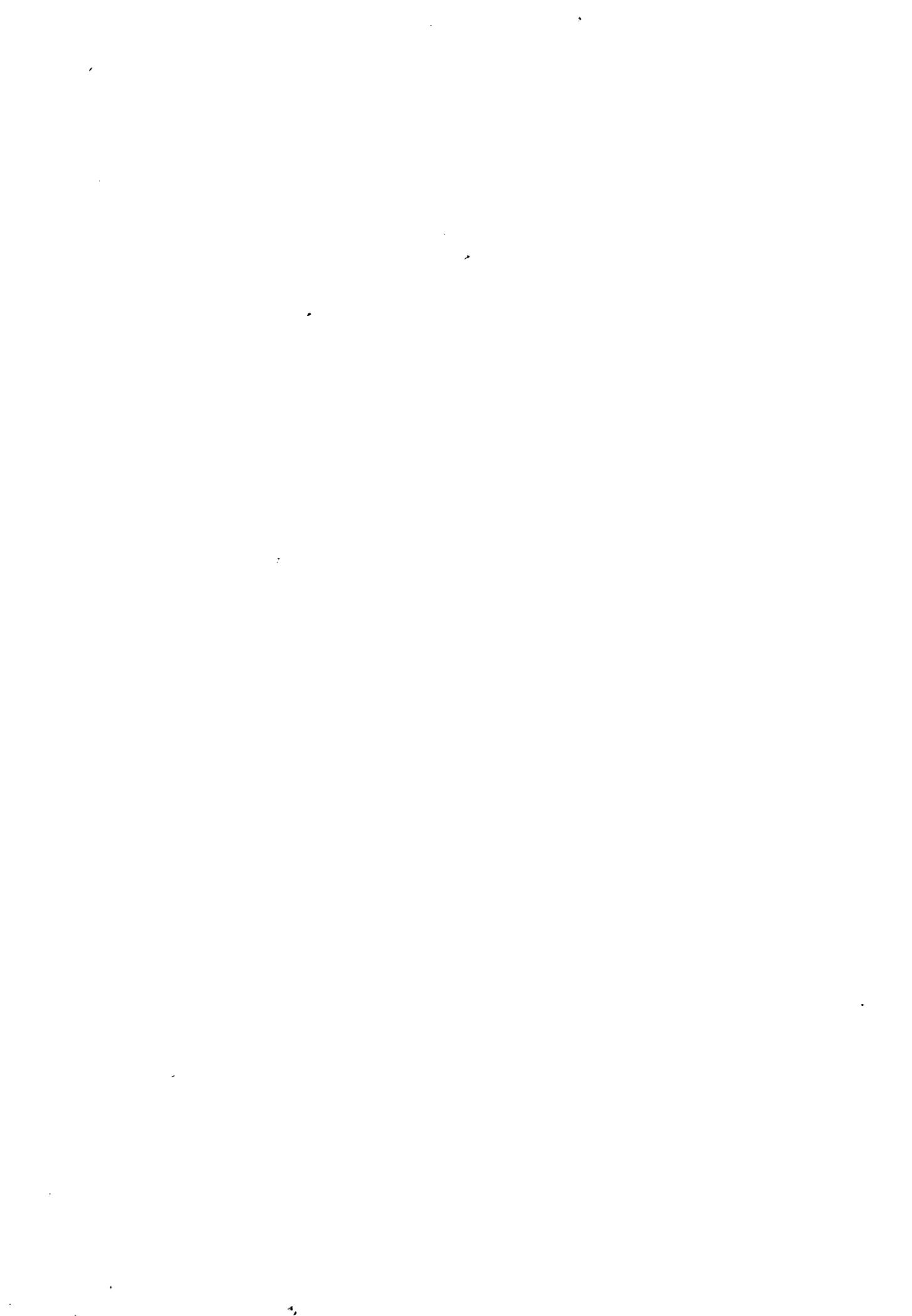


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BY

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# CRUSTACEA.

## PART I.



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# CRUSTACEA.

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## INTRODUCTORY REMARKS.

THE collections of Crustacea, which are the subject of the following Report, were made by the Exploring Expedition at all the various points visited in the course of the cruise, and through all the oceans traversed. The principal coasts which have contributed to the department are as follows :

- |                                   |  |
|-----------------------------------|--|
| 1. Madeira,                       | 12. Society Islands,                     |
| 2. Cape Verde,                    | 13. Samoan or Navigator Islands,         |
| 3. Rio Janeiro,                   | 14. Tongatabu,                           |
| 4. Rio Negro, Northern Patagonia, | 15. Feejee Islands,                      |
| 5. Nassau Bay, Tierra del Fuego,  | 16. New Zealand,                         |
| 6. Valparaiso, Chili,             | 17. New South Wales,                     |
| 7. Callao, Peru,                  | 18. Kingsmill Islands,                   |
| 8. San Francisco, California,     | 19. Wakes Island,                        |
| 9. Coast of Oregon,               | 20. The Phillippines, Sooloo Sea, Singa- |
| 10. Sandwich Islands,             | pore, and Cape Town.                     |
| 11. Paumotu Islands, Pacific,     |  |

Our stay at these different places varied from twenty-four hours to four months; and the extent of the collections they afforded is consequently as various as the time allowed for exploration. The waters of the Atlantic, Pacific, Antarctic, and Indian Oceans also added largely to the number of oceanic species.

The scientific world naturally demands results correspondent with the opportunities for investigation. As bearing on this point, the

author deems it incumbent to state that the Crustacea constituted one out of three extensive departments under his charge, Geology and Zoophytes,—reports on which subjects are already published,—having occupied a large share of his time and labours. Moreover, the unfortunate wreck of the Peacock on the Columbia bar sacrificed all the collections made through two seasons in the South Pacific, ranging over the ocean from the Paumotus to the Navigator Islands and also to the Kingsmill Group, and only a few dried Crustacea, not included in the packages lost, answer to a detailed catalogue numbering more than a thousand specimens.

Besides this misfortune, another befell the collections after reaching the country, before the return of the Expedition. A large part of the packages were unfortunately opened, and the specimens prepared, by drying, for exhibition. By this means, the references to the catalogues were to some extent lost, and many specimens were badly injured. Some were rendered wholly unfit for description, especially those of small size, which, without regard to their delicacy of structure, were taken from the bottles containing them and dried, and sometimes transfixed with pins, to the obliteration of many of their characters. Moreover, the larger species were rendered by this process unfit for dissection.

Notwithstanding these occurrences, the number of new species described in the following pages exceeds five hundred, although in many of those collected we have been anticipated by foreign investigators, owing to the delay in our publications.

The species embraced belong to every branch of the department of Crustacea, including the minute Entomostraca as well as the higher grades. The subject of classification has therefore come necessarily under consideration. We have also been led for the same reason to a study of the homologies of Crustacea, and have endeavoured to present the parallel relations of species in all the prominent groups.

## I. ON THE CLASSIFICATION OF CRUSTACEA.

---

THE following observations on the classification of Crustacea relate only to the grander divisions of this class of animals. The various subdivisions and their distinctions come under consideration in the succeeding descriptive part of the work, in connexion with the detailed descriptions of the several groups.

In presenting our remarks on this subject, we offer first a few observations on the limits of the department of Crustacea, and a brief review of the distinctive characters of the class.

### I. LIMITS OF THE DEPARTMENT OF CRUSTACEA, AND DISTINCTIVE CHARACTERS OF THE CLASS.

1. *Limits.*—The only point of doubt that has existed of late upon the limits of the department of Crustacea refers to the lower orders of the class, and, through recent investigations, the uncertainties are now mostly removed. The Cirripedia have been claimed by the conchologist as Mollusca, and the Rotifers by Ehrenberg and others as a branch of Infusoria. The former are so completely like Cypridinea in the young state, as first shown by Thompson,\* both in external form and internal structure, and so unlike any species of Mollusca, that their relations to the Articulata were made out satisfactorily by this observation alone. The author collected some of these young Anatifæ in the Equatorial Atlantic in 1838, and, not being aware at the time of Thompson's investigations, the species were referred to the Cypris group. Subsequent investigations off Fuegia, where the young and adult forms were found together, enabled him to trace out the transitions. Another fact of importance, fixing the relations of the Cirripeds, was observed by the author in the harbour of Rio Janeiro. Numerous exuvia of Cirripeds were collected, proving that these animals undergo exuviation,—a process in growth characteristic

\* Zoological Researches, by J. V. Thompson, Esq., F.L.S., No. 3, January, 1830.

of this branch of the Articulata, and not so of any true Mollusca. Again, the organs of the mouth as well as the jointed structure of the legs are completely Crustacean in type.

The Rotifers have the mandibles and other mouth-organs of Crustacea, and some of them resemble certain Entomostraca in general form, and in the jointed structure of the caudal extremity. In these species we have, therefore, the lowest Crustacean form under a Radiate type,—the type of the inferior branch of the animal kingdom.

