspis, *Adams & White, Voyage of the Samarang, Crust.* p. 55. t. 12. f. 1.

(Senior.) B.M.

Ixa inermis, *Leach, Zool. Misc.* iii. t. 129. f. 2.
Edw. Hist. Nat. Crust. ii. p. 135.

Hab. In mari Indico.

Obs. A careful examination of all the specimens of this genus to which I have access, amounting to about twelve, has led me to conclude that they all belong to one species. The variations which exist between any two of them are nearly as great as those which have given rise to the establishment of a distinct specific name in the case of *I. megaspis* of Messrs. Adams and White. I possess two specimens which were obtained by Mr. Hinds, which differ so much from others, that until I had carefully examined the whole of those I have alluded to, I had provisionally given them a distinct specific name. The form and size of the lateral process vary considerably. In some it is cylindrical, in others it is somewhat conical; in some it is either direct or even bent slightly backwards, in others the apex is turned forward; in some there is a filiform appendage at its apex, in others there is not a vestige of this armature. The degree of granulation of the different parts also varies.

With respect to *I. inermis* of Leach, I see no difference but what might be supposed to depend upon great age; and the distinction is really less on examining the actual specimens, than appears to be the case from merely a comparison of the figures. Under these circumstances, I have ventured to give the references to the three supposed species, as synonyms of the old *Cancer Cylindrus* of Fabricius.

Genus 17. NUCIA.

"Carapax parcè transversus, anticè non productus, latere non dilatatus, inermis, superficie paulò tuberculatus, fronte bilobatus et non saliens. Oculi paulò remoti, grandiores, marginales. Area buccalis benè triangulata. Maxillipedis externi articulus 3tius triangulatus; palpus angustus, extùs rectus. Pedes toti breves, et crassi, digiti in plano subverticali claudente, eodem cum manus articulatione."

Nucia, *Dana, Crust. U. S. Explor. Exped.* p. 397.

1. NUCIA SPECIOSA.

Nucia speciosa, *Dana, Crust. U. S. Explor. Exped.* p. 397. t. 25. f. 5.

Hab. —— ?

THE END.

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June 1855.

To J. S. Kingsley, Esq.
with the respects and thanks of
the Author.

[*From the* ANNALS AND MAGAZINE OF NATURAL HISTORY *for October* 1877.] 313

ON

BELLIDIA HUNTII, 8

A GENUS AND SPECIES OF CRUSTACEA SUPPOSED TO BE NEW.

BY

PHILIP HENRY GOSSE, F.R.S.

? Hippolyte

[Plate X.]

Family **Alpheadæ.**

BELLIDIA (gen. nov.), Gosse.

Internal antennæ very little above the external: composed of two filaments forming a right angle.

External antennæ with the basal plates very large.

Feet: first pair small, didactyle, consimilar. Second pair long, very slender, didactyle; both arm and wrist many-jointed.

Eyes not covered by the carapace.

Abdomen bent abruptly.

Tail-plates large, all undivided.

Bellidia Huntii, Gosse.

As this is the only species known, no diagnosis can be given; but it may be thus described :—

Beak simple, small, rounded, smooth, acute.

Internal antennæ of two filaments, the one projecting, the other erect and strongly ciliated on one side (*e*); seated very little above the external pair.

External antennæ one third as long as the body. Basal plates very large; in form one-fourth of a long ellipse; a single tooth in the outer edge, near the tip (*b*).

First pair of feet small and short, both didactyle, consimilar; the thumb gibbous, solid; the movable finger somewhat shorter, slender, finely pointed, much curved, colourless, and translucent (*d*).

Second feet moderately long, very slender, didactyle; hand minute; both arm and wrist many-jointed.

Outer foot-jaws long, strong, foot-shaped; the terminal joint armed with strong teeth on the upper edge.

Eyes not covered by any vault of the carapace, but projecting above the rostrum.

Abdomen abruptly bent, much as in *Hippolyte*; attenuated rapidly (*a*).

Legs moderately long; all monodactyle.

Tail-plates large; the outermost showing no trace of transverse division (*c*).

Length three quarters of an inch from end of rostrum to end of tail.

The specimen was a female, heavily laden with advanced spawn: the ova large, globular, densely attached to the fringes of the false feet, and thus increasing the apparent depth of the animal.

Colour: a dark rich lake-crimson, marked, on the cephalothorax and abdomen, with well-defined vertical stripes of brilliant opaque white, imparting a zebra-like aspect to the creature. The head bears two longitudinal stripes of white on each side. The entire length of the back is dark red, with a broad white stripe running down the median line. All the limbs red. The ova of a dark sea-green hue.

With considerable affinity to the family Crangonidæ on the one hand, and to the Palæmonidæ on the other, this little creature is separated from the former by the chelæ, from the latter by the rostrum. It must be placed in the Alpheadæ.

With *Alpheus* it agrees in the minute rostrum and in the outer tail-plate being entire. From *Alpheus* it differs in the equality and consimilarity of the hands, and in the unshielded condition of the eyes.

With *Nika* it agrees in the multiarticulate arms as well as wrists of the second feet, and in several minute characters. From *Nika* it differs in *both* the hands of the first feet being didactyle, and in the outer tail-plate being entire.

With *Athanas* it agrees in the unshielded eyes, and in several other characters. From *Athanas* it differs in the inner antennæ having three filaments, and in the outer tail-plate being entire.

This elegantly shaped and brilliantly coloured little shrimp was dredged by Arthur R. Hunt, Esq., F.G.S., in about 6 fathoms, off the Shag Rock*, at the northern end of Torbay, on the 10th of August, 1877. During this summer I had enjoyed the privilege of numerous dredgings in Torbay with him in his convenient little yacht the 'Gannet;' and we had both lamented the paucity of results. On this particular day we had been occupied at the south-west corner of the bay; and my friend, having landed me at Torquay with my *opima spolia*, proceeded to the Shag Rock to spend another hour in dredging alone. The result proved unwontedly rich. Besides many examples of *Comatula rosacea*, adult, and in the crinoid condition variously advanced, and some other interesting things, he obtained two creatures, which he at once saw to be unfamiliar, and which proved to be, both of them, new to the British fauna, and, as I believe, each of them a type of an undescribed genus. The one was the elegant shrimp above described; the other was the nudibranch mollusk that forms the subject of the following paper. Surely it was a most noteworthy reversal of fortune that two new generic forms should reward a single dredge-haul!

My friend, after he had preserved the specimens alive for a few days in his own aquarium, kindly presented them both to me. The *Bellidia* continued awhile in health and vigour, manifesting, in its alternations of active motion and still repose, a resemblance to the little Crangons. The liftings from vessel to vessel, the confinement in small cells for microscopic examination, and the manipulations to which it was unavoidably subjected in order to define and figure it, careful and tender as I was in performing these, were, however, fatal to it; for it

* Mr. Hunt gives me the locality more exactly thus:—"In about 6 fathoms on a submerged rock, off Meadfoot Sands, that extends from the Shag Rock, in the direction of the Thatcher, to the well-known sunken rock, Morris's Rogue."

soon died*. The specimen, preserved in spirit, I am about to deposit in the British Museum.

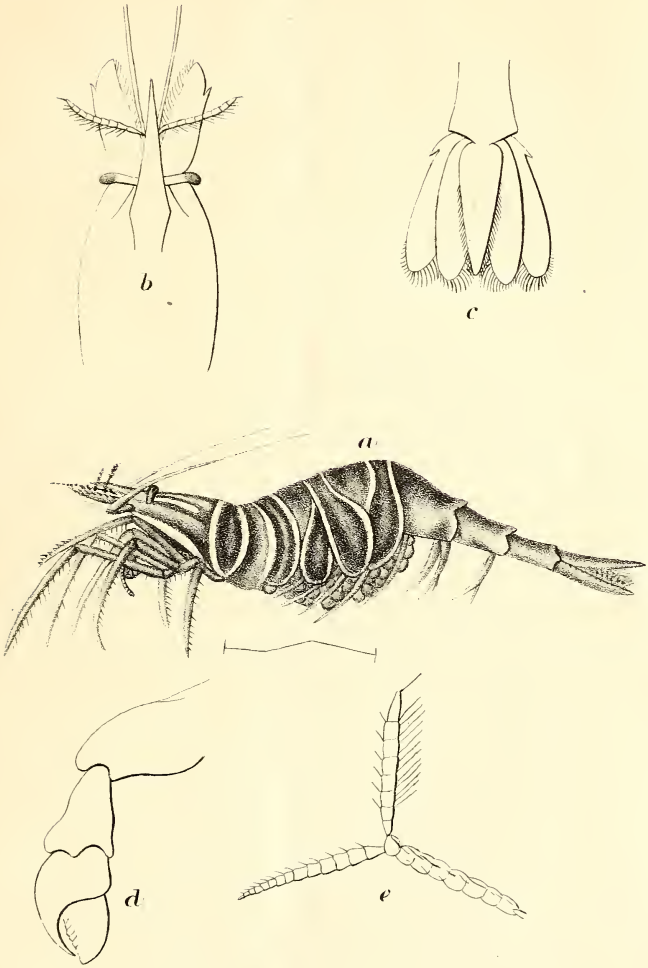
I wish to dedicate this genus to the venerable author of 'A History of the British Stalk-eyed Crustacea,' to whom I personally owe a life-long debt of esteem, and gratitude, and love†. And the species to the friend to whom science is indebted for its fortunate discovery.

EXPLANATION OF PLATE X.

a. *Bellidia Huntii*, magnified $\frac{4}{1}$.
b. The anterior organs, viewed from above.
c. The tail-plates.
d. The left hand.
e. One internal antenna.

* My friend favours me with the following note:—"*Bellidia* is doubtless a rocky shrimp, not a sandy one; and its colours would match the beautiful red weeds among which it is found. I believe it was off a mass of red weed that I picked the *Hancockia* (see the following memoir), and the very minute *Aplysia* found on the same occasion, which I afterwards showed you."

† I had at first written the word as "*Bellia*;" but I find that this form is already occupied in zoology. As I do not choose to relinquish my tribute of affection to my friend, I adopt another termination.



P. H. Gosse. R. Mintern lith.

Mintern Bros. imp.

BELLIDIA HUNTII.

From Loudon's Magazine of Natural History

Vol V Jan 1832 p 41

Illustrations of British Zoology by George Johnston M.D.

Caprella acuminifera is about half an inch in length very slender, pellucid, and colorless, except at the joints of the legs and the vesicular processes which are spotted with red. The superior antennae are as long as the body and the last articulation of these is as long as the four inferior, being composed of a number of short joints, that are bristled with very short cilia. The inferior antennae are half the length of the others, and beneath them are seen the short articulated palpi. The eyes are round and scarlet; head obtuse with a spinous process above the front and two lesser ones behind; first pair of hands small; the second much larger, oval serrated on the inner margin with a tooth like process above, and armed with a curved sharp claw. The joints of the wrist are short; the brachial ones lengthened. The vesicular or branchial processes are in pairs, oval and compressed; they appear to consist of a bladder filled with an opaque [illegible], and are connected with an anterior [illegible] situated part of their base. The three hinder points of the body are each furnished with a pair of slender monodactyle legs, the last articulation of which is slightly convex, [illegible] its teeth at the upper side, is [illegible] [illegible] ~~[illegible]~~ serrated and grooved on the inner edge for the reception of the claw. A straight intestine [illegible] the centre but I could not [illegible] any trace of a circulating system. I do not know to whom the discovery of the animal first [illegible] is due; it is probably to [illegible].

7 a

J. S. Kingsley
regards of
T. W. Kirk
(Colonial Museum)
Wellington N.Z.

LV. Additions to the Carcinological Fauna of N.Z.

LVI. On Some N.Z. Aphroditæ

LVII Notes on Some N.Z. Crustaceans.

9

Art LV.—*On Additions to the Carcinological Fauna of New Zealand.*

By T. W. Kirk, Assistant, Colonial Museum.

[*Read before the Wellington Philosophical Society, 31st August,* 1878.]

The publication of a 'Catalogue of New Zealand Crustacea' by the Geological Survey and Colonial Museum Department, has proved a great boon to students and collectors in the colony, by bringing together, in a convenient form, descriptions of all the species known to inhabit these shores, thus enabling them to pronounce, with some degree of certainty, upon any specimen which may be under discussion.

The remarkable resemblance which our fauna bears to that of England and California has been pointed out by many authors. I have now to record the occurrence here of at least two additional European and the same number of Californian species.

Three of the species mentioned in this paper, viz., *Caprella lobata, C. novæ-zealandiæ,* and *Ebalia tumefacta,* were obtained in Cook Strait, in January, 1876, whilst dredging for the telegraphic cable.

Group Aberrantia.

The coxæ of the pereiopoda are not squamiformly developed, some of all being fused to their respective segments. The pleon has one or more or the segments absent.

Fam. 2, Caprellidæ.

Pleon rudimentary: oral appendages normally developed; coxæ fused with the pereion; branchial sacs attached to the first two or three segments of the pereion.

Caprella.

Caprella, Lamarck, Syst. des anim. sans vert., p. 165.
Leach, Linn. Trans. II., p. 363.
Edwards, Hist. des Crust. III., p. 105.
Kröyer, Nat. Tidskr. IV., p. 496, 1842-3.
Ægina, Kröyer, Nat. Tidskr. IV., 1843.
Podalirius, Kröyer, Nat. Tidskr. V., 1844.

Body cylindrical; cephalon and first segments of pereion confluent; pleon rudimentary; gnathopoda sub-chelate; first two pairs of pereiopoda represented by the branchiæ attached to their respective segments only; three posterior pairs of pereiopoda subequal; first and second pairs of pleopoda rudimentary in the male; the rest obsolete. (Spence Bate, Cat. Amphip. Crust. Brit. Mus., p. 353.)

Caprella novæ-zealandiæ, sp. nov.

Cephalon furnished with a spinous tooth directed forwards; first segment of the pereion rather short, second long, third and following gradually decreasing; superior antennæ two-fifths the length of animal; flagellum with the infero-distal extremity of each articulus produced, but *without* cilia; inferior antennæ not so long as the peduncle of the superior by one joint; second pair of gnathopoda articulating behind the centre of second segment of pereion; propodos ovate; palm armed with a prominent posterior tooth, against which the closed dactylos impinges, and a smaller but distinct anterior tooth (not lobe); dactylos very much curved; three posterior pairs of pereiopoda have the anterior margins excavate and ciliate; the parts against which the closed dactylos impinges, armed with a strong tooth.

Length 1 in.

Hab: Cook Strait.

This species approaches *C. geometrica*, Say, (Cat. Amphip. Crust. Brit. Mus., p. 357), from which it differs, however, in the form of the spine on the cephalon, in the length of the antennæ, and in the articulation and arming of the second pair of gnathopoda.

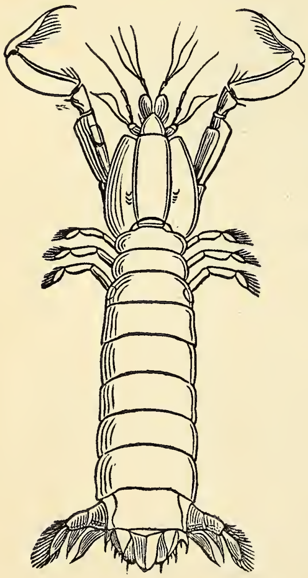
Caprella lobata, Guérin.

Squilla lobata, Müller, O. Fabr. Faun. Grönl., p. 248.
Caprella lobata, Guérin, Iconogr. Crust., pl. 28, f. 22.
" " Kröyer, Voy. en Scand., pl. 25, f. 3.
" " Stimpson, Nat. Hist. Invert. Grand Manan., p. 44.
Ægina longicornis, Kröyer, Voy. en Scand., pl. 26, f. 3.
Caprella lævis, Goodsir, Edinb. New Phil. Journ., XXXIII.
" " White, Hist. Brit. Crust., p. 215.
Caprella linearis, Leach, Edinb. Encycl., p. 404.

Body carrying a few minute tubercles, the most conspicuous being the one on the cephalon, and the most constant those upon the posterior segments of the pereion. First segment of the pereion long; second scarcely longer than the first; the three succeeding rather shorter, sub-equal. Superior antennæ not half the length of the animal; inferior scarcely reaching beyond the second joint of the peduncle of the superior. Second pair of gnathopoda articulating with the pereion posteriorly to the centre of the second segment; propodos long-ovate, palm defined by one and armed with two teeth, the anterior one being often less perfectly defined than the posterior. Three posterior pairs of pereiopoda having the propoda with the anterior margin excavate; the part against which the closed dactylos impinges armed with two stiff corrugated spines.

Hab: Cook Strait.

The only examples of the genus *Squilla* yet recorded from New Zealand are *S. nepa*, Cat. N.Z. Crust., p. 89, and *S. armata*, M. Edw., Trans. N.Z. Inst., IX., p. 474. It is with very great pleasure I now add a third. In addition to the specimen exhibited, which was obtained at the Chatham Islands, another, unfortunately mutilated, was secured by H. B. Kirk while on a visit to Kapiti.



Squilla indefensa, sp. nov.

Rostral plate semi-oval, and pointed at its distal extremity. Carapace retracted in front, expanded and rounded behind, smooth, the antero-lateral angles rounded and slightly produced forward; large prehensile limbs with terminal joint as long as preceding one, and armed with *nine* spines; abdomen smooth, terminal segment with six marginal spines, and three depressed longitudinal ridges which terminate posteriorly in spines.

Length, 2½ inches.

Hab: Chatham Islands and Kapiti.

This species is easily distinguished by the absence of carinæ on the abdomen, and by the absence of the antero-lateral spines of the carapace.

Ebalia.

Ebalia, Leach, Zool. Misc. III.

External antennæ extremely minute, inserted in the inner canthus of the orbit; internal antennæ lying in oblique fossæ, which are entirely separated by a small process of the epistome, and concealed by the front; external pedipalps elongato-triangular, reaching forward to the margin of the epistome; the internal footstalk gradually acuminated, the third joint internally palpigerous; anterior legs large, equal, the hand inflated, those of the male larger than those of the female; the other legs shorter than the first pair, diminishing gradually in length, terminating in a slightly curved, rather strong claw; abdomen seven-jointed, but with several of the middle joints confluent; that of the male narrow; of the female very broad, the last joint very small, abruptly narrower than the preceding; carapace rhomboidal, with the angles more or less truncated or rounded; front produced, elevated; eyes very small; orbits with two small fissures on the superior margin.

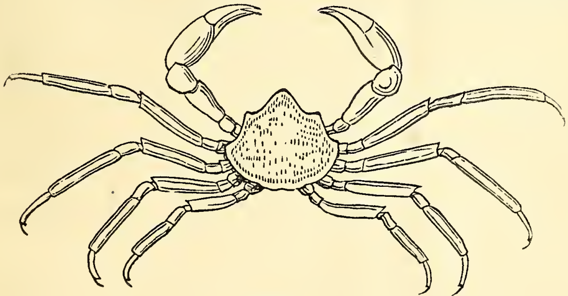
Ebalia tumefacta. Bryer's Nut Crab.

Cancer tumefacta, Mont., Trans. Linn. Soc. IX., p. 86, T. II., f. 3.
Ebalia bryerii, Leach, Mal. Podoph. Brit., T. XXV., f 12-13.

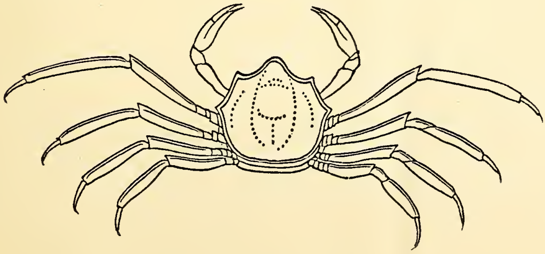
Carapace slightly and minutely granulated; lateral margin entire, somewhat revolute at the angles; two tubercles on the cardiac region, and one on each of the branchial in the male; these parts very tumid in the female; abdomen in the male with the third to the fifth joints united; in the female the fourth to the sixth; arm not more than twice as long as it is broad. (Bell's Brit. Crust., p. 145.)

Hab: Cook Strait. A single female, and the right anterior leg of another specimen.

Elamena producta, sp. nov. New Zealand Spider crab.



Male.



Female.

Carapace flat, broader than long, margin with two teeth, which, however, vary much in size; rostrum very prominent; anterior legs in male large and equal, hand and wrist much swollen; fingers curved and armed with hairs along their inner margins; in the female these legs are slight, and the fingers almost straight; succeeding legs very flat, the anterior margin of the first joint produced so as to form a very prominent point, almost a spine; claws half the length of preceding joint; whole animal destitute of hair, except on the fingers. Length, $\frac{5}{8}$ in.; breadth, $\frac{4}{5}$ in. First three pairs of ambulatory legs very long, more than twice the length of the carapace.

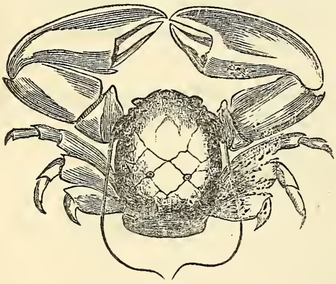
Hab: Wellington.

Petrolisthes elongatus, Miers.

In the 'Catalogue of New Zealand Crustacea,' p. 60, this species is said to be of a "reddish-yellow" colour. The specimens from which the description was drawn up must have been preserved in spirit. This change of colour is usual in specimens so treated. The following is taken from living examples.

Above dark blue, greenish-blue, or sometimes even black. Below green, getting much darker towards the posterior margin of the anterior legs, anterior face of wrist a bright red, mobile finger and antennæ deep brown.

Porcellana rupicola, Stimpson.



A single specimen of this species was recently obtained by myself at Lyall Bay, living apparently upon terms of intimacy with a large family of *Petrolisthes elongatus*. Upon a comparison with the foreign Crustacea in the Colonial Museum, I find it to agree in every particular with a specimen contained in the collection lately received from Prof. Button of the University of California, and labelled as above.

Unfortunately I have not been able to obtain the description either of this or the next species, but there can be no doubt respecting their identity, as those forwarded by Prof. Button are duplicates of the U.S. Exploring Expedition's collection.

This species may be easily distinguished from *Petrolisthes elongatus* by its having the posterior margin of the wrist produced, so as to form one strong tooth, by its more drooping front, and by having the lateral margins obtuse instead of thin and sharp. Length, $\frac{5}{8}$ in.; breadth, $\frac{4}{8}$ in.

Xantho spino-tuberculata, Lockington.

A fine pair of this beautiful little crab was procured at Porirua Harbour, in January of last year, and although only about half the size of the Californian specimen, there can be no mistaking their identity.

The carapace is much broader than long, the front armed with spinous tubercles; regions well defined; anterior legs strong, equal, the outer and upper surfaces covered with very prominent tubercles; fingers brown, tipped with white, smooth, except their internal margins, which are armed with 3 or 4 tubercles. Ambulatory legs densely covered with hairs.

Male, length $\frac{6}{16}$ in., breadth $\frac{9}{16}$ in.

Female, length $\frac{5}{16}$ in., breadth $\frac{8}{16}$ in.

Art. LVI.—*On some New Zealand* Aphroditæ, *with Descriptions of supposed new Species.* By T. W. Kirk, Assistant in the Colonial Museum.

[*Read before the Wellington Philosophical Society, 30th October*, 1878.]

Aphrodita.

Halithea, Savigny, Syst. Annel. 11 and 18. Lam., An. s. Vert., v. 306.

Aphrodita, Leach, in Suppl. Encyclop. Brit. I., 452; Aud. and M. Edw., Litt. de la France, II., 63; Blainville in Dict. des Sc. Nat. LVII., 455; Fleming in Encyclop. Brit., Edit. 7, XI., 221; Johnston in Ann. Nat. Hist. II., 427.

Body ovate or oblong, the back convex, covered with fifteen pairs of scales, either concealed by a felt or exposed; the venter distinctly separate, flat, marked with the dissepiments and a longitudinal mesial furrow; antenna one, mesial, small; the palpi two and long; segments 39, with scales on the second, fourth, fifth, seventh, and every alternate segment to the twenty-fifth, and on the twenty-eighth and thirty-second; the intervening segments with a dorsal cirrus; feet stout, biramous, with three fascicles of bristles, two on the dorsal and one on the ventral branch; and each foot has a ventral setaceous cirrus; bristles various, simple or compound, with a spine in each fascicle; no anal styles.

A. aculeata.

Aphrodita aculeata, Linn. Sys. X., 655; XII., 1084.

Body from 3 to 8 inches long, oval, narrowest behind, convex dorsally; the back of an earthy colour; roughish, with a thick close coat of hair and membrane, forming a sort of skin, which entirely conceals the scales; the sides clothed with long silky green and golden hairs clustered in fascicles, and glistening like burnished metal, with blackish-brown spiniform bristles intermixed; ventral surface flat, often light coloured and dotted, sometimes dark brown, obsoletely ribbed across; head small, entirely concealed, roundish, with two round clear spots or eyes on the vertex; antenna minute; palpi large, subulate, flesh-coloured or dusky, jointed at the base, where they approximate, but are separated by a black membranous crest; mouth with a large edentulous proboscis; the orifice encircled with a short, even, thick-set fringe of compound penicillate filaments divided into two sets by a fissure on each side; each filament has a short stalk, with a tuft of numerous forked papillæ on its summit; exterior to the orifice of the proboscis there are four fleshy tubercles placed at the angles; scales fifteen pairs, roundish, smooth, thin and vesicular, blotched with black stains and specks, the first pair small, laid over the head, the anal pair oval; feet thirty-nine pairs, largest and most developed near the middle of the belly, very small and approximate at the anus, biramous, the branches wide asunder; the superior carries, in a sort of crest-like fashion, the long, flexible, brilliant-coloured bristles which form the silky fringe on each side of the body, and above them some still more delicate hairs, which, by their intertexture, constitute the membrane covering the scales, and with which the strong spiniform bristles are intermixed, placed in a sort of cross series; the inferior branch is armed with three rows of stout, short bristles; in the upper row only two or three, which are longer and stouter than those of the next row, in which there are five or six, and which again are stouter but less numerous than those in the lower row; spine golden-yellow, conical, smooth; superior cirrus long, subulate, bulged at the base; the inferior short and conical; anus large, with a dorsal aspect, encircled with several tentacular cirri.

"The very vivid iridescent hues, which the hairs of this remarkable worm reflect, render it an object of wonder and surprise to the most incurious; they are not equalled by the colours of the most gaudy butterfly, and rival the splendour of the diamond beetle. It creeps at a slow pace, and in its progress a current of water is ejected at short intervals, and with considerable force, from the anus. When placed in fresh water, the creature gives immediate signs of its painful situation, and soon dies, first ejecting a white milky fluid, and in the agony of death, a large quantity of blackish-green turbid liquor. The size and strength of the proboscis is remarkable, and not less so the structure of the filaments which garnish the orifice. The œsophagus is short; the stomach and intestine seem to be alike and inseparable; together they form a straight intestine, sometimes with a wide dilation in some part of its canal, with a velvety inner surface folded into longitudinal plaits near the termination at the anus." (Cat. Worms, B.M., p. 104.)

I have quoted Dr. Johnston's descriptions and remarks at some length in the hope that the attention of local collectors being called to this branch of our fauna, we shall soon possess better specimens of this very interesting group than are at present to hand.

Unfortunately our specimen, which is very young, does not show the brilliant iridescent colours mentioned above; it is of a uniform dull brown, but after a very careful examination and comparison with two specimens from Europe contained in the collection of Annelids in the Colonial Museum, I have not the slightest hesitation in referring it to this species; it was obtained, together with specimens of the following species, amongst a mass of tangled seaweed, thrown up in August last, at Worser Bay.

Lepidonotus.

Lepidonotus, Leach in Ann. Phil. XIV., 205 (1819), and in Supp. Encyclop. Brit. I., 452.
Lepidonote, Oersted, Annul. Dan. Consp. 12; Annul. Dorsibr. 11.
Polynoë, Savigny, Syst. Annel. 20. Lam. An. s. Vert., V. 308, Aud. and M-Edw. Litt. de la France, II., 74. Cuv. Régn. Anim., III., 207. Johnston in Ann. Nat. Hist., II., 428 and 431. Williams, Rep. Brit. Assoc. 1851, 217.
Eumolphe, Blainville in Dict. des Sc. Nat., LVII., 457.

Body oblong, flattened, obtuse and rounded at both ends, composed of a definite number of segments, the back covered with two rows of scales; head distinct with two pairs of eyes on the sinciput; proboscis fringed with simple tentacles at the orifice, and furnished with two jaws; antennæ 3; palpi 2; tentacular 2 on each side; these are similar in structure, and jointed only at the base; scales naked, 12 placed over every alternate segment, so that the 12th is on the 23rd; if there are more scales, the succeeding are on every third segment; feet well developed, biramous, but the branches are almost connate, furnished with two fascicles of bristles, the superior in a spreading tuft, the inferior in a flattish brush, a spine on each fascicle; bristles simple, stout, the superior tapered to a serrulate point; the inferior with a claw-like point, and flattened underneath on one side of the shaft, where it is roughened with spinous tentacles in claw-set transverse series; anal segment with styles.

"*Lepidonotus* is easily distinguished from *Aphrodita* by the number of the antennæ, by the more powerful armature of the mouth, and by the part of the body at which the scales cease to alternate with the cirri. The back is either entirely covered with scales, or naked in the middle, the scales in the latter case being less developed, and not meeting on the mesial line."

"The *Lepidonoti* are carnivorous. They prey on living invertebrates, and the strong do not hesitate to kill the weak of their own and allied species; they live in obscurity on rocky shores, and can move with considerable quickness. Some of them swim easily in a wriggling manner, but they hasten to find the bottom. They have the power of renewing the scales, which are frequently removed by abrasion and injury."

Lepidonotus squamatus.

Aphrodita squamata, Linn. Syst. X. 655; XII. 1084.
Lepidonotus squamatus, Johnston, Cat. Worms B.M., p. 109.

"Body generally about one, rarely two inches long, depressed, linear-oblong, of equal breadth at both ends, of a uniform cinereous colour, rough; scales twelve on each side, rather large, ovate, imbricate, rough with brown granulations, ciliated on the external margin, the overlapped smoother than the exposed portion, for the granules on the former are more minute than on the latter; the anterior scales are smaller and rounder than the others, and completely cover the head, which is a sub-triangular pink or purplish corneous plate, furnished with four small eyes; antennæ three, the central one largest, bulbous near the point; palpi two, longer than the antennæ, swollen near the apex; the tentacular cirri similar to the superior cirri of the feet, these are white, with a blackish ring at the bulb where the acumination commences, retractile, originating from above the dorsal branch of every alternate foot, and under the scales; the last three pairs of feet each with a cirrus; feet twenty-five pairs, obtuse, sub-bifid, the dorsal branch shorter and less than the ventral, each terminated with a brush of stiff brown bristles, and under the ventral branch there is a small setaceous cirrus, and also a fleshy spine at its junction with the belly; bristles when removed golden-yellow, those of the dorsal branch slenderest, gently curved, pointed, and serrulate for about half their length, those of the ventral branch stouter, slightly bent near the top, and serrulated with a double series of teeth on the outer side of the bend, each tuft of bristles enclosing a dark brown straight spine, the inferior stouter than the upper one; ventral surface straw colour, prismatic, marked with the viscera, and sometimes spotted with black near the base of the feet." (Cat. Worms, B.M., p. 107.)

Two very fine specimens of this species were obtained at Worser Bay in August last.

Lepidonotus giganteus, sp. nov.

Body elliptical, rather broader posteriorly than in the front; convex dorsally, of a brown colour, tinged with slate; scales ovate, imbricate, coarsely granulate, projecting beyond the sides of the body, towards the posterior and lateral margins of each scale the granulations assume the character of short stout spines, external margins ciliated, the overlapped smoother than the exposed portion; anterior scales smaller than the others, sub-circular, very coarsely granulous, completely covering and projecting beyond the head; twenty-five pairs of feet, sub-bifid, the dorsal branch much the smaller, and carrying a bunch of *silky hairs*, while the ventral is armed with a bundle of *coarse bristles* of a deep golden colour. Under the ventral branch is a fleshy cirrus. A very obtuse fleshy spine marks the junction of each foot with the belly; ventral surface a pale yellowish white.

Length, 4 inches; breadth, $1\frac{4}{10}$ inches.

Hab: Wellington.

Art. LVII.—*Notes on some New Zealand Crustaceans.* By T. W. Kirk, Assistant in the Colonial Museum.

[*Read before the Wellington Philosophical Society, 11th January,* 1879.]

Squilla, Fabr.

Squilla armata, M. Edw., Hist. Nat. Crust., II., p. 521; Gray, Hist. Chile, Zool., Vol. III., Crust., p. 223; Trans. N.Z. Inst., Vol. X., p. 474.

Several very fine specimens of this species were recently obtained in Wellington Harbour.

At the same time a specimen was procured differing from *S. armata* in having a high median crest on the carapace; no spines on the ophthalmic segment; only five spines on the terminal joint of the prehensile limbs, and a nearly square rostral plate.

The specimen is much broken, the whole of the thoracic segments are missing. Length about 5 inches.

Squilla indefensa, Mihi.

A third specimen of this species was shown to me a short time since; it was procured at Waikanae by Mr. J. Taylor, a student of the Wellington College, and is now preserved in the Museum of that institution.

Calocaris, Bell.

Calocaris macandreæ, Bell; Brit. Crust., p. 231.

Two specimens of this remarkable Crustacean were obtained by myself a few weeks since, on the Otaki beach, near the wreck of the 'City of Auckland.' Although they must have been lying on the sand for some hours at least, one of them showed distinctly the delicate pink colouring mentioned by Prof. Bell in his description.

Callianassa, Leach.

Callianassa. sp. ind.

A specimen undoubtedly referable to this genus has been obtained by Mr. H. B. Kirk, at Island Bay. The carapace is much broken; right claw the largest. Total length, 1⅝ inch.

Gebia, Leach.

Gebia hirtifrons, Dana; U.S. Explor. Exped., XIII., Crust., part I., p. 511.

A specimen in the private collection of Mr. H. B. Kirk appears to belong to this species. It measures 2½ inches in total length, "the hand slender, hairy, and not denticulated below; the wrist has a spine at its upper apex and one on the inner margin, but none at the lower apex;" legs hairy; "front hardly, if at all, three-lobed."

The specimen agrees well with the figure of *G. hirtifrons*, in the Zoology of the Voyage of H.M.SS. 'Erebus' and 'Terror.'

There are also in the collection specimens agreeing well with the description of *G. danai*, Miers.

Portunus, Leach.

Portunus pusillus, Leach, Malac. Brit., t. IX., f. 5–8; Edwards, Nat. Hist. Crust., I., p. 444; Bell, Brit. Crust., p. 112.

Three specimens agreeing well with Prof. Bell's description are in the Colonial Museum; the only difference being that the New Zealand specimens have a prominent spine on the anterior margin of hand.

Female, length, $\frac{5}{10}$ inch; breadth, $\frac{6}{10}$ inch. Male, length, $\frac{4}{10}$ inch; breadth, $\frac{5}{10}$ inch.

Hab.: Cook Strait.

Podocerus, Leach. Probably not Say's species

✓ *Podocerus cylindricus*, Say, Jour. Acad. Philad., I., part 2; Edwards, Hist. des Crust., III., p. 64; Cat. Amp. Crust. B.M., p. 256.

Three specimens were obtained at Worser Bay, in tangled seaweed.

Pleustes, Spence Bate.

✓ *Pleustes panoplus*, Kroyer, Grön. Amf., p. 42, pl. 2, f. 9; Edwards, Hist. des Crust., t. III., p. 41: Cat. Amp. Crust. B.M., p. 63.

Seven specimens at same time and place as last species.

These are both arctic species, and their occurrence on our coast is somewhat remarkable.

ZOOLOGICAL RESEARCHES.

MEMOIR 1.

On the Metamorphoses of the Crustacea, and on Zoea, exposing their singular structure and demonstrating that they are not, as has been supposed, a peculiar Genus, but the Larva of Crustacea!!

The transformations which animals undergo in their progress from the egg to a perfect state, have ever been regarded as among the more remarkable traits which their history affords; these, as they affect the *Land* animals offer themselves freely to our observation, and have been ascertained to be strictly confined to the class of true insects: the marine and aquatic animals in general (exclusive of amphibious insects) never emerging from an element which presents numerous obstacles to the investigation of their habitudes, have been considered as undergoing no metamorphosis, with the exception of a few aquatic Reptiles, and some genera of the Linnean Monoculi, viz. Apus, Branchipus, Cyclops and Argulus; indeed so decided has been this notion in respect to the more perfect Crustacea, *(Malacostraca)* that the acute and indefatigable Doctor Leach, one of the chief investigators of this tribe of animals, has assigned it as one of their principal characters, *that they undergo no metamorphosis.* Ency. Brit. — Art. *Crustacea.*

One of the objects therefore of the present Memoir, will be to show the erroneous nature of this opinion, and to announce the *important discovery,* that the greater number of the Crustacea do actually undergo transformations, of which, in addition to the facts now adduced, further instances will be given in future memoirs.

The circumstance of the Crustacea being supposed to pass through no intermediate form, has been brought forward heretofore as one of the arguments for their separation from Insects; but, although the fallacy of that opinion may diminish the number of the characteristics which distinguish these two tribes of animals as *distinct Classes,* there yet remains those depending on the anatomical structure of their respiratory and circulating systems, which are quite sufficient to render the separation permanent. It may also be observed, that the changes presented to our notice in the Crustacea are quite peculiar, and of a totally different description from those of Insects.

The sea (which is the habitation of the greater part of the Crustacea,) to the casual observer, offers nothing but an immense body of water, here and there presenting a solitary whale, or a vagrant troop of some of the smaller Cetaceous animals; the appearance of a fish of almost any other kind in the track of a vessel over the vast expanse of the open ocean, is regarded even by the mariner, as a kind of phenomenon, and creates an interest not to be appreciated by those who have not engaged in distant voyages. The fathomless parts of the ocean certainly do not offer the same profusion of inhabitants with the shores of Islands and Continents, or those parts where the bottom is within the reach of the sounding line, or where its surface is interspersed with fields of Sargosa *(Fucus natans;)* on due examination however, we shall not fail to find it every where peopled by a considerable variety of animals either of small size, or possessed of such a degree of translucency as to render them invisible, or scarcely perceptible even when on, or near to, its surface: that it should possess its share of the organized beings which we see spread over every other part of the surface of our globe, is a conclusion we might arrive at indirectly, from the consideration of Oceanic fishes and birds being observed in those parts of the ocean most distant from the land, and the provident care of the Deity which we invariably witness throughout the domain of nature, to furnish food for all the meanest of his creatures; the more minute and invisible inmates of the sea then, must constitute the food of Oceanic fishes and birds. Few of these marine animals, except some of the larger and more conspicuous, have as yet been observed, so that the investigation of them holds out the promise of a rich harvest to the Naturalist and a vast field of exploration replete with novelty and interest; * to accomplish this object however, he must use the greatest diligence, seizing every opportunity when the way of the ship does not exceed three or four miles per hour, to throw out a-stern a small towing net of gause, bunting, or other tolerably close material, occasionally drawing it up, and turning it inside out into a glass vessel of sea water, to ascertain what captures have been made; when a ship goes at a greater rate, and in stormy weather, a net of this kind might be appended to the spout of one of the *sea-water* pumps, and examined three or four times a day, or oftener, according to circumstances.

The luminosity or sparkling of the sea by night, is a phenomenon which never fails to attract the attention of voyagers the most incurious, and having been found in the greater number of instances, to be produced by marine animals, first led the author into the use of the towing net, and discovered to him the variety and profusion in which they occur, both luminous and otherwise, and amongst others, the animals which form the subject of the present memoir.

* To speak the truth, our own seas have been almost as little explored, although they teem with curious and unknown animals.

The animals of the supposed Genus *Zoea,* have been hitherto little known from their small size, transparency, and the other circumstances above alluded to. Slabber, Bosc and Cranch, are the only Naturalists who have had the good fortune to observe them; to these may be added the author, who in towing for luminous animals, during a voyage from the Mauritius in 1816, discovered the species figured in Plate I. fig. 2, and fig. 4, *a. b.* without having it in his power to throw any new light upon their nature or structure: great variety of subjects, and the difficulty of pursuing microscopical dissections of minute animals on so turbulent an element, having prevented this being followed up at the moment, and having subsequently lost these specimens, we might have remained for an indefinite period without the knowledge of their *real* nature, the profusion in which they occur in our own seas, their variety, and the peculiarities of their structure, had not he continued to use the muslin towing net, for the detection of minute marine animals, since his return to Europe; many, and important, have been the results of this simple procedure, but none attended with greater surprise, than the vast profusion of the animals of Zoea discovered on our coasts and in our bays and estuaries, the novel and curious history of which, it is intended to give in this and subsequent memoirs.

Slabber in a Dutch Work entitled "Natural Amusements and Microscopical Observations" published at Harlem in 1778, has given us a description and figure of the species which has been since designated *Zoea taurus,* Plate I. fig. 1, *a* (in outline and without adventitious groups of a vorticella) several of these were taken at sea, July 24, 1768. From the observers of that period, any very exact analysis of such an animal was not to be expected, its whole length being but 1½ line; he describes it as of a greenish colour, the tail paler, the corselet with a long frontal and dorsal spine, the fourth joint of the tail with a projecting spine behind, and the fifth or terminal joint formed as in all the genuine Zoeas, of a deep fork, the inner sides of which are furnished with three small spines, the feet he erroneously counted as eight, none of them provided with more than four terminal plumose setæ, the antennæ entirely escaped observation, nor does it appear whether there are any lateral spines to the corselet. Upon the whole, we ought to feel grateful to Slabber for the first and most characteristic figure that has been given of these curious animals, and the pains he took to throw light upon their history.

Bosc, one of the most judicious naturalists of the French school, in a voyage which he undertook to America with a view to Natural History, discovered a single individual of the species figured Plate I. fig. 3 in the Atlantic Ocean, 5 or 600 leagues from the coast of France; and justly conceiving it distinct from all the other Genera of the Crustacea, first instituted that of Zoea for the reception of these anomalous animals, distinguishing the above species by the title of *pelagica;* it appears to have been one of the smallest size, transparent as glass, and differs from the former, principally, by the addition of a long deflected lateral spine on each side of the corselet; the antennæ did not entirely escape the observation of this able and zealous Naturalist, but he also failed in detecting the peculiar structure of its other members.

Mr. Cranch, in the course of Captain Tuckey's Voyage to the Congo, discovered the curious and singular species Plate I. fig. 5. in N. Lat. 1° 56″, W. Long. 8° 46,37″ which Dr. Leach has named Z. Clavata, from the club-like shape of its dorsal and lateral spines.

Of the two species observed by the author in 1816, that taken September 17, N. Lat. 16° W. Long. 26° 37″ and figured Plate. I. fig. 2. resembles most the Zoea taurus of Slabber, its frontal and dorsal spine shorter in proportion; the lateral spines sufficiently conspicuous; the three antipenultimate joints of the tail with a short adpressed spine on each side; the other projections seen in the figure at the sides of the body and tail, are probably parts of the bent up members of the animal; it was quite transparent, and occasionally luminous and scintillating by night. The second species, taken August 22, in S. Lat. 17° 30″, W. Long. 1° 30″ and figured Plate I. fig. 4. *a.* and *b.* was like the former discovered by its luminous scintillations in the dark, and when examined next day, it appeared to have no spines strictly to be called *lateral,* or *dorsal;* the anterior spine is short, as in the former, and posteriorly, the corselet ends apparently in three short spines; the tail being bent up close under the breast of the animal was not observed; the setæ which terminate the feet, were very long and feathered: this may probably be the second species of which Bosc appears to have had a glimpse, and which he describes as being black and without any dorsal spine.

Up to the year 1822, these were all the Zoeas known to Naturalists, who, while they agreed as to their being Crustacea, could not determine the place they ought to occupy in that Class. Slabber referred them to the Monoculi! although so obviously provided with a pair of extremely large and distant eyes: most of our contemporary Naturalists of the greatest discrimination, still associate them with the Entomostraca, an order formed out of the Linnæan Monoculi;* others, not less puzzled by the association of characters belonging to widely separated groups, have preferred approximating them to the more perfect Crustacea, thus Bosc† places them at the head of the edriophthalma (onisci &c.) and considers them to be intermediate between these, and the podophthalma (lobsters,

* Latreille, Hist. Nat. des Crust. &c. Sonnini's edit. of Buffon, 1802, and in his Genera Crust. et Insect. 1807. Dumeril, Zoologie analytique, 1806. Cuvier, Regne Animal, 1817. Lamarck, Animaux sans Vertèbres, 1818.

† Hist. des Crust, Castel's edit. of Buffon.

&c.) Dr. Leach, with that uncommon foresight for which he is distinguished, placed them at the tail of his malacostraca,* until having inspected the species discovered by Cranch, he declared them to belong to the podophthalma, and to the same group with Nebalia.† It will no longer be a matter of surprise, that all the leading Naturalists of the present day, should have been at a loss how to dispose of Zoea in their arrangements of the Crustacea, when it is known, that this singular type, is not a perfect animal, but merely the *larva* or imperfect state of the *Crab!* and not as had been imagined, an animal *sui generis!* This is a discovery quite new, and interesting in a double point of view, as proving their real nature, and that the more perfect of the Crustacea undergo a Metamorphosis, and that of a description totally different from any hitherto known; so little has this been suspected by Naturalists, that as before stated, the contrary has been assigned as one of the distinctive characters of the class, and been used as an argument for their separation from insects. It may be urged, that this is no new discovery, and that Slabber has the merit of having first indicated a metamorphosis in the Crustacea; the metamorphosis however, which this observer thought he witnessed, is of so different a description, that we must either suppose him to have fallen into some error, or that there may be Crustacea which pass through other forms than those now for the first time made known. That Naturalists may be put into possession of all the circumstances necessary to a just decision, we shall first point out the supposed discovery of Slabber, and then state what we have ourselves observed.

Slabber, wishing to continue his observations on his Zoea, took care to renew the water in which it had been placed, and on the third day, finding its movements become slower, and its colour more pale, he subjected it to the

* Art. Annulosa, Suppl. Ency. Brit. † Captain Tuckey's Voyage to the Congo.

microscope, and found to his surprise, that the anterior portion of the animal had changed its form, and on the fourth day it had acquired the appearance represented Plate I. fig. 1, 6, so that together with the other individuals he had taken, it seemed to have experienced a complete metamorphosis; under this new form, the dorsal spine had disappeared, the front spine had become comparatively small, the antennæ were rendered conspicuous, the feet and eyes were apparently more developed, and the tail had changed from forked to spatulate, fringed by a row of thirteen short spines. It will readily occur to the reader, that observations made in this way, upon aquatic animals at once so minute and so transparent, require the greatest care and circumspection to insure any positive result; from much experience, the author is led to suppose, that Slabber lost his Zoeas in changing the sea water, and that the new form came from the added portion, a circumstance rendered more probable, by his having met with both these types at the same season of the year.

It was during the spring of 1822, that the author to his great surprise, first met with Zoeas in the harbour of Cove, and that in considerable abundance; the year following at the same season, one of considerable size occurred, amongst a great number of smaller ones, and judging it full grown, (Plate II. fig. 1, 2,) and a fit subject to keep for the purpose of witnessing the metamorphosis observed by Slabber, it was daily supplied with fresh sea water in the most careful manner, from May 14, until the 15th June, when it died in the act of changing its skin, and of passing into a new form, but one by no means similar to that expected, as appears evidently by its disengaged members (fig. 11.) which are changed in number, as well as in form, and now, correspond with those of the Decapoda, (Crabs, &c.) viz. five pair, the anterior of them furnished with a large claw or pincer: the metamorphosis not having been completed, prevented any knowledge being acquired of its general form, enough however has been gained to shew, that the distinctive characters of Zoea, and of Slabbers changed Zoea, were entirely lost, that the members, from being natatory and cleft (as shall shortly be shown,) become simple, and adapted to crawling only. On the 1st of May of the present year, (1827,) another large Zoea was taken, and dying towards the end of the month without having the requisite strength to disengage itself from the exuvium, presented precisely the same results with the former.

The proof however might be deemed incomplete, had not the author the good fortune to succeed in hatching the ova of the common Crab *(Cancer pagurus)* during the month of June last, which presented exactly the appearance of Zoea taurus, with the addition of lateral spines to the corselet: the *Crustacea Decapoda* then, indisputably *undergo a metamorphosis,* a fact, which will form an epoch in the history of this generally neglected tribe, and tend to create an interest which may operate favorably in directing more of the attention of Naturalists towards them. In their first and tender stage, they are essentially and purely *natatory* animals, and no doubt possessed of corresponding habits, swimming about freely and without intermission in search of appropriate food; in their perfect state, the greater number can no longer avail themselves of the power of swimming, but are furnished with pincers and feet almost solely adapted to crawling, so that they are now under the necessity of confining their excursions in pursuit of prey within more narrow limits. This curious piece of economy, explains what has ever appeared paradoxical to naturalists, viz. the annual peregrinations of the Land-Crabs to the sea side, which, although acknowledged to be true by several competent observers, could never before be satisfactorily accounted for.

Having avoided going much into detail of the structure of the Zoeas so imperfectly observed by the authors cited, it only remains to unfold this part of our subject, in order to render their history complete, premising, that the following description has been derived from one of the full grown specimens above alluded to, which may therefore be supposed to differ from such as occur of smaller size in the greater degree of developement of all its parts; thus, the eyes are more distinctly pedunculate, the natatory division of the feet have an increased number of plumose setæ, the rudiments of the sub-abdominal fins are quite obvious, and the mandibles shew the rudiment of a palp; in other respects they are essentially the same.

The *Eyes* are large, distant from each other, and although on short footstalks, do not appear to be possessed of any obvious motion.

The *Corselet*, or cephalo-thoracic-clypeus covers the back and sides of the animal, and is prolonged in front into a long deflected spine, and has another long spinous projection on the posterior part of its dorsum, and a pair of short lateral spines.

The *Abdominal* portion uncovered by the clypeus, is composed of four semicylindric narrow joints, each furnished with the rudiment of a pair of sub-abdominal fins, and is terminated by a deeply forked tail, spinous within.

The *Antennæ* or feelers, are double on each side; the inner pair being short, and composed of two basil joints, surmounted by two lobes, of which one lobe is very short, and the other 3-articulate and setose; the outer pair consist of three parts, the central or principal one, large, long, and taper, the lateral ones small and short, one of them of 3 articuli, and attached to the base of the central division, the other also articulate, ending in two setæ, and originating from the first joint of the principal.

The *Members* or legs, consist of but *two* pair, each divided into an outer and inner limb, of which, the outer divisions are adapted to natation, and the inner to the service of the mouth, the former projecting laterally, while the latter are carried in a forward direction, and nearly concealed beneath the body of the animal.

The apparatus of the *Mouth* consists of a pair of strongly toothed mandibles, furnished with the rudiment of a palp, and of two pair of jaws, (maxillæ) together with an upper and under lip: the maxillæ are lobed and spinous, with an external articulated appendage, the innermost of them furnished with a broad ciliated scale at its base, serving it is presumed to fan or aliment the respiratory organ; the labrum or upper lip, is semicircular and simple, the under lip bilobate and bearded.*

Independent of the knowledge we *now* possess of these animals, we should from the foregoing detail, refer them without hesitation, as Dr. Leach has done, to the Shizopoda, or cleft-footed Malacostraca, and consequently next to Nebalia, which is also most probably a crustaceous animal in its progress to a more perfect state; in which case, the only true Shizopodæ as yet described, are the animals of the Genus Mysis or Opossum Shrimp, the structure and natural history of which, are detailed in the following Memoir.

* The French have adopted the term Zoe for these animals, which, as more simple, and better suited to the genius of our own language than the Latin, may be used in familiar discourse without any impropriety.

MEMOIR II.

On the Genus Mysis, or Opossum Shrimp.

The Mysis, or Opossum Shrimp, a Genus instituted by Latreille, appears to have been hitherto noticed by very few Naturalists, and to the bulk of such even as devote themselves to Zoology alone, they may be said to be wholly unknown; those few who have had opportunities of observing them, although they have given us some imperfect notion of their structure, have left their singular economy a mere blank, from a practice hitherto much too prevalent, of attending almost solely to the more remarkable differences which distinguish one genus or species from another, as if this was the only object worthy our attention, whilst those circumstances of structure and economy which give a real interest to natural history are either neglected or overlooked. The object of this Memoir therefore, will be to make the Opossum Shrimps more generally and perfectly known, and to display the more remarkable traits in their economy, and may thence be considered as having novelty to recommend it to the attention of the curious; at the same time it may be observed, that the Marsupial Quadrupeds or Opossums, (although so long and so well known) having lost little of their original interest with the admirers of the works of creation, induces a hope, that a somewhat similar economy displayed for the first time in an animal of a very inferior order, may not be without its attractions; if in addition to these circumstances we take into account the *extraordinary peculiarities of structure*, which these animals present to our notice, in being provided with a *quadruple* row of feet or members, and with hands vastly more complicated and beautiful than in man, or any known creature, there could hardly be found a subject more worthy to engage our contemplation, or more capable of inspiring us with adoration of the Divine Perfection, as manifested in the minuter works of creation.

It will hardly be credited that such interesting peculiarities could have remained unnoticed, when it is known, that the Opossum Shrimps are in these climates the most common of all the Crustacea, that they abound to such a degree, as to astonish by their countless myriads, and that (unlike all the other animals of their class) they offer themselves freely to our view when we stroll along the margin of our estuaries, where, particularly in spring and summer, they may be observed forming an almost continuous band or column of some feet in breadth, extending along either margin of the tide, from the sea up to where the water becomes almost fresh. If we stop to consider so singular a piece of negligence, it only furnishes a proof of the little attention that has hitherto been paid to this class of animals.

The Opossum Shrimps belong to a small group of the Crustacea, at present embracing but three or four Genera, which it is proposed to develope in succeeding Memoirs, as they are for the most part nondescript, and in other respects highly interesting; this group has been designated by modern systematists as a *family*, under the title ot Shizopoda or Fissipedes, from the singular circumstance of having all their feet or members divided to their very origin into two parts or limbs, the inner limb being constructed for progression and the seizing of their prey, and the outer one for swimming and the giving that motion to the water which is essential to the respiratory organs; which organs, with a view to the due oxigenation of their circulating fluid, are as it were wrapped around the base of this limb, and fully exposed to the action of the ambient fluid: in the other Crustacea to which they most nearly approach in appearance, as the Shrimps, Prawns, and Lobsters, it may be observed, that there is a single row of *five* feet on each side, (and they are hence designated by the family title of Decapoda) and these adapted to crawling, except some of the anterior pairs, which are generally chelate or formed into a kind of pincers; and further, that the branchia or gills, which are attached to the outer part of their base, are reflected backwards and upwards, and entirely protected and concealed by the sides of the shell or cephalo-thoracic-clypeus.

The number of feet in this Genus, and in such of the Shizopoda as are thoroughly known, is *eight* in each of the *four rows,* in all thirty-two feet! of which sixteen are adapted to prehension, and sixteen to swimming. We plainly perceive in this instance, how organization modifies the habits of these two descriptions of Crustacea, the Shizopoda being almost always found swimming near the surface of the water, whilst the Decapoda with extended tails, (Macroura) as the true Shrimps. &c. are obliged to confine their perambulations to the bottom; these latter it is true are not altogether incapable of swimming, but when they do, it is evidently an effort, and effected solely by means of the subcaudal fins: it results from the above economy, that these, clear the bottom of numerous impurities, and by their predacious habits, keep in check the mollusca, annelides, &c. below, whilst those, (the Shizopoda) effect the same purpose in the supernatant element, where the medusæ and lighter portions of extraneous matter, furnish an equally abundant stock of nutriment; thus the ocean is freed from much of its impurity, and the balance of nature sustained.

Confining our views to the Genus Mysis or Opossum Shrimp, it may be observed by reference to the magnified figure, Plate I. fig. 1. that its general appearance approximates much to that of the Shrimps and Prawns, but independent of the number and structure of the feet and branchia above stated, the abdomen, which is always kept extended, is furnished with fins of a very peculiar structure, Plate I. fig. 9, added to which, the female is provided with a post-thoracic pouch, Plate I. fig. 1. *u.* composed of four concave valves, which are articulated inside the base of the two posterior pair of legs, and strongly ciliate or pectinate where they meet in front: of these valves the posterior are the most capacious, and exterior to the others; it is within this pouch, that the eggs are received when excluded from the ovarium, and enveloped in a mucous or subgelatinous secretion, and gradually developed without any visible attachment to the parent. The ova when first received into the pouch, are considerably more advanced than those of the Shrimps, Crabs, &c. on their first expulsion, and by no means so numerous, a circumstance more than compensated by the rapidity with which one brood succeeds to another during the whole of the spring and summer months: the number of broods produced by one individual, as well as the time occupied in their evolution, have not been determined, but the changes which the embryo undergoes in configuration are sufficiently obvious; in the present instance, these cannot be considered as metamorphoses, but simply a gradual developement of parts, hence the Shizopoda may be regarded as one exception to the Crustacea undergoing transformations, another character by which they are separable from the true Shrimps, &c. to which they bear the same relation that the Syren among the reptiles (amphibia) does to the family of Lacerta. The first change which is perceptible in the ova after their reception into the maternal pouch, is a slight elongation at one end, and the appearance of two short members at each side, Plate I. fig. 10, *b*; this elongation which proves to be the tail, increasing in length, shortly after, becomes forked at the end, accompanied by a proportional growth in the four lateral members fig. 10. *c.* and which are the rudiments of the two pair of antennæ in the perfect animal, the embryo going on thus with a progressional developement from day to day, begins to assume a more complete form, and an approximation to that of the parent, fig. 11, in which stage the divisions of the abdomen, the tail, the pedunculate eyes, and the various members are sufficiently distinct; a still more close resemblance to the perfect animal is attained before the young are finally excluded, which is effected by the parent spreading open the valves of its pouch, when the whole brood emerge at once into the ambient element, and in most of the species, continue associated with the community from which they sprang: the slight differences which they now present, (and which are necessary to be known in order to preclude the possibility of their being mistaken for individuals of a different species,) affect only the inner rows of feet, the sub-abdominal fins, the outer antennæ and the tail; the first of these, in place of the multi-articulate termination seen in Plate I. fig. 8. *a.* have but one or two short joints and a curved claw fig. 12, superadded to the end of the tibiæ, and hence this division of the limb is shorter in proportion; the sub-abdominal fins consist only of a linear joint surmounted by a few bristly hairs, and do not put on the elegant appearance seen in fig. 9; the outer antennæ differ in no other respect than in the ciliated scale which is attached to their base, being shorter and less developed, as is also the brush of hair in the males fig 5; the three intermediate scales of the tail are proportionably shorter, but yet present the character peculiar to the species, in their form, indentations, and appendages, so as to testify the acuteness of Dr. Leach in having fixed upon this part to distinguish the species from each other.

What is further remarkable of the embryo, is the way in which they are arranged within the pouch from the moment they assume an elongated form; their heads being towards the breast of the mother, with the curvature of the tail part suited to that of the outline of the pouch, the convexity being at the same time invariably on the belly side, fig. 11, which is the more singular, since the curvature of the perfect animal, and of other embryo Crustacea is as invariably in a quite opposite direction; after this manner, they lie closely compacted together, and present a perfectly symmetrical arrangement, easily observed from the translucency of the valves of the pouch, and the large size and blackness of their eyes.

This curious and extraordinary piece of economy can hardly fail to be regarded by the Physiologist as equally interesting with that of the Opossums, and other Marsupial Quadrupeds, and of a much more unaccountable nature; for in these last, although the object of the Creator is not obvious, yet we can understand the manner in which it is carried into effect, the young being excluded from the uterus when they have scarcely attained a fourth part of the growth of the embryos of other animals—naked, helpless and blind, they are received into the abdominal pouch of the mother, and by some wonderful instinct, or by the mother's agency, attached each to one of the teats which are situated within it, from whence, when sufficiently grown, they make occasional sallies, until able entirely to provide for themselves; in the Opossum Shrimp on the contrary, we comprehend the object, but are completely at a loss to account for the manner in which it is brought about, for these animals have nothing analogous to teats, the embryos have no visible attachment to the mother, appear to be in no capacity to take food, nor to carry on the respiratory function. It is nevertheless probable, that the secretion in which they are immersed, constitutes the source of their nutrition, whether taken in by suction or by absorption; yet if we admit this, what are we to think of the function of respiration thought to be equally necessary with nutrition to the continuance of life and the evolution of the fœtus, as the subgelatinous secretion appears to exclude the direct influence of the ocean upon the respiratory organ, which moreover does not appear to be developed until the moment prior to their exclusion from the pouch, this circumstance, taken in conjunction with the suspicions of some Physiologists as to the oxigenation of the fœtal blood, may lead to such further observations as may tend to throw some new light upon this still obscure function in the fœtus.

To the Philosophical Naturalist, who delights to trace the changes which parts are made to assume in figure and use, in contiguous groups of beings, so as to fit them for different modes of life, the Opossum Shrimp must prove highly interesting, for independent of the peculiar structure or modification of its feet before noticed, and which renders it essentially natatory, it points out to us in the clearest manner possible, by the changed appearance of its three anterior pairs* of feet, that what have been considered in the Crabs and Lobsters, &c. (Decapoda) as three pair of auxiliary jaws or Pedi-maxillæ, are no other than the above members in a disguise which seems to appropriate them in a decided manner to the service of the mouth; for in the Decapoda there are (as the name of the family implies) but five pair of feet, and three pair of auxiliary jaws, which jaws being added to the front of the series of feet in the Opossum Shrimps, encreases their number to eight pairs, of which the sixth, reckoning upwards, are not to be distinguished in structure from those posterior to them.

The males in this Genus appear to be much less numerous than the females, and differ principally in being smaller, and in the substitution of a peculiar organ between the last pairs of feet (Plate I. fig. 13, 14.) instead

* The peculiar structure of the limbs, being subdivided into two, renders necessary this unauthorized application of *pairs*.

of the valvular pouch of the other sex; they have further the addition of an appendage at the bifurcation of the inner antennæ, so densely tufted as to resemble a brush, (Plate I. fig. 5;) it is probably this appendage which has induced Naturalists erroneously to assign to Mysis, *trifid* interior antennæ.

Hitherto, the Opossum Shrimps have not been observed further South than the precincts of the English Channel, but they occur as far to the North as the icy seas of the Polar regions, where they must exist in very great abundance during the summer season, as they are said by O. Fabricius to constitute one of the principal sources of nutriment to the Whale, which taking in myriads at a gulp, separates them from the water by means of its complicated strainers, and swallows the congregated pabulum which they now form, at leisure; we should hardly give credence to the fact, that an animal so disproportioned, should constitute the food of this Leviathan, did we not perceive that the peculiar structure of the mouth, and smallness of the gullet in these enormous creatures (the Mysticete Whales) is in perfect accordance, and fits them for separating small and soft animals of every kind from the sea water, while it precludes the power of masticating, or of swallowing bodies of even moderate size: abundance in this instance, makes up for the individual smallness of the prey, and these little animals must be allowed to be a much more substantial food than the medusæ, upon which the whales are also understood to feed. In these climates, the Opossum Shrimps serve as food to the herring and pilchard, and probably to many other fishes, and although by their numbers they might tempt the epicure to serve them up in the aggregate, as they do the young fry of fish in some parts of the world, the species with which we are best acquainted are so little particular in their food as to counteract any design we might form upon them; this objection however, does not apply to the oceanic species, nor indeed to the others, provided they are taken where the water is pure and saline, and at a distance from rivers and towns. The Opossum Shrimps in common with all the smaller Crustacea, are animals which require the best eyes and instruments to observe properly, and the most detailed sculpture to represent, if therefore the accompanying figures seem minute, they are rude when compared with the originals.

It is in looking closely into the structure of these little animals, that we see the *perfection* of the Divine Artist; nature's greater productions appear coarse indeed to these elaborate and highly finished master-pieces, and in going higher and higher with our magnifiers, we still continue to bring new parts and touches into view. If for instance, we observe one of their members with the naked eye—which may be the utmost stretch of unassisted vision—with the microscope it first appears jointed, or composed of several pieces articulated together—employing a higher magnifier, it appears fringed with long hairs, which on further scrutiny gain a sensible diameter and seem to be themselves fringed with hairs still more minute; many of these *minute* parts are evidently jointed, and perform sensible motions, but what idea can we form of the various muscles which put all these parts in movement, of the nerves which actuate them, and the vessels which supply them with the nutrition essential to their growth and daily expenditure, all of which we know from analogy, they must possess.

The magnified figures in Plate I. and II. may furnish some faint idea of the delicacy and elegance of most of the parts in the Opossum Shrimps, particularly that of the sub-abdominal fins Plate I. fig. 9, of the tail Plate II. fig. 2, and above all, that of the hand of the second pair of feet, fig. 3, which is at once complicated and beautiful, and one of the most elegant microscopic objects that can be conceived.

These, and all the other magnified sketches, with which it is intended to illustrate the smaller subjects in the progress of these memoirs, will tend to show, how absurd it is to think of communicating a clear idea of almost any minute animal without them, and how idle to rest satisfied with representations of the *natural size,* since so much that is worthy to be seen and admired, and which appears necessary to the right understanding of their true nature remains invisible to the unaided sight.

In these little animals when young, and particularly in Mysis Vulgaris, the circulation can be better observed than perhaps in any other of the Crustacea. The Heart, which is situated under the centre of the corselet behind, is of an elongated form, (Plate I. fig. 15, *b;*) at its fore part it gives off an anterior aorta, which going towards the head is speedily veiled from the sight by the opacity of the matters contained in the stomach (*a*) and intestine, over which it runs; at its opposite end in like manner it furnishes a posterior aorta, (*c*) which may be traced to the end of the tail; at each side, it further appears to receive a vessel of smaller size, which is probably the united trunks of the pulmonary veins, reconveying the aërated blood from the branchia, again to go the round of the circulation; the pulsations of the heart are so rapid as to resemble vibrations, and together with the blood it is so transparent and colourless, that but for the globules of the latter we should hardly be able to trace the course of the circulation, and which in the figure is represented by little arrows. On observing with attention the termination of the posterior aorta at the end of the tail, a periodical action may be noticed, as if of the opening and closing of a valvular opening on each side, accompanied each time by the filling of the corresponding end of a vessel of considerable size, lying on each side of the intestinal canal, (*d*) these vessels or veins, propel the blood towards the heart by successive contractions of their muscular fibres, as represented in the figure, and seem to be lost at length in a great sinus or auricle, lying beneath the heart; whether this is really the case or not, remains to be ascertained by dissection, there can scarcely be a doubt however, that the two large veins constitute the Venæ portæ, and ultimately send their blood to the Branchia: a somewhat similar appearance, is presented by the venous system of the Caligi, and it is not improbable that in both of these, a valvular communication will actually be found to exist between the posterior commencement of the above described Venæ portæ and the abdominal cavity, into which cavity, we may suppose the fluids to be finally poured by the continuations of the arteries, and by the excretories of the alimentary canal, taking into consideration at the same time, that no lacteals or lymphatic system has been proved to exist in any of the invertebrated animals. Whether these appearances, independent of dissection, warrant such a view of the circulation or not, Physiologists will be enabled the better to appreciate its probability, by referring to a somewhat similar contrivance in the molluscous genera of Aplysia and Sepia, first brought to light by the immortal labours of the first comparative anatomist of the age. See Cuvier, Memoires pour servir a l'Hist. Nat. des Mollusques.

If the Opossum Shrimps are the prey of numerous inhabitants of the ocean, they are themselves equally destructive to animals less in size and power, being however rather omnivorous, than strictly carnivorous, seizing and eating every animal substance which the current or the tide carries along with it, and contending like vultures for the possession of the larger masses, nothing tends however to establish more unequivocally their rapacious nature, than the circumstance, that when confined together in a vessel of sea water, they even kill and devour one another.

That the Natural History of the Opossum Shrimps may be rendered as complete as the state of our knowledge permits, and for the satisfaction of the Scientific Naturalist, and the Systematist, the following short description of the Genus has been drawn up, which may be passed over by the general reader.

The *Corselet* or cephalo-thoracic-clypeus, resembles that of the Prawns, without however being remarkably prolonged in front.

The *Eyes* are very large, spreading, and on rather long pedicles.

The *Antennæ* or feelers, consist of an inner and an outer pair; the former, arise from between the eyes, are composed of three robust basil joints, of which the uppermost is short and supports two long multi-articulate setæ, the innermost of these setæ is shorter, and carried straight in front, while the outermost spread out in a lateral direction; the latter or outer pair of antennæ, are placed upon a lower level than the former, originate from the inner side of the anterior lamina or scales, and end in a single long multi-articulate seta, extended downwards and outwards by the animal in swimming.

The *anterior Lamina,* or scales, which accompany the outer antennæ, correspond with the same members in the Shrimps and Prawns, but are longer in proportion, and vary in their shape, so as to furnish characters for the distinction of the species.

The *Mouth,* situated as in the Shrimps below the base of the antennæ in front, is provided with a labrum, and with a bilobate under lip, a pair of palpigerous toothed mandibles, and two pair of complicate foliaceous maxillæ or jaws. The Palp has its first joint much abbreviated, the second and third, broad, and strongly pectinate on the margin.

Feet: Unlike all the other Macroura, (in which the three anterior pair of feet are disguised and appropriated to the immediate service of auxiliary jaws) the whole series of feet to the number of eight pair, are thoroughly developed, and further, present us with a very peculiar construction, being all divided to the basil joint or coxæ, into an outer and an inner branch; the former corresponding with the flagrum in the Decapoda, having each a branchia wrapped around their first joint, and ending in a pluri-articulate plumose member, adapted to swimming; the latter or inner division, constitute the true feet, and except in the two anterior pair, end in a many-jointed tarsus surmounted by a small hook, this part in the two anterior ones, being reduced to two joints, of which the extreme joint resembles a kind of hand more or less complicated, particularly beautiful in the second pair, being furnished with a marginal row of jointed spines, most elegantly toothed on their opposite edges.

Valvular pouch. Attached to the base of each of the inner divisions of the two posterior pairs of feet in the female, is a large concave scale, strongly pectinate in front, of which the posterior is the outermost, largest, and most concave, lapping considerably over the anterior scale, so as to admit of a considerable extension of the size of the pouch which they form, by meeting each other in front, in order to accommodate its capacity to the growth of the ova and young brood.

In the *male* in place of the valvular pouch of the female, we perceive attached to the inner part of the last pair of feet only, a single small hollow scale on each side, ciliate in front, and provided with a marginal row of slender hooks at the apex: these are probably an appendage of the male organs, which have a similar situation in the Shrimps.

The *Abdomen* or caudal extremity, consists of five joints, furnished beneath with as many pair of fins or natatory members, each fin composed of a *single* elongate flattish scale, plumosely ciliate on its outer margin. We have in this structure of the sub-abdominal fins, which is not found in any other of the Macroura, another instance, of the modifications which parts undergo in the hands of Omnipotence, so as to adapt them to the peculiar habitudes of the animal; in Mysis they are *wholly* adapted to swimming, and therefore present the most simple arrangement, but in the other Macroura, as they also serve to receive and mature the ova, they are necessarily larger and more complicate, and are each composed of two articulate branches supported on a common basis.

The *Tail* is composed of five scales, articulated to the last segment of the abdomen; the middle scale, varying in shape and armature, has been considered by Dr. Leach, as affording the best and most obvious specific characters; of the lateral scales, the outer ones are the largest, and *also* present considerable difference in shape in the different species.

Of the different Species of Opossum Shrimp.

The species of this Genus as yet known, are but few, and appear to be principally littoral, frequenting the shores and shallow parts of the sea, and the estuaries of rivers.

The *Mysis Fabricii* of Dr. Leach,* enumerated by Otho Fabricius in his Fauna Groënlandica, under the title of Cancer oculatus, and very imperfectly figured, (see Plate II. fig. 11, 12) is one of the longest known, and the type of the Genus; it has been lately more satisfactorily developed by Mons. Desmarets in his work "sur les Crustacés" Plate 40, fig. 6. This species is distinguished by the middle scale of the tail being *obtusely* and deeply notched, and at the same time spinous on its edges: the outer scales of the

* Mysis, cauda lamella intermedia apice obtuse emarginata: lamellis exterioribus apice rotundatis. Linn. Trans. Vol. XI. p. 350.

tail, according to Fabricius, are rounded—in Mons. Desmarets figure, they appear obtusely pointed; he also figures the anterior scales as obtusely pointed, serrated, and ciliated all round their margin (as in M. vulgaris), and the front of the corselet obtuse. The Mysis Fabricii inhabits the sea about Greenland, and constitutes with the Mysis pelagicus, the principal food of the whale, (Balæna mysticetus.)

Dr. Leach having observed that some of the *species* of Mysis, had the middle scale of the tail notched, while in others it remained entire, has divided the Genus into corresponding sections; the former species or Mysis Fabricii, together with the two following species, belong to the section with a notched tail, the remainder are referable to his second section.

Mysis Leachii, (the M. *spinulosus* of Dr. Leach.*) The specific names hitherto imposed, not being consecrated by long usage, and being founded in a too partial knowledge of the Genus, such of them as seemed likely to mislead, have been changed for others less objectionable; thus the specific appellation given by Dr. Leach to the present species, would be equally applicable to the most of those with which we are acquainted, the same may be said of the trivial name *flexuosus* employed by Muller. The Mysis Leachii, although not sufficiently distinguished from the following species, by the characters assigned in the note, appears to differ obviously in colour and habitudes, and although the former is rather a doubtful guide, yet in the absence of more precise distinctions may be found an useful auxiliary. Colour when alive, pellucid cinereous. Eyes black, red at their base. Laminæ of the head with a black longitudinal line and spots, every segment of the body with a reddish rust coloured arborescent spot. Tail

* Mysis, cauda lamella intermedia externe spinulosa, apice acute emarginata: lamellis exterioribus acuminatis, latissime ciliatis. Linn. Trans. Vol. XI. p. 350.

fin spotted with the same colour mixed with black. Discovered by Dr. Leach on the Scottish coast in the Frith of Forth near to Leith, where it was observed in *great abundance* in the pools left by the tide. Found with fry from the middle of June to the middle of July, the females being more numerous than the males. Length $1\frac{1}{4}$ inch. Dr. Leach refers to this species, the Cancer flexuosus of Muller (Zool. Dan. p. 34 t 66), as well as Cancer multipes of Montagu, both of which are more probably referable to the following, viz.

Mysis Chamæleon * Plate 2, fig. 1 to 10. This species resembles the former so much in size, and in some of its characters, that it would appear to have been hitherto confounded with it. Mysis Chamæleon differs however obviously, in the form of the outer laminæ of the tail, which are but very slightly taper, and very obtuse at the point; the notch in the middle lamina, is furnished with a margin of smaller spines than those on the outer edge which ends on each side in a straight and stout spine; the adjoining edge of the innermost of the lateral scales, is also spinous, although the spines are not very obvious, from the plumose ciliæ which cover them. The anterior scales are very long, nearly linear, obliquely truncated at the end, with a spine at the outer angle of the truncation, and are ciliated *only* along the inner edge and at the extremity. The Clypeus ends in an obtuse point, and has a short spinous point anteriorly at the sides.

Nothing can shew the fallacy of colour in distinguishing the species, more clearly than the variety of tints which Mysis Chamæleon assumes, as it occurs here in the river Lee and Harbour of Cove, and which have suggested its trivial name; in the upper part of the river below the City of Cork, it occurs of different shades of grey, inclin-

* Mysis, cauda lamella intermedia margine spinulosa, apice acute emarginata; lamellis exterioribus *subtruncatis*: lamellis anterioribus oblique truncatis, intus ciliatis.

ing at times to black, having invariably the greater part of the anterior scales, inner branch of the superior antennæ and joints of the outer laminæ of the tail, black, and the fringe of the scales tinged with pink; lower down, amongst the littoral Fuci, it takes various tints of brown, and those obtained from sites abounding in Zostera and Ulvæ, present us with green colours of greater or less intensity.

This species has been occasionally met with in the stomachs of Herrings, but has never been observed like the other species in any great numbers together, but scattered and solitary, often associated with M. vulgaris. They are extremely quick sighted and wary, darting away or descending tail foremost or retrograde, when any attempt is made to capture them, and more frequently swim with the body in a perpendicular direction, than in any other. In the Lee, they do not appear until towards the latter end of June, but remain until the approach of winter. Length 1¼ inch. That this is the species indicated by Montagu, under the title of Cancer Astacus multipes, can hardly be doubted from the sketches given of it in Linn. Trans. Vol. IX. t. 4, fig. 3, and the accompanying description, derived from specimens occasionally found dead amongst Shrimps taken at Salcomb, and in the Kingsbridge estuary: it appears also from the same authority, to have been noticed on the coast of Kent, by Mr. Henry Boys of Sandwich. The figure given by Herbst in his Work on Crabs, &c. for Cancer flexuosus Plate XXXIV. fig. 8, natural size, and I, magnified, described Vol. II. p. 114, appears also referable to the present species, although like many of the figures in that valuable work, faulty in the colouring; as with us, he describes it — as existing *thinly scattered* in the Baltic.

The remaining species have the middle lamina of the tail entire.

*Mysis vulgaris.** Plate I. This species which with us is probably the most common of any of the Opossum Shrimps, does not appear to have attracted the notice of any Naturalist, a circumstance, either owing to their having been taken for young fry of Shrimps, or to the little attention hitherto given to this tribe of animals. When full grown, they are about one inch in length, translucent, and of a greyish colour. The Clypeus ends in an acuminate point in front; the anterior scales are of a taper form, and ciliated *all round;* the outer laminæ of the tail taper to a point, the middle lamina ends in an obtuse point, surmounted by two short spines. They swim with the body in a horizontal position, and abound in the Lee even up to Cork, from the early part of Spring to the approach of Winter; during the still period of the tide at low water, they repose upon the mud and stones at the bottom of the river, and as the tide rises, may be observed forming a wide belt just within its margin, the youngest swimming nearest to the shore, the oldest farther out and in deeper water; they appear to be mostly females, the males being few in proportion. This species contributes towards the food of various young fish, from which they frequently escape by springing up out of the water.

Mysis scoticus, the *integer* of Dr. Leach, who discovered this species on the coast of the Isle of Arran, in the estuary of the Clyde, but has not furnished sufficient characters to distinguish it from the former; like it, the middle lamina of the tail is without any notch at its extremity, but it is a much smaller animal, being but *one-third of an inch* in length, and different in colour and habitudes; colour, pellucid cinereous, *spotted with black and reddish brown.* Females more abundant. He observes, that at low tides near Loch Ranza in the Isle of Arran, the pools

* Mysis cauda lamella intermedia integra, subulata, margine spinulosa: lamellis anterioribus acuminatis utrinque ciliatis.

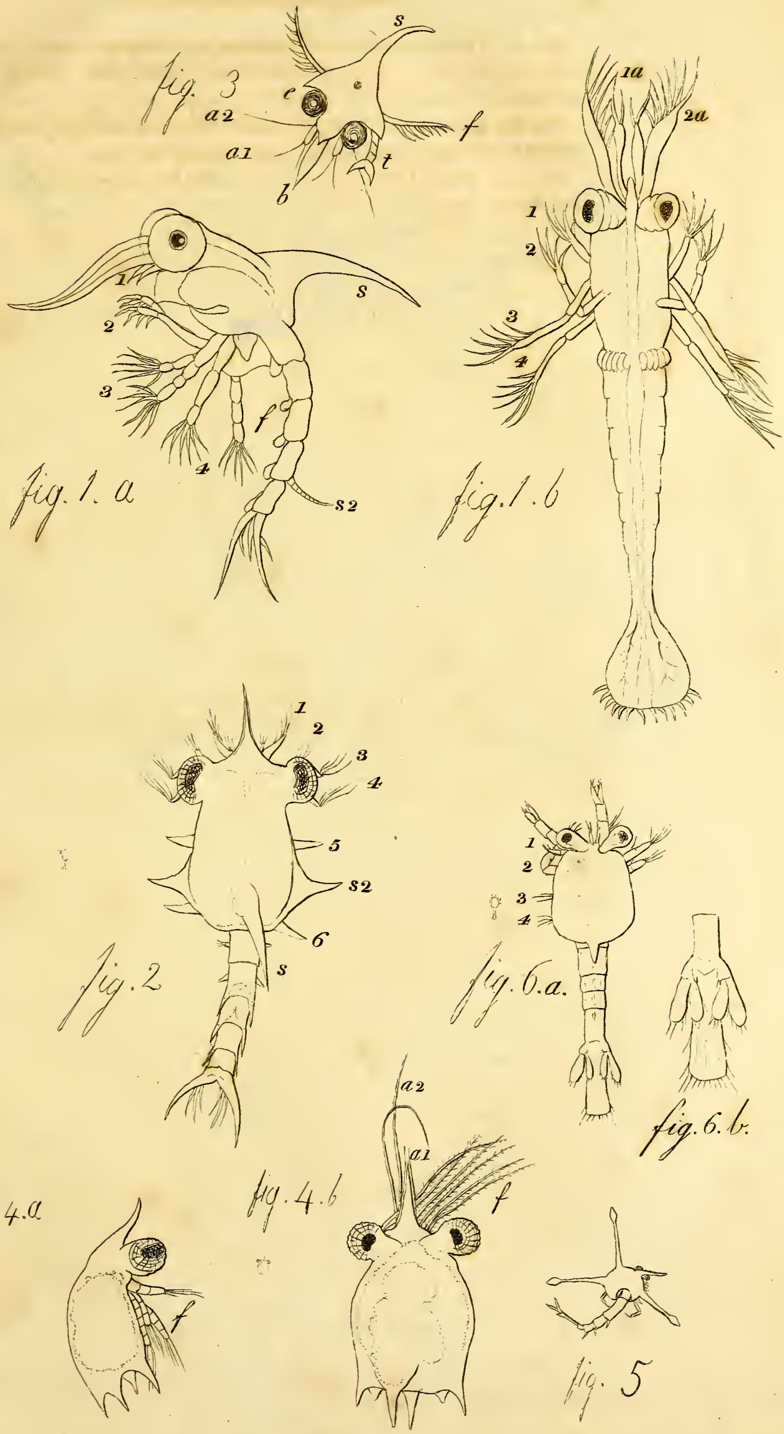
were full of this species in the month of August, swimming with its head uppermost, and its eyes spread, making a most grotesque appearance.