Crustacea also pass, by almost imperceptible shades, into Vermes, through the Caligus and Lernæa tribes; the most degraded Lernæan forms having the sluggishness and almost memberless character of the lowest worms. Their resemblance to the typical Crustacea is so slight, that, without a knowledge of the gradations through the well-modelled Caligi to the higher forms, their relations to the class would hardly be suspected.

2. *Characteristics.*—On account of the wide variations among Crustacea, the systematist experiences great difficulty in laying down the characteristics of the class.

The *higher* divisions have a regular heart; the *lower* (and this is true even of some Caligidæ) have no heart, and only two or three valves in the course of the circulation.

The *higher* have a system of vessels for the arterial circulation, the venous system only being lacunal; the *lower* have no vessels for circulation in any part, and the blood sweeps along among the muscles in broad currents, flowing off in side channels wherever passages are open, more like the sap in the leaf of a plant than what is naturally looked for in the zoological kingdom.

The *higher* orders have branchiæ for the aeration of the blood attached to the thoracic members; species of *another type* have allied organs attached to the abdominal members; and those of the *lower* orders are without any trace of branchiæ or corresponding organs, and the function of aeration devolves upon the exterior surface of the body.

The *higher* orders have a nervous ganglion for each segment of the body, and these ganglia are clustered in two masses only when the limbs are gathered closely about a centre, with the abdomen small and inflexed against the thorax, as in Crabs; but in the *lower* orders, although the body may consist of a series of segments, we find at times only one single ganglion, pierced by the œsophagus, and placed

above the mouth, from which cords pass forward and backward, and subdivide, in order to supply the posterior segments and their members; and in this particular, the great characteristic which is laid down as dividing the Articulata from the Mollusca, fails of being distinctive, and we find essentially the nervous system of a molluscan with a crustacean structure.

The *higher* have large biliary glands; the *lower* often no distinct glandular masses of this kind.

Again, as already observed, while in the *higher* orders the species have a series of limbs for locomotion and prehension, the members are reduced in the *lowest* to a single pair, or even this is wanting,—a long head with its mouth fitted for suction, and a long tail, making up the body.

What is, then, a Crustacean? No definition can be wholly satisfactory. As in other cases, the question must be answered by defining the essential characters of the typical form, and then the relations of the extreme divisions are to be distinguished by gradations of structure, rather than by complete conformity to the type. We observe, however, that there are some invariable characters. All have a straight intestine, without convolutions; all pass through a series of metamorphoses in development; all undergo exuviation; all have the head and thorax combined essentially in a single cephalothorax; all are aquatic in their mode of respiration, the surface of certain gill-like organs, or of some or all parts of the body, serving in aeration.

While, therefore, Crustacea, in their typical forms, have the nervous system of other Articulata, and are thus widely removed from Mollusca, they graduate into species that have nearly the nervous system of the latter division. Yet the articulated body, the structure of the mouth, the jointed appendages, the character of the intestine, and the process of exuviation, are decisive characteristics, with few exceptions; and in the exceptions, the species are elongated and resemble worms rather than Mollusca.

Again, while related to Insects in the nervous system, they are separated from them by the existence of branchiæ, or, if branchiæ are absent, by the fact that the surface of the body performs the function of aeration. In other words, while Crustacea are aquatic Articulata, Insects are essentially sub-aerial species. Moreover, the process of exuviation, the structure of the heart, the coalescence of the head and thorax, and the large number of jointed limbs in the typical forms,

besides other characters, distinguish Crustacea from Insecta. A close approximation of Crustacea to other Articulata is not to be expected, except with aquatic species. And we find an analogy with the aquatic larvæ of many insects, and still closer with certain Vermes, as the Helminths, into which the lower grades, as they are more and more nude of members, evidently pass. A strongly-drawn line is here not to be expected, since both are divisions of the same sub-kingdom, and both are fitted for the same element and similar modes of life.

The position of Crustacea in the scale of animals among the Articulata has been learnedly discussed by Professor Agassiz;\* and he has shown, we think satisfactorily, that they should rank below Insects, and above Worms. The gradation into Worms is evidence on the latter point, and the analogy to the aquatic larvæ of Insects on the former. This author remarks upon the greater number of limbs in Crustacea, which is also a peculiarity commonly of the *imperfect* insect or larvæ,—the smaller number in the mature insect being a result of a higher stage of development. He also observes that the separation of the head and thorax is further indication that Insects rank highest. It is true that Crustacea attain a size never found among the Insecta. But this is attributable to their living in a denser element, and is analogous to the occurrence of the largest but lowest of Mammalia in the ocean. Moreover, size of body is no necessary criterion of relative rank, for, unless the nervous system is of a higher grade as the size increases, the bulk is so far only an encumbrance to the weak forces within, and less agility of motion and inferior attributes in other respects are the consequence. Thus the huge medusa is but an unwieldy mass compared with minute acalephs, and the large crab but a clumsy animal alongside of the nimble ant.

It seems to be a correct principle laid down by Professor Agassiz, that in each zoological group the aquatic species are inferior in grade to those of the land.

## II. SUBDIVISIONS OF CRUSTACEA.

In the classification of Crustacea, we adopt mainly the grand divisions laid down in the excellent treatise by Milne Edwards, although

\* Classification of Insects from Embryological Data. By Prof. Agassiz. 28 pp. 4to., and one plate. Smithsonian Contrib. to Knowledge, vol. ii., art. 6.

with some modifications as to the relative importance of these divisions, and the mode of grouping. The species with *pedunculate* eyes are naturally separated from those with *sessile* eyes; and, in subdividing the latter, the large group including the Amphipoda and Isopoda are as properly separated from the other species, or Entomostraca. These steps in classification were first recognised essentially by the Swedish naturalist, Linnæus.

The Cirripeds also have sessile eyes in the young, if not in the adult, state, and might be arranged with the second of the divisions mentioned. Yet they have so many peculiarities of structure, and their habits are so different from those of other Crustacea, that they more properly form a third grand division. Though Entomostracan in the young state, they subsequently develop in a widely divergent line, producing species with a persistent shelly covering not liable to be thrown off like the skin of the rest of the body, and having a fixed instead of a migratory body, with many peculiarities of structure.

The three grand groups among Crustacea are then as follows :

I. CRUSTACEA PODOPHTHALMIA.

II. CRUSTACEA EDRIOPHTHALMIA.

III. CRUSTACEA CIRRIPIEDIA.

I. PODOPHTHALMIA.—The Podophthalmia have a great similarity of structure, although exceedingly diverse in form,—a diversity principally owing to the greater or less development of the abdomen. The large carapax covering the thorax, exposing only two or three posterior segments, if any, and the characters of the cephalic organs and mouth, are very uniform features for the species. A variation takes place in the number of buccal appendages, but this consists simply in the posterior pairs being either appropriated exclusively to the mouth, or being so elongated as to act the part of feet.

There are species, however, which are removed from the rest by characters of high importance; yet such species are only examples of inferior development;—that is, they are analogous in general character to the condition which the typical species present before arriving at complete maturity. Their degradation is seen in their having the thoracic branchiæ exposed, instead of covered by the carapax; and, in a lower stage, in having no thoracic branchiæ, but only similar appendages to the abdomen; and, in a stage still lower, in the branchiæ being wanting altogether, and even the abdominal appendages rudimentary, as well as one, two, or three posterior pairs of tho-

racic feet;—a condition closely analogous to that of the Cyclopea and other species among the Edriophthalmia, in which the same thoracic feet are wanting, as well as the abdominal feet, and also the branchiæ. Thus it is that the Podophthalmia naturally include two groups,—a higher, with the branchiæ enclosed in the normal condition beneath the carapax, and a second, or lower, with the branchiæ exposed, or wanting. These subdivisions of the Podophthalmia are :

Order I. EUBRANCHIATA or DECAPODA.

Order II. ANOMOB RANCHIATA.

*Eubranchiata*.—The Eubranchiates or Decapoda are naturally divided by Milne Edwards into the three groups—

Tribe I. BRACHYURA.

Tribe II. ANOMOURA.

Tribe III. MACROURA.

The nature and propriety of this arrangement will be the subject of extended remark on a future page, where the Eubranchiata come under consideration.

*Anomobranchiata*.—In the Anomobranchiates the feet are in part two-branched or bifid, and this is an additional mark of their relation to immature forms. But this character is not universal; and, moreover, it is presented by some species of the first division. We therefore have not used the term Schizopoda for the group, but give it to a subdivision of the group which is characterized eminently by two-branched feet; while another small subdivision or tribe, closely allied in most particulars, but with simple feet (Genus Lucifer), forms the tribe *Aploöpoda*.\* Another portion of these species have the anterior thoracic feet clustered about the mouth, and cheliform, and this character suggested to Latreille the name *Stomapoda* (more properly *Stomatopoda*). This structure has a resemblance to that found in some Macrourea, especially the Thalassinidea, and is a proper characteristic for one of the subdivisions of the Anomobranchiata.