Mysis pelagicus, This is the species described by Otho Fabricius under the title of Cancer pedatus,* its characters would require to be more clearly pointed out, so as to distinguish it from M. vulgaris, to which it appears to approximate. It is described as of a pale colour, one inch in length, and of a *very compressed* form; the anterior scales oblong, pointed, and ciliated; the middle lamina of the tail with two short spines at its extremity united at their base; occupies the surface of the sea at Greenland in great numbers, rarely found either at the bottom or near to the shore; swims *on its back,* and forms together with the M. Fabricii, the chief food of the great Northern Whale.

Naturalists who may have opportunities of observing the ill-defined species of Mysis, or such as appear new, will do well to attend minutely to the form of the *anterior* scales, the form and armature of the scales which compose the tail, and the shape of the anterior part of the corselet, adding such information in regard to colour and habitudes, particularly their mode of swimming, as may assist in discriminating them.

* Fauna Groenl. p. 221. Cancer macrourus; thorace lævi, compresso, fronte prærupta, pedibus pectoris duplici serie; manibus adactylis; cauda recta apice aculeato, tetraphyllo.

Pl. 1.



ZOEA

I V T fecit.

PL. II.

ZOEA.

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ZOEA.

PLATE I. Fig. 1, *a*, Zoea taurus magnified, after Slabber. 1, front spine, 2, 3 and 4, three of its four pair of natatory members. s, dorsal spine. s, 2, spine of the fourth abdominal segment. *f*, sub-abdominal fins.

Fig. 1. *b*, The same animal after its metamorphosis according to Slabber. 1, *a*, interior antennæ. 2, *a*, exterior antennæ. 1, 2, 3, 4, its four members. The want of the spines so remarkable in the former figure, and the changed character of the tail are obvious.

Fig. 3. Zoea pelagica magnified, after Bosc. *a*, 1, interior antennæ. *a*, 2, exterior antennæ. *b*, front spine. s, dorsal spine. *e*, eyes. *f*, natatory members. *t*, tail.

Fig. 2. Zoea observed by the author September 17th 1816, magnified. 1, 2, antennæ. 3, 4, 5, 6, natatory members. s, dorsal spine. s 2, lateral spines. Fig. 4, *a*, 4, *b*, Zoea observed by the anthor, August 22nd, 1816, magnified. *a*, 1, *a*, 2, antennæ. *f*, natatory members.

Fig. 5. Zoea clavata of Dr. Leach.

Fig. 6, *a*, A Crustaceous animal observed by the author, September 19th 1816, S. Lat. 17° 38′, Long. W. 27° 12′, approximating the second form of Zoea, magnified. 1, 2, 3, 4, natatory members. Fig. 6, *b*, its tail more highly magnified.

N. B. On the left hand side of Fig. 2, 4, and 6 the respective animals are represented of their natural size and appearance.

PLATE II. Fig. 1. Zoea observed by the author at Cove of its natural size. Fig. 2. The same magnified. s, lateral spines. s 1, dorsal spine. s 2, front spine. *e*, eyes. *f*, feet or natatory members. *a*, 1, inner antennæ. *a* 2, outer antennæ. *t*, abdominal portion, with rudiments of the sub-abdominal fins. *t*, 1, spinous forked tail.—behind the corselet, the rudiments of the limbs of the perfect animal or Crab begin to show themselves.

Fig. 3. One of the mandibles magnified. *a*, toothed extremity. *b*, rudiment of a palp.

Fig. 4. Innermost maxilla magnified. *a*, lobed extremity. *b*, appendage. *s*, ciliated scale.

Fig. 5. Second maxilla magnified. *a*, *b*, *c*, its three divisions.

Fig. 6. One of the anterior pairs of members magnified. *a*, *b*, basil joints. *n*, natatory or swimming division of 2 joints. *f*, inner division of 5 articuli.

Fig. 7. One of the posterior pairs of members magnified, the same letters denote the corresponding parts in fig. 6, but in this the inner division has but 2 articuli.

Fig. 8. One of the outermost pair of antennæ magnified. *a*, *b*, *c*, its three divisons.

Fig. 9. One the inner antennæ magnified. *a*, *b*, its two terminal lobes.

Fig. 10. *a*, Labrum magnified. *b*, under Lip magnified.

Fig. 11. Limbs of the future Crab disengaged from beneath the clypeus on one side, magnified. *a*, chelate member. 1, 2, 3, 4, other members.

Fig. 12. Member anterior to the claw, the rudiment of the outer pedimaxilla.

MYSIS.

Plate I. Fig. 1. Side view of Mysis vulgaris magnified; the straight line near it expressing its real length when fully grown. 1 *a*, innermost seta of the right superior antenna. 2 *a*, its outermost seta. 3 *a*, setæ of the inferior antennæ. *s*, anterior scales. *e*, eye. *p*, palpi. 1 *f*, prehensile, or innermost rows of feet. 2 *f*, natatory or exterior feet. 3 *f*, sub-abdominal fins. *u*, valvular sub-pectoral pouch, or receptacle of the young in the female. *c*, the cephalo-thoracic-clypeus. The five-jointed posterior part of the trunk, and the tail require no figures to make them obvious.

Fig. 2. The anterior part of the animal from above, more highly magnified, shewing the taper pointed form of the anterior Scales, the form and position of the superior antennæ, with regard to the inferior and exterior pair, the pointed termination of the Clypeus in front, and the Eyes.

Fig. 3. The Tail from above, magnified in the same degree with fig. 2, for the purpose of shewing the form of the laminæ, and particularly the middle one, with its spinulose margin.

Fig. 4. One of the Palpi from within, very highly magnified. *a*, basil joint, by which it is articulated to the mandible, *b* middle joint, *c* last joint, ending in a strong spine and a row of muricated clavæ, and having a row of hooks along one margin, and a double decussating row of bristles along the other; to do justice to the curious and complicated structure of this one joint it would require the entire plate to itself.

Fig. 5. The basis of one of the superior antennæ in the *male*, to show its brush-like appendage; the setæ have been cut off short; × indicates the point of attachment to the animal.

Fig. 6. One of the first pair of feet, (the left) highly magnified, × point of attachment. *a* its inner division. *b* its outer division abbreviated, as being similar to those of all the other feet. *g* its branchia.

Fig. 7. One of the second pair of feet, (the left) highly magnified, × point of attachment. The same letters indicate the analogous parts in fig. 6, 7, and 8. In this figure, the outer or natatory division of the limb is fully represented.

Fig. 8. One of the last (or of the eighth) pair of feet, (the left) highly magnified; shewing the pluri-articulate tarsus of the inner division, consisting of about ten joints, and ending in a short claw. The 3d, 4th, 5th, 6th, and 7th pair of feet are exactly similar. Fig. 12, shews the tarsus and claw, as they appear when the young animal first emerges from the maternal pouch.

Fig. 9. One of the sub-abdominal natatory fins, very highly magnified, consisting of a single joint, and very beautifully feathered on its edge.

Fig. 10. Figures of the natural size and magnified, shewing the progress of developement in the Ova. *a*, ova when first received into the valvular pouch. *b*, side and front views of the elongated ova, with its two pair of lateral projections. *c*, side view of the embryo, the tail considerably elongated, forked, and bent backwards, and together with the lateral members, slightly ciliated. Fig. 11. The Embryo of the natural size, and magnified,

approaching to maturity; its pedunculate eyes, two pair of antennæ, clypeus, feet and posterior extremity almost fully developed.

Fig. 13. The last or eighth pair of feet in the *male*, magnified. × indicates the situation of those organs in the male which occupy the place of the female receptacle. *fig*. 14. One of these organs (the left) more highly magnified, × its point of attachment.

Fig. 15. Magnified sketch of the Heart and great blood vessels, the arrows indicating the course of the circulating fluid. *a*, the stomach, lying over the anterior aorta, and obscuring its further course towards the head. *b*, heart. *c*, posterior aorta. *f*, indicates the line of the posterior part of the clypeus. *d, d*, presumed venæ cavæ. *e, e*, what seems to be a receptacle placed beneath the heart. The two *lateral* vessels which are seen entering the heart, are probably the trunks of the pulmonary veins, coming from the branchiæ. The great transparency of this species, (M. vulgaris,) particularly when young, permits all this to be seen without dissection.

N. B. In order to avoid the unnecessary multiplication of plates, and as the *remaining members of the mouth, and the valvular pouch*, are similar in M. Chamæleon, these parts have been copied after *that* species, and will be found in the following Plate.

Plate II. Fig. 1. Anterior extremity of the female Mysis Chamæleon, highly magnified. 1 *a*, superior antennæ. 2 *a*, inferior antennæ. *c*, corselet. *e*, eye. s anterior scales.

Fig. 2. Posterior extremity of the same somewhat more magnified, to shew the peculiar form and armature of the middle scale, as well as the shape and admirable plumose fringe of the outer ones.

Fig. 3. The last joint of the inner division of the second pair of feet, very highly magnified; a small circle on the left indicates its natural size, and the line on the right the length of the full grown animal. This very beautiful member, may be observed to end in a strong spine above, to have its front armed with a gradation of hooks, its back bristly, and its margin surrounded by a graduated row of bi-articulate flattish spines, most elegantly toothed on their opposite edges. It is hardly possible to do justice in such a sketch, to the complication, and extreme elegance of this wonderful little hand.

Fig. 4. One of the first pair of maxillæ, highly magnified, from the right side, (as seen from within,) foliaceous, complicate, and variously ciliated: *f* the analogue of the flagrum, placed at its outer edge.

Fig. 5. One of the second pair of maxillæ, from the same side, (also from within,) its middle division with a double row of teeth, its inner division, ending in three denticulate spines. *f*, analogue of the flagrum.

Fig. 6. Mandible and Palp of the left side, highly magnified, as seen from without. *a*, fulcrum for muscular attachments: *m*, acting part of the mandible and its toothed extremity. *p*, Palp, (as in Plate I. fig. 4) attached to the angle of the mandible.

Fig. 7. Labrum, highly magnified.

Fig. 8. Labium, highly magnified.

Fig. 9. The outer or *posterior* valve of the maternal pouch, from the left side, magnified, × point of attachment; front edge strongly ciliate or pectinate.

Fig. 10. The inner or *anterior* valve of the maternal pouch, from the same side as the former, magnified, × point of attachment.

Fig. 11. Mysis Fabricii from the Fauna Groenlandica. Fig. 12, tail of the same.

ERRATA.

Page 8, line 4.... *for* fig. 1, 6, *read* fig. 1. *b*.
16, " 6.... from bottom, *for* Lacerta *read* Salamadra.

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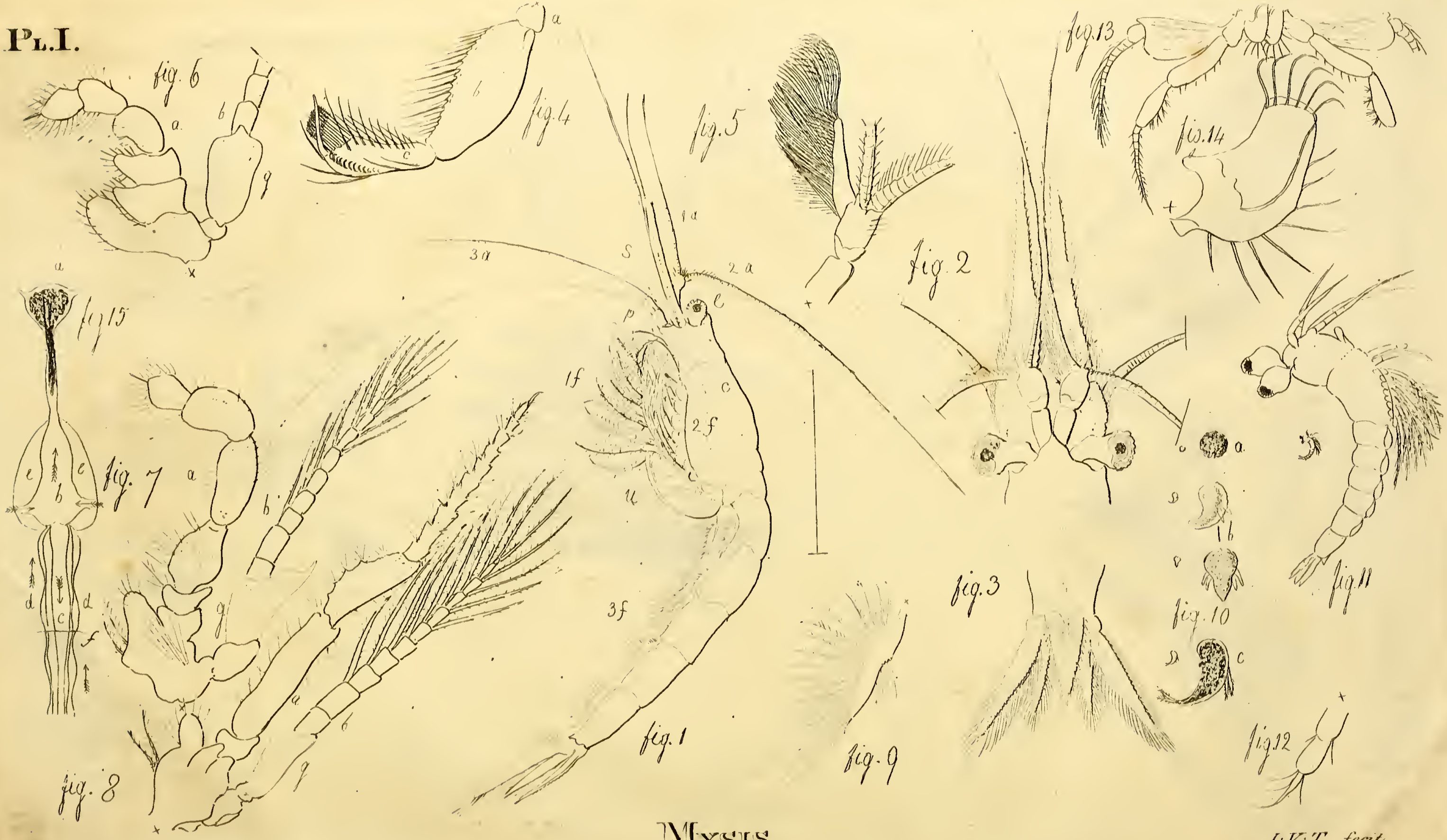
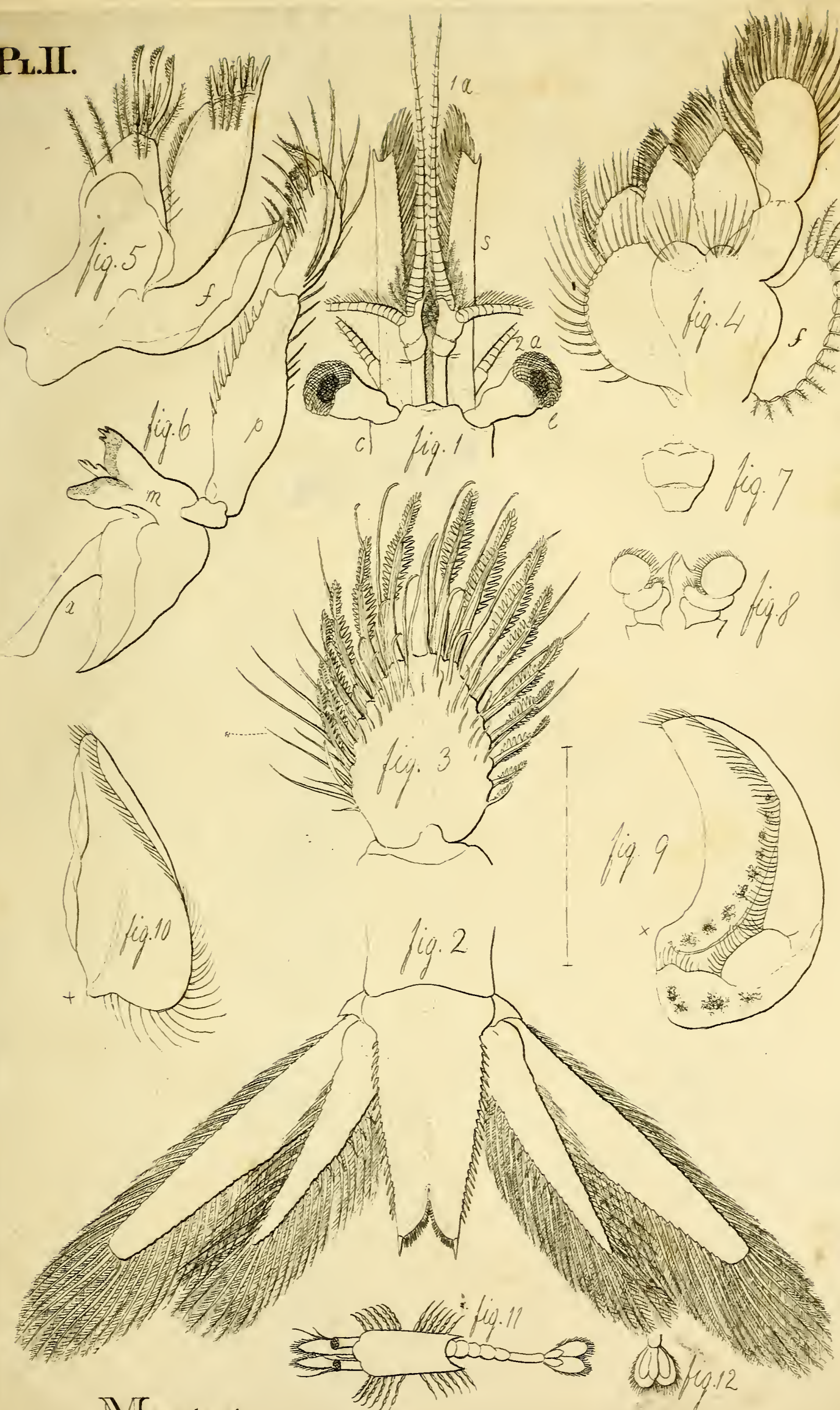
Pl. I.



Mysis.

I·V·T. fecit.

Pl. II.



MYSIS.

J. V. T. fecit.

No. II. *April*, 1829.

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On the Luminosity of the Ocean, with descriptions of some remarkable species of Luminous Animals (Pyrosoma pigmæa and Sapphirina indicator) and particularly of the four new genera, Nocticula, Cynthia, Lucifer and Podopsis, of the Shizopodæ.

THE animals of which we are about to treat, contributing largely to the phosphorescence or sparkling of the sea, the following general observations relating to that subject, may not be deemed unacceptable or out of place.

Of the various Luminous Phenomena which nature offers to our notice, that afforded by the luminosity of the ocean, is one of the most remarkable, and has consequently attracted a good deal of attention from Philosophers and Naturalists: having ever been alive to this interesting appearance, in various seas and regions, I feel myself authorized to offer the following general observations upon the subject.

(A.) The most common and familiar kind of luminosity is that, which, when the water is slightly agitated by the winds or currents, shews itself, in scattered sparkles in the spray of the sea, and in the foam created by the way of the ship; these sparkles or luminous points, vary in magnitude, and often continue to shine for some moments, as they pass the sides of the vessel, or follow in the track; the kind of light exhibited by this variety, is perhaps more brilliant and condensed than that of any of the others, and very much resembles every way, that of the red, gold, and silver rain of the Pyrotechnist.

(B.) The former kind of luminosity, is not unfrequently accompanied by flashes of a paler light of momentary duration, and independent of the light with which these strike the visual organs, often illuminate the water to the extent of several feet; these are more or less vivid, according to the distance of the observer, and the depth at which they make their appearance. This kind of luminosity, resembles extremely the lightning so often seen in tropical regions, and which presents itself in diffused flashes of light, now issuing from one mass of clouds, now from another, in constant succession over the whole face of the heavens.

These modifications of the luminosity of the ocean, are common to every part of it in the more temperate and tropical regions. A variety of the last kind, (B) in which these larger masses of phosphoric light possess a greater degree of permanence, has been noticed by Spallanzani in the Mediterranean, and may occur in other situations, but has never been seen by the author. "If" says he "in the beginning of the night we enter the strait of Messina (October was the month in which these observations were made) in a low bark or boat coasting near the land, where the water is perfectly calm, the Medusæ, which are usually very numerous there, begin to shine with a light, which as the darkness increases, acquires intensity and extent, every medusa resembling a bright torch, that may be seen for some hundred paces around; and on approaching it, the brilliant phosphorus shews the form of the body. This light, when the evening twilight is extinct, is of a lively white, which strikes the eye even when the animal is five-and-thirty feet below the surface. As the medusa, by its oscillation, transfers itself from place to place, so the light is variable and is stronger in the systole than in the diastole. Sometimes it continues for a quarter of an hour, half an hour, or more; but at other times it suddenly becomes extinguished, and does not re-appear till after a considerable interval. These luminous medusa are called *Bromi* at Messina—at the Lipari islands *candellieri di mare*." (*Travels*, vol. IV. p. 229.)

(C.) A third kind of luminosity, is peculiar to gulfs, bays, shores and probably to parts of the ocean where the bottom is at no great distance, in all the warmer regions of the globe; here the luminosity is so predominant that the slightest agitation of the waves, the passage of fish, the movement of the oars, or the way of a ship, produces a diffused pale phosphorescence, and under some of its modifications, resembles a sea of milk, or rather of some metal in a state of igneous liquefaction.

Passing for the moment some less common and peculiar kinds of luminosity, it may be observed, that all the various foregoing appearances, so interesting and often alarming to those who travel by sea, have been ascribed at different periods and by different individuals to a variety of causes, viz. *a*, the absorbed light of the sun, disengaged by the friction of the waves; *b*, electricity, excited by the same means; *c*, phosphoric matter diffused through its mass; *d*, lastly, to luminous marine animals. The investigations of the practical Naturalist have tended to set aside all these, with the exception of the last, which would appear to be the sole cause of this curious phenomenon, in all the modifications above stated, as well as in every other instance: the first and third kinds (A & C.) being attributable to minute crustaceous animals, the smaller medusæ and molluscæ, and perhaps some annelides, modified in degree, by the animalcules being more or less scattered, and the prevalence of particular species: the second kind (B.) as already explained, appears to be the production of medusæ of a larger size, of which as yet, but two species have been observed to be possessed of this curious property, viz. medusa pellucens of Sir Joseph Banks, *(Philos. Trans.* 1810, pl. XIV, fig. 3) and the medusa Spallanzanii not hitherto figured; both of these belong to the genus Aurelia of Lamarck, of which we have many species not luminous.

The third kind of luminosity, (C) is comparatively of rare occurrence, and that which is the most alarming in appearance; I had but once an occasion to witness and to investigate it as it occurs in the Mediterranean. Returning from a fishing party *late* in a still evening across the bay of Gibraltar, in a direction from the Pomones river to the old Mole, in company with Dr. Drummond, (now Professor of Anatomy to the Belfast Institution) and a party of naval officers, the several boats, although separated a considerable distance, could be distinctly traced through the gloom by the snowy whiteness of their course, while that in which we were, seemed to be passing through a sea of melted silver; such at least was the appearance of the water, displaced by the movement of the boat and the motion of the oars; the hand, a stick, or the end of a rope, immersed in the water, instantly became luminous and all their parts visible, and when withdrawn, brought up numerous luminous points less than the smallest pin's-head, and of the softest and most destructible tenderness, appearing on a closer inspection out of the water, like hemispheric masses of a colourless jelly, evidently however, organized and included within an enveloping tunic; these were probably some species of minute medusa. This appearance however, is probably caused by several different animals; thus the animal discovered by Mr. Langstaff on a voyage from New Holland to China, appears to have been the linked young of some Salpa, while that observed by Riville is undoubtedly a crustaceous animal of the ostracoda. The former, as cited by Professor Macartney in his valuable paper on luminous animals, *(Philos. Trans.* 1810,) states "In going from New Holland to China, about half an hour after sunset, the sea presented a milky appearance, the ship seemed to be surrounded by ice covered with snow, no bottom was discovered on this occasion with 70 fathoms of line — a bucket of water being hauled up, and examined in the dark, discovered a great number of globular bodies, about the size of a pin's head, linked together. The chains thus formed did not exceed three inches in length and emitted a pale phosphoric light. By introducing the hand into the water, several chains of the luminous globules were raised — the globules, were so transparent that they could not be perceived when the hand was taken into the light — this extraordinary appearance of the sea was visible for two nights. As soon as the moon exerted her influence, the sea changed to its natural dark colour, and exhibited distinct glittering points as at other times." *(Philos.Trans.* 1810, p. 269, 270.)

Riville's description of this phenomenon is as follows. "The surface of the sea gently agitated, was covered with little stars, each wave which broke around the vessel gave out a very lively light, and like in colour to that of a cloth of silver electrified in the dark. The waves, which seemed from time to time to be confounded one with another, formed at the horizon a plain covered in appearance with snow, and the track of the vessel was of a lively and luminous white, strewed with brilliant and azure coloured points." This was in a voyage to India when off the Malabar coast, in N. Lat 8° 47′, and Long. E. of Paris, 73° at 9 o'clock, P. M. on the 14th July, 1754. (See Godcheu de Riville in *Mem. de l'Acad. des Sciences— Savans Etrangers tom.* iii, p. 267. Observations on two Entomostraca of which he gives the figures.) Latreille thinks the first of these must be a species of Lynceus, but as no species of that Genus has been discovered out of *fresh* water, this is to be doubted; it may be satisfactory to know that some new animals of this tribe (Ostracoda) have been detected in our own seas and will be made known in some future Memoir. Riville describes the phosphorescence as residing in what he calls a blueish liquor, which exuded from the animal, giving the same luminous appearance to the water, and which lasted several days; but on due examination, this blue matter was found to be a moveable congeries of globules, lodged within the posterior part of the shell of the animal, of a blue colour, but which became yellowish and dark as the animal approached its end; these globules Latreille imagines to have been its eggs.

To the above may be added the testimony of Captain Horsburgh, (as it relates in all probability to the same animal,) as extracted from the notes he gave to Sir Joseph Bankes. "There is (says he) a peculiar phenomenon sometimes seen within a few degrees distance of the coast of Malabar, during the rainy Monsoon, which I had an opportunity of observing at midnight: the weather was cloudy and the sea was particularly dark, when suddenly it changed to a white flaming colour all around. This bore no resemblance to the sparkling or glowing appearance I had observed on other occasions in seas near the equator, but was a regular white colour, like milk, and did not continue more than ten minutes. A similar phenomenon, (he adds) is frequently seen in the Banda sea," &c. (Professor Macartney *Philos. Trans.* 1810.) More lately this appearance has been noticed by Captain Tuckey. "After passing Cape Palmas and entering the gulf of Guinea, the sea appeared of a whitish colour, which encreased together with its luminosity until making Prince's Island, so that at night the ship seemed to be sailing in a sea of milk. To discover its cause a bag of bunting, its mouth extended by a hoop, was kept overboard and collected *vast numbers* of animals of various kinds particularly pellucid Salpæ with *innumerable* little crustaceous animals of the Scyllarus Genus (Squillæ) attached to them, to which I think the whitish colour of the water may be principally ascribed. Of Cancers we reckoned 13 different species, eight having the shape of crabs, and five that of shrimps." *Tuckey's Voyage to the Congo.*

These are all the recorded instances of this very remarkable kind of phosphorescence having been seen; it is therefore almost unnecessary to say, that the attention of voyagers should be given to it whenever it is met with, and to the animal or animals which appear to cause it, none of which have been satisfactorily described; this may be done by preserving some of the water until next morning for due investigation, or by straining a portion of it and preserving the filter in a well-closed vessel of common spirits, until subjected to the scrutiny of some qualified naturalist.

Independent of the animals which operate in a more general way in the production of the luminosity of the ocean, there are some others which present a peculiar character, and are moreover of a local nature, at least they have never been observed beyond certain circumscribed limits; two very remarkable kinds of luminosity of this sort have as yet been noticed.

The first of these (D.) presents itself to the astonished voyager, under the appearance of thick bars of metal of about half a foot in length ignited to whiteness, scattered over the surface of the ocean; of these, we perceive some to assume the luminous state and continue it as long as they remain in view, while in others, we witness the luminosity to decline and disappear; the greater number of these apparently incandescent masses pass close to the sides of the vessel, or follow in her wake, their phosphorescence being called into activity by coming in contact with her prow or bottom, as that of such as are more distant appears to be, by the conflict of the waves. This appearance results from the Pyrosoma atlantica, a compound animal resembling a hollow cylinder of a transparent gelatinous substance, open at one end, and papillary on its surface, belonging to the class of Tunicata, and first discovered and figured by Messrs. Peron and Le Sueur, *(Voyage aux Terres Australes, tom.* I, p. 448, pl. 30, fig. 1. and *Annales de Museum, tom.* 4, p. 440. A figure of it may be seen in Shaw's Zoological Lectures, plate 127. The light which this animal yields, appears to pervade its whole substance, and when examined near at hand, varies in intensity and in shade, often exhibiting a very beautiful phosphorescence of a blueish or greenish tinge, like a pale sapphire or aquamarine as it gradually fades away; agitation or friction renews it as in other luminous animals as long as it continues to exhibit signs of life, but it is most vivid, when the animal is first drawn up, and at length can scarcely be called forth by the rudest treatment. As we observed this interesting animal, with Milbert's florid description at hand *(Voyage Pittoresque a l'Isle de France, tom.* I. p. 110.) I can aver, that the red, aurora, and orange colours, did not present themselves to the eyes of any of our numerous party, who were nevertheless, highly gratified at the sight of so brilliant and singular a creature.

This phenomenon may often be witnessed by vessels bound to India or the eastward of the Cape of Good Hope, occurring in the calm latitudes near to the Line. Peron's observations led them to restrict the limits of its habitation between the 19° and 20° of Long. W. of Paris, and the 3° and 4° of N. Lat. We first fell in with the Pyrosoma however, in N. Lat. 12° and carried it with us all the way to the Line, between the Longitudes of 16° and 20° W. Ships generally cross the Equator to the Westward of W. Long. 20° to avoid the calms which prevail nearer to the African coast, those therefore, which from necessity or choice pass to the eastward of this longitude, may expect to meet with the Pyrosoma, within the limits indicated above. As we approached the Equator, a smaller species made its appearance, intermingled with the former; in this, the luminosity is more condensed about the mouths of the little animals which compose it, and as these are not placed irregularly, as in the larger species, but are arranged in rings or whorls, it puts on a very beautiful appearance, resembling a gem studded with the diamond or opal, Plate 8, fig. 3. This species did not exceed an inch in length, had about seven or eight rows of animals, and a somewhat contracted aperture; this species I would designate by the specific appellation *pygmæa*. Subsequent to the discovery of the Pyrosoma atlantica, two other species of this very remarkable Genus have been detected in the Mediterranean, viz. Pyrosoma elegans* resembling my P. pygmæa, and Pyrosoma gigantea † having a greater degree of affinity with P. atlantica, but having the mouths of many of the animals furnished with a foliaceous appendage probably conducing to the locomotion of the aggregate; this species exceeds a foot in length. We have yet to learn whether these species are luminous, but they have furnished Naturalists with the means of becoming acquainted with the very peculiar structure of Pyrosoma, which will be found amply developed by the authors above cited. I cannot dismiss this subject without adverting to a point connected with the economy of these animals which seems to declare that the Atlantic species have been created for the locality where we find them; possessing no power of locomotion in themselves, they are driven to and fro by the light and variable winds which are known to prevail to the north of the equator, and repressed from emigration into either Temperate zone by the constant action of the Trade winds on the North and South: the Mediterranean species on the other hand, inhabiting a sea influenced by tides, and by winds and currents altogether variable and often rude, are furnished with exterior appendages which

* Le Sueur, Nouv. Bull. des Sciences, Juin 1813, p. 283. pl. 5 fig. 2; and Mai 1815, pl. 1, fig. 4.

† Idem, Mai 1815, p. 80, pl. 1, fig. 1-3, 5-13. and Journ. de Phys. Juin 1815, fig. 1-3, 5-13. Savigny, Mem. sur les anim. sans Vertebres, Memoir 3d pl. 4. fig. 7. and pl. 22. 23.

seem to have no other use, unless we suppose them to be given for the purpose of locomotion. For a confirmation of this circumstance we naturally look to those Naturalists who may find themselves favorably placed, to make observations upon living Pyrosomæ.

The other kind of luminosity of a more local nature, (E.) is that which presented itself to the observation of Captain Horsburgh, a gentleman richly entitled to National Honours and to the gratitude of posterity, for his valuable contributions towards the safe navigation of a large portion of the trackless Ocean. His example in the present instance deserves to be imitated. At sunrise on April 12, 1798 in the Arabian Sea, he perceived several luminous spots in the water, which conceiving to be animals, he *went in the boat,* and caught one: it proved to be an insect somewhat resembling in appearance the wood-louse, (Oniscus) and was about one third of an inch in length. When viewed with a microscope it seemed to be formed by sections of a thin cutaneous substance.—"During the time that any fluid remained in the animal it shone brilliantly like the fire-fly." Taken from his notes given to Sir Jos. Banks, as quoted by Prof. Macartney, *Phil. Trans.* 1810. who has appended to his paper, Pl. XV. f. 4, an engraving of the animal copied after a pen-sketch by Captain Horsburgh. Having had the good fortune to meet with this same animal (Pl. 8. f. 2. a. b. c.) by day light while in soundings near to the Belliqueux Shoal, which lies off the South extreme of the island of Madagascar, and again on the Agullas Bank near to the Cape of Good Hope, August 9th, 1816, I am entitled to say that it is no Limulus as suggested by the learned Professor, and although not sufficiently scrutinized by me to determine its actual structure, is an animal which it is impossible to associate with any other genus of the Crustacea. Individually I feel under great obligations to this beautiful little animal, which by its splendid appearance in the water induced me to commence the use of a muslin hoop-net, which when it failed to procure me a specimen, brought up such a profusion of other marine animals altogether invisible while in the sea, as to induce a continued use of it on every favorable opportunity. The *Sapphirina indicator*, which is the name I propose for this animal which is so beautifully luminous by night, by day resembles the finest Blue Sapphire in colour, with the opalescence of the Moonstone or precious Opal, and although but one third of an inch in length, this colour (which is thence probably a modified phosphorescence) pervades the surrounding element so as to give the animal the appearance of being round and of the size of a livre or rupee when seen from the deck of a vessel, appearing larger in proportion to its distance below the surface. When turned upon its back, Pl. 8. f. 2. c. it presented an opaline hue, and the appearance of numerous radii or members from each side of the segments which compose its body, together with a trifid colourless process f. 2. b. c. × occasionally projected by the animal at the sides of the corselet; these various members assumed at times a rapid movement backwards and forwards, but as the weather was dark, coarse and unfavorable to minute investigation, I could not succeed in developing the structure of these parts at the moment; but by placing several of the animals in the slides attached to my Microscope hoped to be able to do so at some more favorable juncture, in this however I was disappointed by the slides having been subsequently lost while the Instrument was undergoing some alterations at an Opticians in London. If this animal is elegant when viewed by reflected light, it puts on a still more extraordinary appearance when the light is transmitted through its body to the eye of the observer; by a direct light of this kind it resembled the Fire-stone, with tints of yellow, and by a less vivid and indirect illumination it assumed varied intermingled tints of orange, rose, blue, and green of a metallic splendor, and impossible to imitate. The body of the Sapphirina, which is much depressed, is composed of nine segments; of these, the anterior is largest, constitutes the clypeus, and presents towards its middle part the appearance of a pair of proximate eyes; the posterior segments diminish in width as they approach the opposite end or tail, and the last of them is terminated by two elliptic fins or scales, setaceous on their outer edge and having a central longitudinal nerve or rib. The Sapphirina swims in all directions with apparent ease by the motion of its tail, and often darts away by some sudden effort of its concealed members. There can be no doubt of this animal belonging to the Monoculi of Linnæus, and most probably to the same family with Cyclops, a relationship which will be more apparent, when we become acquainted with the structure of a nondescript member of it lately detected in our own seas, and which it is intended to develope in a succeeding Memoir. The geographical distribution of the Sapphirina appears to be limited to the seas situated to the north and west of a line drawn from the Cape of Good Hope to the southern extremity of the Island of Ceylon.

There is yet another of these luminous Phenomena which merits a moments consideration, viz. that which in violent storms at sea, makes it appearance in a luminous patch or ring upon the masts and on the windward yard-arms, gradually mounting up the former as the storm increases in violence; this appearance most probably results from the minute luminous animals being carried up and lodged there by the spray of the sea, which, while it continually furnishes a fresh supply and excitement, gains gradually a higher range, until the storm is at its height. Having only sailed in *large* Vessels, I have frequently observed an appearance of this kind on the lower masts and windward rigging; this has in all likelihood been often confounded with the Fire of St. Elmo, which would seem to be a purely electrical phenomenon, and is described as resembling a radiant star or flame playing about the very summits of the masts.

Philosophers have naturally been anxious to discover the *object* of this curious property in animals, which is so little obvious, that they have not hitherto been able to bring forward any explanation which applies to more than a limited number of cases ; thus in luminous *Insects*, which are all of them crepuscular or nocturnal, it has been supposed to serve the purpose of bringing the sexes together, which is extremely probable; but when we investigate this property as it occurs in *marine animals*, this is evidently not the true solution, as the major part of them have the sexes united, are destitute of visual organs, and shine equally in their young or larva state. From the vast number and variety of these last, and from observing all such to be more or less translucent, added to the circumstance that the luminosity seems to be in every case intimately connected with their irritability, and is apparently under the controul of the individual, we should be tempted to consider it as an evidence of volition, or the transmission of the nervous influence in a condensed form, to some of the organs of the animal requiring an encreased energy to counteract the unusual external force which operates upon them for the moment, for it may be remarked, that it is in general the contact of other bodies, or the concussion of the waves which calls the luminous property forth ; we must give up this explanation however, when aware, that numerous translucent marine animals do not shew any luminosity, and that it is not found but in *particular species* of the same Genus. Meditating upon this subject, I think it not improbable, that the Deity, who has done nothing in vain and whose Omniscience extends to every epoch, foreseeing that man would invent the means of tempting the trackless ocean, and explore the most distant regions of our Planet, has given it as one means of rendering his nights less gloomy, and of diminishing the number of his dangers; especially if we consider, that this luminosity is seen only in the night season, is vivid in proportion to the darkness, disappearing even before the feeble light of the moon, and also, that it increases with the agitation of the sea, so that during the prevalence of storms it greatly diminishes the dense gloom which at such times is often impenetrable to the moon or stars, throws such a light upon the Ship and rigging as to enable the sailors to execute their allotted tasks with certainty, and at all times points out to the cautious mariner the lurking danger of sunken rocks, shoals, and unknown coasts, by the phosphorescent or snowy appearance which it gives to the Breakers, so as to render them visible at a considerable distance; where again the diffused luminous appearance (described under C.) of the Sapphirina indicator is seen, he may be certain that he is in soundings, and probably at no great distance from some fatal spot.

In the terrestrial animals which are luminous, we perceive organs especially provided to secrete and treasure up the luminous matter, and transparent spots to permit the transmission of the light; in marine animals nothing of this kind has ever been discovered, and their bodies appear so homogeneous and transparent, that wherever the focus of light may be, when excited, it seems to pervade, and as it were light up the whole body of the animal. Dr. Smith indeed, during the interesting voyage of Captain Tuckey to the Congo, observed that the luminosity of a kind of shrimp appeared to emanate from the brain, which "when the animal was at rest resembled a most brilliant amethyst about the size of a large pin's head, and from which, when it moved, darted flashes of a brilliant silvery light" *Tuckey's Voyage.* Spallanzani with his usual ingenuity and perseverance, resorted to a variety of expedients to ascertain where the luminous property resided in the phosporescent medusæ of the Mediterranean, and came to the conclusion, that it is confined to the viscid excretion which is found towards the margin of the umbel, on the larger tentacula and "on the surface of the purse communicating with that aperture of the umbella which is perhaps the mouth of the animal."

All these parts, he observes, become luminous on being touched—rendering the fingers luminous, "and if this humour be scraped off with a knife and put into a glass filled with (fresh) water or milk and stirred with the finger or a spatula, both those fluids will become phosphoric, which they will not when the moisture expressed from any other part of the medusa is mixed with them" *Travels,* vol. IV. p. 242-248. Query — Is the luminosity in the viscid excretion, or in the animalculi which adhere to it, and which probably constitute the food of the animal?

Of Some New Genera of Luminous Crustacea.