The Anomobranchiata will thus include three tribes:—

Tribe I. STOMAPODA.

Tribe II. SCHIZOPODA.

Tribe III. APLOOPODA.

II. EDRIOPHTHALMIA.—The *Edriophthalmia* embrace a great variety of forms and structures, with very unlike habits. Separating the Amphi-

\* From *απλοος*, simple or undivided, and *πους*, foot.

Pods and Isopods, it leaves a large group, ranging from well-organized forms to the sluggish worm-like *Lernæa* on one side, and to the microscopic Rotifer on the other,—the line of gradation to the former being through the Caligacea, and to the latter through the Cyclops and Daphnia groups. Moreover, while some species have mouths with regular jaws, like the higher Crustacea, others have a trunk for suction; and in still others (*Limuli*) the jaws are but the basal joints of the legs.

May we, in view of these differences, retain all the species in a common group, subdivided in accordance with the varieties of structure? or shall we, as done by Milne Edwards, give the very highest rank in classification to the character of the mouth, and so make our first three grand divisions of Crustacea paramount to all others, the following, 1, those with proper jaws (*Crustacés Maxillés*); 2, sucking species (*Crustacés Suçeurs*); 3, those with the basal joints of the legs acting as feet?

The differences here alluded to, are, in our estimation, of comparatively small importance. They are confined to the mouth, and are simply an adaptation of the same organs to somewhat different modes of life. The sucking Crustacea have the mandibles of other species, although more slender and placed in an elongate trunk; and all other important characters are identical with those of certain maxillated species of like form and grade of structure.

In all Crustacea, the mandible is but a process from the basal joint of a leg, and the maxillæ are of like character. In the higher species, the leg or jointed portion of the organ is short; but among the lower, it often has a large development, and all the maxillæ may be like feet in form, and actually so in part of their functions. It is, therefore, but a single step, a shade beyond, which brings us to the *Limuli*, in which all the mouth organs are feet, and similar in form, the basal joints of which act together as jaws. In the *Calani* and *Cypridinæ*, true mandibulated species, the maxillæ are much enlarged, and the mandibles have long, jointed, foot-like appendages. Facts of this kind are too well known to require repetition, and they need but be appreciated, we think, to make the impropriety evident of laying that stress upon this characteristic which is done in the classification just alluded to.

We acknowledge that if this adaptation to suction occurred among the superior grades of Crustacea, it should have a high value in classi-

fication; but in fact it is confined to the lower grades, and it indicates only subordinate divisions of the inferior group. We deem it of so little taxonomic importance, that we do not assume it as a basis of a grand distinction among the Edriophthalmia; for it appears evident that the characters of the Amphipoda and Isopoda separate them widely from the rest of the species. Indeed, the sucking Caligi are so like the Sapphirinæ among the Cyclopacea in every point of structure, except the mouth, and so close even in this organ, that they seem to be only related groups of the same subdivision—that of the Entomostraca.

Besides the species alluded to, there are also in this sub-class the Trilobita and Rotifera. The latter evidently have the lowest place. The former have been arranged both with the Entomostraca and Isopoda; but the opinion of most authors places them at present in an intermediate group. A few brief considerations on this point are offered on a following page, after our observations on the Entomostraca. The subdivisions of the sub-class Edriophthalmia are, therefore, as follows:—

Order I. CHORISTOPODA (or Tetradecapoda), including the Amphipoda and Isopoda.

Order II. TRILOBITA.

Order III. ENTOMOSTRACA.

Order IV. ROTIFERA.

I. CHORISTOPODA.—The *Choristopoda* are so called from *χωριστος*, *separate*, and *πους*, *foot*, alluding to the most striking peculiarity of these species, separating them both from the Macroura and the Entomostraca, viz.:—that the thorax consists of a series of segments exposed to view and corresponding each to a pair of thoracic feet, which feet are ambulatory or prehensile. This division of the body into distinct segments from the head to the abdomen has scarcely an exception. Yet sometimes one or two pairs of the feet are rudimentary or wanting, and one or two of the anterior segments of the thorax, adjoining the head, are obsolescent or concealed; and in a very rare case two segments are coalescent.

Among the Choristopoda, there are two prominent groups, the Amphipoda and Isopoda.

In one group, the *Amphipoda*, the abdomen is elongated, with flexible articulations; the three anterior pairs of appendages are natatory; the three posterior pairs styliform; the branchial vesicles are attached to the thoracic legs at base.

In the other, the *Isopoda*, the abdomen is short, with the articulations admitting of little flexion; four or five pairs of abdominal appendages are lamellar and branchial, and only the posterior pair styliform.

Such are the characteristics laid down respectively for these groups. But there is another character of high importance, which has not been alluded to by previous authors, corroborative of this arrangement of the species. In the *Amphipoda*, *four* pairs of the thoracic feet are directed *forward*, and *three* outward and *backward*: while in the *Isopoda* *three* pairs are directed *forward*, and *four* *backward*; that is, the sets of legs are four anterior and three posterior in the *Amphipoda*; three anterior and four posterior in the *Isopoda*.

A third subdivision of the *Choristopoda* was proposed by Latreille, under the name *Lœmipoda* (or *Lœmodipoda*). The species included are characterized by having the abdomen nearly or quite rudimentary. In the more essential characters they are closely related to the *Amphipoda*, rather than to the *Isopoda*, and are not properly intermediate, nor a new type alike distinct from both; for they have the thoracic branchial vesicles of the *Amphipoda*, and the abdomen in species that have this part somewhat elongated, partakes of the *Amphipod* character. They are properly therefore *Amphipoda*, with certain parts obsolescent. That this is a correct view of their relations is shown by the thoracic feet, the four anterior pairs being forward feet, as in the *Amphipods*. This conclusion has been adopted by many Zoologists.

There are, however, true intermediate species between the *Amphipods* and *Isopods*, and if any third or intermediate group is admitted, these should be considered as constituting it. These species belong to the genera *Tanais*, *Arcturus*, *Leachia*, and others allied. Like the *Amphipoda*, they have the four anterior pairs of feet of the forward series, and the three posterior of the hinder; but like the *Isopoda*, they have the abdomen very short, and composed of six very short joints, and only the last pair of members is styliform (instead of the three posterior pairs, as in normal *Amphipoda*), while the others are lamellar and branchial, as in *Isopods*.

We therefore recognise three groups or tribes of the *Choristopods*, as follows:—

1. *Amphipoda*. Branchial vesicles thoracic; forward series of thoracic feet eight in number.
2. *Anisopoda*. Branchial vesicles abdominal; forward series of tho-

racic feet eight in number, and used like arms, the six posterior ambulatory or affixing.

3. *Isopoda*. Branchial vesicles abdominal; forward series of thoracic feet six in number, and all ambulatory (except that one or two anterior pairs are sometimes prehensile).

The name Anisopoda, from the Greek *ανισος*, *unequal*, and *πους*, *foot*, alludes to the unlike functions and size of the anterior and posterior feet; the six posterior feet serve as feet for affixing themselves and standing; while, the eight anterior are used like arms, and are stretched out in search of food. Unlike most Amphipods and Isopods, therefore, the two sets of thoracic feet are strikingly different in function; and from the latter, they differ in that only the six posterior feet are ambulatory, and these have the additional function of enabling the animal to hold on to objects with an erect body, while the anterior members are free to move in every direction.

II. ENTOMOSTRACA.—The Entomostraca agree in a general degradation of character (by which they differ from the Choristopods), rather than in any similarity of form; yet, there are strong points which unite them. Unlike the Choristopods, the thorax does not consist of a series of seven segments following the head, with as many pairs of ambulatory, or ambulatory and prehensile feet. The abdomen, moreover, is without a regular series of appendages, either natatory or branchial, a caudal pair being usually the only one present, though sometimes, one or two preceding pairs, of peculiar structure, exist connected with the egg-system. Of the thoracic members, the posterior two pairs are, with few exceptions, obsolete, and in these exceptions they are natatory; and the three to five pairs preceding, when present, are natatory, excepting when one of them is genital in its use. These natatory feet are well seen in the groups, Cyclops, Sapphirina, Caligus, Daphnia, and others; and they are not found in the Cypris group, because three of these pairs of legs, elsewhere natatory, are here obsolete. These are striking peculiarities, removing the species far from the Choristopods; and they as closely bind the species together into a common family. Other points of resemblance are as follows:—1, the absence in general of arterial vessels; 2, the frequent diversion of the posterior antennæ to a natatory or prehensile purpose; 3, the diverse forms often presented by the anterior thoracic members; 4, the reduction of the nervous system, in most cases to a single ganglion, encircling the cesophagus, which gives out all the

nerves of the body without other ganglions in their course; 5, the absence of branchiæ, or any organs especially fitted for the purpose, in most species, and in cases where branchia-like appendages exist, they being only an adaptation to this function of some portion of a thoracic leg.

The species differ among themselves in number of segments, which in a few instances is largely multiplied, and in others, reduced to four or five, or even less; in the size of the anterior shell or carapax, which may be confined to the head, or be so enlarged as to enclose like a shell, the whole body; in the number of legs, which varies between a single pair, or even none, and fifty pairs or more; in the number of organs devoted to the mouth, from a single pair of mandibles to mandibles with three pairs of maxillæ or maxillipeds which may either be regular jaws, as in the higher Crustacea; or, may be imbedded, the basal joints of a series of legs acting as jaws; or, may project and form a moveable trunk, with slender, spiculiform organs for mandibles.

Of these differences, the last mentioned is of the widest importance. The trunk-form or sucker mouth characterizes a large number of species, which constitute a natural group, among the Entomostraca; and through these species, the class of Crustacea declines into the more degraded class of worms.

The mouth with jaws formed by the bases of a series of pairs of legs, affords a less important distinction. The aspect and structure in such species are peculiar, as observed in the Limuli, where this kind of mouth is in perfection; but, the mandibles are as much a pair of legs in the Cypris, and, indeed, they are the largest and strongest pair in these species; moreover, in the Cyclops, the jointed or pediform portion of the mandibles and maxillæ is largely developed, as already remarked. The Limuli are, therefore, but an example of the same principle, more perfectly carried out. Still, this may be a sufficient ground for placing these species in a separate subdivision of the Entomostraca, although not authorizing a wide separation from the Order.

The *Entomostraca* are, therefore, distributed here into three groups, as follows:—

Sub-order I. GNATHOSTOMATA (from *γναθος*, *jaw*, and *στομα*, *mouth*).  
The mouth with regular jaws, and not forming a moveable trunk.

Sub-order II. CORMOSTOMATA (from *κορμος*, *trunk*, and *στομα*). The mouth having the form of a moveable trunk.

Sub-order III. MEROSTOMATA (from *μηρος*, *thigh*, and *στομα*). The basal joints of the legs constituting the joints.

*Gnathostomata*.—Among the Gnathostomata there are species with an excessive or abnormal number of segments to the body, and lamellar appendages below, corresponding to the segments. These are naturally separated from the other species, which are essentially normal in their characters, the variations in the normal species being occasioned by obsolescence of parts, and not by increase. The former are very appropriately called PHYLLOPODA\* by Latreille, in allusion to the foliaceous character and great number of the appendages, while the latter he designated LOPHYROPODA,† on account of the fact that the feet are usually setigerous, being terminated or margined by long hairs.

The two groups include to some extent parallel forms, and admit of parallel subdivisions. Cyclops or Sapphirina of the Lophyropoda is analogous to Apus, among the Phyllopoda, and Cypris or Daphnia to Limnadia.

Moreover, these Phyllopodous species seem, in a certain degree, to be recent representatives of ancient forms, the Trilobites, which were also abnormal in the number of segments by a like multiplication. The Gnathostomata are therefore naturally divided into these two groups, the Phyllopoda and Lophyropoda.

The LOPHYROPODA contain the natural groups or tribes *Cyclopacea*, *Daphniacea*, and *Cypridacea*, as usually laid down; and the Phyllopoda, the Tribes *Branchipodacea*, *Apodacea*, and *Limnadiacea*. The graduation of the Macroura into the maxillated Entomostraca is seen through Mysis, Nebalia, and Branchipus, as observed by Milne Edwards, all three having pedunculate eyes.

The *Cormostomata*, or sucker-mouthed species, pertain to two widely different types—one, the Cyclops type, as seen in *Caligus* (which has closely the form of Sapphirina, one of the genera of the Cyclops group), which group is named *Pæcilopoda* by Latreille; and another, the Arachnoid type, as in Nymphon, Pycnogonum, and the allied. The former pass into the Lerneæ group; the latter are like spiders in form,

\* From *φυλλον*, *leaf*, and *πους*, *foot*.

† From *λοφυρος*, *having hairy or tail-like appendages*, and *πους*, *foot*.

and have their closest analogy among Crustacea with the Choristopods, especially the Caprellidæ, the joints of the body being distinct, and the legs long and ambulatory.

*Trilobites*.—With regard to the position of Trilobites in an arrangement of Crustacea, we offer the following observations.

In Apus and Limnadia we have examples of species with an abnormal number of segments, and foliaceous organs of locomotion concealed below. The absence of pediform jointed appendages among all examples of fossil Trilobites is proof that there were no such appendages when living, as they could not have escaped preservation. A shell of a texture durable enough to be preserved, must have existed on legs sufficiently large to correspond in size with many Trilobites; for the articulation in all Crustacea legs is made by processes in the shelly covering of the legs, these being the only firm parts; and such articulations for large legs would require a firm exterior, or else the member would be little better than a flabby piece of flesh, even if it had articulations. It is clear, therefore, that the organs of locomotion must have been foliaceous, as in Limnadia. Such organs would be sufficient for swimming, and would not interfere with the adhesion of the animal, Chiton-like, to any body at hand. The antennæ in some species may have been elongated, jointed organs, as specimens have shown.

Considering these points as established, does it follow that the species were properly Entomostracans related to the Phyllopoda? One great distinction separating the Entomostraca and Choristopods—between which groups the Trilobita are supposed by authors to lie—consists in the existence of a regular series of organs below the abdomen in the latter, and the absence of such organs in the former. Even in Limnadia and Branchipus, the abdomen has no such series of organs.\* This part of the body in the Phyllopods is often very short, as in Limnadia, or narrow, as in Branchipus, while in many Trilobites, as the genus *Isotelus*, it is very broad and large,—so large, in fact, that we can hardly refuse to believe that it was provided with leaflets below, either like those of the thorax, or more properly branchial in character. In many species there is no obvious line between the thoracic and abdominal joints, as is true of some Isopoda, while in

\* The large posterior segment of the *Limulus*, with which the caudal appendage is articulated, and which covers foliaceous appendages, appears to be cephalothoracic and not abdominal, and the so-called tail in the common species is, therefore, all that exists of the abdomen.

others the distinction is obvious. In either case we have reason to conclude, from the breadth and extent of this part of the body, that the abdomen must have had its regular series of appendages.

On this ground, we should conclude that the species are intermediate between the Isopoda among the Choristopods, and the Phyllopoda among Entomostracans, and properly fall into neither of these divisions, though ranking most nearly with the former in perfection of structure and general character.

The following is a Tabular View of the Classification of Crustacea, explained in the preceding pages.

CRUSTACEA.

SUBCLASSIS I. <b>PODOPHTHALMIA.</b>  ORDO I. EUBRANCHIATA, or DECAPODA.  Tribus 1. BRACHYURA. 2. ANOMOURA. 3. MACROURA.	SUBCLASSIS II. <b>EDRIOPHTHALMIA.</b>  ORDO I. CHORISTOPODA.  Tribus 1. AMPHIPODA. 2. ANISOPODA. 3. ISOPODA.	SUBCLASSIS III. <b>CIRRIPEDIA.</b>	
	ORDO II. TRILOBITA.		
	ORDO III. ENTOMOSTRACA.		
	SUBORDO I.      SUBORDO II.      SUBORDO III.		
	GNATHOSTOMATA.      CORMOSTOMATA.      MEROSTOMATA.		
ORDO II. <b>ANOMOBANCHIATA.</b>  Tribus 1. STOMATOPODA. 2. SCHIZOPODA. 3. APLOPODA.	Legio I. PHYLLOPODA.  Tr. 1. Branchipodacea. 2. Apodacea. 3. Limnadiacea.  Legio II. LOPHYROPODA.  Tribus 1. Cyclopacea. 2. Daphniacea. 3. Cypridacea.	Legio I. PUECLOPODA.  Tribus 1. Caligacea. 2. Lernæacea.  Legio II. ARACHNOPODA.  Tr. 1. Nymphonacea.	Tribus 1. Limulacea.
	ORDO IV. ROTIFERA.		



## II. HOMOLOGIES OF CRUSTACEA.

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1. *General Typical Structure of the Body.*—Notwithstanding the great diversity of forms among Crustacea, there is in general little difficulty in tracing out the typical structure through all its many modifications, and distinguishing the true relations of the parts, even in the most aberrant species.