If we sometimes and at particular seasons witness the sparkling appearance of the sea in the Temperate Zones, within the limits of the Tropics it may be said to prevail all the year round, and that in a remarkable degree, soon after the sun dips beneath the horizon and that the light of the moon is withdrawn. The individuals of the first of the following Genera constitute a principal cause of this luminosity, to which the others also contribute,—not that this phenomenon, in the situation indicated, results solely from luminous Crustacea, for a vast number and variety of Mollusca, &c. have been ascertained to lend their aid towards it. Although the muslin towing net cannot be used with effect in detecting these minute animals when the progress of a vessel is considerable, yet we can often succeed in capturing a luminous point now and then, by suspending it by means of a very short line over the stern in such manner as that it may just trip along the surface or dip a little into the water on the heave of the sea, taking care to hawl it quickly up when any of them appear to be intercepted by it, and removing them with a camel-hair pencil, into a glass vessel filled with sea water for examination the following morning: if the observer is either unprovided with a microscope, or incompetent to the task of developing the structure of such small objects as are thus procured, they can be preserved in a closely corked phial of spirits unchanged for any length of time, with the exception of such as *feel* soft, gelatinous and yielding, which being species of Medusæ, cannot be kept from dissolution by any of the means hitherto tried, and if mixed with the others might tend to cause the corruption of the whole; these therefore, should be carefully separated and rejected, or what would be still better, every kind might have a phial to itself. When the luminous animals are observed to be remarkably numerous, they may also be conveniently obtained by drawing up a bucket-full of the water, from which they may be separated by means of a small wire hoop or open spoon covered with muslin.

Genus 1.

Nocticula, or Luminous Shrimp.

The animal which forms the type of this Genus, was first discovered by Sir Joseph Banks, in the passage between Madeira and Brazil. Observing that the sea was particularly luminous, he had some of the water drawn up in a bucket, and found that the sparkling appearance was owing to the present animal, which he therefore named Cancer fulgens. (Macartney *Phil. Trans.* 1810.) The drawing which Sir Joseph caused to be made of it, and published in the paper above referred to (Pl. XIV. f. 1 and 2) and copied Pl. 5 f. 2 although perhaps not remarkably exact, shews that it approximates the Opossum Shrimp (Mysis) in figure, and in the number and structure of its members. Having had an opportunity of taking numerous individuals of the Luminous Shrimp, in my homeward passage from the Mauritius, I have been enabled to figure it with more care, Pl. 5 f. 1: Making due allowance for drawings made at sea of suchminute objects, I am inclined to consider these as identical, it may be observed, that neither show the natatory division of the members, which from the great transparency of the animal, their position, and not being suspected, wholly escaped observation; what strengthens the probability of their identity, is, that those obtained by the author were found in the track necessarily pursued by Sir Joseph Banks towards Rio Janiero, viz. between the Latitudes of 5° 25' S. and 29°30' N. and West Long. 17° 18' and 32° 55, on the 6th 12th and 25th September, where they were in considerable abundance, widely distributed, and uniform in character.

The Nocticula Banksii or Luminous Shrimp, resembles in figure the animals of the Genus Mysis described in the former Memoir, as they do also in structure, and particularly in the number and formation of the members, which consist of eight pair, and which, on due investigation will no doubt be found cleft or divided into two branches as in Mysis, so that was it not for the very different construction of the sub-abdominal fins, it would merge in that Genus; this peculiarity however, is undoubtedly generic, and argues a somewhat different mode of life and means of rearing their young, which last, is probably effected after the same manner as we witness in the true Shrimps, where the ova are appended to the sub-abdominal fins, which by their great length and more complete developement they are not only fitted to accomplish, but to add considerably to its power as a swimmer. As amongst the individuals taken, none presented the remarkable character of the *pouch* of Mysis, this would appear to authorize the opinion of Nocticula breeding after a different manner, however as it would be highly desirable to ascertain this point by an examination of the female in the breeding season, I commissioned several gentlemen going to the West Indies, to procure some of these animals, furnishing each of them with a small hoop-net, a line, and phials. One of these alone communicated the result of his exertions (Major Gilland on his outward voyage in 1825,) which amongst a variety of Gammari, Cyclops and other marine animals, produced a solitary specimen, which on investigation, proved to be the type of an approximating Genus, (Cynthia) so that it still remains a desideratum to know in what manner the ova are disposed of and hatched after exclusion from the Ovarium, and whether the animals undergo any change or metamorphosis during their progress to maturity.

This luminous animal, which is the only species of Nocticula as yet known, I have named Banksii from its first discoverer, and as a small tribute to a Naturalist possessed of affluent circumstances, yet whose zeal for the cultivation of knowledge led him to expose himself to the greatest personal risk and inconvenience — to devote his fortune and his whole life to this object, and finally to bequeath his valuable and accumulated stores of knowledge to posterity. It may be truly averred that no one individual was ever so instrumental in promoting and encouraging every species of knowledge and every useful art: the recollection of these circumstances, of the admirable arrangements which he made for this purpose, and of his obliging condescension and affability to all, must cherish a grateful remembrance in the breast of every Philosopher and Naturalist of the same era, while his bequest to the Nation which he adorned, will secure to him the admiration of posterity, more than any other Monument that could be erected to his memory.

The following description of the Luminous Shrimp, has been copied from my journal.

Corselet like that of the shrimps.

Abdominal portion of seven joints.

Tail composed of five lamina, the outer ones the broadest, oblong, serrate on their inner edge and ciliate, intermediate ones nearly linear, serrate and ciliated, middle lamina taper, acute, having a subulate appendage on each side towards its apex.

Eyes large and conspicuous from their dark blue centre.

Antennæ two pair, the inner and superior pair with three robust basil joints, and terminated by two long multi-articulate hairy setæ, the outer and inferior pair on a basis of but two joints, ending in a single seta, similar and nearly as long as those of the former; at their base, an elongated taper scale (particular form not determined) tufted at the extremity.

Thoracic members eight pair, long, filiform and ciliate within.

Sub-abdominal members five pair, each, of *three* articulations, the first clavate, and the terminal one ciliate—there are to be seen between the thoracic and abdominal members, some obscure processes in constant and rapid motion, these are no doubt the indications of the natatory division of the posterior thoracic members.

The motions of this animal were observed to be lively, and it gave out brilliant scintillations in the dark when disturbed. It was perfectly transparent, tinged here and there with orange-red, particularly its anterior feet, and showed the circulation most distinctly.

Genus 2.

Cynthia.

It may be objected, that this appellation has been already appropriated by Mons. Savigny to the most common and familiar type of the Ascidiæ, a name, which most Zoologists are more likely to retain, with every respect for that very eminent Naturalist; I therefore beg to apply it where it is more likely to remain undisturbed, and where it indicates the affinity which exists with the other luminous Genera of the Shizopodæ.

As I have just stated, the efforts made to procure females of the former Genus, led to the discovery of the present type, which bears a considerable resemblance both to Mysis and to Nocticula, and in structure coincides to such a degree with the former, that many, of what are very improperly termed rigid Linnæans, would be disposed to consider them merely in the light of different species; no Naturalist however who understands any thing of the Crustacea, will refuse his assent to their being generically distinct, (not withstanding that we have only a *male* individual to contemplate) when the very peculiar structure of its sub-abdominal fins is considered; these in Mysis consist of a *single* joint, in Nocticula of *three* joints, while in Cynthia they are intermediate, and composed of but *two*; it is not in the *number* of joints alone, however, that they differ, their form and structure is also essentially different. In Cynthia, the four last of these members are each composed of a very large bilobate scale, supporting at its apex, two taper articulate fins, strongly ciliated with plumose setæ; from between these, originates an opaque organ, which bifurcates, its two extremes of unequal length, being rolled inwards the one over the other; the first pair differ in having but one perfect terminal fin, with the rudiment of the second and of the intermediate organ.

In what part of the Atlantic the specimen of this animal was procured has not been ascertained, but may be stated in a general way, as somewhere in the usual track pursued by West-Indiamen between Madeira and Barbadoes; neither is it known whether luminous or not, although presumed to be of the former description, this circumstance therefore remains to be determined, as well as the difference of structure in the female, and the mode of carrying her eggs.

The only other difference which declares it to be generically distinct from Mysis, we find in the inner division of the six posterior feet, which in place of the pluri-articulate termination, have this part obscurely divided into two or three joints only.

Description of Cynthia.

Corselet as in the Shrimps, slightly pointed in front.

Abdominal portion of seven joints.

Tail of five scales; outer ones oblong, obliquely truncated, truncation and inner edge serrate and ciliate, with a strong spine at the outer angle; intermediate scales taper, serrated, ciliated on their outer edge, inner edge with alternate long and short spines; middle scale slightly taper, truncated at the end or very slightly indented, serrate and spinous on its outer edges, the spines lengthened towards its end where they appear almost clustered.

Eyes remarkably large.

Antennæ two pair; the inner antennæ of three remarkably robust basil joints, surmounted each by a pair of pluri-articulate setæ of which the outermost are the longest, at the inside of the last basil joint is a taper sessile appendage very strongly ciliated and analogous to the brush of the male Mysis; inner antennæ of two basil joints ending in a shorter pluri-articulate seta, slightly hairy, the scale at its base, oblong, obliquely truncated, with a short spine at the outer angle of the truncation, and serrated and ciliated along its inner edge.

Thoracic members eight pairs, divided to the Coxæ into two parts; the outer divisions being pluri-articulate, and feathered towards their extreme, and bearing the Branchia at their base; the inner divisions, independent of a basis resembling the branchia of the outer ones, are composed of about five joints, which in the six posterior, bear a strong terminal curved claw, the two anterior resembling considerably the same members in the genus Mysis.

Mouth, not dissected; the Palpi in their two last joints appear to approximate to the same organs in Mysis.

Sub-abdominal fins, already sufficiently described.

The appendage to the Male organs in situation and structure shews also an approximation to the same part in Mysis, and ends in three curved hooks.

Genus 3.

Lucifer, Long-headed Shrimp.

This singular and extraordinary type of the Shizopodæ, like Nocticula, conduces to the sparkling appearance of the sea in the Tropical regions, the individual figured in the plate having been taken in the Atlantic September 15th N. Lat. 11° 56′ W. Long. 32° 55′

We percieve in this animal a form hitherto unknown amongst the Crustacea, viz. linear or vermiform, the corselet not being broader than the abdominal segments, with its anterior portion lengthened out into a kind of neck widening in a slight degree upwards, and bearing at its extremity, the Eyes and Antennæ with their appendages, while the mouth is situated at a great distance under the breast.

It shews no further relationship to the former Genera, than in possessing, long, simple, ciliated thoracic members, these seem however to be fewer in number, and although the natatory divisions characteristic of the Shizopodæ were not observed, for the same reason as mentioned under Nocticula, I have no doubt of their existence: the thorough developement of the abdominal portion of the animal, of the sub-abdominal fins and tail, discountenance the idea of its being the larva of some known Crustaceous Genus.

The whole of the animal is colourless and transparent, with the exception of its intestinal canal, which from the opacity of its contents could be traced from the thorax to the tail.

Description of Lucifer.

Corselet, linear, posteriorly compressed, anterior portion lengthened out and truncated, with a short spine at the outer angles.

Abdominal portion, of six linear segments, the last largest with two short aculei on each side.

Tail of five scales; the outer ones oblong, obtuse, and ciliated; the intermediate scales taper, rather acute and ciliate; middle scale subulate and somewhat shorter than the rest.

Eyes extremely large, placed at the end of long spreading footstalks.

Antennæ, two pair; inner pair, linear, longer than the eyes, each composed of a long basil joint and three shorter joints, surmounted by a few short hairs; outer pair (probably broken in the specimen) composed if two long and one short intermediate joint, rather longer than the inner antennæ. Scales narrow, taper, and ciliate, as long as the first joint of the outer antennæ.

Thoracic members five or six? pair, long, setaceous and hairy; the anterior pair, short and bent downwards, were continually in motion, and may probably prove to be its Palpi, as the mouth appears to be situated between them.

Sub-abdominal fins, of which there is a pair to each of the five anterior segments of the abdomen, are composed of a basil joint, supporting two taper ciliated fins, with the exception of the first, which as in Cynthia, supports but a single fin.

Genus 4.

Podopsis, Hammer-headed Shrimp.

This Genus remarkable for the great length of the Foot-stalks on which its large and spreading Eyes are placed, like the former, was discovered in that region of the Atlantic frequented by the Nocticula, being captured in N. Lat. 29° 30', W. Long. 32° 55', on the 25th September, where it contributes its share to the luminosity of the sea. Like the former Genera also it is perfectly diaphanous and colourless, and although its members were not particularly scrutinized, is undoubtedly a natatory Shizopoda.

Description of Podopsis.

Body in general configuration similar to that of the Shrimp, but of a more slender and taper form, with the Eyes spread out horizontally.

Corselet, somewhat taper, truncate or slightly emarginate anteriorly.

Abdominal portion taper, of six segments, the last long and very slender.

Tail of five scales; the outer ones broad at the base, acuminate and ciliated; intermediate scales taper and ciliate; middle scale very short and pointed.

Eyes very large, on extremely long, slender, divaricate footstalks.

Antennæ; near to the insertion of the footstalks of the Eyes, are two short appendages which are probably the rudiments of the upper antennæ; the lower pair of antennæ are as long as the corselet, filiform, composed of four joints tipt with hair, Scales equal in length to the antennæ, taper and ciliated on their inner edge.

Thoracic members; one pair *unique,* nearly twice the length of the corselet, of five joints, the last hairy within; the rest of the members appear to be composed of three or four ? joints, and hirsute.

Sub-abdominal fins, five pair, each, of two or three joints, the terminal joints ciliated, and doubled in the two last pair.

General Remarks on the Shizopodæ.

Having completed the description of all the cleft-footed Crustacea decidedly belonging to this Order, as well as of such as from their structure are presumed to be referable to it, and which if they do not find place here, cannot be associated with any other known group, it may be advantageous to review the characters which are peculiar to these animals, and which appear to distinguish them from the Decapodous Macroura, (Shrimps, &c.) which they most resemble. In all the well defined genera of the Shizopodæ viz. Mysis, Nocticula, and Cynthia, we have found a greater number of locomotive members or feet viz. *eight* pair, divided to the Coxæ (hip) into two branches, of which the outer are exclusively adapted to swimming and carry the branchia or gills around their basil joint, so that they present us with *perfect* animals possessed of *four rows of feet!* the inner rows, which are appropriated to the same purposes as the usual members in the true shrimps, are besides wholly unfurnished with chelæ or claspers. Our present ignorance of the habitudes of these animals, will not permit our deriving any benefit from characters taken from their mode of breeding, but as in Mysis, it is probable that they do not undergo any metamorphosis.

The animals with which they are most likely to be confounded, however, are the larvæ of the Decapoda, which are *temporarily* Shizopodæ, but may generally be distinguished by the division of the limb originating from the extremity of the femur or thigh, and shewing no appearance of external branchia ; besides, they are comparatively small and *imperfect* animals, in which the sub-abdominal fins and tail are never completely developed. From a consideration of these characters, the author is induced to exclude Nebalia from the true Shizopodæ, which as before hinted, is probably the larva of some crustaceous animal ; at all events, its characters have not hitherto been sufficiently developed by the few Naturalists who have become acquainted with it, to enable us to pronounce as to its true situation or affinity.

No doubt the Shizopodæ will receive considerable accessions both of genera and species, when more attention is given to the less conspicuous of the marine Crustacea, for as we have seen, the largest of them scarcely exceed an inch in length, and they appear to be widely distributed, existing from the Equator to the confines of the North Pole, as well in the briny ocean, as in the brackish water of rivers and estuaries.

[illegible]

On the Metamorphoses of the Crustacea.

In Plate VIII. fig. 1, is given a representation of the Zoe or Larva of the common or edible Crab, (Cancer pagurus,) alluded to page 9, and which should have accompanied the Memoir it was intended to illustrate, had not the plates been previously filled. Immediately beneath the magnified figure, the animal is given of its natural size : on comparing these figures with those in Plate II, we shall gain a tolerable idea of the disparity in size, between a Zoe newly hatched and one which has attained its full developement, and of the changes which the various parts undergo during the growth of the animal ; it must not be taken for granted, nevertheless, that these are the Zoe of the same species of Crab, for although the Zoes of different genera resemble in the main, they yet appear to present variations which may enable an acute observer to pronounce as to the species, when we become more familiar with these curious animals : the most obvious and remarkable difference which the present figure exhibits, is the total absence of the sub-abdominal fins, and the natatory division of the two pair of feet, being provided with only *four* terminal plumose setæ. Zoes of this latter kind or in their younger stages, are very numerous in the harbour of Cove during Spring, while those of full growth are of comparatively rare occurrence, so that it is probable that multitudes of them fall a prey to the other inhabitants of the deep, neither their grotesque figure, nor the extraordinary length of their spines, affording a sufficient protection against many of their enemies.

Subsequent to the discovery announced in the first Memoir, p. 8, viz. that Zoe in undergoing a metamorphosis, appeared to pass into some form of the Decapoda, the author became desirous of ascertaining whether it might not be possible to hatch the ova of some of these animals, so as to afford a satisfactory confirmation of so novel and unlooked for a fact, and after numerous fruitless attempts year after year, he at length procured, in 1827, examples of the common Crab with spawn apparently ready to hatch, and by means of the kind assistance of Mr. Kingdom, Naval Storekeeper at Hawlboline, succeeded in protecting one individual until the young burst from their envelopes and swam about in myriads, under the exact form given in the plate; in this stage, they are colourless and transparent as glass, except the dark central part of each eye, and a blackish dot on each side every abdominal segment, the dorsal spine exhibiting a pale pink tint for nearly half its length from the point downwards.

Some gentlemen having expressed doubts as to the *universality* of the metamorphosis in the Decapoda, let it be remembered, that the contrary opinion hitherto held, is merely an assumption, and that the metamorphosis having been proved in a *single* instance, amongst animals so uniform in structure as the Homobranchia, we may safely infer from analogy, as far as regards the particular tribe alluded to, that it is general; we have seen that in the common Crab, (Cancer pagurus) the young is a Zoe, an animal so totally different in its aspect, structure, and habitudes, that it is evident, a very remarkable metamorphosis must take place before it can assume the form so familiarly known of the parent animal; when this fact is coupled with the circumstance, of no less than *six* other Zoes having been figured, (see Pl. I.) which from their localities and difference in form, most probably belong to as many genera of the Decapoda, it can hardly be said that the universality of the change wants confirmation. Besides, since the former Memoir was penned, the Author has had a confirmation of it in one of the West Indian land-crabs, and in some other of our most widely separated native genera, authorizing what he has advanced at p. 2, viz. "that the greater number of the Crustacea do actually undergo transformations, of which, in addition to the facts now adduced, further instances will be given in future Memoirs."

In the first Memoir also, when speaking of the satisfactory explanation which this discovery gives of the annual visits of the Land-Crabs to the sea, in order to deposit their spawn in that element, he appears to have been misunderstood, for hitherto the rationale of this long and dangerous journey did not appear. Naturalists have thought it strange and inexplicable, that an animal decidedly and wholly terrestrial, should not spawn in its native haunts, and rear its young at home, instead of putting them to the trouble and risk of a tedious and unknown route back again in their very tender age. There could scarcely be a stronger confirmation than this very circumstance of the universality of metamorphosis, for if there were any exceptions, it would certainly be made in favour of the terrestrial species, but no, they are, when first hatched, incapable of living out of water, with members solely adapted to swimming, hence the parent is impelled by its instinct to seek that element for its progeny, which nature has designed for the whole of the tribe to which they belong. Having been many years amongst the West India Islands, with the facts connected with the land-crabs constantly before me, I could never invent any plausible excuse for this curious piece of economy, nor indeed any one else, which should teach us to regard with complaisance the deviations and eccentricities which we observe in Nature, and which have all, no doubt, some specific object in view, although difficult or impossible for us to discover.

I avail myself of this opportunity to correct an error in the Explanation of the Plates to the Memoir on Zoea, p. 33, where in Plate II. fig. 8, the *two* antennæ from the *same* side are figured, *a.* being the inner, and *b.* the outer antenna.

On Mysis.

At page 16 of the second Memoir where the gradual developement of the embryo of the Opossum Shrimp is stated, it must be clearly understood that it is not the egg of which the Author speaks, but the *embryo* divested of the tunics which envelope the *ovum* on its first exclusion; in the other animals of the Crustacea in which an analogous *structure* to that of the pouch is observable, viz. the aquatic Isopodæ, it serves merely as a protection to the *ova*, which hatch all at once, the young as far as we know, coming out quite perfect, as we see in most oviparous animals.

ERRATA.

Page 39, line 5.... *for* medusa *read* medusæ.
41, " 31.... *for* Godcheu *read* Godeheu.
50, " 12.... *for* of *read* or.

NOCTICULA.

Plate V. Fig. 1. *a*, Nocticula Banksii of its natural size. Fig. 1. *b*, magnified; 1 *f*, feet; 2 *f*, supposed male organs; 3 *f*, sub-abdominal fins; *e*, eye; *a* 1, inner pair of antennæ; *a* 2, outer pair of antennæ; *s*, anterior scales. Fig. 1. *c*, Tail more magnified.

Fig. 2. Luminous Shrimp, after the figure in the Philos. Transactions.

CYNTHIA.

Plate VI. Fig. 1 *a*, Cynthia magnified. Fig. 1 *b*, its natural size.

Fig. 2. Anterior parts of the same more magnified; *c*, corselet; *e*, eye; 1 *a*, superior antennæ; *b*, analogue of the brush in the male Mysis; 2 *a*, lower antennæ; *s*, anterior scales.

Fig. 3. Tail of the same still more highly magnified.

Fig. 4, *a*, *b*, the two extreme joints of one of the Palpi.

Fig. 5. One of the inferior antennæ; *a*, its pluri-articulate seta; *s*, its ciliated scale.

Fig. 6. Inner branch of the anterior thoracic member.

Fig. 7. Second Member; *a*, inner division; *b*, outer natatory division; *g*, branchia; ×, point of attachment to the animal.

Fig. 8. One of the six posterior members; *a*, inner division; *b*, natatory division; *g*, branchia; ×, point of attachment.

Fig. 9. *a*, One of the second pair of the sub-abdominal fins; ×, point of attachment; the third, fourth, and fifth are similar.

Fig. 9. *b*, One of the first pair of the sub-abdominal fins.

Fig. 10. One of the scales situated between the hindermost pair of thoracic members.

LUCIFER AND PODOPSIS.

Plate VII. Fig. 1. Podopsis, magnified, and of its natural size; 3 *f*, sub-abdominal fins; *a* 2, anterior members; *p*, probably palpi; *a*, supposed rudiments of the superior antennæ; *a* 1, inferior antennæ; *s*. ciliated scale; *e*, eye.

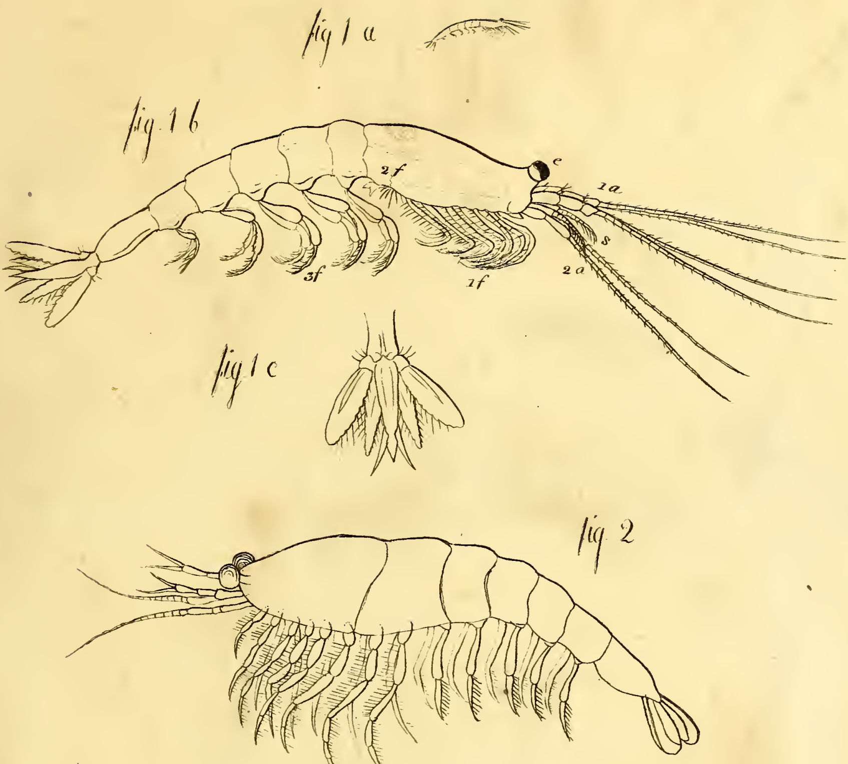
Fig. 2. Lucifer magnified, and of its natural size; 1 *c*, anterior part of the corselet; 2 *c*, posterior part of the corselet; *f* 1, ciliated members; *f* 3, sub-abdominal fins; *a* 1, superior antennæ; *a* 2, inferior antennæ; *s*, ciliated scales; *e* eye; *t*, tail.

Plate VIII. Fig. 1. The Zoea of the common crab, (Cancer pagurus,) magnified. Near the letter *f* it is represented of its natural size; *a*, antennæ; *f*, feet; *s*, one of the lateral spines.

Fig. 2. Sapphirina; *a*, natural size; *b*, magnified, from above; *c*, magnified, from beneath; ×, trifid anterior members.

Fig. 3. Pyrosoma pygmæa.

Pl. V.



Nocticula.

J V T fecit

PL. VI.

CYNTHIA.

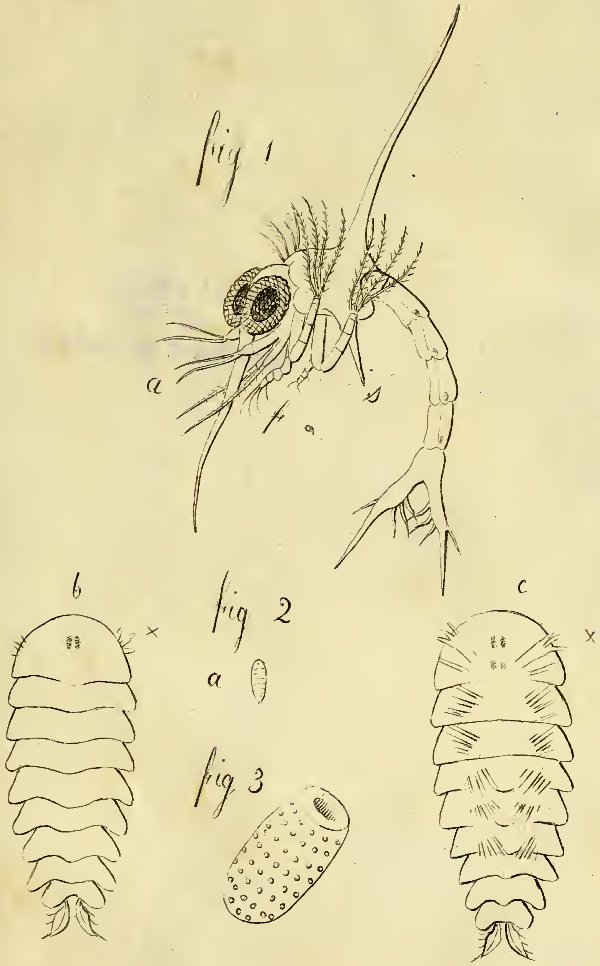
I.V.T. del et sculp.

Pl. VII.

LUCIFER. PODOPSIS.

J. V. T. fecit

PL. VIII.



I.V.T. del et sculp.

C. fornicata Fabr. Suppl p 345
Calappe voûté Latr. Hist. v p 394
Cancer calappa Lin 13 Edt p ~~394~~ 1048 Herbst pl 12 f 73 + 74

C. granulata
tuberculate posterior angles dentate last tooth strong acute posterior margin at base of abdomen emarginate
C. granulata Fabr Suppl 346
Calappe granuleux Latr Hist 392 pl 43 f 1-2
Cancer gran Lin Syst nat Edit 13 p 1043
Herbst pl XII f 72 76
Mediterranean

p 29

Genus Hepatus — Calappa Fabr
Meros of external maxillipeds elongate triangular narrowing from base to apex, acute
Hepatus fasciatus — Hepate fasciate Latr
Hist Crust Ins vi p 388 pl 42 f 3
Calappa angustata Fabr Suppl p 347
Herbst pl 38 f 2
American Ocean

Genus Cancer Lin Fabr Lamk — Alpheus Dald
I Broad anterior margin semicircularly arcuate nearly plane. bipinned narrow Meros of external maxillipeds subquadrate inner angle emarginate for articulation of succeeding joints

~~C.~~
Cancer pagurus
Sides 9 dentate
C. pagurus Linn Edit 13 p 1044 —
C. Tasca fucs Edit 2 No 2028
Fabr Suppl p 334 Herbst 9 f 59
European Seas

P. 30

C. Maenas
rather smooth sides 5 dentate front trilobed
C. moenas ~~[illegible]~~ Linn Edit 13 p 1043 Fabr Suppl 334 Herbst vii f 46-47
European Seas

II Cordate quadrate or trapeziform anterior margin

4 nearly straight rounded at the angles

Cancer spinifrons

Smooth sides dentate 2nd & 3d teeth bifid front and hands with many spines

C. Spinifrons Fabr Suppl 339 Herbst x, f 65

Crabe frons épineux Latr Hist v p 370

European Seas

Annotatio Huc referendus Cancer fluviatilis Belonii Rondeleti generi Ocypodum viam parans

II Vigiles

Observation Palp of external maxilliped borne on external angle of exernal joint - Carapax subcordate ~~sub~~ quadrate or orbiculate

P. 31

Genus Ocypode Dald. Fabr. Lam Cancer Lin Fabr

Eyes elongate inserted near the middle of front margin Carapax truncate subquadrate or rhomboid

O. Vça

Truncate subcordate sides abruptly convex feet hirsute tarsi with 5 or six denticulous elevated lines hands above & below tuberculate hispid

Cancer ~~H~~ vça Lin Edit 13 p 1041 Herbst vi 38

- Ocypode en coeur Latr Hist vi p 37

Vça una Pison Braz p 76 Seba Mus vii, xx f 4

America Meridionali

O. fossor Latr Hist vi 38 young of same

O tourlourou

truncate subcordate sides in front abrupt convex Tarsi with six serrate elevated lines, hand smooth.

Cancer ruricola Lin Edit 13 p 1040 Fabr Suppl p 339 Herbst ~~3~~ iii f 36 et 49 f 5

America Meridionali

O. cordata

Truncate subcordate above ~~s~~ rather convex Tarsi with 4

Elevati serrati lineis

p 32

O. runcola Latr Hist vi 35 pl 44 2

C. cordatus Lin Edit 13 p 1039 Herbst x f 57

with preceding

O. ceratophthalma

rhomboid quadrate Arms granulate hands cordate ocular peduncles prolonged beyond the eyes in a spine spine smooth

O. cerat. Fabr Suppl 347 Latr Hist vi 47 pl 45 f.

C cursor? Lin Syst Nat Edit 13 p 1038

C. cerat Pallas Spicil IX pl v f 7

Shores of East Indies

Genus Grapsus Lamk Alpheus Dald

Cancer Lin Fabr Degeer

Eyes short arising at angles of carapax. Carapax depressed Antennulae hidden under the reflexed front.

G. varius

Carapax behind & sides plicate at the anterior angles bidentate front 4plicate Arms short digits concave

p 33

Grapse mélangé Latr Hist vi p 67

Herbst pl XX f 114

Mediterranean & Shores of France

G. pictus

Carapax with posterior & lateral portions plicate at the anterior angles bidentate front with 4 denticulous folds fingers concave Carpus internally strongly undulate

Grapse peint Latr Hist vi 69 pl 47 f 2

C. grapsus Lin Edit 13 p 1048 Fabr Suppl p 342 Herbst v f 33 et 47 f 7

American Mana

G. cruentatus

Carapax as in preceding bidentate at angles frontal folds 4 denticulous fingers conical carpus spinis tuberculosa

Crabe de Terre Desfon Man vii p 417 pl XXV f 1

6 Grapsus sanguinolenti Latr Hist vi p 70
Herbst v f 34
America meri

Genus Plagusia
Cancer Linn Fabr Grapsus Lam Alpheus Dald
Eyes short arising at anterior lateral angles of carapace. Quadrate Antennulae received in two fissures of the front
p 34

P. clavimana
Depressed Clypeus in middle + sides 4 dentate hands clavate
Seba iii pl xix f 2
East Indies versus Australasia

P Depressa
Depressed front bidentate sides 5 dentate dorsal tubercles notated
C. depressus Fabr Suppl 342 3 Herbst iii 35
Grapsus Aplat Latr Hist vi pl 66 pl 47 f 1
Mediterranean

P. squamosa
front + sides as in preceding dorsal tubercles ciliate squamosae
Grapsus squamosus Latr Hist vi 73
Herbst pl x f 3
Hab --- ?

P semicylindrica
elevate, sides entire
C semic Fabr Suppl p 344
Indian Ocean

Genus Pinnotheres
Cancer Lin Fabr

Suborbiculate - quadrate or ovate orbiculate
p 35

External maxillipeds united at their base Animals living in a bivalve shell
P. pisum
orbiculato quadrate rather soft ~~[illegible]~~ - four

Hand oblong Abdomen broad
Pinnotheres pisi Latr Hist vi p83
Cancer pisum Linn Edit 13 p1039 Fabr
Suppl ~~p~~ 343 Herbst ii f 21 Sloan
Jamaica ii pl 245 f 1
In the Ocean

P. mytilorum
ovate orbiculate slightly narrower in front convex solid hand ovate fingers arcuate
Pinnotheres Des Moulins Latr Hist vi p83 pl 48 f 1
C. varians Oliv Encyc vi p155
Herbst pl 2 f 24 & 27
in Mytilus

Family II Oxyrhynchi
Subovate or triangular length greater than breadth Antennae generally exserted

p 36

I Dactyle conical not natatorial

Genus Leucosia
Subovate convex generally rather smooth External maxillipeds narrow nervus acuminate reaching front margin Antennae and eyes small

1 L. nucleus
in front bidentate posterior margin bicrenate a small spine on each side, superior arms elongate filiform
L. nuc Fabr Suppl 351
Leucosia noyau Latr Hist vi 115
C nucleus Linn Edit 13 p1042
C. macroculus Aldrov Crust lib 2 Cap 25
Herbst pl 2 f 14
Mediterranean

L. cranolaris
granulate in front above depressed posterior margin crenulate spines wanting front undulate brachia below verrucose hands cylindrical compressed fingers conical inner margins acute dentate.
L. cran. Fabr Suppl 350

Inachus craniolaris Latr Hist vi p 117
Cancer c. Lin Edit 13 p 1041 – Inachus Leach ... 431
Herbst ii f 17
Coast of Malabar
p 37
Genus Maia Lam Cancer Lin Inachus, parthen-
ope Lat Fabr
Test triangular (generally rough and rostrate Ante-
nnae and ... of Ext Maxipeds broad Eyes moderately
distant Feet similar posterior neither small or spinous
I Brachia very stout ad angulum rectum ex thesaurum
maintained Manus latis antice subparallele incum-
& bentibus
M. horrida
spinose above very uneven abdomen
eroded hands ovate
C. horridus Lin Ed 13 p 1047 Herbst XIV 88
~~Maia~~ Maia horribile Latr Hist vi p 106 pl 49 f 2
Parthenope horrida Fabr Suppl 353
Asiatic Seas
II Brachia haud crassissima, porrecta
a second pair of feet not three times as long
as Carapax nor slender
M. squinado
Front two spined sides with six elongate con-
ical Chelipeds scarcely longer than the two suc-
ceeding pairs Hands cylindrical short digits ...
...
Herbst pl XIV f 84, 85
M. squin Latr Hist vi p 93
Mediterranean
p 38
M. armata
elongate trigonal, gibbis dorsalibus tomentose
behind tridentate front 2 spined stout porrect
hands elongate
Herbst pl 16 f 92
Inachus Opilio? Fabr Suppl p 356
Maia armata Latr Hist vi p 98
Mediterranean

From the Annals & Magazine of Natural History Second Series Vol 3. May 1849. Page 353 [illegible]

XXXVIII Additions to the fauna of Ireland by William Thompson 12

Crustacea

1. Hippolyte pandaliformis Bell

On examining two specimens of Hippolyte some months since, which had been dredged in Belfast Bay, I could not identify them

Page 354

with any described species. They were submitted to Prof Bell for the use of his work on the British Crustacea and proved to be of a species that he considered new, and of which he had just drawn up a description under the name of H. pandaliformis "this name" (he observed) "suggests itself from their leading to the typical Palaemons through Pandalus" a peculiarity of structure which had also attracted my attention.

2 Idotea acuminata Leach?

Among crustacea kindly sent from Dublin by R. Ball Esq were two Idoteae 10 lines in length, very distinct from the common forms D. pelagica, D. entomon & D. arcturum Thun. were enclosed by Mr. McCalla but on what part of the coast taken was not stated. I mark the species with a doubt on account of Leach's only specimen in the British Museum, with which they were compared being in a bad state of preservation. The D. acuminatum was first noticed in the British Museum Catalogue of Crustacea p 95 (published in 1847) as among Dr. Leach's inedited species. He obtained it on the coast of Devon, and called it in his Ms. Leptosoma lanceifer.

3 Caligus Nordmanni Edw Hist-Crust iii p 455 Atlas Cuv. Reg. an. pl 77 f 1

I took several specimens of this fine Caligus alive on a sunfish (Orthagoriscus mola) captured on the Coast of Antrim Sept 1848. They were all adherent externally to the skin of the fish on different parts of the body. When living they were marbled over with grayish-lilac of dark and light shades. This species was erroneously included in a

paper published in the 20th vol. of the annals p 248
the name C. mülleri being substituted there for
C. nordmanni will make all correct. Two
others noticed there require the following correction
according to Dr. Baird

Caligus vespa should be C. stromii Baird
Report Berwickshire Naturalists Club 1847
p 259. Ann & Mag II i p 396

Caligus sturionis should be C. rapax Edw
Anat iii p 453 pl xxxviii f 9.

Annals & Magazine of Natural History
First Series vol 17. July 1846 p 497.

Proceedings Entomological Socy Apr 7th

Mr. A White exhibited drawings of various remarkable species of Crustacea, and read the description of a new genus of Brachyura somewhat allied in appearance to Plagusia
" The two divisions of Plagusia and Grapsus were formed by Latreille & Lamarck for the reception of certain crabs to which, from their square carapace and frequently perpendicular sides, Latreille gave the name Quadrilaterales. By de Haan the former of these genera has been divided into two, his ~~Phyllira~~ Philyra depressa being founded upon the Cancer depressus of Herbst while he retains the name Plagusia for those species of which the Cancer squamosus of Herbst i. 260. t. 20. f. 113, is the type: of this last group he is acquainted with four species two of which he describes. Professor Edwards only sectionally divides the genus Plagusia and describes a new species P. tomentosa from the Cape. A careful perusal and

comparison of the description given by Linné
of his Cancer chabrus (M. L. U. Reg 438)
has made me consider the P. tomentosa
synonymous with the Linnean species, in
which case P. chabrus must stand for
P. tomentosa. Were there any just ground
for separating P. depressa & P. tomentosa,
the name Philyra DeHaan ought to be
changed because already used for one of
the Leucosiadous family of Crustacea

Without further referring to the divisions
of the marked group Grapsus, I may here
exhibit a sketch of a most remarkably
formed genus from one of the Government
voyages, somewhat allied to Plagusia, but
differing much from it in appearance
and even in family

Telmessus. White

Carapace depressed, somewhat pentagonal,
the latero-anterior sides being the longest,
the latero posterior sides have two teeth in the
middle, the latero-anterior sides have two

broad dentated teeth between the external angle of the orbit and the strongly developed, wide dentate division, the end of which forms one of the prominent angles of the carapace; the beak is very wide and is formed of three broad teeth, the lateral forming the internal angles of the orbit; the central is the widest, and by three notches at the end is divided into four small teeth; the inner antennae are small, and not contained within a groove of the front; the outer are very large, two basal joints thick and strong and project beyond the notch of front. The external Pedipalps have the third joint pointed at the end, it is oblong ovate. Legs very long, compressed, tarsi longer than the joint before them, somewhat compressed.

Telmessus serratus White

Surface covered with small warts arranged in some places in lines, with hairs proceeding from the front of them

The specimen is a male

Annals & Magazine of
Natural History
Vol 20 – No 132. Sept 1847.

pp 205. Art 4. Short Descriptions of some new species of Crustacea in the Collection of the British Museum By Adam White, F.L.S.

Family Parthenopidae

Cryptopodia dorsalis, White & Adams, n. s.

Carapace narrower and wider than the same part in C. fornicata, the greater part of the back covered with slight pustules; on the posterior part of the carapace are two deep grooves placed longitudinally and slightly bent, so as to have a lyre shaped form; posterior edges of the carapace with coarser and rounder crenations than in C. fornicata; the ridges on the chelae with blunter tubercles.

This distinct and beautiful species of a singular genus was found by Mr. Adams in the Sooloo Sea, where the bottom was stony.

When alive it is of a dirty flesh color with brown markings and minute black specks; on each chela there is an orange lunar spot: under surface of a dead white; on the breast reddish.

Mr. Adams informs me that the species of this genus resemble those of *Calappa* in their habit of simulating death when disturbed, folding the chelae close to the front of the carapace and concealing their legs under the dilated sides of the carapace. They are always found in deep water, while the *Callappidae* are found on sandy flats, sometimes buried under the sand.

Family *Ocypodidae*.

Gelasimus crassipes White, Cat. Crust in Brit Mus p. :

Carapace very much arched suddenly narrowed behind; the hind pair of legs thicker and stronger than in other species front with a lobe, without narrow stalk.

Hab. Phillipine Islands (Siquejor) from Mr Cumings Co.

Gelasimus bellator White, l. c.

Carapace with the forepart just behind the insertion eye peduncles sinuated, the front slightly dilated into a round lobe. Larger hand with the fingers very long, the moveable with the sides nearly parallel, two or three larger tubercle on the edge near the base; fixed finger margined on the under side; the cutting edge with a very wide shallow tuberous sinus at base; at the end of sinus beyond the middle strong wide tooth, which gradually slopes down to the end, where curves up.

Hab. Phillipine Islands. From Mr. Cuming's Collection

Gelasimus cultrimanus, White, l. c. p 25 - (35)
Front between the eyes with a small dilated rounded lobe.
Edge

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of lower orbit very distinctly crenated; carapace with the upper surface smooth; the lateral edges rounded, without any sharp keel from the outer orbital angle. Larger hand with the fingers wide, both at the end slightly curved outward, the lower finger with a very wide sinus in the middle; near the end a wide lobe serrato-crenated on the edge; moveable finger with the lower edge nearly quite straight.

Hab Philippine Islands from Mr. Cuming's Collection.

Gelasimus porcellanus White. l.c. p 36.

Eye pedicels very long; frontal portion of carapace not narrowed at base; the hind part of carapace much longer than side. Lower finger thickened at the end, the inner margins of both fingers with four larger tubercles amongst the smaller crenules.

Hab. Borneo, Presented by the Lords of the Admiralty.

Family Maiidae

Tyche emarginata White l.c. p 10.

Carapace with the dilated part behind, deeply notched in the middle; the tubercles on the sides of the depressed part with nains.

The genus *Tyche* was established by Prof Bell in the Zoölogical Transactions for a species from Panama, which he has figured and described under the name of *T. Lamellifrons*. The specimen from which the above brief description is taken is very much mutilated, but is clearly distinct from Mr. Bell's.

Hab. West Indies. British Museum.

Family *Thelphusidae*

Valdivia nov. gen.

Outer jaw feet with second joint wider than long, third joint longer than wide slightly notched at the end. Carapace depressed, rather more rounded in the outline than in *Thelphusa* the latero-anterior edge with four sharp teeth directed forwards; legs very long, last joint very long smooth.

This genus is closely allied to *Trichodactylus*.

Valdivia serrata White l. c p 31.

Front quite straight; a strong distinct keel from last tooth on side of carapace to hind part; the whole upper surface of carapace and legs is covered with a brownish epidermis.

Hab (— ?) British Museum.

Family *Grapsidae*

Utica White nov. gen.

rapace somewhat right angled, tabular, the latero anterior margin with three teeth; the latero-posterior part of the carapace oblique; carapace behind very straight; behind the middle there is a

[Page 207]

very strong transverse ridge. Outer jaw feet with the third joint on the outside straight, not dilated. Fore-legs small; hind-legs very long; tarsus not particularly dilated somewhat elongated, fringed with hairs as is the preceding joint.

This genus which is briefly characterised above belongs to the Family Grapsidae, being nearly allied to Trichopus, De Haan, which is synonymous with Varuna, M. Edwards

Utica gracilipes White l.c. p 43

Front wide - fore edge very straight; behind it and extending to the middle of the carapace, there is a considerable, wide, somewhat three-sided elevation, separated from the transverse ridge by a deep lunated depression, from the ends of which a slight impressed line proceeds to the side of the ridge where it deepens, legs very slender and fringed with hair.

This species is a native of the Philippine Islands from which it was first brought by Mr. Cuming. He found it in a fresh water rivulet among the mountains of the Island of Negros. Mr. Adams found it also in the Island of Mindanao and from his journal has given me the following description, taken from the crustacean when alive:—

Carapace dark horn-color legs reddish brown; under surface dark brown, on the legs with a lighter tinge: abdomen also of a lighter color with a yellowish line down the middle. ♀. Frequents the deep still muddy fresh water rivers of the Island of Mindanao, hiding under weeds and rotten wood. When caught, this singular crustacean feigns dead, contracting its limbs and rendering them rigid as if it were in a catalepsy.

[illegible] the [illegible] [illegible] of [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] descriptions of [illegible] [illegible] [illegible] [illegible] By

Adam White F.L.S. Assistant in the Zool. Dept. British Museum.

Family [illegible]

Schizophrys White.

Carapace [illegible], somewhat attenuated behind; beak deeply cleft; upper orbit deeply crowned with a strong [illegible] in the

p. 283

middle of the cleft; under orbit with an elongate appendage on the inside with six teeth at the end. Tail of the male with 7 joints the sides nearly parallel. Fore legs shortest. Fingers without teeth

Schizophrys serratus White List of Crust in Brit Mus p. 9.

Two [illegible] pair of hind legs with [illegible] [illegible] [illegible]; sides of carapace with six strongish teeth, including the tooth of orbit, the two strong teeth of the front with a tooth each on the outside

Hab. Isle of France (Maurice) Coll Brit Museum

[illegible] [illegible] White [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] each [illegible] [illegible] [illegible] from the orbit [illegible] [illegible] [illegible] middle [illegible] [illegible] [illegible] small teeth. Carapace above with numerous small tubercles amongst which are 14 of larger size, arranged mostly [illegible]. Carapace of [illegible] [illegible] [illegible]

Hab Philippine Is. Siquijor. Isle of Bohol. Coll B.M. Cumming Coll

Ceramia [illegible] White n.c. 410

Carapace with the front very wide & semicircular in front; a [illegible] spine behind the eyes [illegible] in a line [illegible], a [illegible] in the [illegible]. Legs flat & foliaceous

[illegible] Coll B.M.

Stenocia [illegible] Haanii White n.c. 10

[illegible] elongate depressed; beak compressed [illegible] with a [illegible] at base directed forward; carapace behind the eyes with [illegible]

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nearly parallel the end straight; sides with two [illegible] bluntish [illegible] & lobated appendages directed backwards, separated by a roundish insinuation

Hab Phillipine Is. Coll B.M. Cummings Coll

Planorthius Forceps White n.c.

Upper part of carapace very irregular all over, the front with three teeth arising from the same stem, the middle one very much elongated and bent down at the end; the side margin with several largish crenations; base of the fore legs with two or three tubercles on the outside. Blastia monoceros Leach ms

Hab Isle of France ♂ & ♀

[illegible] Americae

Genus Actaea De Haan

Actaea [illegible]ulosa White n.c. 15

[illegible] thickly covered with rounded tubercles largest [illegible] the [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] middle

longitudinally impressed, the posterior edge is straight and [illegible] [illegible] [illegible] [illegible] [illegible]

lines of small tubercles claws both upper and under with longitudinal keels, [illegible] [illegible].

Hab Isle of France Coll B. M.

Actaea ~~[illegible]~~ ~~[illegible]~~ Cancer Carcharias White l.c. 15

Carapace & legs [illegible] [illegible] closely with sharp rough tubercles; on the front the tubercles

are much smaller, the upper surface divided into different divisions by transverse and

longitudinal lines; upper edge of legs serrated.

Hab ~~Isle of France~~ Australia (Swan River) This species is nearly

allied to Actaea calculosa (Cancer Calculosa Edw Crust i 378)

Atergatis De Haan

Atergatis sinuatifrons White l.c. 14

Carapace with marginal limb very entire and rather thick, of a uniform breadth [illegible] front

with three lobes each notched in the middle. Fingers of fore legs with tufts of hair, black, extreme tip

white. Width of Carapace four inches.

[illegible] Coll B. M. Pres by Lady Frances Cole.

Atergatis ~~[illegible]~~ subdivisus White l.c. 14.

Carapace with marginal limb divided by four very indistinct lobes; greater part of top of Carapace [illegible]

[illegible], with yellowish spots; [illegible] paler. Fingers black, base of movable finger yellow. Front of Carapace

with two straightish lobes sinuated close to eye. Width of carapace [illegible] inches [illegible] lines

Phillipine Is [illegible] [illegible] Cuming [illegible]

[illegible] [illegible] marginata

with remarks
Atergatis ... [illegible] White l.c. 14

Carapace with antero-lateral sides with a cutting edge, part of the carapace behind this punctate ... of upper surface almost quite smooth, with three or four impressed lines in front, Hands ... especially above fingers both moveable & fixed deeply channeled. ... yellowish red; fingers darker; ... of fore legs pale brown coloured.

Hab. Philippine Is. Coll. B.M. ... Cuming; ...

... tis ... White l.c. 15

Carapace with each of the sides having three projecting teeth; hands crested above and below, fingers short, face brown; hands ... on the outside

Hab. unknown Coll. B.M.

Xantho. Auct

Xantho depressus White l.c. p. 17

Carapace much depressed, very flat, in front tuberculated, many of the tubercles sharp pointed, front deeply notched in middle, sides with three teeth. Hands on outside tuberculated, three last joints of legs slightly tuberculated & with a few hairs

Hab. Philippine Is, I. of Corregidor) Cumings Collection.

This is quite a magazine genus in the family Cancridae it requires subdivision greatly

Xantho denticulatus White l.c.

Carapace with antero-lateral edge long ... with eight sharp teeth ... each side ... behind. Front of carapace between the orbits separated into four parts by ... longitudinal ... two transverse lines about the middle. Hands on the outside smooth, ... with a ... edge ... on each side

Hab ... from Mrs ... Collection

X [illegible] White l.c. [illegible]

[illegible] [illegible] [illegible] with [illegible]

[illegible] with [illegible]

the [illegible] which meet in the middle. [illegible]

longitudinal impressed lines on the [illegible] with small

[illegible]. Carapace [illegible], [illegible] with [illegible].

Hab Philippine Is. Brit. Mus. [illegible]

[illegible] lamellifera White l.c. 1[illegible]

Carapace [illegible], with [illegible] on each side; [illegible]

[illegible] Hands rough on outside; edge of [illegible]

with a [illegible] margin; edge of hands above & below with a lamella

[illegible] legs on the upper edge lamellar

Hab. Isle of France Coll. Brit. Mus.

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Scorodius Linck

Scorodius [illegible] White l.c. 18

Carapace smooth [illegible], [illegible] in the middle, the

[illegible] with [illegible] teeth; [illegible] thin [illegible] very thick [illegible]

[illegible] with [illegible] thick tooth; hind legs with many [illegible]

[illegible] Is. Brit. Mus. Coll. [illegible]

[illegible] White l.c. 1[illegible]

Carapace [illegible] with [illegible]

in younger and approximately [illegible] [illegible] [illegible]
[illegible] with one spine above the eye, legs covered with [illegible] like [illegible].
[illegible] a long [illegible] continued down the middle in front
with six marks on hind part of carapace

Hab. Philippine Is (Rotol) Coll. Brit. Mus. Cuming

[illegible] [illegible]oides White l.c. 18

Carapace & legs covered with brown hairs; carapace somewhat depressed, sides with three teeth covered with spines; fore part of carapace with several bosses and rough with spiny tubercles; on hind part of carapace are four transverse raised lines, the innermost the shortest. Hand large upper edge serrated outside & top with roundish tubercles. Fingers on the outside & top channeled, several tubercles at the base of the moveable finger; fingers black, hollowed ends white. Hind legs serrated above, second and third joints with three rows of serratures.

Hab Singapore. Philippine Is (Rotol) Brit. Mus. Cuming

[illegible]

[illegible] [illegible] White l.c. 18

Carapace having the sides furnished with five lobes the first three blunt and wide, the last two sharp and narrow; front with four lobes, the two middle largest; fore part of carapace [illegible] near the edge, depressed and irregularly tuberculated most of the tubercles very small. Hands very unequal in size the right largest fingers thick, the left small, the fingers much elongated upper part [illegible] with [illegible] in [illegible] ~~[illegible]~~ yellowish marks

[illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible] subverrucosus [illegible]

[illegible] anterior [illegible] in [illegible] with [illegible]

[illegible] the middle [illegible] [illegible]

the [illegible] ~~[illegible]~~ [illegible] thickly covered with [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] separated by a [illegible]

with a [illegible] notch between the front and orbit, and a [illegible]

between the outer orbital angle and the first lobe of the side

[illegible] — !

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Family Hippidae

[illegible], [illegible]

[illegible] [illegible] [illegible] White [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible] [illegible] [illegible] on each side

[illegible] [illegible] in which are placed the eyes. [illegible]

[illegible] [illegible] [illegible] the [illegible] convex, with [illegible]

[illegible], [illegible] [illegible] [illegible] the upper

[illegible] [illegible] with [illegible] [illegible] [illegible] the inner surface

~~[illegible]~~ concave. [illegible] [illegible] [illegible] compressed [illegible]

[illegible], but [illegible] [illegible] internally, and ending [illegible]

[illegible] in a short spine, [illegible] compressed elevation with the

[illegible] arched, but not so sharp as in *Notopus*;

[illegible] convex and [illegible] with asperities [illegible]

[illegible] ridges, interrupted and transverse; finger [illegible],

[illegible] ~~short incurved~~

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short [illegible] [illegible] [illegible] compressed [illegible]

with a sharp apex and a strong tooth near the distal

extremity,

Feet short and weak as in *Notopus*; the first tibia

[illegible]; the tarsus subquadrate anteriorly bicarinate,

with a [illegible] shaped claw; the second tibia one keeled

with the tarsus oblong and a sharp elongate trigonal

claw; the third tibia sub-triangular, tarsus short

flattened sub-trigonal, with a falcate claw; fifth tibia

triangular, very short, flattened, tarsus [illegible] [illegible]

with a small narrow claw.

Abdomen of the male [illegible] jointed the [illegible]

[illegible]

[illegible]

Cancer [illegible] differs from [illegible] by [illegible] sides, [illegible] in [illegible] front [illegible] species, in front [illegible] on each side in the [illegible] being much compressed, especially in front, and in the [illegible] while in [illegible] it is [illegible] straight across in front; and in the side being entire, with a short sharp spine at the antero lateral angle

The cut represents this species of [illegible] the natural size, and is named in ~~[illegible]~~ compliment to J. E. Gray Esq., F.R.S. Keeper of the Zoological Dept in the British Museum.

[illegible] Page

White
[illegible] & Aquilla

fulvo, fusco (præcipuè ad angulum anfractuum) interruptim fasciato.

Hab. Van Diemen's Land. Var. *truncata,* Philippines; H. Cuming.

This species was originally included in the *C. granosa,* Sowerby, Conch. Illustr., but the general aspect of the shell, especially the banded variety, is so different, owing to the greater fineness of the striæ, that on examining a number of specimens I think they may well be separated.

2. Cancellaria tæniata (Thes. Conch. pl. 95. f. 75, 76). *Canc. testâ elongatâ, turritâ; costis numerosis, transversè striatis, ad angulum anfractuum acutè angulatis; spirâ acuminatâ, apice mammelliferâ; aperturâ internè lævigatâ; margine acuto; columellâ lævi, biplicatâ; colore pallidè fulvo, fusco tæniato.*

Hab. ——? Mus. H. Cuming.

3. Cancellaria melanostoma (Thes. Conch. pl. 95. f. 78). *Canc. testâ ovali, longitudinaliter striis noduliferis et transversè striis alternatis minutè decussatâ; spirâ acuminatâ, anfractibus paucis, rotundatis; aperturâ ovali, magnâ, internè costatâ; labio externo denticulato; columellâ expansâ, anticè granulatâ, triplicatâ; colore pallidè fulvo, fusco latè fasciato; labio externo bimaculato, columellâ fuscâ nigricante.*

The smoothness of the decussating striæ, the more oval form, the peculiar dark colour and granulation of the columella, serve to distinguish this species from the preceding.

Mr. Cuming possesses the only specimen which we have seen. Its locality is unknown.

4. Cancellaria excavata (Thes. Conch. pl. 93. f. 18). *Canc. testâ ovatâ, lævi; spirâ acuminatâ, turritâ; anfractibus ad suturam profundè excavatis; aperturâ breviusculâ, angulatâ, labio externo lævi, internè costato; columellâ triplicatâ, umbilicatâ; colore nullo.*

Hab. South Australia.

It resembles *C. spirata,* but the aperture is shorter in proportion to the spire, and the upper part of the whorls more deeply excavated. The shell is umbilicated behind the columella, and of a white colour.

5. Cancellaria foveolata (Thes. Conch. pl. 103. f. 30, 31). *Canc. testâ oblongo-ovali, turritâ, lævigatâ, obsoletè striatâ; spirâ productâ, anfractibus angulatis, ad suturam excavatis, ad angulum subcoronatis; aperturâ triangulari, lævi; columellâ triplicatâ; umbilico mediocri; colore fusco, vel fulvo tæniato.*

From the sands in Algoa Bay. One specimen is of a uniform brown colour, and the other beautifully lineated.

6. Cancellaria semidisjuncta (Thes. Conch. pl. 95. f. 62, 63). *Canc. testâ ovali, ventricosâ, turritâ, spiraliter sulcatâ; anfractibus angulatis, ad suturam profundè excavatis, ultimo disjuncto; umbilico maximo, costato; aperturâ triangulari, columellâ triplicatâ; colore fulvo, fusco longitudinaliter fasciato.*

Proc Zool Soc London 1848

Collected by Mr. Cuming in sandy mud, at twenty-five fathoms' depth, at Cagayan, Isle of Mindanao.

3. Description of two species of Mammalia from Caraccas. By J. E. Gray, Esq., F.R.S. etc.

The British Museum have lately purchased from M. Sallé, through Mr. Cuming, a Monkey and a Squirrel, which appear to have been hitherto unnoticed in the catalogues; I have therefore sent a short description of them to the Society.

Mycetes palliatus (Mantled Howler).

(Mammalia, pl. 6.)

Black brown; hair of the middle of the back and upper part of the sides yellow brown, with black tips; of the lower part of the sides elongate brownish yellow, forming a kind of mantle on each side.

Hab. Caraccas.

The hair of the forehead short, reflexed, forming a slight crest across the middle of the head; of the back of the head rather longer; of the cheeks few, scattered, short and greyish; of the hinder part of these rather longer than those on the rest of the head, and forming a slight beard, which is more distinct in the males; the lower part of the hairs on the shoulders is sometimes yellowish.

Sciurus dorsalis (Black-backed Squirrel).

(Mammalia, pl. 7.)

White, hairs black, with, more or less, long white tips; the eyebrows, back of the head, nape and middle of the back brownish black, forming a very broad, well-defined dorsal streak.

Hab. Caraccas.

The black of the hairs of the sides of the body and tail show through the general white colour; the black occupies all except the tip of the hairs. The hairs of the lower part of the legs and feet are white to the base; ears rounded, not bearded, and with scattered hairs.

This may be only a variety of some other American species, but the two specimens which were sent home were exactly alike.

4. Description of a new species of Herpestes, from Abyssinia. By J. E. Gray, Esq., F.R.S. etc.

Mr. F. H. Hora having kindly presented to the Museum a specimen of a male Herpestes which he lately caught in Abyssinia, and as it is different from any of the species of the genus described by Dr. Rüppell in his Fauna of that country, original specimens of which are in the British Museum collection, I have the pleasure of laying a short description of it before the Society for publication in the Proceedings.

Herpestes ochraceus (Ochraceous Herpestes).

(Mammalia, pl. 8.)

Pale brownish yellow, very minutely mixed or punctated with a darker tint; chin, throat and under part paler, not punctated; end of tail bright yellow, with an elongated black tip.

Hab. Abyssinia.

The hair of the back short, yellow, with a short blackish base and a narrow dark brown subterminal band; of the throat and under part of the body longer uniform pale yellow, with a short dark band at the base; of the lower half of the tail longer pale yellow, with three or four rather narrow, equidistant darker bands; of the end of the tail uniform bright yellow, and of the hinder end all black, forming a terminal tuft. Ears rather large, rounded, covered with short close-pressed hairs. The soles of the hind-feet bald to the heels.

The skull is rather elongate and narrow; the false grinders are 3–3, the first being very small and conical; the third are subtriangular, with a slight tubercle on the inner side: the orbit not quite complete, but with a short interruption in the middle of the hinder side.

Length of skull $2\frac{1}{12}$ inches, width $\frac{11}{12}$; length of palate $1\frac{1}{15}$ inch; of face from front of orbit $5\frac{1}{2}$ lines; of lower jaw 1 inch $3\frac{1}{2}$ lines.

5. Description of a new species of Cinclosoma. By J. Gould, Esq., F.R.S. etc.

(Aves, pl. 6.)

Cinclosoma castaneothorax, n. sp.

Sp. Ch.—Crown of the head, ear-coverts, back of the neck and upper tail-coverts brown; stripe over the eye and another from the base of the lower mandible, down the side of the neck, white; shoulders and wing-coverts black, each feather with a spot of white at the tip; all the upper surface, the outer margins of the scapularies, and a broad longitudinal stripe on their inner webs next the shaft, deep rust-red; primaries, secondaries, and the central portion of the scapularies dark brown; tail black, all but the two central feathers largely tipped with white; chin and throat black; chest crossed by a band of rich rust-red; sides of the chest and flanks brownish grey, the latter blotched with black; centre of the abdomen white; under tail-coverts brown, deepening into black near the tip, and margined with white; bill and feet black.

Total length, $8\frac{1}{2}$ inches; bill, 1; wing, 4; tail, $4\frac{1}{4}$; tarsi, 1.

Hab. Darling Downs, New South Wales.

Remark.—Nearly allied to *C. castanotus* and *C. cinnamomeum*, from which it is however easily distinguished by the colour of the chest and back.

Dr. Macdonald communicated orally his ideas on the Vertebral Homologies as applicable to Zoology, of which observations he has furnished the following abstract:—

"Dr. Macdonald gave a short sketch of the characters of the typical vertebra, as proposed by Professor Owen and several continental zoologists and comparative anatomists, and then contrasted it with one which had been the result of many years' study, and which he considered more in accordance with the vertebra and its autogenous and exogenous elements as traceable in the endoskeleton of the Vertebrate classes, and also as showing its analogy in the Annulose animals. The table which he exhibited points out these, from which it would appear that Dr. Macdonald considers the bodies of the vertebræ, as described by anthropotomists,—continued downwards through the sacrum and coccyx to the top of the tail, and the basilar process upwards to the sella turcica,—as so many portions or segments of a central axis formed around a centrochord,—and not a notochord as usually described,—from which the autogenous elements spring and radiate to the periphery, and, converging mesially along the dorsal aspect, enclose within the tunnel of the *Neuro-Camera* the whole cerebro-spinal axis, of varying dimensions in the different regions, and another set of radii meeting sternally, and forming the three thoracic regions, having a costal region interposed. The Rachedian development from the sella turcica to the tail, with its mesothorax and metathorax, is the longest, and forms the Rachal type; the anterior towards the nose—the facial or proboscidian—is the shorter, and has only one thorax, the cephalothorax, formed by the mandibular costæ and palatine sternum.

"This framework, like a large trunk, is enclosed by three cycloid or segmental zones :—

1. The *Temporal*, formed by the squamo-temporal, zygoma and malar bones, and supporting its membral or epicycloid *ramus*, formed by the maxilla.

2. The *Humeral* or scapular clavicle and manubrium sterni, with its *epicycloid ramus*, the brachium, cubit and carpodactyle portions.

3. The *Coxal* or ilio-pubic, with its epicycloid ramus, femur, crus and tarso-digital portions.

"In so extensive a subject Dr. Macdonald restricted his present communication to the consideration of a portion of the epicycloid ramus of the metathoracic or coxal zone, and pointed out the strong analogy which might be traced between the tarsus and the bones of the arm in the human skeleton, in order to facilitate the examination of the same organs in the lower classes, and more especially in the osseous fishes, where, from an early prejudice, resulting from what appears to Dr. Macdonald as the hasty observation of preceding observers, it has long been overlooked and considered as the homologue of the pectoral limb. This great error has rendered the whole subject confused and complicated, and has given rise to many of what Dr. Macdonald considers the extravagances of Geoffroy St. Hilaire and his followers in the French school, and constrained them to mistake the true respiratory or humeral epicycloid ramus, and superadd to this class the additional zone and membral ramus, under the vague idea of its being greatly developed tympanic bones; whereas, had they seen the analogy of the human tarsus and carpus, they never would have mistaken the tibia for the scapula or brachia, or the calcis for the ulna, and the scaphoid for the radius; and had they even examined the higher or cartilaginous fishes, they would have seen the opercular bones removed somewhat further down the trunk, and the pelvic or coxal zone and epicycloid ramus more distant. This would have led Professor Owen not to have considered the posterior extremity or coxal zone and limb as the divergent appendages of the occipital vertebra. As to the homologies of these parts, the Doctor postponed the consideration of them till another opportunity, and proceeded simply with the tarsus. This consists in Man and many mammals of seven bones, which are arranged in two rows; each row has developed from it one or more digital phalanges when most developed; with the first row the thumb or great toe is developed, while the other toes having metatarsal and digital phalanges are connected with the anterior row or distal end of the tarsus, where the tarsal bones are fused or developed in a single bone. This is beautifully seen in many of the birds, especially the Cursores and Grallatores: in the Apteryx, as figured in the 'Zoological Transactions' by Prof. Owen, vol. iii. pl. 49, the tarsus is seen to consist of a single bone, terminating in three distinct knuckles, for the articulation with the metatarsal phalanges; while the thumb is seen with its different joints on the posterior and inner aspect, and in its natural position. This part of the leg has long been mistaken by ornithologists: Prof. Owen calls it tarso-metatarsal, and Dr. Melville views it as the metatarsal, which Dr. Macdonald asserts is surely more erroneous than even Prof. Owen's view.

"The thumb or great toe very often disappears in the endoskeleton, but may sometimes be seen in the exoskeleton, as in the leg of the Horse and some other mammals, where the metatarsus is fused into a single or shank-bone, terminating in a single phalanx as in the Horse, or double phalanx as in the Llama.

"Dr. Macdonald also briefly alluded to the nomenclature adopted by entomologists and other annulose zoologists, and maintained, that if the nomenclature of the anatomist was to be appropriated by them, they were bound to use the terms anatomically; and then submitted the following sketch of the homologies of the posterior leg:—

Coxa = Cotylon.
Trochanter = Femur.
Femur = Tibia.
Tibia = Tarsus and great toe.
Tarsus = Metatarsus and phalanges.

"These homologies are easily traceable in all the six legs of the Entomoid classes, and also in the thoracic legs of the Crustacea, and are particularly well marked in the large claw of the Crab, where the lines and markings point out the metatarsal and digital phalanges, terminating in the large claw; where the thumb or opposable claw is jointed to what may be viewed as homologous to the tarsus, while the rest is the fused terminal phalanges."

The communication was also accompanied with a verbal explanation of the several diagrams exhibited.

December 12, 1848.

R. C. Griffith, Esq., F.G.S., in the Chair.

The following papers were read to the Meeting:—

1. On the Habits of a living specimen of Nanina vitrinoides (Desh.). By H. E. Strickland, F.G.S.

(Mollusca, pl. 2.)

On the 2nd of December, 1847, Capt. W. J. E. Boys presented me with three specimens of a terrestrial mollusk, named *Nanina vitrinoides*, by Mr. Gray (P. Z. S. pt. 2. p. 58; *Helix vitrinoides*, Desh.). Capt. Boys had procured them a considerable time before, certainly not less than a year, in the district of Ajmeer in Upper India. The animals still remained within the shells, but from the length of time during which they had been kept dry they were greatly reduced in bulk, and had almost wholly retired from the outer volution, as was easily seen from the transparency of the shell. Like many of the *Helicidæ* of hot climates, especially those which are exposed to long intervals of drought, the *Nanina vitrinoides* secretes a calcareous *poma*, or deciduous operculum, every time that it retires into a state of torpor. The specimens in question had formed two or three successive *pomata*, one within the other, during the process of their desiccation.

In hopes of restoring their animation, I placed them upon some wet moss in a warm room. Two of them proved to be past recovery, but the animal of the third was seen through the transparent shell to be gradually enlarging in bulk by the absorption of moisture, and at the end of a week it finally reached the door of its dwelling, threw off the *poma*, and began to crawl. A morsel of boiled carrot was presented to it, which it greedily devoured, and speedily increased in health and vigour. I have now kept this interesting creature a twelvemonth, and have often been tempted to exclaim with Oken, "What majesty is in a creeping snail; what reflection, what earnestness, what timidity, and yet at the same time what confidence! Surely a snail is an exalted symbol of mind slumbering deeply within itself."

Since its revival my *Nanina* has greatly increased in size, and has added half a volution to its shell, which now measures $\frac{7}{10}$ inch in diameter. Its favourite food is boiled carrots and raw lettuce-leaves. It generally remains quiet during the day, but crawls forth and shows considerable activity in the evening, and has never shown any inclination to hybernate or become torpid for a lengthened period.

The shell of *Nanina vitrinoides* is brown, glossy and pellucid, and in shape and colour closely resembles the shells of the European genus *Zonites*, from which, without examination of the animal, it seems to be generically undistinguishable. The animal however is very different, and is more allied to, though quite distinct from, that of the genus *Vitrina*. The foot, when contracted, is too large to be withdrawn into the shell, except after a considerable period of desiccation. When expanded, and at full stretch, the foot is remarkably long and narrow, measuring about two inches in length and $\frac{1}{5}$ inch in breadth (see figs. 1, 2). The hinder extremity is abruptly truncate, surmounted by a short horn-like appendage, similar to that in the larvæ of certain Lepidopterous genera. But the most peculiar character in the animal of *Nanina* is that of the two elongate pointed lobes or flaps which project from the margin of the mantle, one on each side of the mouth of the shell. These lobes possess a certain amount of lateral motion, and a considerable power of retraction and expansion, but are always kept in close contact with the surface of the shell (see fig. 1. *a*, *b*).

The animal is in the frequent habit of performing the following singular operation, which, as far as I am aware, has not before been noticed in any terrestrial mollusk. Crawling to the top of its prison (which consists of an inverted tumbler, with a small aperture for air), it suspends itself to the glass by the hinder half of the foot, and twists the anterior part round, so as to bring its lower surface into contact with the shell. By the great length and flexibility of the anterior half of the foot, it is enabled to twist in a variety of directions, and thus to crawl as it were over every part of its own shell in succession, the hind-part of the animal remaining all the while firmly attached to the surface of the glass (see fig. 2). During this operation the horns are partially contracted, and the mouth of the animal is applied closely to the shell, and is seen to be alternately expanded and contracted, as if in the act of suction. In fact the whole process closely resembles the action of a cat when licking its feet and body, and is performed with just the same appearance of systematic determination. The object of this operation is no doubt the same in both animals,—that of clearing their persons from extraneous matter, and producing that aspect of cleanliness and beauty which is one of the laws of organic nature in its normal state. Hence that brilliant gloss which distinguishes the shell of the mollusk here referred to.

It would be desirable to ascertain whether any analogous habit is possessed by the allied genera *Vitrina* and *Zonites*. The shells of the British species of *Zonites* (*Z. nitens*, *alliacea*, *cellaria*, &c.) closely resemble *Nanina vitrinoides* in form, colour, and glossiness of surface, and their brilliancy must apparently be due to some polishing action similar to that here described. On the other hand, it is difficult to understand how the animals of *Zonites* and *Vitrina*, whose foot is much broader and shorter than in *Nanina*, should be able to reach every part of their shell and to purify its surface.

The animal of *Nanina vitrinoides* is of a deep cinereous, the mantle yellowish, its lateral projecting lobes darker, the under surface of the foot pale grey, with a yellowish stripe along each side.

Fig. 1 is a lateral view of the animal crawling; *a* and *b*, the lobes of the mantle.

Fig. 2 is a side-view of the animal when in the act of cleaning its shell; *a b*, the portion of the foot attached to the glass; *c*, the medial portion of the foot, twisted from a vertical to a prone position.

Fig. 3 the *poma*, or deciduous operculum.

2. Description of two new species of Crustacea. By Adam White, F.L.S., Assistant Zool. Dept. Brit. Mus.

(Annulosa, pl. 6.)

Cancer (Galene) dorsalis, White, n. s. *C. pallidè carneus hepatico-rubris punctulis confertim sparsus, thorace maculâ magnâ hepaticâ dorsali, mediâ, anticè angulatâ, posticè rotundatâ; thorace parte posticâ dimidiatâ immaculatâ; pedibus carneolo-suaviter variegatis; pedibus penultimis longissimis; chelis magnis, pallidis, supernè punctulis hepaticæ sparsis, subtus et infra immaculatis; fronte planâ, medio duobus tuberculis, thorace, lateribus anterioribus, tuberculis quatuor minime elevatis.*

This singularly pretty species was sent home by Mr. John MacGillivray, the naturalist attached to Capt. Stanley's expedition: its beautiful dotted surface, the large liver-coloured mark on the middle of its carapace, and the great length of the penultimate pair of legs, as well as its semi-nodose, semi-crenate, latero-anterior edge, well determine it.

Squilla multicarinata, White, List of Crustacea Brit. Mus. *S. thorace, et segmentis abdominalibus, multis carinis, sæpè parallelis, carinâ singulâ, posticè productâ in spinam brevem; ordinibus duobus carinarum utriusque lateris, paulò majoribus.*

This species comes in the second section of M. Edwards, and in his first subsection of it, in which the rostral plate does not cover the ophthalmic ring: the very numerous nearly parallel crests on each segment of carapace and abdomen, each crest produced slightly behind into a spine, at once indicate its distinctness from all *Squillæ* with the description of which I am familiar. Two specimens were found in the Philippine Isles by Mr. Cuming (an indefatigable Fellow of this Society), and one, but a very small and badly-preserved one, was obtained on the voyage of H.M.S. Samarang, in Nangasaki Bay in the Eastern Seas.

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Description of two new species of 13
Crustacea. By Adam White.

Cancer (Galene) dorsalis White MS.
C. pallide carneus hepatico-rubris punc-
tulis confertim sparsus, thorace mac-
ulâ magnâ hepaticâ dorsali, mediâ,
anticè angulatâ, posticè rotundatâ, thorace
parte postica dimidiata ima maculata, pedibus
carneolo-suaviter variegatis; pedibus penult-
imis longissimis, chelis magnis, pallidis,
supernè punctulatis hepaticae sparsis,
subtus et infra immaculatis; fronte planâ,
medio duobus tuberculis, thorace, lateribus
anterioribus, tuberculis quatuor minime
elevatis.

This singularly pretty species
was sent home by Mr. John Mac-
Gillivray, the Naturalist attached to

Capt Stanley's Expedition: its beautifully dotted surface, the large liver colored mark on the middle of carapace and the great length of the penultimate pair of legs, as well as its semi-nodose, semi-crenate, latero-anterior edge, well determine it

Squilla multicarinata White List of Crustacea Brit. Mus.

S. thorace, et segmentis abdominalibus, multis carinis, saepe parallelis, carinâ singulâ, posticè productâ in spinam brevem: ordinibus duobus carinarum utriusque lateris, paulò majoribus

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on the voyage of H.M.S. Samarang, in
Nangasaki Bay in the Eastern Seas.

Whiti Littorales

I have two Bogota skins of this bird. It comes very close to *R. jacapa*, of which it is doubtless the New Grenadian representative. But it is of the same dark sanguineous purple above as below, while *R. jacapa* has the back almost black, just glossed with that colour. Its bill is of the same size as in the *jacapa*, but the base of the lower mandible is not so bright.

6. Ramphocelus magnirostris.

Ramphocelus magnirostris, Lafr. R. Z. 1853, p. 243.

Similis R. jacapæ, *sed crassitie paulo majore, rostro majore, longiore, et colore pectoris clariore differt.*

Hab. Trinidad.

Mus. Brit.

I have seen many examples of this bird from the island of Trinidad. It certainly seems to have the beak always larger than the Cayenne bird, but this feature varies a little, some individuals being particularly remarkable for the size of the beak. The breast is also rather brighter than in *R. jacapa*.

7. Ramphocelus venezuelensis.

Ramphocelus venezuelensis, Lafr. R. Z. 1853, p. 243.

Valde affinis R. jacapæ, *sed pileo, collo, dorso uropygioque totis nigro-granatinis, et subtus rubedine paulo intensiore: media parte abdominis nigra: mandibula inferiore breviore, retro minus producta: nigredine alarum et caudæ intensiore.*

Hab. Venezuela (*Lafr.*).

Mus. Lafresnayano.

I have not yet seen any bird answering to this description of M. de Lafresnaye.

8. Ramphocelus dimidiatus.

Ramphocelus dimidiatus, Lafr. Mag. de Zool. 1837, pl. 81; Bp. Consp. p. 242; Sclater, P. Z. S. 1855, p. 156.

Ramphopis melanogaster, Sw. Am. in Men. p. 359.

Ramphopis dimidiatus, Gray, Gen. p. 363.

Corpore supra ad dorsum medium et gutture cerviceque antica obscure coccineis, pennis subtus nigricantibus: dorso imo et abdomine coccineis, dorso clariore; ventre medio tibiisque nigris: alis caudaque nigricantibus: rostro nigricanti-plumbeo, sed basi argentescenti-alba. ♀ obscurior, capite toto et gutture nigricanti-fuscis, interscapulio erubescente: tergo et abdomine brunnescenti-coccineis: alis caudaque fuscis.

Long. tota 6·5, alæ 3·2, caudæ 3·0.

Hab. Carthagena (*Mus. Paris*); New Grenada, S. Martha (*Fontanier*); Bogota; Chiriqui (*Bridges*); Nicaragua (*Delattre*).

Mus. Brit.

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9. Ramphocelus luciani.

Ramphocelus luciani, Lafr. R. Z. 1838, p. 54; Mag. de Zool. 1839, pl. 2; Bp. Consp. p. 242.

Ramphopis luciani, Gray, Gen. p. 363.

Similis R. dimidiato, *sed dorso superiore atro: capite purpurascentiore nigro.*

Hab. Carthagena (*Lafr.*).

Mus. Lafresnayano.

I am not well acquainted with this bird, having seen only one example, and that several years ago, in the collection of Baron de Lafresnaye.

10. Ramphocelus uropygialis.

Ramphocelus affinis, Less. R. Z. 1840, p. 1 et 133?; Bp. Consp. p. 242.

Ramphopis affinis, Gray, Gen. p. 363. sp. 4.

Ramphocelus uropygialis, Bp. R. Z. 1851, p. 178; Note s. l. Tang. p. 29.

Velutino-niger, dorso medio coccineo tincto: cervice et pectore antico obscure coccineis, pennis subtus nigris: uropygio, abdomine laterali et crisso vivide coccineis, ventre medio et tibiis nigerrimis: alis caudaque fusco-nigris; rostro nigro, basi argentescenti-plumbea: pedibus nigris.

Long. tota 6·8, alæ 3·3, caudæ 3·1.

Hab. Guatimala.

I have in my care at present the type of *R. uropygialis*. It is the property of Mr. Edward Wilson, and will eventually, I believe, go to the Museum of the Academy of Natural Sciences at Philadelphia. I have never seen a second specimen.

11. Ramphocelus atrisericeus.

Ramphocelus atrisericeus, Lafr. et d'Orb. Mag. de Zool. 1837, p. 34; d'Orb. Voy. p. 280. pl. 26. fig. 1; Tsch. F. P. p. 206; Bp. Consp. p. 242.

Ramphopis atrisericeus, Gray, Gen. p. 363.

Ramphocelus aterrimus, Lafr. R. Z. 1853, p. 244 (avis junr.).

Sericeo-aterrimus: capite supra ad nucham et lateribus obscure purpureis: mento, gula et pectore antico coccineis. Junr. *nigerrimus unicolor.*

Long. tota 6·5, alæ 3·1, caudæ 3·0.

Hab. Bolivia (*d'Orb.*); East Peru (*Tsch.*).

Mus. Brit., Paris.

I have seen several specimens, clearly showing by their intermediate plumage that Lafresnaye's *R. aterrimus* is nothing more than the present bird in its immature state.

12. Ramphocelus passerinii.

Ramphocelus passerinii, Bp. L'Antologia, 1831, no. 130; Less. R. Z. 1840, p. 133 (excl. syn.); Bp. Consp. p. 242.

Ramphopis passerinii, Bp. Notes Orn. p. 52.
Ramphopis flammigerus, Baird, Stansbury's Exp. to Gt. Salt Lake, App. p. 36?

Velutino-niger: dorso postico toto rubro-coccineo. ♀ flavo-brunneo-olivascens; dorso postico brunnescenti-flavo: capite toto et gula fuscis: alis intus et cauda nigricantibus.

Long. tota 6·3, alæ 3·1, caudæ 2·7.

Hab. Colombia river, Oregon (*Baird*); Mexico, Guatimala, Nicaragua (*Delattre*); Chiriqui (*Bridges*).

Mus. Paris.