Before entering on this subject, it is important that we should explain what we understand to be the *typical structure in Crustacea*. The investigations of Audouin and Milne Edwards have supplied the science, we think, with correct knowledge on this point. According to Edwards, the body of a Crustacean consists normally of *twenty-one* segments, *fourteen* belonging to the head and thorax, and *seven* to the abdomen. In some species, as the Choristopods, seven of the first fourteen pertain to the thorax, and seven to the mouth and anterior part of the body or head; but as the mouth-organs may become legs, and the legs mouth-organs, by slight variations, this last-mentioned division is far from general. The segments are as follows:—

I. CEPHALOTHORAX. 14 segments.	{ 1st segment, ophthalmic. 2d segment, 1st antennary. 3d segment, 2d antennary. 4th segment, mandibular. 5th to 14th segments, maxillary and podal, <i>ten</i> pairs.
II. ABDOMEN. 7 segments.	{ 15th to 19th segments, bearing abdominal feet or appendages, <i>five</i> pairs. 20th segment, bearing caudal abdominal appendages, <i>one</i> pair. 21st or caudal segment, without appendages.

The variations among species, as brought out by Audouin, depend on the modifications which the normal segments may undergo by enlargement, diminution, coalescence, or obsolescence, together with such

changes of form in the existing parts as may accompany either of these conditions.

The normal parts of the separate rings or segments in the *Articulata* should be in mind in tracing out the homological relations of species, that is, that each of these rings consists normally of eight parts or segments,—two below, called *sternal*, two above, called *dorsal*, one either side of the sternal, called the *episternal*, and one either side of the dorsal, called *epimeral*.

A different typical structure has been recently suggested, according to which the parts are multiples of the number *six*, instead of *seven*. It is based on the supposition that the organ called the posterior or lower lip by Edwards and others, is a true pair of maxillæ, to be counted with the following organs. Admitting this as correct, the cephalothorax consists normally of *fifteen* segments; the first *three*, organs of senses, the next *twelve* pertaining to the mouth and thorax, the last *six* of these twelve (the outer maxillipeds thus included) being properly thoracic, according to the hypothesis. The abdomen, according to this hypothesis, consists of six segments, bearing appendages, and a seventh, which is normally composed of three segments. This gives for the normal number of segments twenty-four, a multiple of *three* or *six*.

As the truth of this hypothesis is to be ascertained mainly by inquiring whether the so-called lower lip corresponds to a pair of maxillæ or not, we offer a few considerations on this point. The organ consists of two oblong flat lobes, in some Decapods, somewhat maxilla-like in form. We observe, in the first place, that it is peculiar in being without articulations, and in no species throughout the range of Crustacea does it bear a palpus, or any corresponding appendage. In these particulars it is unlike true maxillæ. In some Schizopoda, as the *Euphausia*, it is a small, quadrate plate, consisting of two naked lobes in contact on the medial line; and descending lower among Crustacea, the organ is a simple plate, with the lobes quite short and small. In the *Caligi*, the part corresponding to the lower lip forms the lower or posterior part of the buccal trunk. Such are in general the variations it undergoes.

Very different are the variations among the other mouth-organs. While in the Decapoda the lower lip is comparatively larger than in the Entomostraca, the maxillæ of the former are comparatively smaller than in many of the latter. Among the Entomostraca, these organs

and the mandibles as well as the maxillipeds are often enlarged into feet, the palpus being much lengthened into a pediform or natatory appendage. But this lower lip retains its fold-like character and partakes of none of these modifications, being the same essentially in the highest and lowest species, excepting a diminution in size in the latter. The mandibles and maxillæ it will be remembered form a continuous series, alike in their relations and similar in their modifications: while the lower lip, although following next after the mandibles, undergoes no corresponding variations.

It is obvious, therefore, that this organ, which is never jointed, never develops a palpus, and never takes a pediform character, is not a member of the same series with the mandibles, maxillæ, and feet, and that, in fact, it is only a fold of the skin, as generally understood.

Excluding this organ as only a lower lip, as done by Edwards and others, we have the number of segments for the cephalothorax, just *fourteen*, and those of the abdomen, *seven*. This number may be actually counted in some species. The idea that the last abdominal segment consists normally of three segments, cannot be inferred from observation. The teeth of the margin are no necessary indication of such sutures, no more than are those of the carapax.

In the legs of the higher Crustacea, the number of joints is *six*. But this number becomes *seven* if we count the episternal plate which belongs to each, and which sometimes admits of some motion.

2. *Subdivision of the Body into Cephalothorax and Abdomen.*—Before proceeding further, it is necessary to consider the actual natural grouping of the parts in Crustacea. May we distinguish three separate sections to the body, as in Insects,—a head, thorax and abdomen—or only two,—the head and thorax being united in one, and the abdomen the other? The latter is the accepted and true view. Crustacea have a cephalothorax, but not a head; and even in the very few species which have a separate antennary segment in front, it is rather an unusual development of the anterior portion of the body, than any new fundamental subdivision, for this anterior part does not include any of the mouth-organs, some of which are cephalic organs in all animal species that are said to have a head. The principal arguments appealed to, as proof of the oneness of the cephalothorax, are as follows:—The continuous succession of parts in the cephalothorax, and the absence of any constriction dividing a thoracic portion from a

cephalic, or any abrupt line of demarcation; and the fact that the mouth-organs of one species, even to the mandibles, may in others be developed into feet, and conversely the feet may become mouth-organs.

But there are other evidences of equal importance. It is a fact of much weight that the obsolescence of members takes place commonly at the extremities of the cephalothorax, and at the extremities of the abdomen. In the former, the pedunculate eyes and anterior antennæ may become obsolete at one extremity, and one, two, or three posterior pairs of thoracic legs at the other, the exterior pair in each case being the first to disappear. In the abdomen, the basal segment and the apical are often obsolete in the lower Crustacea. A table given on a following page illustrates this point.

The pedunculate eyes are absent from a large part of Crustacea, and in some Daphnidæ, the first antennæ also are obsolete. In some Schizopoda, the last thoracic feet are wanting, in others, the last two pairs; in Cyclops, the last two or three pairs; in Daphnia, the last four; in Cypris, the last *six* pairs; while the intermediate organs in each of these cases are all present.

It hence appears that the cephalothorax and abdomen should each be viewed as a whole, in which the extremities of each, according to a fundamental law, fail of developing the full allowance of members. In the Caprellidæ there is a seeming exception, since here the feet near the middle of the cephalothorax are often obsolete. But these cases do not set aside our conclusion; for the feet which fail are not the anterior thoracic feet, and therefore they do not mark or indicate any subdivision between a head and thorax. A general survey of the facts seems to show, that the cephalothorax and abdomen are each a distinct centre of development, in which progress reaches to a wider or narrower circumference in different species.

Embryology sustains us in this deduction. The abdomen in the growing germ appears as a mere point, almost as soon as a trace of the anterior part of the body appears and before any members can be distinguished, and it is a separate centre of development. In the head and thorax united there is but one other centre, and from it progress goes on either way anteriorly and posteriorly. The anterior part of the buccal mass marks this centre; the mandibles are the first organs that begin to appear, and, at the same time, rudiments of the upper lip may be traced; then the posterior and anterior antennæ commence, and the former (or the organs next before the mandibles), are most

rapid in development; next, rudiments of the eyes are seen; about this time, the maxillæ and maxillipeds are developed in succession, first the three pairs of maxillæ, then the following two pairs; and, as these continue enlarging, the feet finally become apparent, the anterior pairs being earliest. The succession is thus in a line, either way from the mandibles. The mandibles at the centre are often the shortest of the organs, and in the Decapoda, the size increases from these forward and backward, becoming largest in the posterior series, usually in the sixth pair following the mandibles (the first pair of feet in the Decapods,) and in the anterior series, in the posterior or anterior antennæ, usually the former. Notwithstanding the diversity of results, the general fact of progression from a single centre, holds true for the cephalothorax, and strongly confirms the view, that in Crustacea this portion of the body is a unit of itself.

While, therefore, *fourteen* is the whole number of successive parts or pairs of parts in the cephalothorax, we cannot properly divide them, and attribute a particular number to the head and the rest to the thorax.

3. *Homologies of the Carapax among Crustacea.*—In the study of the homologies of Crustacea, the true relations of the carapax to the other parts must first be correctly understood; and here lies one of the principal difficulties in this department of investigation. Milne Edwards has ably met the subject and arrived at the conclusion, that in the Decapods, the shell properly pertains to the *third* or *fourth* of the normal segments of the body, that is, to the *second antennary* or the *mandibular* segment. The argument on this point, drawn from certain Stomatopods, as the Squillidæ, in which all the rings or segments are distinct and may be counted, excepting the third and fourth, which appear to be blended, is satisfactory as to the main point. The same structure is found also in some of the Entomostraca; yet it is not universal among these species, as is seen in the Cyclopacea, Caligacea, and others; whose relations will be considered beyond. But the question as to *which of these two segments*, the second antennary or mandibular, the body of the carapax belongs, has not, hitherto, been decided.