This species may be at once distinguished from *R. flammigerus*, with which it has been generally confounded, by its smaller size.

13. Ramphocelus flammigerus.

Ramphopis flammigerus, Jard. and Selb. Ill. Orn. pl. 131; Sclater, P. Z. S. 1855, p. 156.
Ramphocelus varians, Lafr. R. Z. 1847, p. 216 (*partim*).

Velutino-niger: dorso postico toto ruberrimo.

Hab. New Grenada, Caly (*Delattre*); Bogota.

14. Ramphocelus chrysonotus.

Ramphocelus varians, Lafr. R. Z. 1847, p. 216 (*partim*).
Ramphocelus chrysonotus, Lafr. R. Z. 1853, p. 246; Sclater, P. Z. S. 1855, p. 156.
Ramphocelus aurinotus, Sclater, Tan. Cat. Sp. p. 9 (err.).

Velutino-niger: dorso postico toto aurantiaco-flavo.

Hab. New Grenada, Juntas (*Delattre*).

Mus. Acad. Philadelph.

This orange-rumped bird is scarcer than the other two species, *R. flammigerus* and *icteronotus*, which it so closely resembles; and I have some doubts as to its real distinctness from the former.

15. Ramphocelus icteronotus.

Ramphocelus icteronotus, Bp. R. Z. 1838, p. 8; P. Z. S. 1837, p. 121; Sclater, P. Z. S. 1855, p. 156.
Ramphopis icteronotus, Gray, Gen. p. 363; Dubus, Esq. Orn. pl. 15. ♂ & ♀.
Ramphocelus varians, Lafr. R. Z. 1847, p. 216 (*partim*).

Velutino-niger: dorso postico toto flavissimo. ♀ pileo, cervice, interscapulio, campteriis et alarum tectricibus minoribus flavo-olivaceis: alis caudaque obscure fuscis, illarum tectricibus mediis et secundariis flavo-olivascente marginatis: rostri ambitu sordide fuscescenti-flavo: corpore subtus flavo.

Long. tota 6·8, alæ 3·6, caudæ 3·0.

Hab. New Grenada, western coast, S. Bonaventura (*Delattre*), Choco Bay (*Capt. Kellett*); Guyaquil (*Dubus*); Ecuador, western slope of the Andes, near Quito (*Jameson*).

Mus. Brit., Paris., &c.

16. Ramphocelus sanguinolentus.

Tanagra (Tachyphonus) sanguinolentus, Less. Cent. Zool. p. 107. pl. 39.

Tachyphonus sanguinolentus, Gray, Gen. p. 365.

Ramphocelus sanguinolentus, Bp. Consp. p. 242.

Velutino-ater: pileo postico, nucha cum cervice laterali et pectore conjunctis necnon tectricibus subalaribus et uropygio crissoque coccineis: rostro albo: pedibus nigris. ♀ mari similis, sed coloribus obscuribus.

Long. tota 7·5, alæ 3·7, caudæ 3·3.

Hab. South Mexico, Valle Real (*Deppe* in Mus. Berol.); Cordova (*Sallé*); Coban (*Delattre*, in Mus. Derb.); Honduras, Camalacan river, near Truxillo (*Dyson*).

Mus. Brit., Derbiano.

3. Some remarks on Crustacea of the genus Lithodes, with a brief description of a Species apparently hitherto unrecorded. By Adam White.

(Annulosa, Pl. XLII.)

Having laid before the Society a description of the interesting *Lithodes (Echidnocerus) cibarius*, of which a very excellent figure is published in the Proceedings for 1848, drawn by the late W. Wing, F.L.S., I conceive that a brief account of another very curious *Lithodes*, of which a notice was given at a meeting of the Linnean Society, may not be without interest to some of the members.

The group *Lithodes*, founded by Latreille upon our well-known, though not very common, spine-covered, empty-bodied *Lithodes Maia*, begins now to become better known. Of the excellent figure of this type of the genus, published by Dr. Leach in his 'Malacostraca Britannica,' it is sufficient to say that it was drawn and engraved by the late James Sowerby, F.L.S., and coloured from his pattern.

A very young specimen, procured by R. McAndrew, Esq., F.R.S., during his late Norwegian cruise, shows that in the young state the asperities are rather sharper, and the carapace is decidedly longer in comparison with its breadth, than in the adult state; the arrested development of the pieces forming the tail is characteristic in the adult as it is in the young specimen, 1 inch long, dredged by Mr. Barrett, and presented by Mr. McAndrew to the Museum.

Seba (vol. iii. pl. 22. f. 1) has figured a specimen with longer and more divergent terminal horns to the rostrum. As a bad specimen exists of this variety in the Paris Museum, Prof. Milne-Edwards fancies, and with good reason too, that it may prove a distinct species; he has provisionally named it *Lithode douteuse* (Crust. ii. 186); at all events, it is a variety which research may find in this country, for different specimens differ in their degrees of divergence in the horns of the rostrum.

Haan, in his 'Fauna Japonica,' 217. t. 47, has figured the male of *Lithodes Camschatica*, a species first described as *Maia Camschatica* by Tilesius in the 'St. Petersburg Memoirs,' v. p. 336. pl. 5. & 6, the female (1812). This species is named by the Chinese *Sima-gani*—that is, the Insular Crab.

Tilesius tells us that it is found on the shore of Kamschatka, among the rocks, where it conceals itself and keeps sedentary, living upon cuttle fish (*Sepia octopodia*), and snaring Starfishes and Mollusca. He records that this *Lithodes* fixes itself so firmly and resolutely in a hole of a rock, that you could not draw it out without breaking its shell. He compares the tenacity with which the Lithodes is held in the hollow of the rock to the fixedness of the *Echinus mammillaris*.

The same learned naturalist has figured another large species from Japan (218. t.48) as the *Lithodes hystrix*; it is one which Siebold, in his 'Spicilegia,' p. 15, had only ventured to regard as the common *L. Maia* (*Lithodes arctica*, Lam., Sieb.). The *L. hystrix*, Haan, is a beautifully distinct species very thickly covered with sharp spines, named by the Japanese, *Jeara-gani*, the prickly crab, or *Aka-onigani*, the Devil's red-crab.

This list completed the number of the group found in the northern hemisphere, up to the publication of *L.* (*Echidnocerus*) *cibarius*, before alluded to. The species to be described in this paper was found by Mr. Lobb cast ashore after a violent storm on the coast of California; and as it has some peculiarities of structure in its legs, antennæ, carapace and abdomen, distinguishing it from any other, it may be named *Lithodes* (*Petalocerus*), from the beautiful petal-like lobes of the antennæ. Before describing it, it may be well to review the species of *Lithodes* found in the southern hemisphere.

Messrs. Hombron and Jacquinot, on D'Urville's 'Voyage au Pole Sud,' discovered a fine species which they named *Lithodes antarctica*, pl. 7–8. f. 9, jun. Dana, too, has described and figured this in the 'Crustacea of the United States Exploring Expedition,' i. 427. pl. 26. f. 15. ♀. He found it at Nassau Bay in Fuegia, where he tells us it grows to a very large size; the exuviæ of one, obtained by Mr. Dana, were 8 inches long, and the longest legs were 15 inches in length. He describes the species as abundant in water 6 or 7 feet deep, "where it is observed to creep along the bottom with sluggish motion; they have no legs or appendages fitted for swimming. Colour, dark cherry-red, the carapace with a slight purplish tinge. The long spines that cover the carapace and legs are longest proportionally in small individuals; the right hand is much the stoutest, the second basal joint of outer antennæ with a single longish spine on the outer side" (*loc. cit.* i. p. 428).

We hope that Mr. Despard and his noble band, who are now, or will shortly be, in these seas, will find this and the other, and perhaps new, Fuegian species. Specimens of the young are sometimes found in the stomachs of fishes, as in the case of the half-digested *Lithodes Maia* sent to Dr. Leach by the late Dr. Patrick Neill, and now in the British Museum. It would be well to keep some specimens like this.

Gay in his 'Chili' mentions it (iii. 182) as a native of Chili.

The *Lithodes granulosa*, Hombron and Jacquinot, 'Voy. au Pole Sud,' pl. 8. f. 15, has the beak scarcely projecting at all beyond the extra-orbital angle, the carapace and upper parts of its legs are thickly invested, as in some of the *Canceridæ*, with close strawberry-surfaced granules, closely pressed together. It is a small species, evidently very distinct from *Lithodes* and more allied to *Lomis*—it may be called *Paralomis granulosa*. We have it in the British Museum. The figure in the 'Voyage au Pole Sud,' is extremely bad, not at all giving correctly the surface of the carapace and legs, which are *closely* matted with the warts.

Messrs. Edwards and Lucas have published the description of a fine species, said to come from the Southern Pacific, in the Archives du Museum, ii. 465. pl. 24–27, and given ample details of it. It is named, from its short legs, *Lithodes brevipes*; its beak is short. In the British Museum we have a specimen.

The *Lithodes verrucosa*, Dana (pl. 26. f. 16. vol. i. pl. 428), was found by that able and active naturalist in Fuegia. The carapace is verrucose throughout.

The *Lomis hirta* of M. Edwards, founded on the *Porcellana hirta* of Lamarck (Anim. s. vert. v. 229), is an interesting generic form, to which Lichtenstein, in one of his catalogues, had applied the name *Thylacurus*. De Haan, who quotes this, has figured a second species in his 'Fauna Japonica' (219. t. 48. f. 2. & t. Q), under the name *Lomis dentata*:—"tota tomentosa, setis brevibus densis; thoracis margine medio 8-spinoso, pedibus secundis, tertiis et quartis margine antico 15-spinosis, spinis cristam subcontinuam formantibus."

Lomis hirta is abundant on the coast of Tasmania.

Lithodes (Petalocerus) Bellianus. (Pl. XLII.)

The first feature of the curious crab here figured is the strawberry-like surface of its carapace, and of the blunt spines with which its legs are covered; the next feature is the subequilateral triangular figure of that carapace; this part is produced above the eyes into a notched projection, with two slight prominences down the middle; this covers up the front part of the head, and conceals a wart-covered spine above the base of the pedicels of the eye, which pedicels are spiny above. The carapace has 3 spines on each side, and 2 tubercles; the first spine is directed forwards, and has one or two indistinct spinelets at its base, the second and third are separated from the first by a considerable sinus, and are near each other; they are directed laterally, but slightly inclined forwards like the other two, and indeed like the whole of the carapace and the spines on the legs; they are covered with the close warting so characteristic of this species; the two tubercles on the lateral border, but at its end are united at the base; the anterior is the larger; the hind part of carapace is straight, bending round towards these tubercles and thickened on the edges, one of its monticuli being connected with the hindmost lateral tubercle; the stomach, genital, and cardiac regions are covered by a projecting portion occupying a considerable part of the back of the carapace and raised above it; this projecting part is environed by a somewhat lyre-shaped wall, pinched in front on the sides and somewhat notched behind with two deep fossæ placed transversely and connected by a short canal, the base of which is smooth with only a few groups of warts.

The abdomen is very regular and complete for the group, and when additional specimens will admit cf its being dissected, its structure promises to be curious; the various parts of it are hardly perceptible in the individual examined; a tolerably regular series of strange, close-placed appendages on its edges, seem, on cursory observation, very curious: there are about 12 deepish fossæ over it, the 2 deepest in the basal portion close to back part of carapace, and almost at right angles to the rest of abdomen, 3 on each side diverging into smaller fossulæ towards the edges, and four down the centre. The figures, drawn by Mr. Westwood from the specimen, before it came into Mr. Bell's possession, show as much as can be shown without injuring the rare example.

I exhibited a drawing of this crab at a meeting of the Linnean Society some two years ago, and not having the specimen by me, concluded, as Mr. Westwood's drawing showed it, that there were no visible traces of the imperfectly developed leg-appendages, so prominent in some species of *Lithodes*. A subsequent examination of the specimen kindly sent me by Prof. Bell has shown me I was mistaken; and on removing the carapace, which Mr. Westwood did, they are to be seen concealed as represented in the figure. There is, however, no outward opening.

This fine species is named *Lithodes* (*Petalocerus*) *Bellianus* in compliment to the ablest of our British carcinologists, the learned and scientific President of the Linnean Society, Professor Thomas Bell; in whose fine collection it is preserved. It is to him I am indebted for the loan of the specimen.

The plate represents—

1. *Lithodes* (*Petalocerus*) *Bellianus*, of the natural size, viewed from above.
2. The same from beneath, showing the pitted abdomen.
3. Rough sketch of carapace in profile.
4. Profile view of rostrum, with eyes, antennæ, &c.
5. Outer antennæ with petaloid processes.
6. Inner antennæ.
7. Hind pair of legs, concealed under the carapace.
8. Jaw feet.

May 27, 1856.

Dr. Gray, F.R.S., in the Chair.

Mr. Gould brought under the notice of the Meeting a portion of the Birds collected by Mr. John MacGillivray, the naturalist attached to H.M. Surveying ship Rattlesnake, and lately sent home by Capt. Denham, the Commander of the Expedition. They were obtained on the Fijis, San Cristoval, Isle of Pines, and other islands.

Perhaps the most remarkable of these birds is a species of *Centropus,* which exceeds in size every other member of the genus Mr. Gould has yet seen. The single specimen sent home is not fully adult, as is evidenced by some freshly moulted feathers of the tail and wings differing in colour from the older ones. On account of its large and robust form, Mr. Gould proposes to call this species

Centropus Milo.

Head, neck, mantle and breast tawny-white, remainder of the plumage mottled brown and green; some of the feathers being brown indistinctly banded with green, while others are entirely green, the mottled hue being that of immaturity, and the green the adult livery: bill black.

Total length, $26\frac{1}{2}$ inches; bill, $2\frac{1}{2}$ inches long by $1\frac{1}{2}$ deep at the base; wing, $10\frac{3}{4}$; tail, $14\frac{1}{2}$; tarsi, 3.

Hab. Guadalcanar Island.

Remark.—The specimen is a male. Unlike the other members of the genus, this species has bare orbits, with the colouring of which Mr. Gould is not acquainted.

For a fine species of Fruit-eating Pigeon from the Isle of Pines, Mr. Gould proposed the name of

Ianthœnas hypœnochroa.

Head, neck, breast, and under surface vinaceous brown, with glossy purple reflexions on the back of the neck, and a slight gloss of the same hue on the sides of the neck and breast; chin, sides of the face and throat white; all the upper surface, wings and tail dark slate grey, the margins of the wing-coverts and the feathers of the back and upper tail-coverts glossed with bronzy green; bill scarlet at the base, yellow at the tip; orbits naked and scarlet; feet reddish flesh colour.

Total length, 16 inches; bill, $1\frac{1}{8}$; wing, $9\frac{1}{4}$; tail, 7; tarsi, 1.

Hab. Isle of Pines.

Remark.—This is a fine species, about the size of the common Pigeon of Europe. It pertains to the subgenus *Ianthœnas,* the members of which are very nearly allied to the birds constituting the genus *Carpophaga.*

Another pigeon from the same locality was named

Turacœna crassirostris.

Head, all the upper surface, wings and tail dark slaty black, the feathers of the back margined with a deeper black; a broad band of grey across the lateral tail feathers near the base, and the outer feather on each side tipped with darker grey; throat greyish white; under surfaee sooty, washed with grey on the sides of the neck, the breast and centre of the abdomen.

Total length, $14\frac{1}{2}$ inches; bill, $1\frac{1}{8}$; wing, $7\frac{3}{4}$; tail, $7\frac{1}{2}$; tarsi, 1.

Hab. Guadalcanar Island.

Remark.—This is a smaller bird than the Australian *Macropygia phasianella*, has a much thicker bill, and a shorter tail, which organ is moreover of a graduated form.

A fine Lory from San Cristoval was named

LORIUS CHLOROCERCUS.

Head, nape, and a patch on each side the neck black; plumage of the whole of the body fine scarlet, with a broad crescentic mark of rich yellow across the breast; tip of the shoulder silvery blue; wing-coverts yellowish green; outer webs of the primaries and secondaries dark grass-green; inner webs dull black, with a broad oblong mark of scarlet along their basal portions; basal half of the tail scarlet, the remainder grass-green; under wing-coverts and thighs fine blue; bill orange; feet dark brown.

Total length, 10 inches; bill, $\frac{7}{8}$; wing, $6\frac{5}{8}$; tail, $4\frac{1}{4}$; tarsi, $\frac{3}{4}$.

Hab. San Cristoval.

Remark.—This is one of the most beautiful species of the genus, and differs from all its congeners in having the apical half of the tail green.

A new *Hirundo* from Moala, one of the Feejee Islands, was characterized as

HIRUNDO SUBFUSCA.

Forehead, chin and throat rufous; crown of the head, all the upper surface, wing- and tail-coverts steel black; wings and tail dark brown; under surface of the body and under wing-coverts dark fuscous; under tail-coverts steel black, margined with light brown.

Total length, 5 inches; bill, $\frac{1}{2}$; wing, $4\frac{1}{4}$; tail, 2; tarsi, $\frac{1}{2}$.

Remark.—This is a very remarkable Swallow, resembling in the colouring of its back, throat and forehead the common Swallow of Europe; it is also very similar in size, while it has a much larger bill and a very diminutive and but slightly forked tail, the outer feathers not being produced as in the European bird.

The five birds above described are now deposited in the collection at the British Museum.

Mr. Gould also described a new and very beautiful Pigeon from the Solomon Islands as

IOTRERON EUGENIÆ.

Crown of the head, cheeks, upper part of the throat and ear-coverts white; centre of the throat and chest of the richest crimson; upper surface and wings green washed with orange; along the shoulder a mark of light grey, and a large spot of grey near the tip of each of the tertiaries; primaries dark slate grey tipped with orange-brown; secondaries slate grey bordered with orange-brown, and with a very narrow edge of yellow along the apical portion of the external web; under surface of the body greyish green; under surface of the wings grey; vent washed with yellow.

Total length, about 8 inches; bill, $\frac{3}{4}$; wing, $4\frac{1}{2}$; tarsi, $\frac{5}{8}$.

Hab. The Solomon Islands.

Remark.—The only specimen I have ever seen, and which is unfortunately imperfect, being destitute of tail, was sent to me by Mr. Webster, who had visited the above islands. This beautiful little Pigeon, certainly the most brilliantly coloured of the entire group, has been named in honour of Her Imperial Majesty the Empress of the French.

2. List of Mammals and Birds collected by Mr. Bridges in the vicinity of the Town of David in the Province of Chiriqui in the State of Panama. By Philip Lutley Sclater, M.A.

The town of David lies in a beautiful plain on the left bank of the river of the same name, about twenty-five miles above its exit into the Pacific at Boca Chica. On the west of the town rises the extinct volcano of Chiriqui, a peak 9000 feet in altitude, and on the north the Sierra de Chorcha, a flat table-mountain, which here forms the watershed between the two oceans.

Mr. Bridges arrived at David in the month of January in the present year, and stayed there until the middle of the following March. He was principally engaged in collecting the magnificent Orchids of that country, of which he succeeded in obtaining a considerable series. During his leisure moments, however, he procured about fifty species of Mammalia and birds, of which a list is subjoined. These were principally collected near the town on the banks of the river, or between that and the '*Boqueti*,'—an elevated savannah of about 4000 feet above the sea-level, lying on the western slope of the volcano of Chiriqui.

This locality is very interesting to naturalists, being a stage in the passage between North American and South American zoology, which has not, as far as I am aware, been hitherto much explored. M. Warszewiz, the well-known Polish collector, was resident in David some time in 1849, but did not turn his attention much to birds except *Trochilidæ*, of which he discovered the six very interesting new species which were described by Mr. Gould before this Society in 1850.

Mr. Bridges has very greatly added to the value of my list by supplying me with notes upon the exact spot in which he found each species and upon what he recollected of their habits.

The nearest Bird-fauna to the present of which any detailed accounts have been published are those of Nicaragua, as given by Prince Bonaparte in his catalogue of the Birds brought from that country by Delattre in the *Comptes Rendus* of the Academy of Paris for 1854, and of the interior of New Granada, as shown by my List of Birds received in collections from Bogota read before this Society last year. To both of these papers I have frequently referred in the following list in order to show the geographic range of the species, and to avoid the repetition of synonymy already given.

Mammalia.

1. Saimaris sciurea (Linn.)?
Forests near David. A skeleton only of an animal probably of this species.

2. Sciurus ——— ?
A black species, difficult to distinguish. Mr. Bridges states that it is common in the immediate vicinity of the town of David, and between that and the port of Boca Chica.

3. Sciurus æstuans, Linn.
This seems to agree with Bogota specimens so marked in the British Museum. It is from the Boqueti at the base of the volcano of Chiriqui.

4. Cyclothurus didactylus (Linn.).
From the vicinity of David. Also seen near Panama. A strictly nocturnal animal.

5. Cholæpus didactylus.
From the forests near David. I believe neither this Sloth nor the Little Anteater has been hitherto observed so far north.

Aves.

1. Pharomacrus mocinno, De la Llave!—*Trogon resplendens*, Gould, Mon. Trog. pl. 21.
From the dense forest on the Boqueti; only three specimens seen.

2. Trogon aurantiiventris, Gould, sp. nov. See *antea*, p. 107.
Inhabits the same locality as the preceding, and is more common. Also found farther down towards David.

3. Momotus lessoni, Lesson, Icon. Orn. pl. 62.
Agrees with Guatimala specimens. From the vicinity of David in the thickets. Stops during the day in the shady underwood, and seeks its food towards evening in the open spaces on the banks of the river.

4. Ceryle americana (Gm.)—P. Z. S. 1855, p. 136.
On the banks of the river David. Its habits are the same as those of our Kingfisher. Mr. Bridges also observed a large species more common than this, probably *C. torquata*.

5. Galbula melanogenia, Sclater, Cont. Orn. 1852, p. 61 et 93, pl. 90.

On the banks of the river David, rather uncommon, only three or four times observed.

6. Campylopterus cuvieri.—*Trochilus cuvieri,* Delattre et Bourc. R. Z. 1846, p. 310.

7. Heliomaster longirostris (Vieill.).—Gould, Mon. Troch. pt. 5, pl. 9.

8. Lampornis veraguensis, Gould.

These three Humming-birds are found in the outskirts of the town of David, feeding among the flowers of a large arborescent species of *Erythrina.*

9. Amazilius riefferi (Bourc.), R. Z. 1843, p. 103.

Found feeding on a malvaceous plant near the Boqueti, at an elevation of 4000 feet.

10. Saucerottia niveiventris (Gould), P. Z. S. 1850, p. 164.

11. Saucerottia atala (Less.).—Bp. Consp. p. 77.

12. Hylocharis (?) cæruleigularis (Gould), P. Z. S. 1850, p. 163.

All these three short-billed species are found in the very town of David feeding on the *Tamarindus indicus* and orange-trees. They are very pugnacious and constantly fighting together. Besides the seven Humming-birds here given, Mr. Bridges observed three others of which he did not obtain specimens. One of these (probably *Heliomaster constantii*) was feeding on a beautiful blue species of *Salvia* on the Boqueti.

13. Cæreba cyanea (Linn.).

Already noticed as far north as Nicaragua (Bp. Notes s. l. Ois. Coll. Delattre, p. 50), and lately brought by M. Sallé from the vicinity of Cordova in Mexico.

14. Picolaptes ——?

Vicinity of the town of David on the large forest-trees, with the habits of our Creepers.

15. Thryothorus rufalbus, Lafr. R. Z. 1845, p. 337; P. Z. S. 1855, p. 143.

In the dense jungle near David.

16. Rhodinocichla rosea (Less.), P. Z. S. 1855, p. 141.

Mr. Bridges only procured one specimen of this singular bird—a male. It was hopping about in the thicket close to the ground in the flat land between the rivers David and Chiriqui, uttering a very peculiar note, by which his attention was called to it.

17. Mniotilta varia (Linn.).

A North American species, ranging as far south as Bogota (P.Z.S. 1855, p. 143). Mr. Bridges says it has the habits of our Creeper, running up the trunks of the trees and searching for insects in the bark. He found it in the town of David.

18. Rhimamphus æstivus (L.), juv.

Mr. Bridges found this bird not uncommon in the town of David in the fruit-trees and *Erythrinæ*.

19. Tyrannus melancholicus, Vieill. P. Z. S. 1855, p. 150.

Margins of the plains near David, very common.

20. Milvulus tyrannus (Linn.).—" *Tijerita.*"

Ranges from the Southern United States as far south as Bogota (P. Z. S. 1855, p. 150). Very common in the plains near David.

21. Todirostrum cinereum (Linn.).

See my remarks on the range of this species, P. Z. S. 1855, p. 148. Mr. Bridges found it amongst the trees in the vicinity of David.

22. Tyrannulus elatus (Spix),—P. Z. S. 1855, p. 150.

On the trees in the vicinity of David.

23. Tityra mexicana (Less.).—*Psaris mexicana*, Less. R. Z. 1839, p. 41, et *P. tityroides*, Less. R. Z. 1842, p. 41.

I consider this bird probably distinct from *Tityra semifasciata* of Bolivia and East Peru, to which it is generally united. It has all the rectrices banded across with black; while the other, speaking from the specimens I have seen of it, has the inner web of the outer pair of tail-feathers white. Delattre procured this bird in Nicaragua (Bp. Notes Orn. p. 88); M. Sallé has lately brought specimens from Cordova in Mexico; Mr. Bridges' examples are from the forests on the Boqueti.

24. Chiroxiphia melanocephala (Vieill.). See P. Z. S. 1855, p. 151.

In the bushes on the margins of the rivers near David.

25. Thamnophilus doliatus?

26. Thamnophilus bridgesi, sp. nov.

T. fumoso-brunneus: capite nigro, plumarum rachidibus albis: alarum tectricibus nigris maculis apicalibus rotundis albis: remigibus et rectricibus fumoso-nigricantibus, harum trium utrinque extimarum apicibus nigro marginatis; illarum marginibus externis brunnescentibus: gula et pectore toto ad summum ventrem nigricantibus, longitudinaliter albo striatis: tectricibus subalaribus albis.

Long. tota 6·7, alæ 2·8, caudæ 2·5.

This is a typical *Thamnophilus* not very closely allied to any described species, but to be placed near *nigrocinereus, maculipennis*, &c. (*vide* Edinb. Phil. Journ. n. s. 1855, i. p. 226 *et seq.*). Mr. Bridges found these two Bushshrikes in the thick bush on the margins of the river David. The first species was very common, but of the present only one individual was seen.

27. Thamnophilus melanurus, Gould?
A female specimen, probably referable to the New Grenadian species.

28. Sturnella ludoviciana (Linn.)?
"*Paxaro Savanero.*" Amongst the grass on the plain near David. Very tame, and when disturbed does not fly far, but runs much.

29. Yphantes baltimorensis (Linn.).—Bp. Consp. p. 432.
Already noticed as far south as Real del Monte in Mexico by Bullock (Sw. Phil. Mag. 1827, p. 436), and Guatimala by Prince Bonaparte (P. Z. S. 1837, p. 116).

30. Saltator magnoides, Lafr.

31. Ramphocelus dimidiatus, Lafr. Mag. de Zool. Ois. pl. 81 (1837).

32. Ramphocelus passerinii, Bp.
Both these *Ramphoceli* are tolerably common, and generally met with together in the bushy underwood on the margins of the rivers. They feed on the fruit of a small species of *Ficus*. They are always seen near the water.

33. Pyranga æstiva (Linn.), P. Z. S. 1855, p. 156.
"*Sangue del Toro.*" Not uncommonly met with near the Boqueti on the tops of the trees.

34. Tanagra diaconus, Less.
"*Azulejo.*" The commonest bird in the country. Very abundant in the town of David.

35. Calliste gyroloides (Lafr.).
This is a wide-ranging species, extending hence to the head-waters of the Amazon in Bolivia, where specimens were obtained by d'Orbigny, that is, from 8′ north latitude to 18′ south latitude.
Mr. Bridges says it was not common at David. It is found on the high trees near the town, and feeds on the fruit of the small-fruited *Ficus*.

36. Calliste franciscæ (Lafr.).—*Aglaia fanny* (!!), Lafr. R. Z. 1847, p. 72; Des Murs, Icon. Orn. pl. 56, fig. 1.
This species appears distinct from *Calliste larvata* of Du Bus, to which it is usually united. The general colouring is pretty much the same, but the tints are still brighter in the present bird, and the head in particular is paler.
Mr. Bridges obtained a single specimen only of this beautiful Tanager, from the tops of the high trees on the banks of the river David.

37. Euspiza americana (Linn.).
Already noticed as far south as Nicaragua, and lately received by MM. Verreaux of Paris from S. Martha on the north coast of New Granada. Found in small flocks near David.

38. Embernagra conirostris (Bp.).—*Arremon*! *conirostris*, Bp. Consp. p. 488. — *Embernagra striaticeps*, Lafr. R. Z. 1853, p. 62; P. Z. S. 1855, p. 154.

I consider M. de Lafresnaye is quite right in placing this bird in the genus *Embernagra*. It is, at least, certainly no *Arremon*. It is found, like the last bird, in small flocks near David, feeding on the grass-seeds in the savannahs.

39. Melanerpes formicivorus (Sw.).

Agrees with Mexican specimens. Not rare in the forests of the 'Boqueti,' found on the evergreen *Quercus*.

40. Centurus subelegans, Bp. P. Z. S. 1837, p. 109; Consp. p. 121; P. Z. S. 1855, p. 162.

Seems to agree with Bogota and Venezuelan specimens.

41. Chloronerpes cecilii (Malherbe)?

Both these Woodpeckers are found on the trees in the outskirts of the town of David. The first is the more common, only one pair of the latter having been observed.

42. Geotrygon chiriquensis, sp. nov.

G. pure castanescenti-brunneus: dorso medio purpurascente: pileo cærulescenti-griseo: subtus dilutior, abdomine albescentiore: mento gulaque lactescenti-albis, rufescente tinctis: remigibus et rectricibus nigricanti-schistaceis: caudæ apice brunnescentiore: rostro nigro: pedibus rubris.

Long. tota 11·0, alæ 5·9, caudæ 3·5.

Both Prince Bonaparte and Mr. G. R. Gray, who have lately paid great attention to the *Columbæ*, consider this species as new to science, and it is upon their authority rather than my own that I have ventured to name it as undescribed.

43. Chlorœnas rufina (Temm.).—Bp. Consp. ii. p. 52.

From the dense forests of the Boqueti at the base of the volcano.

44. Odontophorus veraguensis, Gould, *antea*, p. 107.

From the Boqueti, where it is found in coveys running on the ground in the forests. The males have a peculiar call-cry.

45. Aramides cayennensis (Gm.) (Pl. Enl. 352).

In the bush on the banks of the river David.

46. Parra hypomelæna, G. R. Gray, juv.?

Found in the shallow waters running amongst the stones.

A young bird, white underneath, probably of *P. hypomelæna*, but it would be hazardous to decide positively without seeing adult specimens from the same locality.

3. Note on some Birds from the Island of Ascension. By Philip Lutley Sclater, M.A.

Dr. Acland, of Oxford, having lately placed in my hands, for naming, a small collection of birds from the Island of Ascension, I think it will be useful to record a list of them, although none of them are of great rarity, in order to make some contribution, however small, towards a more accurate knowledge of the geographic range of species.

Mr. Darwin (Zool. Beagle, p. 133) tells us that there are no aboriginal land-birds on this island. The only bird he mentions, which might claim that name, is a *Porphyrio* (*P. simplex*, Gould), which however, we are informed, was evidently a straggler not long arrived.

But recollecting the beautiful Thrush (*Nesocichla eremita*) lately described by Mr. Gould from the Island of Tristan d'Acunha, there is certainly no *primâ facie* reason why the Island of Ascension should not also possess peculiar land birds.

The specimens in Dr. Acland's collection are all Natatores, belonging to the following species.

1. Onychoprion fuliginosus (Gm.).

Latham (G. H. x. 102) has recorded the existence of this Tern upon the island in "*prodigious numbers.*" It is found also on the American coasts from Texas to the Floridas.

2. Phaethon æthereus, Linn. (Pl. Enl. 998).

Visits Tobago, whence Sir William Jardine received the eggs of this species from his correspondent Mr. Kirk. See Cont. to Orn. 1852, p. 351, pl. 84, where the eggs of all three species of *Phaethon* are figured.

3. Phaethon flavirostris, Brandt (Pl. Enl. 369). *P. æthereus,* Audub. nec Linn.

Mr. G. R. Gray has rejected Brandt's excellent appellation for this species in favour of Brisson's *candidus*. But Brisson was no binomalist, and has no claim to bestow *specific* names in a *binominal system*. This *Phaethon* breeds on the Bermudas (Cont. Orn. *l. c.*), and visits the coast of Florida (Audubon).

Professor Brandt has written a good Monograph of the *Phaëthontinæ* in the Transactions of the St. Petersburgh Academy. These two species, and the *P. phœnicurus* from the Indian Ocean, appear to be the only three well-distinguished birds of the genus.

4. Tachypetes aquila (L.).

This name ought, I think, to be retained for the Atlantic bird. Mr. Gould has described and figured a smaller species from Australia; but he has also a larger bird from the coasts of that country, which appears different from the present.

5. Sula fusca, Vieill. Gal. Ois. pl. 277; Gould, B. Aust. vii. pl. 78.

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attended with so much expense, and such great inconveniences of all kinds. Although the Portuguese Government allow me £45 per month, I shall nevertheless be under the necessity of contracting heavy debts before I return to Europe, since everything is at least three times dearer here than in London. As there are few roads, and fewer beasts of burden, all baggage, provisions, water, presses, paper, beds, cooking utensils, with the necessary articles for barter (*e.g.* guns, powder, brandy, cotton goods, glass-pearls, &c.), must be conveyed on the heads of negros; so that even the shortest excursion of three or four days costs an enormous sum.

Meanwhile my reliance is upon England; that is to say, I anticipate that my cases of living plants, insects, seeds, &c., as also a few herbaria of the flora of this neighbourhood, will be duly honoured; and in that hope, I intend within two or three weeks from this time, to make up a sample-collection for London. About the 16th or 18th of the present month, the English ship of war Penelope will leave here for England, and I shall avail myself of this opportunity to send living plants, as well as seeds and *Hymenoptera*, to Messrs. Wilson Saunders, Hooker, &c.

Read also a paper "On a new species of *Anomourous Crustacean* belonging to the family *Homolidæ*, found by Mr. Wm. Lobb, at Monterey in California, in the winter of 1850." By Adam White, Esq., F.L.S. &c.

This species Mr. White stated to be in some respects allied to *Lithodes* (*Echinocerus*) *cibarius* from the Columbia River, but to differ from it in the more regularly triangular and depressed form of the carapace, and in the outer antennæ having two or three beautiful petaloid processes at the base, instead of the strong thorn-like spines at the base of the other. The abdomen is singularly pitted on the under side; the surface of the carapace is covered with strawberry-like tubercles, and the thick spines with which the legs are covered are similarly ornamented. The most singular character however is the absence of the hinder pair of legs, or (as the President suggested) their apparent absence, there being no hole between the carapace and abdomen through which these appendages could come.

Mr. White gave a revision of the species of *Lithodes*, which had been much added to, since the work of Prof. Milne-Edwards, by a Japanese species described by De Haan; three species from Fuegia, obtained on the voyage of Dumont D'Urville; one described by Edwards and Lucas; another by Dana; and another by Mr. White himself. He proposed for the fine species obtained by Mr. Lobb, the name of *Lithodes* (*Petalocerus*) *Bellianus*, in compliment to the President of the Society.

Read also a Memoir "On the External Membrane of the Unimpregnated and Impregnated Ova of the Common Salmon." By John Hogg, Esq., M.A., F.R.S., F.L.S. &c.

In illustration of his paper, Mr. Hogg presented to the Society two phials containing (preserved in spirit) mature ova as they fell from the female Salmon unimpregnated, and others taken at the same time and artificially impregnated. They were taken by Mr. Harrison in December last, and sent to Mr. Hogg in January by Isaac Fisher, Esq. of Richmond, Yorkshire. "The ova in both phials," says Mr. Harrison, "were taken from one fish in the River Tees, on the 27th of Dec. 1853. The female fish was held up by the head, and when the spawn was ready it run out by itself. The ova were with the milt for about half a minute, or as soon as they could be got away. The impregnation naturally takes place in a moment, as is always the case in a stream, where the milt shed in the running water passes rapidly over the ova." Mr. Hogg was unable to obtain either the immature ova from the same female, or ova naturally fecundated —two other conditions which he was desirous of examining to complete the series of his observations.

The object which Mr. Hogg had chiefly in view was the microscopic examination of the external membrane of the ovum in these several conditions, in relation to the statements made by different authors as to its structure and the changes it is supposed to undergo. Thus in the 'Book of the Salmon,' by Messrs. Fitzgibbon and A. Young (Lond. 1850), it is stated (p. 183), that "the eggs of that part of the roe nearest to the vent will be always found of larger size than those situated higher up in the stomach; they are softer also, and their outward filaments (or membranes) are thinner and more porous, and thus they are fitter for impregnation—for absorbing the milt of the male as it is poured over them." And again, p. 185, "Although the unripe ova should be expressed, they would be useless for production, for their absorbing pores are still closed against the interpenetration of the milt, and consequently in this state impregnation is impossible." In like manner Mr. Jacobs, in a communication published in the 'Hanover Magazine' for the year 1763, quoted in Yarrell's 'British Fishes' (ed. 2nd, vol. ii. p. 93), says of the common Trout and of the Salmon also, "After an egg has been fructuated by the sperma of the male, which slips through an invisible opening into it, it lodges in the white liquor, under the shell and round the yolk." Recent discoveries, Mr. Hogg continues, have shown that the fecundating principle of the male fish (as of every animal in which there is a sexual communion) is solely derived from the seminal animalcules or spermatozoa. In the words of our late distinguished Fellow, Mr. Newport, "The spermatozoa alone, in all cases of communion of the sexes, are the sole agents in impregnating the ovum, and impregnation cannot be effected by the *liquor seminis*" (Phil. Trans. 1851, p. 172). Dr. Martin Barry indeed has asserted (Phil. Trans. 1840, p. 533, and pls. 22 & 23. figs. 164–169) that he had observed an attenuation, or an orifice like a cleft, in the thick transparent membrane of the ovum of the Rabbit, at the period of, and after, fecundation, through which the spermatozoa enter; and in a recent communication to the Royal Society (Proceedings, vol. vi. p. 335), the same author has referred to a lately published work by Dr. Keber, in which Dr. Barry states, "That physiologist describes the penetration of the spermatozoa into the interior of the ovum, in *Unio* and *Anodonta*, through an aperture formed by dehiscence of its

Dr. Leidy, F.M. Geol. Soc. Lond.
with the author's compliments.

Indian Museum, Calcutta.
July 14th, 1871.

Kingsley from Dr Leidy

[*From the Journal, Asiatic Society of Bengal*, Vol. XL, Part II, 1871.]

Contributions to Indian Carcinology.—On Indian and Malayan Telphusidæ, Part I,—*by* James Wood-Mason *of Queen's College, Oxford.* 14

(With Plates XI and XII.)

[Read 5th April, received 25th April, 1871.]

In the year 1869,* M. Alphonse Milne-Edwards published a Revision of the genus *Telphusa* with descriptions of some new forms which brought up the number of known species to thirty-six.

In 1868,† E. von Martens (in a paper entitled "*Ueber einige Ost-asiätische Süsswasserthiere*" described *T. Borneensis* from the rivers of Borneo.

In this, the first part of my paper on the Telphusidæ, which will be continued in succeeding numbers of the Journal, I shall give descriptions of fifteen new species; of which two belong to Milne-Edwards' sub-genus *Paratelphusa.*

For the opportunity of drawing up these descriptions, I am especially indebted to my friend, Dr. F. Stoliczka, who has also added to the Museum collections under my care many interesting species of marine Crustacea; to Dr. Francis Day; to my colleague Dr. J. Anderson who collected several species during the Yunan expedition; to Major Godwin-Austen and to Captain Stewart-Pratt of Morar; to Messrs. W. T. Blanford, V. Ball, H. L. Houghton and above all to that indefatigable observer Mr. S. E. Peal of Sibsaugur who has so greatly enriched the collections of the Indian Museum in every group of the Arthropoda.

The Telphusidæ are essentially fresh-water Crustaceans, but in India are commonly called land-crabs from the circumstance that many of the species are able to live for a very considerable time out of water, far removed from rivers, tanks, marshes, jhíls, &c., provided that the air that enters the branchial chamber is sufficiently saturated with moisture to prevent the branchiæ from becoming desiccated, and so unfitted for the performance of their respiratory functions. My freind, Captain Stewart Pratt, forwarded to me, at the commencement of the present hot season, specimens of *Telphusa*

* Nouvelles arch. du Mus., 1869, tom. V, p. 161—191, pl. 8—11.
† Wiegmann's Archiv für Naturg., xxxiv, Jahrg., 1 Bd., p. 18.