Some facts have been observed by the author which lead to a conclusion on this point. It is evident, when the carapax of a crab is separated from the body, that it is an anterior segment prolonged far posteriorly; for its sides are free, and only at the *anterior* extre-

imity, between the mouth and the inner antennæ, is the lower arch complete, by a junction of the sides across the ventral surface. This anterior portion is then the true ring, and the posterior part is only a backward expansion of it; and the carapax must therefore pertain to the same segments which constitute the lower arch. This lower arch, or inferior surface (Plate 11, fig. 9 *d*), is the prælabial space ( $p$ ), and epistome ( $e e'$ ); posteriorly it is articulated with the mandibles, and anteriorly with the second antennæ ( $\alpha^2$ ), whence its normal relations lie between the mandibular and second antennary segments, one or the other, or both.

The second antennæ in some cases seem to be articulated as much with the epistome inside of the basal portion of the basal joint as with the part posterior to it. But in other species, its actual, intimate connexion with the anterior margin of the prælabial area, is evident. It is often prolonged backward, much beyond the part of the epistome adjoining it on the inside; and it is frequently soldered to the prælabial plate, so as to be continuous with it, while an open suture separates it from the epistome,—a fact indicating its closer connexion with the prælabial plate. Again, as in a *Lithodes*, its direct articulation with the margin of the prælabial plate is distinctly obvious. There seems, therefore, to be no doubt that the anterior portion of the prælabial plate pertains to the same segment as the second antennæ.

In order to arrive at an answer to the question, which of the two segments, the second antennary or the mandibular, corresponds to the carapax, we have examined with some care the sutures in the prælabial plate, and those of the carapax, either side of the buccal area. The suggestions thus obtained are of considerable interest.

The prælabial plate, as is well known, has generally three emarginations in its anterior margin ( $p, p^1, p^2$ , Plate 11, fig. 9 *d*, *Chlorodius monticulosus*), and these emarginations are the terminations of sutures, which usually are readily distinguished on the surface of the plate. The median suture ( $p$ ) extends back more than half-way to the posterior margin of the plate, and is often more open where it terminates. The next, either side ( $p^1$ ) continues backward a short distance, and then curves inward; the outer ( $p^2$ ) takes nearly the same course, and leaves an outer and obliquely posterior portion of the plate outside of it. The pieces between these sutures appear to correspond to the two sternal plates between  $p$  and  $p^1$ , either side; and to the episternal between  $p^1$  and  $p^2$ . Now, it is the episternal, with which each of the

second antennæ is connected; and the sutures about the base of the second or outer antennæ often show this conspicuously.\* In many of the Maiadæ, the immoveable basal joint of these organs is continuous with this episternal piece, and in other species, the relation is still more evident in the manner explained above. In the *Thalamita spinimana* (from the Feejees), the sutures of the episternal piece may be distinctly traced across the epistome, so that the base of the antennæ is thus cut off from the rest of the epistome, and the direct relation of the antennary base and the episternal piece is obvious on inspection.

This position of the second antennæ is in accordance with the established principle that the articulated members pertain to the episternal pieces or plates. This therefore confirms still further our conclusion, that the anterior portion of the prælabial area belongs normally to the second antennary segment.

The inward direction of the sutures in the prælabial surface (or palate) seems to show that the whole of this surface does not pertain to a single segment. The outer suture actually separates an outer portion, which is not included in either the sternal or episternal pieces; and also, the rather abrupt termination of the medial suture before reaching the margin behind (and in some cases divergent lines passing from its extremity parallel nearly with the posterior margin of the plate), tends to convince us that the posterior part of this prælabial plate is mandibular, while the anterior is second antennary. The mandibular portion of this plate, if these views are correct, will be the posterior margin and the part outside of the outer episternal suture ( $p^2$ ). In the *Lupa tranquebarica*, these sutures are distinct, and this outer portion alluded to, evidently has different relations from the inner.

The inferior surface of the carapax is marked in the *Brachyura* with a suture ( $r, r^1$ ), extending from the anterior angle of the buccal area to the posterior margin of the body, just over the base of the posterior legs. This suture is the "epimeral" suture of Milne Edwards, who considers the ventral piece cut off by it, the epimeral

\* The same is seen in fig. 9 c, plate 16, of a *Lupa* from the Sandwich Islands. Here the epistome is obsolete, excepting its medial portion; the letters have the same signification as above;  $a^1$  is the base of inner antennæ;  $a^2$ , outer antennæ;  $e$ , epistome;  $p$ , medial fissure in prælabial plate;  $p^2$ , outer suture of prælabial plate (the suture or emargination intermediate between these two is not apparent in this species). The prælabial surface is crossed by a ridge separating the efferent canal from the rest of the surface. The connexion of the base of the outer antennæ with the anterior margin of the prælabial plate is well seen in this figure.

portion of the carapax. The suture is so marked, that in many species, even when fresh, the carapax breaks readily along its line; and generally, the suture opens very easily when the carapax has been weathered by exposure, if not before. Near the anterior angle of this ventral piece there is an oblique suture often apparent, very near the angle of the buccal area (see Plate 11, fig. 9 *d*, *f*, and Plate 13, fig. 6 *h*, also Plate 16, fig. 9 *c*), extending backward to the margin of this area; and it separates a small part of the ventral piece, which piece seems generally to be continued some distance backward, as a narrow margin to the ventral piece.

It becomes a question of interest, what is the proper relation of the ventral pieces of the carapax? Are they true epimerals or not? There is certainly a difficulty in the way of admitting them to be epimerals. We have pointed out the *sternal* and *episternal* pieces of the praelabial piece. Beyond the episternals, the *epimerals* normally come next in order. But the next piece is, in fact, the small plate, *f* (fig. 9, Plate 11), and then comes the larger one behind; so that, if *f* is the epimeral, as it should be, the latter is not so. This difficulty is avoided only by supposing the suture separating *f* from the part behind, to be unessential, and the whole, therefore, to be properly one piece, or the true epimeral.

But there is an additional difficulty which, in connexion with other facts, throws doubt upon this received opinion. Although each ventral piece, or rather the part *f*, actually adjoins the anterior portion of the praelabial plate, the suture *p*<sup>2</sup> is very distinct, while the outer and posterior portion of the praelabial plate passes into the piece *f* with perfect continuity, and with often a solid, shelly texture throughout. This continuity proves a closer relation with the posterior and outer portion of the praelabial plate, than with the episternal pieces themselves. It shows that the posterior portion and the ventral pieces are one united plate; and if this posterior portion of the praelabial plate belongs to the *mandibular* segment, then the piece *f*, which so solidly coalesces with it either side, is also mandibular in its relations. Indeed it seems altogether probable that this is the true view of the subject. The piece *f* is the epimeral of the mandibular segment, and *g* is the following or dorsal portion of this segment. On this ground we understand the ready disjunction of the carapax and ventral pieces; for they are actually distinct segments of the body. The forward extension of the piece *f* alongside of the episternals of the anterior margin of the præ-

labial plate, produces the suture alluded to. The carapax in this case is mainly the second antennary segment. It unites with the episternals of the same second antennary segment just at the base of the second antennæ. The suture about the plate *f g*, anteriorly is sometimes so open, that on this ground alone, we should infer its belonging to a distinct segment; and moreover it sometimes appears partly to overlie at the margin the adjoining parts, showing still farther that it is probably a separate segment.

If these deductions are correct, the epimerals of the second antennary segment or carapax are not distinguishable, even in outline. A fissure or emargination in the under side of the orbit, common in the Brachyura, may perhaps indicate its limit, or perhaps, some of the sutures or depressed lines on the back of the carapax; but this is only conjecture. No objection to our view can thence be urged, since there is no special reason for expecting that the epimeral should be distinct, and much less for inferring that it should be as separable by fracture, as is the case between the carapax and its ventral pieces. We are therefore led to believe, *that the so-called epimerals, or ventral pieces of the carapax, are in fact the posterior extensions of the mandibular segment.*

In the preceding explanations, we have intended to draw a line between the epistome, or rather its anterior portion, and the front margin of the prælabial plate. In many species the two are united in an unbroken surface; but in others, there is a deep and open suture, and in some, as the Chlorodius, referred to above (Plate 11, fig. 9 *d*), there is an unossified membrane (between *e* and *e'* of the figure referred to). We have shown that the second antennæ are connected with the prælabial plate, rather than the epistome, when the distinction can be drawn. But this epistome is immediately connected, anteriorly, with the *inner* antennæ, and is continued within either side, so as to form the inner walls of the orbit. We have reason, therefore, for inferring that *the epistome (or its anterior part) belongs to the second, or to the second and first normal segments—that is, to the first antennary, or the first antennary and the ophthalmic segments.* The latter is the more probable view; for, otherwise, the ophthalmic segment must be obsolete, while the eyes that pertain to it are present. The anterior extremity of the epistome, or the inter-antennary septum, is sometimes prolonged into a spine, as in some Oxyrhyncha, which is more prominent than the front of the carapax; but

this is not usual among the Decapoda. In the Squillidæ, however, we find the segment pertaining to the first antennæ pushed forward and placed anterior to the carapax, and the first, or ophthalmic segment, is still more forward, or forms the anterior portion of the first antennary segment.

According to these explanations then, the carapax of the Brachyura, includes—

I. The first and second normal segments, represented by the epistome, or its anterior portion, and the inter-antennary septum.

II. The third normal segment, represented by the main body of the carapax, and the anterior portion of the prælabial plate or palate.

III. The fourth normal, or mandibular segment, represented by the posterior and outer part of the prælabial plate, and the ventral pieces of the carapax.

It remains to speak of the areolate markings in the carapax of the Brachyura, and also of the relations of the parts to those homologous with them in the Macrourea.

4. *Areolate Markings on the Carapax of Crabs.*—The areas into which the surface of the carapax of Crabs is subdivided, were in part distinguished and named by Desmarest. But there is a uniformity of character and number which this author did not fully recognise.

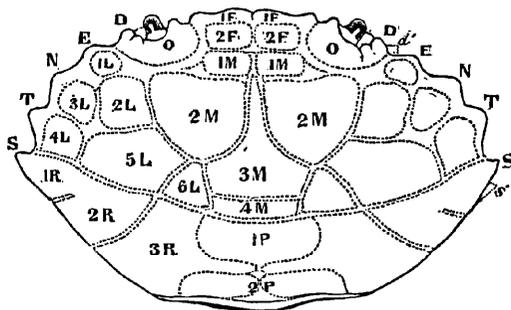
In those species of Cancroidea, which have the markings most perfectly brought out, and which exhibit best the system of areas, the carapax is divided transversely, in the first place, by a depressed line, commencing just anterior to the last of the normal lateral teeth, and crossing the carapax back of the middle; there is thus a *posterior* and an *anterior* portion.

The anterior portion is divided into three parts by depressions extending from back of the orbits obliquely inward to the transverse depression alluded to, which they meet a short distance either side of the centre. There are thus, to the anterior portion of the carapax, a *medial region*, and *two antero-lateral regions*. The medial region covers the stomach, from which it seems indirectly to derive its former outline, and includes the *gastric* and *genital* regions of Desmarest.

Near the front, between the orbits, a transverse line separates from the medial region, a region that we may call the *frontal*. And on either side, the orbits form another region, which may be designated the *orbital*.

The posterior portion of the carapax consists of a *postero-lateral* region, and a *posterior* region.

In the figure here given, the areolet of the *frontal* region are marked F; of the *orbital*, O; of the *medial*, M; of the *posterior*, P;



those of the *antero-lateral*, L; and those of the *postero-lateral*, R;—R being the initial of the last syllable of the word *lateral*, while L is the initial of the first.

The normal areolet of these several regions are as follows:—

a. *Frontal Region*.—1 F, the front margin; 2 F, a prominence just posterior to the front, either side of the middle.

b. *Medial Region*.—1 M, two small anterior prominences, the *præ-medial*; 2 M, two large areolet, the *extra-medial*, or gastric of Desmarest; 3 M, a large central areolet elongated anteriorly between the areolet 2 M, the *intra-medial*, or genital of Desmarest; 4 M, a transverse areolet, just posterior to 3 M, the *post-medial*. Two deep punctures (over processes on the inner surface that serve for the attachment of mandibular muscles), usually mark the limit between 3 M and 4 M, even when there is no depression. 1 M is here annexed to the medial, rather than frontal region, because it often coalesces with the former, and is a part of it, at times, in general outline. The whole medial region may also be called the *gastric*.

c. *Antero-Lateral Region*.—In this region there are normally six areolet:—1 L, near the first tooth following the post-orbital; 2 L, 3 L, posterior to 1 L, in a line nearly with the second tooth; 4 L, 5 L, 6 L, between 4 M and the third tooth.

d. *Postero-Lateral Region*.—This region on either side consists normally of three areolet, 1 R, 2 R, 3 R.

e. *Posterior Region*.—1 P is situated directly behind 4 M, and is sometimes well circumscribed, and occasionally has the shape nearly

of 3 M reversed and shortened; it is the *cardiac* of Desmarest, and may be so called. 2 P, directly behind 1 P, may be either simple, or, as is more common, divided into two areolets; Desmarest's designation, the *intestinal*, is appropriate.

*f. Orbital Region.*—The elevation which forms the upper side of the orbit is usually divided by sutures into three parts.

The variations in the markings of Crabs arise in the main from the greater or less prominence of these areolets, their various subdivisions or their obsolescence. When there are only a few undulations on the carapax, a little study with the normal type in view, will commonly discover that the system is there, although it may be but just apparent.

In the *obsolescence* of the areolets, the posterior are the first to disappear, and when so, this part of the surface is flat or only undulated. Next the postero-lateral fail; next, 5 L and 6 L coalesce, and also 1 M and 2 M. Next the posterior of the medial areolets become obsolete, and at the same time 5 L, 6 L disappear, or are indicated only by a slight undulation along the space that ordinarily separates them. The extra-medial may be circumscribed only anteriorly, and the slender elongation of the intra-medial be all that appears of that areolet; next, the remaining antero-lateral areolets may disappear with the frontal, and the surface is then quite smooth. 1 L is sometimes indistinct when the others are prominent, though usually it accompanies them.

When 4 L, 5 L, 6 L become indistinct, the transverse depression, described as separating the posterior and anterior portions of the carapax, may be obsolete, and the transverse line bends more forward, passing along by the side of 3 M, then anterior to 5 L, but not anterior to 4 L, in which case, the transverse line has nearly a straight, transverse course. Again, the line may pass anterior to 5 L, to the interval between the teeth N and T, or between E and N; and in the latter case it is often deep, as in the *Oxyrhyncha*.

In the *subdivision* of the areolets, the first that partake of it are 2 M, 5 L, and 3 M. A commencement of this division of 2 M, the extra-medial, is very common, and when completed, it divides it into two parts longitudinally.\* 5 L also subdivides from above across obliquely and inward; 3 M subdivides at times into three parts, as shown in some of the *Chlorodii* (see Atlas), and occasionally is farther divided. Again,

\* This is an important specific character, and though hitherto unmentioned in descriptions, is easily described when a proper notation is adopted.

2 M is not only divided in halves longitudinally, but each part is again divided. In the *Daïra perlata*,\* the outer half of 2 M consists of four tubercles, and the inner of three; 1 M consists of one; and 3 M is also divided into several tubercles. In some species, a portion is separated from the anterior part of each half of 2 M, while the rest remains entire.

It is common also for 1 R to be subdivided, or to have one or two tubercles upon its surface adjoining the transverse depression S S.

*g. Teeth of the Antero-lateral Margin.*—The teeth of the margin are normally *five* in number, including the post-orbital as the first. These five, in the preceding figure, are designated by the different letters of the Latin word *dentes* (or French, *dents*), D, E, N, T, S. Each tooth is often separated from the preceding by a suture, and these sutures may be continued on the under surface. The letters hence mark properly a lobe of the margin, rather than simply a tooth.

The teeth vary by obsolescence or subdivision, like the areolets.

In *obsolescence*, the tooth E (second), is commonly the first to disappear, this reducing the apparent number to *four*. Then N fades out, then T, leaving S alone, which also may be wanting. Again, S is sometimes smaller than T, or disappears altogether; in many species N, T, S, are all wanting.

In the *multiplication* of teeth, there is often, as a first addition, a tooth *s'* (or two *s'*, *s''*) posterior to S; it corresponds to the fold in the under surface shown at *s'* in figure 9 *d*, Plate 11.

There is often also a tooth *d'*, between D and E, on a lower level than D.

But the multiplication is generally dependent on the subdivision of the normal teeth, E, N, T, in addition sometimes to S and D; each of these teeth consisting of two or three teeth, either all equal, or one more prominent. In order to determine the normal relations of the teeth when the number is large, there is a guide in the areolets adjoining, when they exist; for the areolet 4 L stands against tooth T, and may be viewed as pertaining to the same lobe, it having about the same breadth as belongs to this lobe. So 3 L (or 3 L, 2 L), gives the breadth of the normal tooth or lobe N; and 1 L when present that of E. The lobes, or teeth, are often a little posterior to the areolets, or are in the same transverse line instead of anterior to them.

\* See Plate 10, fig. 4, where the separate regions are distinguished.

5. *Carapax of Macroura*.—We have been thus minute in detailing these peculiarities of the Brachyura, in this place rather than in connexion with our remarks on that order, because the subject has an important bearing upon the homologies of the Macroura, as compared with the Brachyura, to which subject we now allude. The question is—

*What part of the carapax in the Macroura, corresponds to the ventral pieces (or mandibular) in the Brachyura?* Milne Edwards observes, that the epimeral suture in the former group crosses the carapax near its middle; and that, therefore, the whole lateral and posterior portions are the analogues of the ventral pieces, or the *epimerals*, as designated by him. This suture will be observed in several species figured in the Atlas, and is particularly distinct in the genus *Astacus*. Milne Edwards thus makes the larger part of the carapax epimeral in character.