Indica which he had obtained from holes dug by the crabs in the neighbourhood of water; the bottoms of these holes were found to be below the level of the neighbouring water, and there appears to be good reason for believing that these creatures deepen their holes *pari passu* with the change in the level of the water, so that moisture sufficient for the maintenance of their branchiæ in a state fit for respiration may reach their retreats. Col. Sykes' account* of the so-called land-crabs of the Dekhan, prefixed to Prof. Westwood's description of *Telphusa cunicularis* = *Indica*, Latr., gives a good idea of the terrestrial habits, the prodigious numbers, and the extent of the burrowings of these creatures.

Stimpson,† influenced by the feeble development of the post-frontal crest and by the absence of the epibranchial teeth in certain species, but especially by their terrestrial habits, gave them the generic appellation of *Geotelphusa*. But, as M. Alphonse Milne-Edwards justly remarks, there appear to be no sufficient reasons for the foundation of this new genus, the definition of the limits of such an artificial group being difficult, because there are species possessing all the essential characters of *Telphusa*, in which the frontal crests become more and more obliterated and the epibranchial teeth scarcely perceptible.

The land-crabs, properly so-called, belong to the Gecarcinidæ, a family of the Crustacea grapsoidea of Dana (= Catometopa, M. Edw., *minus* Telphusiens), and are well known from the accounts of the extraordinary periodical migrations of the species of the West Indian genus *Gecarcinus* to the sea for the purpose of depositing their eggs or brood. This family is represented in India by *Cardisoma* which is widely distributed, and by *Gecarcinuca Jacquemontii*, M.—Edw., occurring in great numbers in company with *Telphusa Guerini*, M.—Edw., at Khandalla in the Western Ghâts.

Dana in his great work on the Crustacea, acknowledging the greater affinities of Telphusidæ to the Cancroidea, to which they are united by such forms as *Eriphia*, removed them from their

* Trans. Entom. Soc. Lond. vol. i, p 181.
† Proc. Acad. Nat. Sc. Phil. 1858, p. 179.

association with the GRAPSIDÆ in the CATOMETOPA, and placed them in their more natural position next to the CANCROIDEA TYPICA under the legionary name of the TELPHUSINEA or CANCROIDEA GRAPSIDICA, on the ground that they possess the same number of branchiæ, a similar abdomen, and have the male copulatory organs similarly inserted in the basilar joint of the last pair of ambulatory legs, and covered from their origin by the abdomen. The TELPHUSIDÆ, however, evidently constitute a transition between the CANCROIDEA TYPICA and the GRAPSOIDEA, as may be seen from their general Grapsoid form.

The family TELPHUSIDÆ is divisible into the following genera and subgenera:—

TELPHUSA, (Syn. *Geotelphusa*): *Hab.* Southern Europe, Africa, India and its islands, Burma, China, Australia, Chili.

PARATELPHHSA: *Hab.* South-Eastern Bengal, Assam, Burma, Pegu, China, Siam and the Indo-Malayan Archipelago.

BOSCIA, DILOCARCINUS, SYLVIOCARCINUS, POTAMOCARCINUS, TRICHODACTYLUS, &c.: *Hab.* Tropical America.

DECKENIA: *Hab.* Eastern Africa (Zanzibar). This genus resembles the TELPHUSIDÆ in the development of the branchial regions and in the position of the male copulatory organs, but the structure of the external maxillipedes and position of the efferent orifices of the branchial cavities recalls the disposition of these parts in the Oxystomatous Crustacea.

Of the developmental history of the TELPHUSIDÆ nothing is, I believe, known, and I extremely regret that I have not yet had an opportunity of making observations on this head; but this I can say, that the ova are of large size and few in number. Whether, however, direct development without metamorphosis is correlated with the large size of the eggs and their fewness in number, as in the single instance amongst the Brachyura (in *Gecarcinus*), investigated by Prof. Westwood, or whether the young commence their existence as Zoëas, as in another species of the same genus, noted by Thomson, must be left for future observations. Arguing from what happens in the case of fresh-water branchiferous Gasteropods,* the

* Troschel, Hand. der Zoologie.

young of which possess no ciliated buccal lobes, while these are possessed by the allied LITTORINIDÆ, and from other instances in which fresh-water allies of marine animals, which do undergo a metamorphosis, are ametabolous, it is probable that the young of the TELPHUSIDÆ leave the egg in a condition differing but little from that of their parents.

CRUSTACEA CANCROIDEA.

TELPHUSINEA VEL CANCROIDEA GRAPSIDICA.

Fam.—TELPHUSIDÆ.

Genus.—TELPHUSA, Latreille.

Diagnosis.—Carapace broader than long, with the interregional furrows little marked, with the exception of the cervical suture which is occasionally very deeply impressed. Front deflexed, generally with a straight free margin; orbits large with their infero-internal angle sending upwards a stout vertical tooth to about against the antennæ, which are exceedingly small and lodged in the inner canthus of the eye. Antennulary pits pretty long, but very narrow. External maxillipedes large with their third joint subquadrate, with the antero-internal angle truncated and giving insertion to the fourth joint. Sternal region almost as long as broad. Abdomen of both males and females constituted by 7 free somites.

Sub-genus.—PARATELPHUSA, M.-Edw.

The species referable to the subgenus *Paratelphusa* are further characterized by the presence of an acute spine on the superior angle of the meropodites of the chelipedes, situated just behind the constriction near the distal articular end of the joint; the inferior angles of the joint being rounded off, and devoid of the tubercles which are invariably present in *Telphusa.*

Paratelphusa Dayana, n. sp. Pl. XI.

The carapace is much broader than long, the greatest breadth being measured between the points of the last epibranchial tooth, extremely convex, smooth, punctate, and appears finely granular under an ordinary lens. The branchial lobes are greatly swollen and are not sub-divided into anterior and posterior divisions; the mesial crescentic portion of the cervical suture is distinctly marked and continued nearly to the level of the last epibranchial tooth, where it ends to appear again opposite the second tooth, whence it passes to the edge of the post-frontal crest which it but faintly indents. The post-frontal ridge is well marked and, between the point at which its edge is notched by the passage across it of the cervical suture and the anterior epibranchial tooth, is crenulated; the cardiac lobe is marked off from the branchial by two shallow almost linear depressions on each side of the middle line, and in front from the urogastric by a line curving almost concentrically with the convexity of the cervical suture. The epigastric lobes are slightly wrinkled or foveate anteriorly, and advanced beyond the line of the post-frontal crest as in *Paratelphusa spinigera*, and separated from one another by the mesogastric suture, which rapidly bifurcates as it passes backwards, appearing as a short V-shaped impression on the carapace, the space intercepted between the arms of the V being the point of the narrow anterior prolongation of the mesogastric lobe.

The antero-lateral margins are inclined and armed, not counting the blunt extra-orbital tooth with its curved external margin, each with four acute, spiniform epibranchial teeth of which the most anterior is the largest; the rest are equal in size to, and equidistant from each other; from the last a short well defined keel, obscurely crenated on its inner edge, passes backwards and inwards on to the carapace which is marked with a few small straggling tubercles along the line of the epibranchial spines. Front very broad especially at base, punctate, finely granular and transversely wrinkled, its free margin is bayed in the middle line, but not greatly lamellar and projecting forwards over the epistomial region, as in *Paratelphusa sinensis*, M.-Edw., and in *P. spinigera*.

The inflected portion of the carapace is finely tuberculated anteriorly; anterior pleural lobe distinct and almost devoid of tubercles; posterior pleural smooth, thickly granulated where it bounds the anterior pleural.

The anterior boundary of the epistoma is crenulated; its posterior margin is notched on each side of the middle line from which a long sharp process extends downwards between the palpiform appendages of the external maxillipedes; this process does not correspond exactly with the triangular process of the epistoma in other species of *Telphusa*, but is the greatly developed median palatal ridge; externally to each notch the posterior margin of the epistoma forms two distinct lobes with granulated edges. The second joint of the external maxillipedes is punctate and its external margin crenulated. The third joint is much broader than long and has its external and anterior angles well rounded off and distinctly granular; the exopodite is crenulated on its internal margin. The abdomen of the male differs greatly from that of *Paratelphusa spinigera*, having the form of an isosceles triangle.

The chelipedes are greatly unequal in size, both in males and females, especially in the former; the meropodites have their ventral angles rounded off as in *Paratelphusa spinigera*, their outer or posterior face rugose, their posterior angle also rugose and armed with a sharp spine arising just proximally to the constriction near the distal articular end; carpopodites faintly rugose above, armed with a single excessively long, stout spine; penultimate joint obsoletely tubercular above, externally and internally all but smooth; in the larger claw a considerable hiatus exists between the dentated margin of the prolongation of this joint and that of the dactylopodite, which in the smaller claw is throughout its length in complete contact with the immoveable arm of the pincers.

The terminal joints of the ambulatory legs are extremely slender, acute, and armed with fine sharp spines.

Breadth, ...	42 mm.
Length, ...	31 mm.

Hab. Mandélé and Prome, Upper Burma.

Plate XI. Fig. 1. *Paratelphusa Dayana*, of the natural size; 2. Front view. 3. External view of right chela. 4. External maxillipede. 5. Abdomen of the male. 6. The same of a female.

PARATELPHUSA SPINIGERA, Pl. XII, Figs. 1-4.

'*Thelphusa spinigera*,' White, MSS. List of the specimens of Crustacea in the collection of the British Museum, p. 30, (no description).

Carapace very greatly broader than long, smooth except on the postero-lateral margin which bears numerous wrinkles; these are continued neither on to the inflected portion of the carapace, nor on the posterior pleural region; front broad, punctate, projecting pent-house fashion over the antennulary pits between which it wholly forms the broad septum; its free margin is sinuous, presenting mesially a broad shallow bay; orbital borders indistinctly crenulated; the anterior pleural or subhepatic regions are faintly marked off from the inflected portion of the carapace which bounds them externally, while they are most distinctly separated from those portions of the posterior pleural lobes which pass forwards, so as to form the parallel boundaries of the buccal frame by a deep groove, running outwards and backwards from the epistoma; this is deeply excavated and its posterior margin sends backwards in the middle line a short broad-based triangular projection. The extra-orbital angle is somewhat obtuse and is widely separated from the single acute forwardly directed epibranchial spine, in the rear of which is a very short smooth crest. Branchial lobes enormously swollen and not subdivided, separated from the gastric region by the deeply impressed cervical suture which does not pass through the postfrontal crest; this subsides without reaching the acute, arched antero-lateral margin, and is interrupted by the advanced position of the epigastric lobes; these are in front rugose and faintly distinguishable from the rest of the gastric region, but separated from one another by a short mesogastric furrow. A very deep muscular impression is visible at each postero-lateral angle of the gastric area. Cardiac region convex, distinct. Two large puncta, which frequently become confluent, mark the post-frontal furrow behind the external canthus of the eye. Chelipedes smooth and extremely unequal both in males and females, in some the right, in others the left being the larger; meropodites are smooth and their angles rounded, the upper one only being slightly rugose and bearing proximally to the constriction at its distal extremity a sharp spine, as in the rest of the species of the subgenus. The upper surfaces of the carpopodites are transversely convex; their inner margins armed with an exceedingly stout sharp spine; the penultimate joint is internally smooth, convex and punctate, the puncta being disposed in longitudinal series; the dactylopodites are slender, much curved, longitudinally punctate, minutely granular and only in contact with the extremity of the produced portion of the preceding joint in adult individuals. The ambulatory legs and the dorsal edges of their meropodites are perfectly smooth.

Breadth, ... 58 mm.
Length, ... 40 mm.

Hab. I found this interesting species exceedingly abundant in the tanks of Calcutta. It has recently been collected by my servant, who accompanied Dr. Day on a trip to the upper waters of the Ganges, at Hurdwar and at Roorkee, where it lives in the river itself and in the contiguous ponds and marshes.

Plate XII. Fig. 1. *Paratelphusa spinigera* of the natural size. 2. Front view. 3. External maxillipede. 4. Abdomen of the male.

Telphusa Indica.

Telphusa Indica, Latreille, Encyclo. Méth., Insectes, t. X, p. 563;—Guérin-Méneville, Iconographie du Règne animal, Crust., pl. iii, fig. 3;—Milne-Edwards, Hist. Nat. des Crust., t. II, p. 13; and Voy. de M. Jacquemont dans l'Inde, p. 7, pl. ii, fig. 1—4;—Alph. Milne-Edwards, Révision du genre *Thelphusa* et description de quelques espèces nouvelles.

Thelphusa cunicularis, Westwood, Trans. Entom. Soc., London, vol. i, p. 183, pl. xix, fig. 1—6.

The largest specimen in my possession measures in a straight line in breadth 83 mm., in length 59 mm., and was collected with two others at Singhur near Poona in running water. It was in this neighbourhood also that M. Jacquemont collected his specimens. Col. Sykes, in his account of the land-crabs of the Dekhan, prefixed to Prof. Westwood's description of the species under the name of *Thelphusa cunicularis*, mentions its occurrence in the same place, and in all the valleys and on the most elevated tablelands of the Ghâts at from 2,000 to 5,000 feet above the sea-level, and is of opinion that it does not extend more than fifteen or twenty miles to the eastward of the Ghâts. Mr. W. T. Blanford has, however, brought specimens from S. E. Berar, west of Chanda, and I am indebted to Mr. V. Ball for examples from near Chota Nagpúr. One of the Museum collectors lately obtained individuals from Ranígunj, a place within 120 miles of Calcutta. On the Parisnáth hill it occurs up to about 3,000 feet. It is as yet unknown from any place of the south part of India, or from Eastern Bengal. The 'Tille Naudon' of the Coromandel coast with which it has been said to be identical, is certainly not *T. Indica*, but, as M. Milne-Edwards has stated, *T. Leschenaultii*, which also occurs at Ranígunj. A fine series of specimens of the present species has lately been received from my friend Captain Stewart Pratt of Morar, who has furnished me with some interesting notes respecting the habits of the species.

Telphusa lugubris, n. sp. Pl. XII, Figs. 5—7.

The carapace is very greatly broader than long, distinctly punctate and somewhat flattened posteriorly; the cervical suture curves forwards and outwards to the rudimentary epibranchial teeth; the hepato-gastric area thus limited off is convex in every direction, and only marked mesially by a long tolerably deeply imprinted mesogastric furrow which exhibits a tendency to bifurcation at its posterior extremity; gastric area marked with two larger puncta, one being situated at each horn of the mesial crescentic portion of the cervical suture, from which two shallow hardly indicated longitudinal depressions pass backwards, one on each side of the middle line dividing the cardiac from the convex branchial regions; the sub-division of these into posterior and anterior lobes is scarcely perceptible. Oblique granulated rugosities mark the whole surface of the branchial area, becoming more numerous on the postero-lateral margin, whence they sweep downwards and forwards on to the floor of the branchial chamber. Latero-anterior margin with a short obscurely granulated carina. Postfrontal crest continuous from the mesogastric furrow to the epibranchial teeth, its epigastric portion is wrinkled and bent forward, and it becomes almost effaced behind the inner canthus of the eyes. Front rough, deflexed, with a sinuous obsoletely granulated free border. Orbits very high, with crenulated margins; extra-orbital angles little developed, separated from the epibranchial teeth by a long, granulated, oblique and nearly straight external border; anterior pleural lobes broad, nearly smooth, distinguishable from the inflected portion of the carapace by the termination of the rugosities with which the latter is ornamented. The epistoma is smooth and lighter in colour than the rest of the animal, concave both transversely and longitudinally; its posterior margin sends backwards and downwards a short triangular process, but it is not notched.

The external maxillipedes and their exopodites are coarsely punctate, and appear minutely granular under a lens.

The chelipedes are greatly unequal in both males and females, the convex posterior surfaces of the meropodites are excavated into extremely shallow communicating foveæ; the posterior angles are rugose and rounded off; their ventral surfaces have smoothly tuberculated margins. The carpopodites are minutely foveate above, and punctate and armed on the inner margin, with a short obtuse spine; the succeeding joint is punctate, foveate and granular, and its distal prolongation shows more distinctly these characters, and in young specimens only is in contact with the whole length of the dentated inner edge of the dactylopodite; the teeth and tips of the pincers have both the colour and transparency of amber.

The ambulatory legs are punctate; the dorsal edges of their meropodites are scabrous, and nearly straight, the last joints are extremely stout, and well armed with amber-like spines.

The abdomen in general form resembles that of *Telphusa Indica*, or of *Paratelphusa spinigera.*

Breadth, ...	52 mm.
Length, ...	36 mm.

In colour this species is of a rich dark brown above, below lighter but brighter; the inter-articular membranes are straw coloured, and the teeth of the pincers and the spines on the terminal joints of the ambulatory legs are, as has been described, amber-like. The epidermis is very delicate, rapidly cracking and peeling off after death, and on exposure to the air, when removed from the spirits of wine.

Hab. Pankabaree (about 2000 feet at the base of the Sikkim hills); Teesta valley and Eastern Sikkim at 3—4000 ft.; Thancote hills, Nepâl; Cherra Punjí in the Khasi hills.

Plate XII. Fig. 5. *Telphusa lugubris* of the natural size. 6. External maxillipede. 7. Abdomen of the male.

Telphusa Stoliczkana, n. sp. Pl. XII, Figs. 8—12.

Carapace much broader than long, smooth, punctate, minutely granular under a lens; cervical suture distinctly marked mesially, continued outwards and forwards on each side as a shallow depression which disappears posteriorly to the postfrontal crest, limiting off the gastric area from the branchial lobes, the anterior halves of which are distinguished from the posterior by their greater convexity; cardiac region perceptible; antero-lateral margin carries a not very salient epibranchial tooth, which is separated from the extra-orbital angle by the oblique tuberculated external margin of the latter, and passes backwards for a short distance as a tuberculated crest; postero-lateral margin covered with rugosities from which spring a few hairs; the inflected part of the carapace is more obscurely rugose; the posterior and anterior pleural lobes are smooth, the latter being separated from the former, and from the inflected portion of the carapace by a granulated line; infra-orbital margins crenulate; front narrow, granulated; its free margin is deeply bayed, having in consequence a bilobed appearance; postfrontal furrow smooth, bounded poteriorly by a well defined crenulated crest which passes from the mesogastric furrow to the epibranchial teeth in an uninterruptedly straight line, that part of it which forms the frontage of the epigastric lobes being rugose.

The posterior margin of the epistoma is smoothly tubercular, but those parts of it which go to form the boundaries of the efferent apertures of the branchial chambers are entire.

The chelipedes are greatly unequal in males and sub-equal in females; the meropodites are rugose and have a few hairs near the base of the posterior angle; the carpopodites are rugose above and bear a strong sharp spine in the usual position and beneath it a smaller one; the pincers are multidentate and their arms cross at the extremities.

The ambulatory legs are very long; their meropodites resemble those of *Telphusa longipes*, Alph. M.-Edwards, but their penultimate joints are longer in proportion to their breadth and the last joints are stouter and more elongated.

Length of the female specimen described, ...	30 mm.
Breadth, ...	40 mm.

Length of a male, ... 36 mm.
Breadth, ... 48 mm.

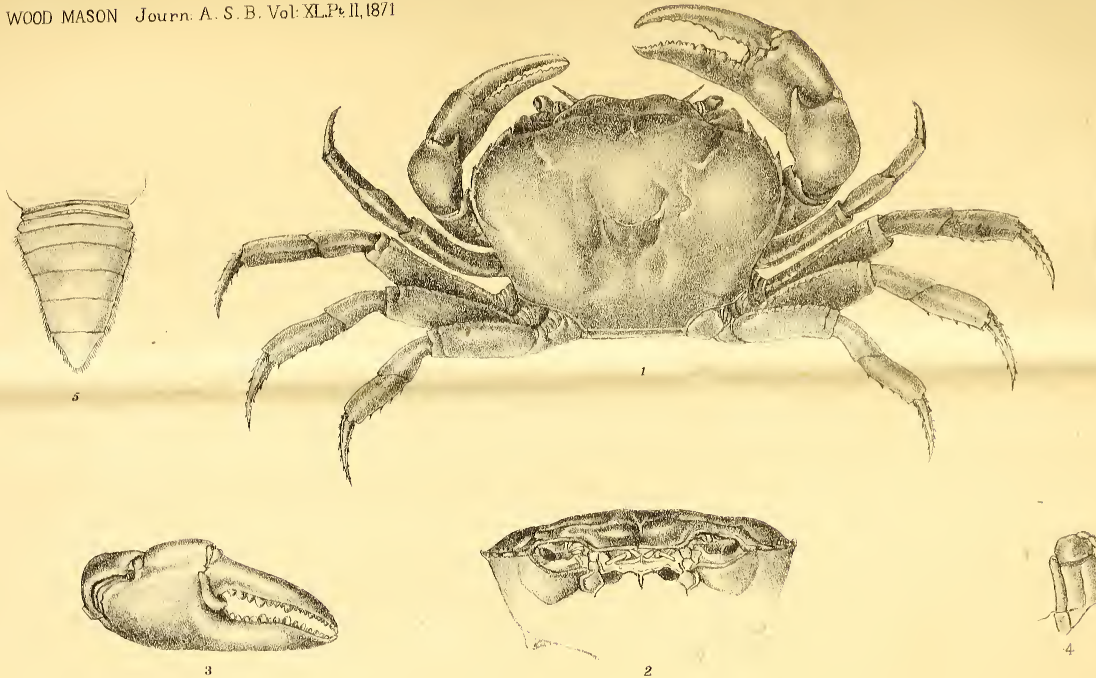
The greater difference between the length and breadth in the male specimen is only apparent, being entirely due to the greater mesial excavation of the front.

A male and a female of this species were collected during a trip to the Malayan peninsula and presented to the Indian Museum, together with an interesting series of marine Crustacea by Dr. Stoliczka.

Hab. Penang.

Plate XII. Fig. 8. *Telphusa Stoliczkana* of the natural size. 9. External view of right chela. 10. Abdomen of the female. 11. Do. of the male. 12. External maxillipede.

(To be continued in the next number of the Journal.)



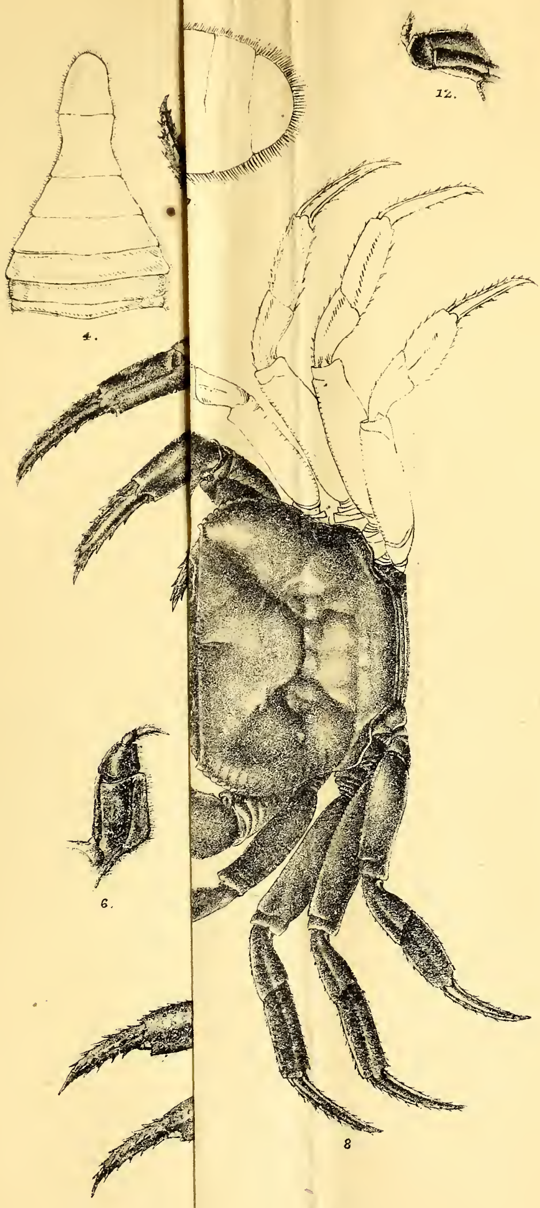
S. Sedgfield. Lith.

Paratelphusa Dayana. n. sp.

Calcutta

J. WOOD-MASON

Pl. XII.



1-4. *Paratelphusa spinigera*. p. 194. 5-7. *Telphusa lugubris*, p. 197. 8-12 *Telphusa Stoliczkana*, p. 199.

Dr. Leidy
with author's compts.
J. W. M.

J. Wood-Mason
(Indian Museum)
Care of Williams and Norgate,
Covent Garden
London.

Kingsley for Dr Leidy

[*From the Journal of the Asiatic Society of Bengal*, Vol. XL, Part II, 1871.]

On Indian and Malayan Telphusidæ, Part I,—
by J. Wood-Mason, Esq.

(With pl. xiii, and xiv.)

(Continued from p. 200.)

[illegible]

Telphusa lævis, n. sp., pl. xiv, figs. 1—6.

The carapace is narrow especially posteriorly, cordiform, smooth, extremely convex in every direction, finely granulated and punctate, unbroken by interregional furrows, the posterior boundary of the gastric area alone being faintly indicated; epigastric lobes hardly perceptible in some specimens; post-frontal ridge feebly developed, interrupted, most apparent behind the eyes; postero-lateral margins rounded off, marked with extremely delicate oblique wrinkles which pass downwards and forwards on to the branchial floor which is much swollen; antero-lateral margins rounded, inclined, bearing rudimentary epibranchial teeth which pass backwards and inwards for a short distance as an obscure, crenulated crest. Front broad, deflexed, terminated by a nearly straight free margin; its anterior third flattened and perfectly vertical. Orbits oval with obscurely crenated margins, not at all salient; their external angles scarcely projecting beyond the general level of the orbital margins; anterior pleural regions convex, finely granulated, separated near their internal boundaries from the rest of the inferior surface of the carapace by a well defined, finely tuberculated line, passing directly downwards from the epibranchial teeth. The posterior margin of the peristoma has a median rounded projection, notched on each side. The chelipedes are very unequal, in some specimens the right, in others the left being the larger; meropodites with their dorsal edges sharply rugose; carpopodites also rugose with their inner margins armed in the usual manner with a sharp tooth, beneath which is a smaller one; the propodite of the larger claw is extremely convex, smooth, granulated and near its extremity canaliculate, punctate, and with the granulations passing into minute sharp spinules; the dactylopodite is similarly marked and is in contact with the extremity only of the produced portion of the penultimate joint in the larger claw.

The ambulatory legs are thin, slender, and rugose.

Length, ... 16 mm.

Breadth, ... 21 mm.

Hab. Cherra Púnjí; Goalparah.

Plate XIV. Fig. 1. *Telphusa lævis*, nat. size. 2. Front view. 3. External maxilliped. 4. Chela. 5. Do. of another specimen. 6. Abdomen of male.

TELPHUSA LESCHENAULTII.

Milne-Edwards, Hist. Nat. des Crust., Tom. II, p. 13, Ann. des Sc. nat., III. Sér., Tom. XX, p. 211. Heller, Reise der Fregatte Novara, Crustaceen, p. 32. Alph. Milne-Edwards, Révision du genre *Thelphusa*, Nouvelles Archives du Muséum, 1869, Tom. V, p. 165, pl. viii, fig. 3, 3a.

Carapace convex from behind forwards and transversely; front broad, especially at base, sinuous, produced, with a sharp chisel-like free edge; anterior boundary of the epistoma almost straight, sending forwards a small median process which indents the sub-frontal lobe, scarcely taking any share in the formation of the inter-antennulary septum; posterior edge divided by two distinct notches into three rounded lobes, the median one of which is largest, lateral lobes internally rounded but passing almost straight outwards to form the anterior boundaries of the orifices for the egress of the water that has served for respiration. Post-frontal crest interrupted, divided into two external larger and two internal slightly advanced smaller portions which together equal in width one of the former; antero-lateral margin armed with an epibranchial tooth continued backwards and inwards as a sharp, finely crenulated crest. The surface of the carapace, especially anteriorly, appears minutely granular under an ordinary lens, its sides behind the points at which the cristiform continuations of the epibranchial teeth subside are marked with oblique sub-parallel corrugations. The four posterior pairs of ambulatory legs are extremely thin; the posterior flat faces of their meropodites are raised into coarse granulations, while the anterior surfaces remain smooth; the dactylopodites are extremely slender, acute. Chelipedes subequal, dactylopodites in contact throughout their entire length with the propodites the outer faces of which are smooth and convex; carpopodites furnished internally with a long sharp spine, beneath which is a smaller one; meropodites corrugated on their posterior surfaces.

I am unable to verify Heller's statement that the crest on the latero-anterior margin is smooth in the females.

Hab. Ranígunj; Pondicherry; Madras; Ceylon; Malabar coast; Mauritius; Nicobar Islands and probably many other islands of the Indo-Malayan archipelago; and Tahiti.

Telphusa Guerini.

Telphusa Guerini, Milne-Edwards, Mélanges Carcinologiques, p. 176; Alph. Milne-Edwards, Nouv. Archives du Muséum, 1869, Tom. V, p. 182, pl. xi, fig. 4, 4a et 4b.

Telphusa planata, Alph. Milne-Edwards, Nouv. Archives du Muséum, 1869, Tom. V, p. 181, pl. xi, fig. 3, 3a et 3b.

Telphusa planata is given as a synonym of *T. Guerini*, M.-Edw., with doubt, although M. Alph. Milne-Edwards' description of the former applies exactly to individuals amongst my series of examples of the latter.

Hab. Concan and Khándalla, Western Ghâts, near Bombay; Belaspúr.

Telphusa Austeniana, n. sp., pl. xiii.

Carapace much broader than long, flattened in the middle posteriorly to a line passing through its widest part; protogastric lobes convex, separated from one another by the narrow forward prolongation of the meso-gastric lobe; meso-gastric furrow passing into the post-frontal, deeply dividing the two epigastric lobes which are all but confluent with the protogastric : branchial lobes convex, each divided by a transverse valley into an anterior and posterior portion ; postero-laterally to the gastric region the surface of the carapace is raised on each side into an irregular areolet bounded antero-laterally by the epibranchial, behind by the meta-branchial lobe from which the cardiac area is separated by an indistinct longitudinal depression ; post-frontal furrow deeply excavated behind the eyes ; post-frontal crest scarcely interrupted by the advanced position of the epigastric lobes, continued outwards on each side from the meso-gastric furrow in an irregular, rugose line to the epibranchial teeth ; these pass backwards, as prominent dentate crests and, with the extra-orbital teeth, are extremely salient ; orbital margins finely crenated ; front deflexed, wider at base than at its free margin, raised into two eminences one on each side of the middle line ; antero-lateral portions of the branchial regions marked with numerous coarse granulations ; postero-lateral margins and the parts of the carapace which form the floors of the branchial cavities rugose. Chelipedes slender ; chelæ externally rugose, covered, especially on their infero-internal surface, with small rough tubercles. Carpopodites above rugose with a longitudinal row of tubercles near their inner margins, from which there projects a very sharp spine with a smaller one below it. Ambulatory legs enormously long and slender by which character alone it is possible at once to distinguish *T. Austeniana* from all its known congeners.

Breadth, ... 48 mm.
Length, ... 35 mm.

Length of carpopodite of 3rd pair of ambulatory legs = 34 mms. or nearly equal to the length of the carapace.

Hab. Cherra Púnjí ; the only specimen obtained is a female.

Plate XIII. Fig. 1. *Telphusa Austeniana,* nat. size. 2. Front view. 3. Chela. 4. External maxilliped.

Telphusa Pealiana, n. sp., pl. xiv, figs. 7—11.

Carapace thick, not much broader than long, convex from behind forwards; its areolation is similar to that of *Telphusa Atkinsoniana;* the cervical suture cuts through the post-frontal crest about 5 millimetres internally to the epibranchial teeth ; these are moderately salient ; the branchial region is somewhat convex and covered anteriorly with coarse irregular granulations ; antero-lateral margin inclined, surmounted by an evenly denticulated crest; postero-lateral margin covered with oblique wrinkles which pass forwards and downwards on to the inflected portion of the carapace; posterior pleural lobe, where it is bounded by the anterior pleural, rugose; the latter is limited off by a line of regular bead-like tubercles; post-frontal crest, continuous to the epibranchial teeth from the meso-gastric furrow, curving forwards mesially and at each end; post-frontal furrow smooth behind the eyes; front narrow, deflexed, raised into a bilaterally symmetrical pair of eminences. Chelipedes subequal in the only specimen* (a female) in my possession; the meropodites are tuberculately rugose on their posterior surfaces and their ventral angles are beset with long tubercles; the carpopodites are rugose above and their inner margin is armed with a very sharp long spine from the sides of which spring 2 or 3 minute cusps; beneath the larger spine a smaller one is to be seen. The penultimate joint is externally rough, internally near the inferior margin tuberculated and above presents a few spiniform tubercles; the dactylopodite which is in contact with the other arm of the pincers throughout its length line has a few spinules above near its proximal end.

Length, ... 32 mm.
Breadth, ... 41 mm.

The posterior pair of ambulatory legs has not been preserved, but from those that remain, it will be seen that the penultimate joints resemble slightly those of *Telphusa Austeniana*, and of *T. Stoliczkana*. I have named this species after Mr. S. E. Peal, to whom the Indian Museum is indebted for many novelties in the various groups of Arthropoda.

Hab. Síbsaugor, Assam.

Plate XIV. Fig. 7. *Telphusa Pealiana,* nat. size. 8. Front view. 9. External maxilliped. 10. Chela. 11. Abdomen of male.

Telphusa Atkinsoniana, n. sp., pl. xiv, figs. 12—16.

The carapace is much broader than long, smooth, punctate mesially and posteriorly; the anterior branchial lobe is not greatly swollen above, is covered anteriorly with coarse granulations; epigastric lobes granulated, separated behind and laterally from the granulated proto-gastric and from one another by the meso-gastric

* Several specimens of each sex have been received from Mr. Peal since the above went to press.

furrow; postfrontal crest well developed, most distinctly tuberculated, curving slightly forwards at each end and passing completely into the epibranchial teeth, notched on each side externally to each epigastric lobe and internally to each epibranchial tooth; epibranchial teeth salient, separated from the denticulated margins of the prominent extra-orbital angles by a notch, curving backwards as regularly dentate crests; orbital and frontal margins conspicuously tuberculated; front moderately broad, deflexed, covered with rounded tubercles, smooth in the middle line, terminating in a nearly straight free margin. Postero-lateral margins marked with oblique rugations which gradually assume a tuberculated character as they pass forwards on to the inflected portion of the carapace; anterior pleural lobe beset in the centre with irregularly disposed rounded tubercles, limited off from the surrounding areæ by a regular line of larger bead-like tubercles.

Chelipedes subequal, densely tuberculated; meropodites with all their angles sharply tuberculated; carpopodites above granulately rugose and becoming towards the inner margin tuberculated, the tubercles extending on to the sides of the spine; beneath this spine is a smaller one from which passes upwards and towards the proximal articular extremity of the joint a row of two or three spiniform tubercles; externally the penultimate joint is excessively tuberculately granulated, the tubercles becoming very coarse and irregular in aged specimens, and on the upper border passing into spiniform tubercles in specimens of all ages; the superior margin of the dactylopodites is also beset with spiniform tubercles and their inner toothed margin is in contact throughout its length with the other arm of the pincers; the extremities of these are tipped with a blackish colour which is capable of defying the blanching action of spirit for years.

I will not venture to describe the precise distribution of the colours of this beautiful species, because I omitted to note them particularly when I received the specimen which has been chosen for description fresh from the hands of Dr. Stoliczka, but I can say that the inferior surface generally and the inner aspects of the chelipedes are suffused with a beautiful violet colour, the tubercles and spines offering their bright red tips in remarkable contrast.

Breadth, ... 38 mm.

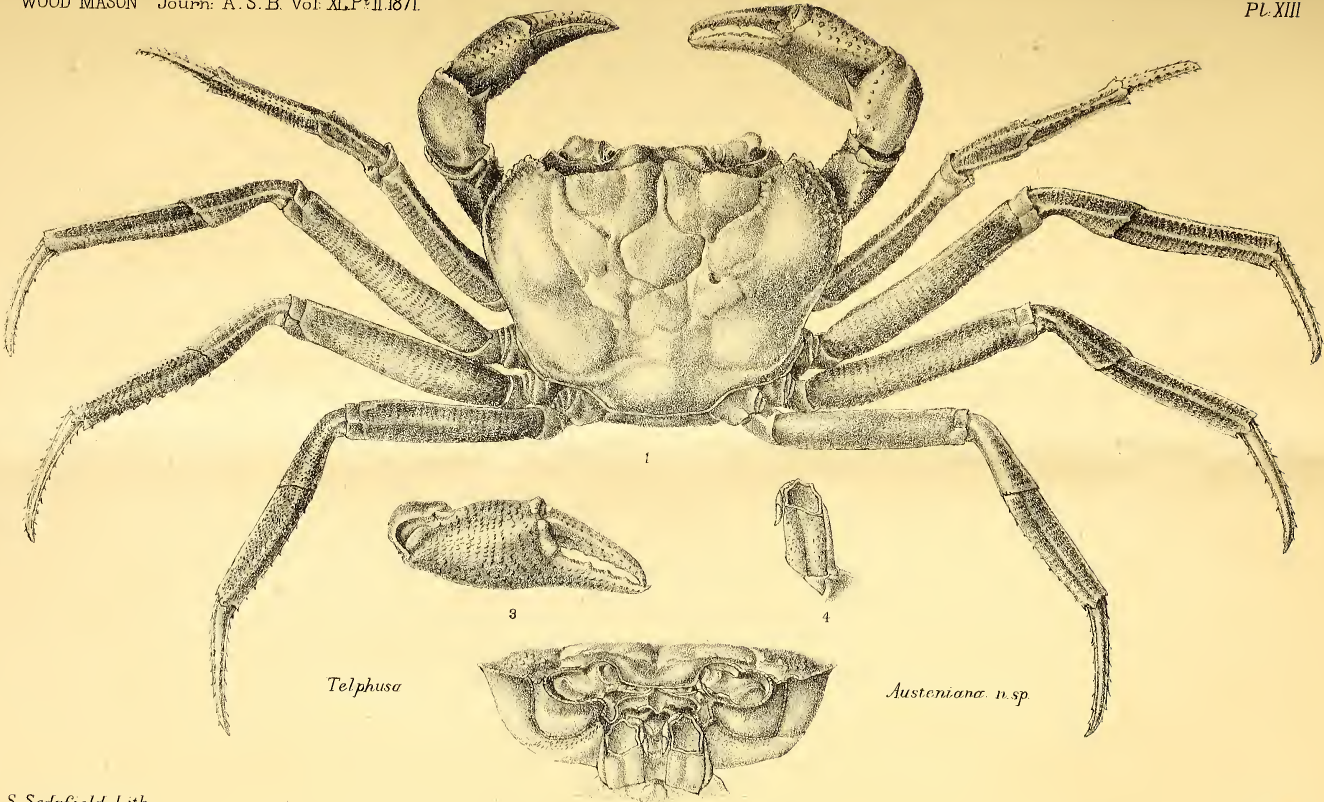
Length, ... 28 mm.

Hab. Darjeeling; Thancote Hills, Nepal; Khasi Hills (?).

I have much pleasure in connecting with this beautiful species the name of Mr. W. S. Atkinson.

Plate XIV. Fig 12. *Telphusa Atkinsoniana*, nat. size. 13. Front view. 14. External maxilliped. 15. Chela. 16 Abdomen of male.

Pl. XIII



1

3

4

2

Telphusa *Austeniana.* n. sp.

S. Sedgfield. Lith.

Calcutta.

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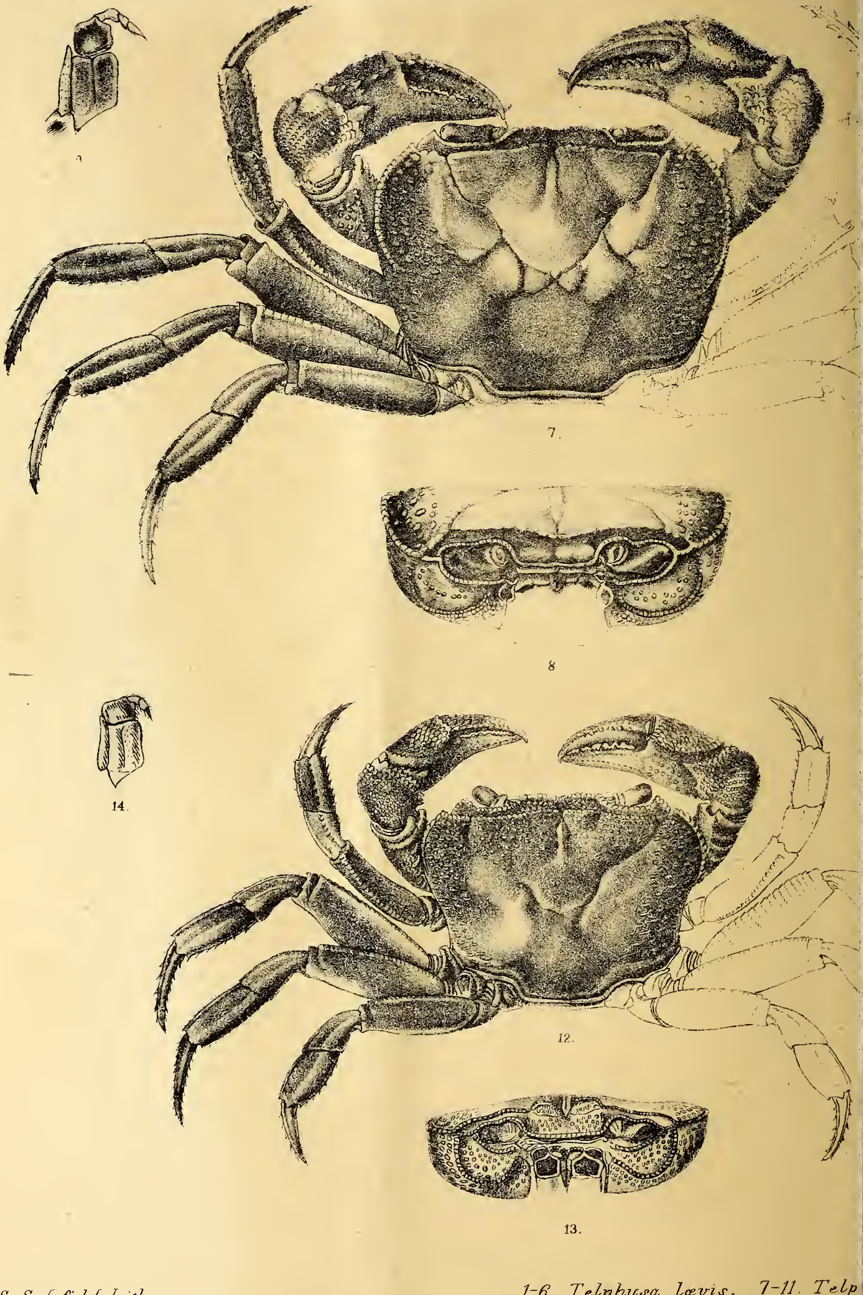


7.

8

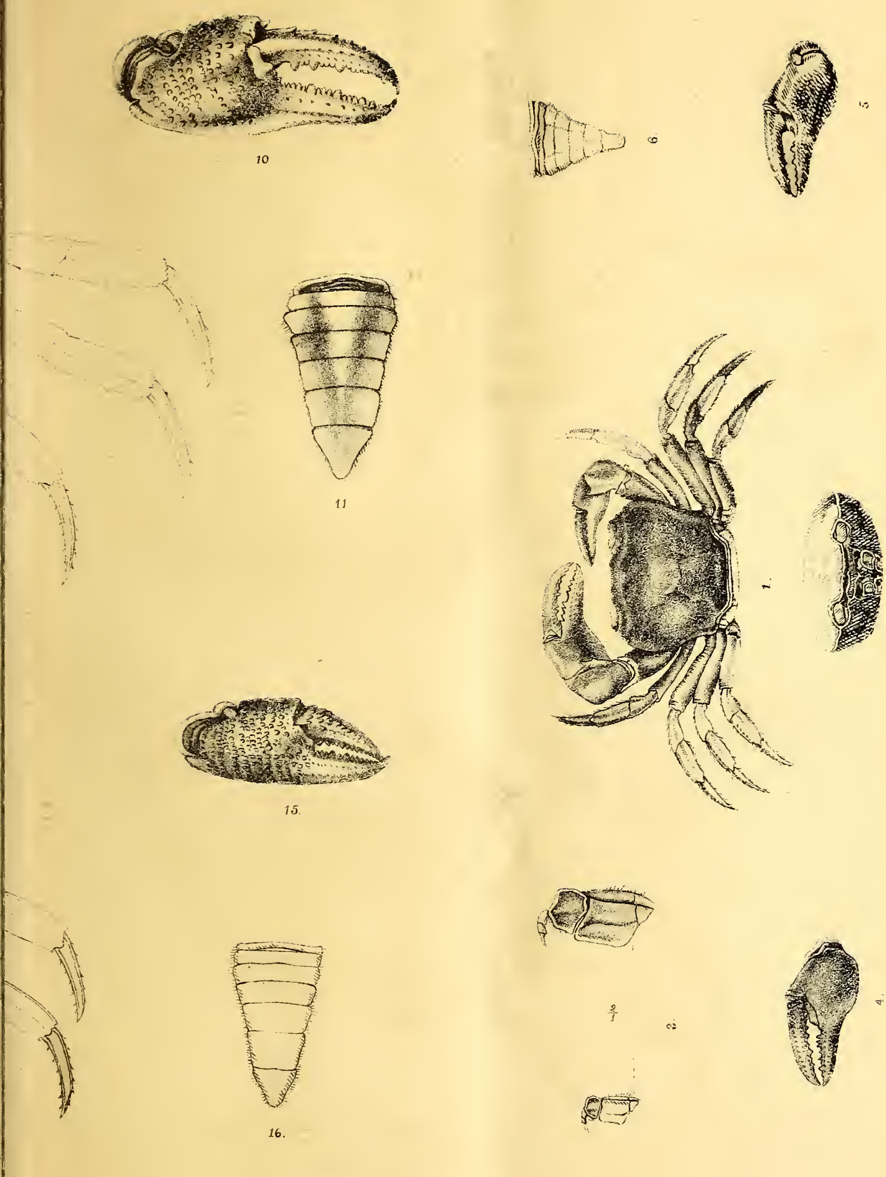
14.

12.

13.

S. Sedgfield. Lith.

1-6. Telphusa lævis. 7-11. Telp



x Pealiana. 12-16. Telphusa Atkinsoniana.

Calcutta.

Dr. Joseph Leidy
with the author's compl^ts.
J.W.L.—

Kingsley from Dr Leidy

From the Journal Asiatic Society of Bengal,
Vol. XLII, Part II, 1873.

15

On Nephropsis Stewarti, a new genus and species of macrurous Crustaceans, dredged in deep water off the eastern coast of the Andaman Islands,—*by* Jas. Wood-Mason.

(Read 7th August, 1872, received 16th January, 1873).

[With plate IV.]

In April of last year, I was deputed by the Trustees of the Indian Museum, with the sanction of the Government of India, to proceed to the Andaman Islands for the purpose of making a collection illustrative of the marine fauna of that part of the sea of Bengal in which those islands are situated. I reached Port Blair about the 6th of April, and immediately put myself in communication with the Chief Commissioner, who at once placed at my disposal a well-manned boat and a small steam-launch, with which I dredged for nearly two months with much success from low-water line down to near 50 fathoms. Towards the end of my stay, General Stewart knowing my intense desire to try my fortune in deeper water, placed at my disposal for one day the S. S. " Undaunted" which had been recently armed and put into commission for service as a guard ship. The time allowed was short, but sufficiently long to enable me to bring away samples of the life supported by the sea-bed at, and beyond, the 100 fathoms' line, and to ascertain that the sea-bed was uniformly covered with a thick deposit of fine olive-coloured mud derived from the waste of the coral-reefs and of the sandstone and serpentine rocks of the islands.* This mud was not very productive, yielding only a few annelids, but was crowded with dead shells of Pteropods and *Dentalium* and with fragments of a large Brachiopod.

It was in the last cast of the dredge that I had the good fortune to capture the interesting addition to the crustacean fauna of these seas, described in the following pages. It is closely allied to *Nephrops. Norvegicus* of northern European seas, so closely allied, indeed, that were it not for the absence of the squamiform appendage of the antennæ, I should be under the necessity of placing it in the same genus as a second species. The absence of this appendage, however, leaves me no choice but to establish a new genus for its reception.

* The following rough analysis by Mr. Tween, the chemist of the Geological Survey of India, will show the proportion of insoluble matter :

Soluble in H Cl mostly Ca O Co_2, ...	42·8
Insoluble clay and sand, ...	57·2
	100·0

The discovery in these warm seas of a very near, of the nearest ally in fact, of so characteristic a cold-water species, remarkable though it is, will not appear so surprising when I mention the fact that my crustacean lived and burrowed in the mud of the sea-bed at a depth of nearly 300 fathoms in a temperature not certainly exceeding 50° Fahr.

One of the chief points of interest attaching to this new form lies in the loss of its organs of vision by disuse, as in *Calocaris MacAndreweæ*, Bell, in *Cambarus pellucidus*—a member of the same family as that to which *Nephropsis* belongs—and in the other crustaceans and animals inhabiting the caves of Carniola and Kentucky. I not only agree with Mr. Darwin* in attributing the loss of the eyes to disuse, but I also regard the great length and delicacy of the antennæ, and the great development of the auditory organs as modifications effected by natural selection in compensation for blindness.†

NEPHROPSIS, gen. nov.

Diag. *Antennal scale absent.*

NEPROPSIS STEWARTI, sp. nov. Pl. IV.

Body covered with fine rounded tubercles and with a short but dense pubescence. The carapace is sub-ovoid, armed on each side, just externally to the base of the rostrum, and behind the anterior margin, with an acute forwardly directed spine; a similar spine springs from each side of the anterior margin itself at about the level of the upper surface of the antennal peduncle; the basis of each of these two spines is confluent with a conspicuous convexity to be seen just behind it; immediately in front of each of these convexities lies a smooth, slightly excavated surface bounded in front by a curvilinear row of tubercles. The cervical suture, dividing the carapace into an anterior or cephalostegal, and into a posterior or omostegal portion, is broad and deeply impressed mesially and laterally, until it reaches the level

* Origin of Species, 5th Edit., pp. 171-173.

† Since these remarks appeared in the abstract of my paper (Proc. Asiat. Soc. Ben. viii, 1872, p. 151) Dr. Hagen's Monograph of N. American *Astacidæ* has reached Calcutta, and from it I give the following extract, on account of its obvious applicability to the species here described, merely remarking that the perusal of it led me to note also the stoutness of the rostrum and the great development of the cephalostegal spines in *Nephropsis* as compared with the slenderness of the one and the minuteness of the others in *Nephrops*: "But it seems to be a somewhat well recognized law in nature (Rathke, Metamorph. Retrograd., p. 135) that if any part is atrophied, or stopped in development, the nearest parts slow an abnormal increase of development. This is apparently the case in *C. pellucidus*; the eyes are atrophied, and the rostrum, the fore border of the cephalothorax, the antennal lamina, the basal joint of the inner antennæ, and the epistoma are altered or largely developed." Op. Cit. 34.

of the anterior margin of the epistoma when it bends boldly upwards and backwards upon itself passing into the well-defined semicircular depression that bounds the lateral convexities described above. The cardiac region is broader than long, very convex transversely and bounded on each side by a densely-tuberculated elevation which running backwards, downwards, and forwards along the line of the granulated rim of the branchiostegite, and finally bending upwards almost opposite the origin of the second pair of abdominal appendages, passes again into the swollen anterior boundary of the omostegite; the ovoidal area thus limited off is more sparsely beset with tubercles and presents a marked depression on its anterior half.

The rostrum carries on each side a most acute spine directed upwards and forwards, and curved slightly inwards; and above presents two roughly granulated ridges coalescent towards the tip but divergent at the base; beyond the spines it is canaliculate on each side, above and below, and each lateral ridge is fringed with long hairs; below it is carinated and coarsely granulated at the base. A faint linear impression, continuous with the groove between the ridges on the rostrum, passes along the middle line of the carapace almost to its posterior border; situated in this line, and marking the anterior limit of the convex gastric region, lies an almost erect spiniform tubercle.

Antennæ and antennules.—The peduncles of these appendages lie as in *Nephrops Norvegicus* in the same horizontal line, and their inner margins are ciliate. The basal joint, or coxocerite, of the former is extremely short, and wants the apical spine in *Nephrops*, but the perforated conical process on its inferior surface is remarkably salient; the second is devoid both of the prominent spine into which, in *Nephrops*, its distal and external angle is produced, and of the squamiform appendage or scale seen in all the other recognized genera of *Astacidæ*,* and developed to such an extraordinary degree in Carideous Crustacea; one or two small folds or impressions between, or upon, the second and fourth joints being all that remains of the antennal scale, and of the rudimentary joint that in *Nephrops* corresponds to the moveable spine of *Astacus*.†

* The antennal scale in *Astacoides* escaped the notice of Guérin who founded his genus on its supposed absence.

† There appears to be no doubt but that the antennal scale is the representative of the outer of the two appendages borne upon the protopodite at an early stage of embryonic life, and, if the moveable spine in *Astacus* and its undoubted homologue in the antennæ of *Nephrops* represent the inner of these appendages, then must the three distal joints of the peduncle with the flagellum be looked upon, as Dr. Fritz Müller looks upon them, as a new formation (Neubildung) and no longer as being in serial homology with the five distal joints of the other appendages, *e. g.*, of an ambulatory leg, which represent the endopodite, the exopodite being completely aborted or represented at most, as Rolleston remarks, by the annular constriction on

The flagella of the antennæ are remarkably long and of excessive fineness at their extremities.

The basal joint of the antennules has its upper surface greatly inflated, owing to the remarkable development of the auditory organ to which, in most Podophthalmatous Crustacea at any rate,* this joint gives lodgment; and the almost globular appearance of the joint as seen from the side contrasts strongly with the flatness of its upper surface in *Nephrops* or *Astacus*. Of the two remaining joints of the antennulary peduncle, the first is short and cylindrical, being less than half the length of the last which in *Nephrops* is short and equal to that which precedes it. The peduncle terminates in the usual manner in a double flagellum, the outer branch of which is conspicuously stouter than its filamentous and cylindrical fellow, perceptibly compressed, and thickly fringed below with short hairs along its distal third.

The *epistoma* is much the same as in *Nephrops*, save that its posterior edge is straight and presents two small tubercles which give it the appearance of being slightly roundly-emarginate in the middle.

The *external maxillipeds* and the parts of the mouth in front of them are identical in structure with those of *Nephrops*.

The *eyes* are completely rudimentary, neither pigment nor corneal membrane being developed; the peduncles indeed are present, but even these are short, subcylindrical, mere aborted structures, concealed entirely from view by the stout base of the overhanging rostrum; in spirit they have become perfectly blanched like the rest of the appendages, but in life the delicate rose-pink coloration of the animal extended itself to their very tips. The peduncles are far less conspicuous from the side view than represented in the plate.

The first pair of *abdominal appendages*, those which bear the great *chelæ*, are unfortunately absent, the specimen having lost its claws a considerable period previous to its capture, as the presence of uncalcified reproduced rudiments of these appendages indicates; the other legs are smooth and slender; the second and third pairs are didactyle; of these the former has both its upper and lower margins, from the base of the carpopodite to the extremity of the claws, fringed with long hairs; the latter, much the slenderer as well as the longer of the two, has its propodite greatly elongated, and its claws only are ciliated. The fourth pair, the longest of all and ciliated only on the outer face of the dactylopodite, and the fifth, about as long as the second pair, are monodactyle.

the ischiopodite. For the facts relating to the transformation of the embryonic exopodite into the antennal scale of the Prawn *pari passu* with the budding out of the flagellum and the abortion of the endopodite, *vide* Fritz Müller's admirable essay on the development of the crustacea entitled "Für Darwin," p. 41, fig. 31.

* The caudal ear of *Mysis* forms an exception to this.

The last abdominal somite is immoveably united to that which precedes it as in *Nephrops* and the common Lobster ;* and the sternum is linear as in the *Astacidæ* generally.

Post-abdomen.—The post-abdomen is gradually attenuated to the extremity of the telson. The appendages of its first somite are as completely rudimentary as they are in the female of *Nephrops Norvegicus ;*† those which follow are long and slender, their foliaceous branches being very narrow, produced to a sharp point, and fringed with excessively long cilia. All the terga are covered with minute rounded tubercles, and present at their anterior ends, just behind the tergal facets, a broad smooth transverse groove with its hinder margin convex backwards.

The pleuron of the first somite is precisely similar to that of *Nephrops Norvegicus*, but those of the remaining somites are even more acutely triangular than in that species, and have their margins denticulate and furnished with a fringe of long cilia. In all the somites, with the single exception of the first, the tergal and pleural regions are most sharply defined as such, the former not curving continuously with the latter but terminating abruptly at the level of the ventral chords in a line convex outwards ; so that, if a somite were detached, deprived of its ventral chord and flattened out on the table with its dorsal surface uppermost, the imaginary continuation from pleuron to pleuron of the plane in which these pleura laid, would pass below that of the surface of the tergum.

The '*swimmeret*' constituted as in all other Macrurous Crustacea by the highly modified and backwardly placed appendages of the last postabdominal somite and by the '*telson*,' differs in no particular of more than specific value from that of *Nephrops ;* the mesial element, or *telson*, is longer in proportion to its breadth, its greatest breadth, being a transverse line separating its anterior from its middle third, and not at the base as in *Nephrops*, is slightly more truncate posteriorly, and the oblique rounded elevations, that gradually narrow as they pass backwards into the spines at its postero-

* On characters furnished by the claws alone Dana artificially divides the recognized genera of *Astacidæ* into two groups, typified respectively by *Astacus* and *Nephrops;* the first of these is further subdivided according to the number of the branchiæ and the mobility or immobility of the last abdominal somite. But no mention is made of the fact that this is firmly fixed in *Nephrops* too. If *Paranephrops*, a genus including only freshwater forms, should turn out to have a mobile last abdominal somite, then we shall have this curious fact presented to us, *viz.*, that all those members of the family *Astacidæ* which live in freshwater or are terrestrial (*Engœus*) have this somite moveably united by membrane only to that which precedes, while those of them that are marine have it fixedly united to the rest of the sternum.

† The ventral plates of the 2nd, 3rd and 4th postabdominal somites in the males of *Nephrops Norvegicus* have an erect spine in the middle line, but the females exhibit no trace of such.

lateral angles, are stronger than in *Nephrops*. The outer plate of the lateral elements of the swimmeret is moveably articulated at its posterior third as in the rest of the *Astacidæ*, but the sutural line is curved and the posterior margin of the proximal and larger division exhibits hardly a trace of the overlapping denticulations seen in other *Astacidæ*.

Length from tip of rostrum to the posterior margin of telson, ... 98 mm.
Length of carapace in middle line, ... 42 mm.
„ „ postabdomen,.................................... 56 mm.
therefore the postabdomen : carapace (rostrum incl.) : : $1\frac{1}{3}$: 1 exactly.
and the length of body : that of postabdomen : : $1\frac{3}{4}$: 1 „

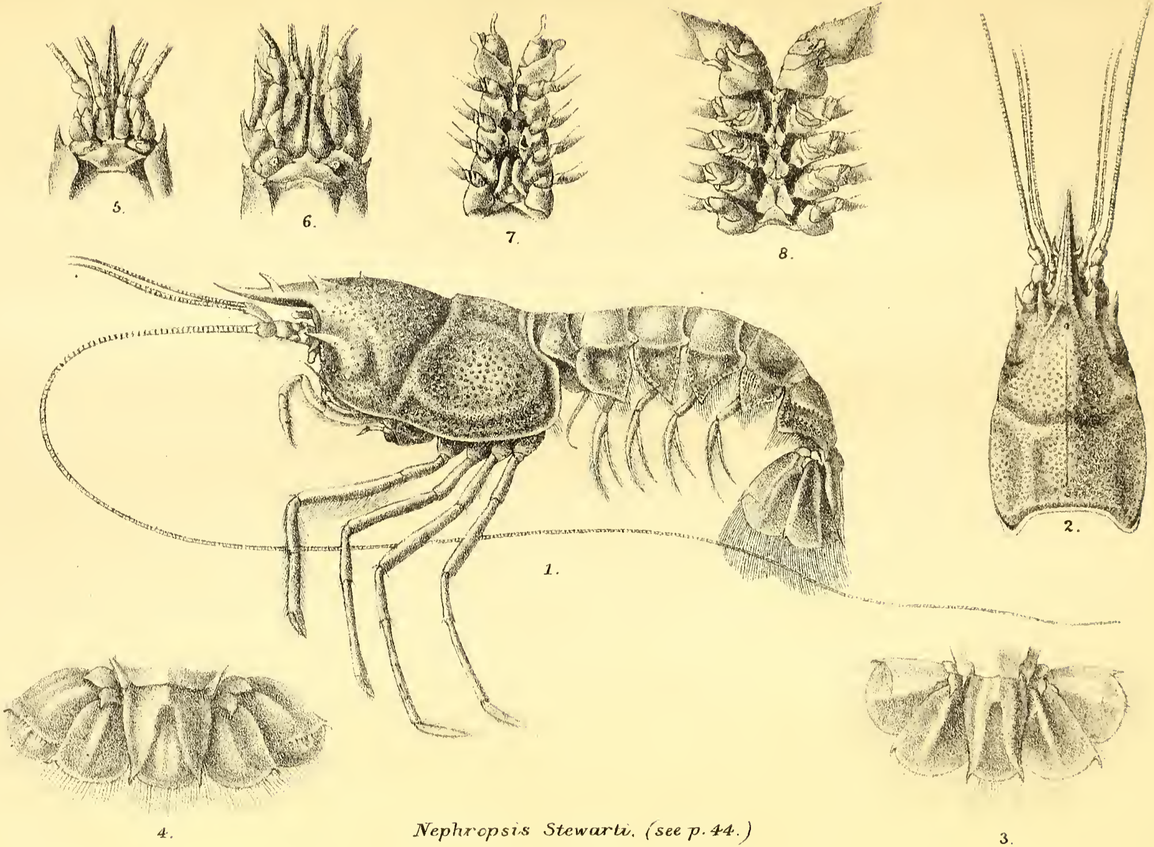
The only specimen (a female) obtained was dredged in from 260 to 300 fathoms about 25 miles off Ross Island on the eastern coast of the Andamans. That the specimen was really brought up from this great depth is certain from the unmistakeable signs of crushing from contact with the lip of the dredge, from its position in the dredge bag and from its firmly adherent greenish coating which appears to indicate that like *Calocaris MacAndreweæ* it was a burrower.

In conclusion I have to thank Captain Beresford, the commander of the vessel, for his skilful management of the sounding-line and for the zeal displayed by him in carrying out my wishes during our too short cruise.

I have much pleasure in connecting with this extremely interesting species the name of Major General Donald M. Stewart, C. B., Chief-Commissioner of the Andaman and Nicobar Islands, to whose ever ready help the success of my trip was so largely due.

Explanation of Plate IV.

Fig. 1. *Nephropsis Stewarti*, ♀, nat. size.
Fig. 2. Upper view of carapace of the same.
Fig. 3. Swimmeret of *N. Stewarti.*
Fig. 4. „ „ *Nephrops Norvegicus.*
Fig. 5. Inferior view of antennary region of *N. Stewarti.*
Fig. 6. „ „ „ „ „ *N. Norvegicus.*
Fig. 7. Sternal region of *N. Stewarti.*
Fig. 8. „ „ „ *N. Norvegicus.*



Nephropsis Stewarti. (see p. 44.)

For D. Leidy.

To Dr. Joseph Leidy, For. Memb. R.S.
with the author's complts.
J. A. —

Kingsley from Dr Leidy

From the Journal Asiatic Society of Bengal,
Vol. XLII, Part II, 1873.

On a New Genus and Species (*Hylæocarcinus Humei*) of Landcrabs from the Nicobar Islands,—*by* Jas. Wood-Mason, *of Queen's College, Oxford.*

(With Plates XV & XVI.)

(Received and read August 6th, 1873.)

Milne-Edwards, in his classical work on the entire class of crustacea published in 1837, divides* the four then recognized genera of the small but remarkable group of *Gecarcinidæ*, or Landcrabs properly so-called, into two divisions accordingly as they have the terminal joints of the external maxillipeds completely exposed, or inserted on the internal face of the third joint near its summit and completely hidden beneath it ; and Dana† in his great work not only adopts these divisions but gives them subfamiliar names :—" The *Gecarcinidæ*," he says, " pertain naturally to two groups or subfamilies, one having the termination of the outer maxillipeds *exposed* as usual, the other having this part concealed beneath the second and third segments. The subfamilies and genera are as follows :—

Subfam. 1. UCAINÆ. Articulus maxillipedis externi 4tus apertus.

1. *Maxillipedes externi non hiantes.*

G. 1. Uca, *Leach.* Articulus maxillipedis externi 4tus angulo externo insitus.

G. 2. Gecarcinucus, *Edwards.* Articulus maxillipedis externi 4tus marginis medio apicalis 3tii insitus.

2. *Maxillipedes externi late hiantes.*

G. 3. Cardisoma, *Latr.* Articulus maxillipedis externi 4tus apice 3tii externo insitus.

G. 4. Gecarcoidea, *Edwards.* Articulus maxillipedis externi 4tus marginis medio excavato apicalis 3tii insitus.

Subfam. 2. GECARCININÆ. Articulus maxillipedis externi 4tus et sequentes 3tio celati.

G. 1. Gecarcinus, *Latr.*

This division is unnatural as separating the genus *Gecarcoidea* (hodie *Pelocarcinus*) from *Gecarcinus* to which it is most closely related, and ranging it with others with which its relations are more general ; and the classificatory value of the character upon which it is based is, moreover, much diminished, if not altogether destroyed, by the discovery of a new form presenting an interesting transition from the former to the latter genus in this very character. A more natural result can, however, be attained, and

* Hist. nat. des Crust., Vol. II, p. 20.

† Unit. States Expl. Exped., Crust., Vol. I, pp. 374-375.

Dana's family names still retained, by the substitution of another maxillipedary character for the one originally selected and now proposed to be rejected: *Gecarcinus*, *Pelocarcinus*, and *Hylæocarcinus*, in fact, agree with one another and differ from all other genera of the family in that the exopodites of their outer foot-jaws are short, without flagella, and completely concealed from view beneath the second joints. The several genera of *Gecarcinidæ* divided into two groups or subfamilies accordingly as they have the exopodites of their outer foot-jaws provided with a flagellum and applied to the external margin of the second and third joints so as to be externally visible; or have them short and rudimentary without flagella, and concealed beneath the second joint; will then be distributed as follows:

Subfam. I. UCAINÆ.

Genus 1. Uca, *Leach.*
„ 2. Gecarcinucus, *M.-Edw.*
„ 3. Cardisoma, *Latr.*

Subfam. II. GECARCININÆ.

Genus 1. Gecarcinus, *Latr.*
„ 2. Pelocarcinus, *M.-Edw.*
„ 3. Hylæocarcinus, *Wood-Mas.*

A careful study of all the numerous figures and descriptions of species of Gecarcinidæ, and, in the cases of the genera *Cardisoma* and *Gecarcinucus*, of actual specimens has convinced me that the Gecarcininæ further agree with one another in the structure of the *epistoma* which in them is of great length from before backwards and nearly horizontal, thus differing remarkably from the Ucainæ in which it is short and nearly vertical; this part has in *Pelocarcinus* been described by Milne-Edwards* as "grand, complétement à découvert et confondu en arrière avec le palais," and it appeared to me to pass insensibly into the *endostoma* or 'palate' in *Hylæocarcinus* also until I had removed the thick clothing of coarse hairs that obscured the parts when I found no difficulty in distinguishing them. It is also a notable fact that the three most closely-allied species of the former, viz., *Gecarcinus ruricola*, *Pelocarcinus Lalandei*, and *Hylæocarcinus Humei*, have six rows of strong spines to the terminal joints of the walking legs, and I would also draw attention to the shallow yellow scars situated in all three on each side of the eye and on other parts of the carapace—tell-tale marks of their descent from a common ancestor!

Hylæocarcinus,† n. gen., Wood-Mason.

Proc. As. Soc. Bengal, August 1873, p. 161.

* Arch. du Mus., 1855, Vol. vii, Pl. xv, fig. 2a.

† ὑλαῖος, sylvester, et καρκίνος, cancer.

Front not united to the internal suborbital lobes as it is in the genera *Gecarcinus* and *Pelocarcinus*, but separated from them by spaces at least as wide as the deep bold fissures that divide to their bases the internal from the external suborbital lobes; into these interspaces project the flagella of the antennæ, the basal joints of which appendages lie tightly wedged between the internal margins of the internal suborbital lobes and the epistoma. The third joint of the external maxillipeds with an obtuse-angled emargination in its anterior border; the external margins only of the first of the three terminal joints is barely visible externally when the appendages are properly closed, its external surface being flattened for movement upon the inner face of the preceding joint: in *Gecarcinus* these terminal joints are completely hidden from view, the angular process that projects like a pillar in demi-relief from the inner face of the third joint and supports them, ending abruptly so very far short of the anterior margin of the joint: in *Hylæocarcinus* the similar but stouter pillar-like projection that carries these joints at its summit extending much farther towards the extremity of the joint than it does in *Gecarcinus* but certainly failing to reach it, these joints can consequently be only partially visible: in *Pelocarcinus* they are completely visible, being articulated to the apex of the third joint.

HYLÆOCARCINUS HUMEI, n. sp.

The carapace is at once distinguished from that of *Pelocarcinus Lalandei*, M.-Edw. by its more arched outline in front, and by the two rounded tubercles on the mesogastric lobe which, as in *Gecarcinus ruricola*, is limited off antero-laterally from the rest of the gastric region by very shallow depressions passing off from the hinder end of the profoundly-deep median groove and joining the branchio-gastric groove on each side; the straight line representing its greatest breadth crosses it just in front of these tubercles; in front of this imaginary line its upper surface is very convex and much swollen everywhere, but behind it flat; it is just perceptibly angulated on each side for a short distance beyond the external margin of the orbits, these angulations corresponding to the lines of spiniform tubercles seen in the same position in *Gecarcinus ruricola*. The outer slopes of the branchial regions, both anteriorly and posteriorly, and the floors of the branchial chambers, all the inflected portions of the carapace in fact, covered with squamiform tuberculated lines which, fine and delicate above, become shorter and coarser as they approach the bases of the legs and the buccal frame. The anterior is divided by a shallow transverse impression slightly interrupted in the middle line from the posterior cardiac lobe, which, just as in the rest of the *Gecarcinidæ*, is much expanded posteriorly between the bases of the posterior pair of legs.

The interantennulary septum is formed mainly by the subfrontal lobe, but partly by a short triangular process of the epistoma. The flagella of the antennæ are rudimentary. Both divisions of the suborbital lobes have their margins roughened with small tubercles, but the external one not nearly so distinctly so as it is represented to be in fig. 1 of pl. XVI.

The sternal region is much broader than long, its greatest breadth being between the bases of the second pair of legs.

The male appendages are very stout and long, reaching beyond the fifth postabdominal somite, and are connected at their bases with a remarkably stout and highly indurated semicircular plate which arches over the intestinal canal; a similar plate has been observed in the genus *Cardisoma* by S. I. Smith,* and is, doubtless, present in all *Gecarcinidæ.*

Postabdomen of the female broadly oval, about as broad as long, covering all but the margins of the sternal region, broadest across the posterior third of its fifth somite; last segment, trefoil-shaped, its sides being slightly emarginate, with its antero-lateral angles slightly covered by the produced postero-lateral angles of the preceding somite.

The chelipedes are equal and very powerful in the male; subequal and slenderer in the female; their meropodites, which in the male, as in *Pelocarcinus Lalandei,* extend much beyond the lateral borders of the carapace, but which in the female hardly reach the level of the branchial regions, have a few obtuse tubercles on their anterior, and some coarse tuberculated squamiform ridges on their posterior angles. The chelæ are granulated and ornamented, especially on the fingers, with minute dark-coloured smooth tubercles: their toothed prehensile edges meet, in the male, only at the extremities which are feebly excavated spoonlike; the margin of the spoonlike excavation in the propodite is notched for the reception of the external cutting edge of the dactylopodite, so as to form scissor-like organs.

The ambulatory legs are also remarkably powerful; their meropodites have their edges and sides much roughened by squamiform tuberculation; the upper crest of their carpopodites is armed with a row of minute spinules; their propodites have a row of stronger spines on each of their four angles, and the dactylopodites are provided with six rows of spinelike teeth.

Colours: upper surface of the carapace and the legs red violet, the claws whitey-brown faintly tinged with reddish violet; the scars at the extra-orbital angles, in the middle of the branchio-gastric suture, on each side of the mesogastric region, etc., and the margins of the orbits, yellow; the flat posterior portion of the carapace is also much variegated with impure yellow.

Breadth of carapace of the male,........................	108 m m.
Length „ „ „ „	80 m m.

∴ B : L :: 1.35 : 1;

* Trans. Connecticut Academy, 1870, Vol. II, p. 142.

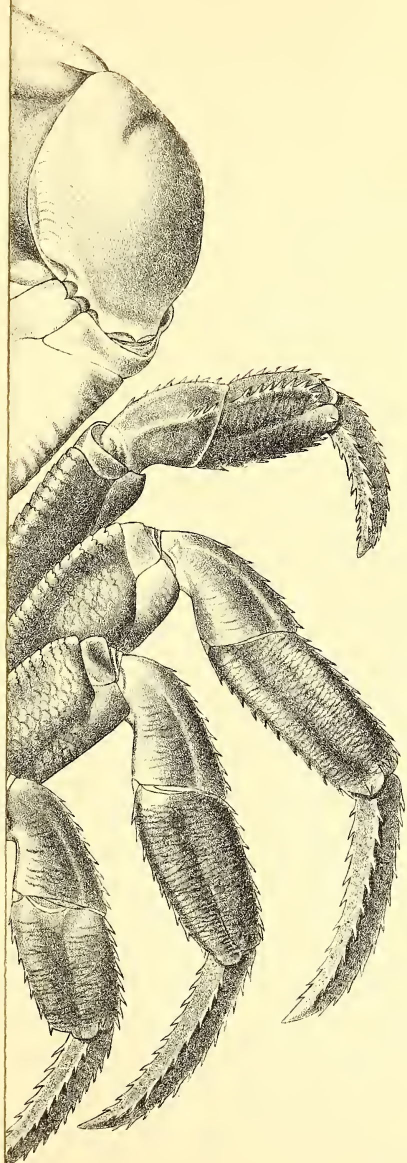
Breadth of carapace of the female,	96 m m.
Length „ „ „ „	73 m m.
∴ B : L : : 1.315, etc. : 1.	
Length of left claw of male,	88 m m.
Ditto right ditto,	87 m m.
Height left ditto,	38 m m.
Ditto right ditto,	38 m m.
Length of left claw of female,	55 m m.
Ditto right ditto,	57 m m.
Height of left ditto,	$21\frac{1}{2}$ m m.
Ditto right ditto,	25 m m.
Length of post-abdomen of female,	55 m m.
Breadth ditto ditto,	51 m m.

Hab. The dark dense damp forests of the Nicobar Islands. I captured a male and a female on Treis Island. Another specimen with a much distorted carapace was subsequently taken on Narkondam Island by Mr. Allan O. Hume, C. B., after whom I have named it.

Explanation of the plates.

Pl. XV. *Hylæcarcinus Humei,* Wood-Mason, male, nat. size.

Pl. XVI. Fig. 1. Facial region of the same. Fig. 2. Front view. Fig. 3. Post-abdomen of the male. Fig. 4. External maxilliped of the left side viewed from the outside. Fig. 5. Internal view of the same. All the figures of the natural size.



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$\therefore$ B : L :: 1.315, etc. : 1.

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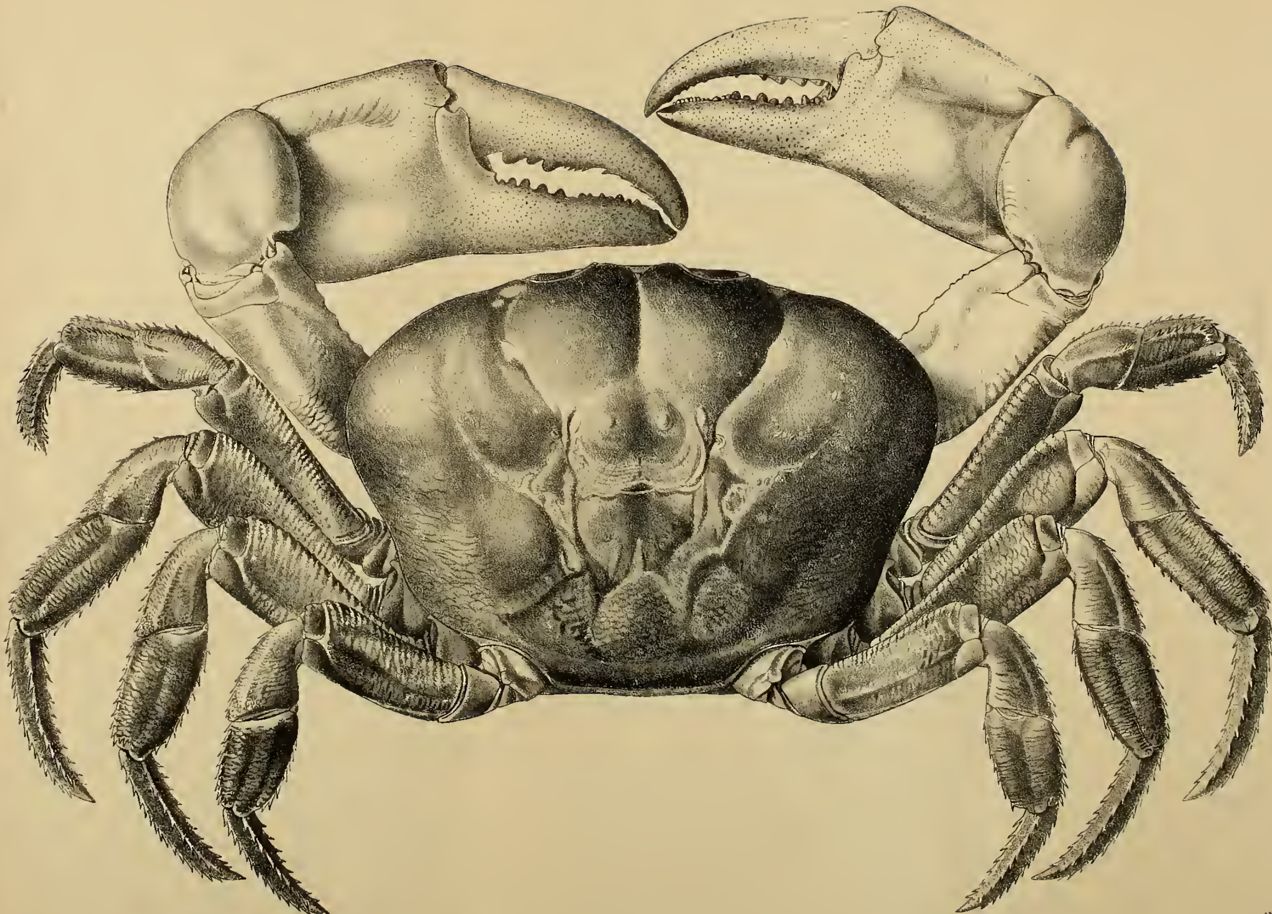
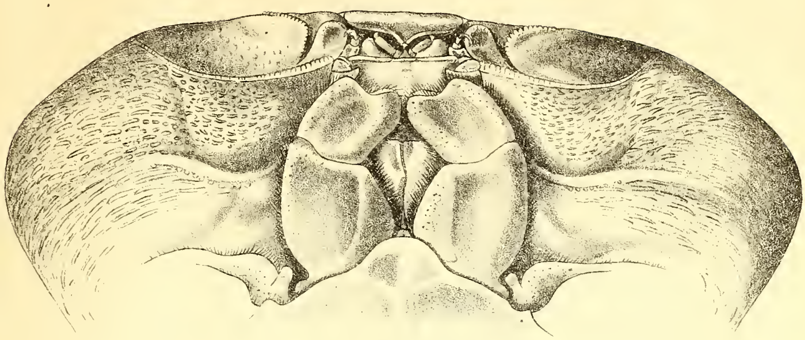


HYLÆOCARCINUS HUMEI.



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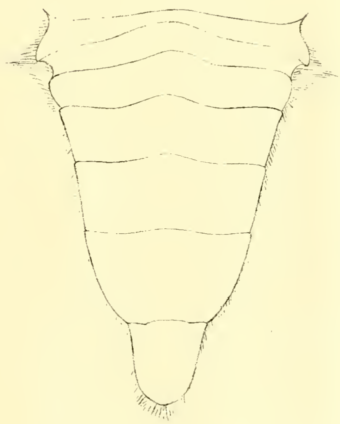

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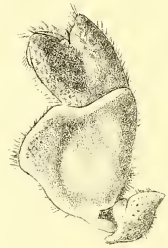

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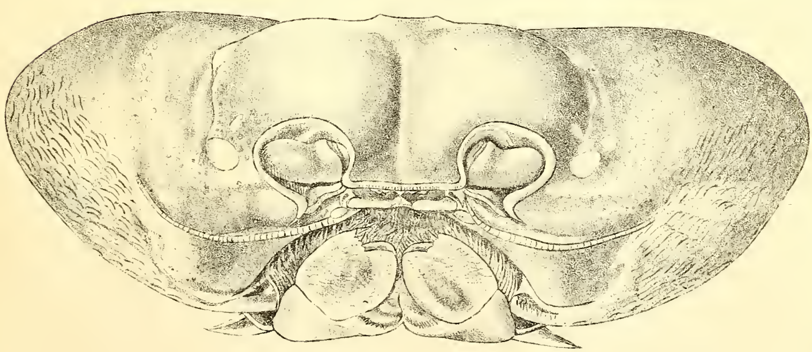

2.

HYLÆOCARCINUS HUMEI.