Excepting that we consider what is here called epimeral, the *mandibular segment*, we agree with 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 the Macroura.

On a hasty glance, we should hardly deem it probable that in species so closely related as the Brachyura and Macroura, the same parts should be so diverse. In the Scyllari, we may trace, on the surface of the carapax, the medial, cardiac, and other regions of the Brachyura, and in analogous positions; as though the surface had similar relations throughout. We should little think the depression between the cardiac and medial regions to be the course of a suture between the mandibular and second antennary segments, any more than it is so in the Cancroidea; yet below, there is a suture extending laterally from the anterior angles of the buccal area, which evidently corresponds to the suture in *Astacus* that is continuous across the back of the carapax in the line here pointed out. Moreover, there are no lateral pieces to the carapax. We are therefore forced to consider this suture, although in the Macroura nearly bisecting the carapax across, the same that takes a more backward course in the Brachyura, and separates only the narrow ventral pieces. There is no other suture of analogous character.

It is an important fact, in its relation to this subject, that although

the suture varies little in position in the Brachyura, still, as the species become more elongated, there is often a deep depression, corresponding precisely in its course to that of the Macroural suture. In the broad Cancridæ, having an areolate carapax, the more strongly-marked transverse depression is that which crosses just posterior to the medial and the antero-lateral regions, and terminates just anterior to the fifth normal tooth. But as the carapax elongates, this depression (which in all cases goes behind the medial region), instead of passing posterior to the antero-lateral regions, bends more forward, and terminates anterior either to the second or third normal teeth. Even in Eriphia, this depression has this forward course; and in the Oxyrhyncha, which are more narrow oblong, the depression is often strongly pronounced, and like the Macroural suture in position, both above and below, although never becoming a proper suture. The carapax seems, in such cases, to be divided across very nearly as in *Astacus*.

These relations just pointed out, may seem to show that the suture in the Macrourea is actually homologous with the depression in the Oxyrhyncha, rather than with the lateral suture of the carapax of these species. It certainly proves a similarity of position in the two; yet we are still disposed to infer, that the lateral suture of the Brachyura is actually represented by the transverse suture of the Macrourea. The latter have no lateral suture, and the transverse suture commences at the same point in each tribe. The Oxyrhyncha indicate, by the character mentioned, a tendency which is exhibited in a developed condition in the Macrourea. It is a foreshadowing of a structure which is not consistent with the Brachyural type, but which, when the abdomen is prolonged, as also the cephalothorax (as in *Pagurus* or *Astacus*), becomes characteristic of the body.

More direct evidence, with regard to the normal constitution of the Macroural carapax, is obtained by tracing the transitions through the Thalassinidea and *Astacus* to the other Macrourea. The longitudinal suture, called the epimeral by Edwards, actually exists in most Thalassinidea; and besides, there is a transverse suture crossing the back, as in *Astacus*, connecting nearly the middle points of the longitudinal sutures.\* The longitudinal sutures are nearly horizontal in *Thalassinia*, but more oblique in *Gebia*, very much as in *Astacus*.

\* See, in the Atlas, the Plate illustrating the Thalassinidea.

The anterior part of the longitudinal sutures and the transverse dorsal suture, taken together, constitute, therefore, the analogue of the transverse suture in *Astacus*. The anterior segment thus cut off, is the true first antennary; it is the only part which reaches this pair of organs. The posterior segment consists of a dorsal piece and two lateral, and cannot therefore be an epimeral to the anterior; it is rather a distinct segment, with its own epimerals separate. The dorsal segment of these three, is either narrow linear, as in *Thalassinea* (and also in *Pagurus*), or broad, as in *Gebia*. In *Astacus*, there are traces of the same division of the posterior part of the carapax into three parts, a dorsal and two lateral, and the dorsal piece is very narrow in some species (as *A. affinis*), and broad in others. There is a close correspondence with the structure exemplified in the *Thalassinidea*. The posterior part of the carapax must, therefore, be a separate segment, and is mainly if not wholly, the mandibular segment. We say *mainly*, for in *Thalassina* there is some reason for believing the posterior dorsal segment and the lateral pertaining to it, to include also two or three segments, more posterior, as there are transverse sutures indicating their limits. This point, and others bearing on this subject, are illustrated in our remarks on the group *Thalassinidea*.

A dissimilarity between related forms, like that described, is no unusual fact among Crustacea. In *Apus* and *Cypris*, the carapax is evidently either mandibular or second antennary, as in the *Brachyura*; for the body is attached to the shell only by its anterior portion. In *Daphnia*, closely related to *Cypris*, as explained beyond, there is a distinct cephalic suture, so that only a small anterior part of the carapax is second antennary, and all the rest is probably mandibular. Pass now to one of the *Cyclopida*. In these elongate forms, not far removed from the *Daphnia*, the shell of the cephalothorax, instead of pertaining to one or two segments, has distinct articulations behind, making, it may be, four segments in all; one quite oblong anteriorly, and the other three or four posteriorly. The anterior one, we might, perhaps, infer from analogy, to pertain to the mandibular or second antennary; but there is sometimes a cephalic segment, as in *Daphnia*, bearing only the second and first pair of antennæ; and there is also in other species still another suture posterior to the cephalic. Thus, the subdivisions of the shell of the cephalothorax are dependent on its connexion with the body. It may, as in *Daphnia*, belong to the anterior segments alone; or, as in *Cyclops*, to a series of segments. So, in the *Eubran-*

chiates, the body of the carapax of the Brachyura may pertain to the second antennary segment, and only small ventral pieces to the mandibular; while the Macroura, in which the shell is somewhat different in its connexion with the cephalothorax, and more oblong and narrow in form (as in Cyclops), may have the suture which separates the mandibular and second antennary segments, run across so as nearly to bisect the cephalothorax. Among the Schizopoda, closely related to the Macroura, the second antennary portion of the shell is still smaller. In some Mysidæ, there is an appearance of a cephalic suture nearly as in the Pontiæ; and in Lucifer, the second antennary segment is a narrow, neck-like elongation, anterior to the main part of the carapax, from which it is separated by a suture. There are hence variations even in species of the Macroural type (under which the Schizopoda are here included); so that, while in some, the suture between the second antennary and mandibular segments nearly bisects the carapax, in others, it separates only a small cephalic segment. Its position in the Brachyura is at the other extreme, the mandibular segment being reduced to the narrow ventral portions of the carapax.

The carapax in Scyllarus is abruptly inflexed either side, as in the Brachyura; while in most of the order Macroura, the lateral surface is flat or evenly convex, and no trace of the lateral margin is to be seen except in one or more spines, in a line below the line of the eyes, which appear to mark its position.

6. *Homologies of the Lower Crustacea.*—The carapax pertains normally to the anterior segments of the body in many of the lower Crustacea. In the Amphipods and other Choristopoda, it is cut short at the seventh normal segment, and covers only what may be called a head; this head is very small, and includes the mandibles and three pairs of maxillæ, besides the organs of the senses, leaving seven pairs of thoracic feet, each pair to its own well-developed segment. The exact normal relations of the shell of the head is with difficulty determined; yet the argument that this segment extends across below, just anterior to the mandibles, and only here, probably holds in this group, as in the Decapoda, so as to show that the shell pertains either to the mandibles or second antennæ: farther investigation may possibly bring out a more definite decision.

In the preceding remarks, we have anticipated, in part, what we have to say respecting the shell in the Entomostraca. Yet we mention the facts here in place, and with some more details.

In *Branchipus*, the same structure in this respect exists as in the *Choristopods*.

In *Cypridina*, of the *Cypris* group, the shell evidently corresponds to the second antennary or mandibular segment, or both, since it is in the neighbourhood of these parts that it is connected with the body. There is a dorsal union in the vicinity of the second antennæ, and a large transverse muscle either side, for closing the shell, that passes out from near the base of the mandibles and maxillæ. It seems probable, from facts observed in the *Daphnia* and *Cyclops* groups, that both the second antennary and mandibular segments are included, and the latter, perhaps, most largely.

In *Apus* there is the same dorsal union as in *Cypridina*.

In the *Daphnia* group, as already observed, there is a distinct segment of the body to each of the natatory legs, and therefore the buckler or shell must pertain to an anterior segment, and either to a maxillary, a mandibular, or a second antennary segment. Between the cephalic part bearing the antennæ (the second antennæ alone are present) and the rest of the carapax, there is often a suture, separating the shell into two distinct parts. The anterior part is evidently the second antennary segment; the posterior must belong therefore to the mandibular or maxillary segment, and probably to the former.

In the *Cyclopacea*, there is in *Cyclops* a single segment covering the cephalothorax to the ninth normal segment, and the ninth, tenth, eleventh, and twelfth segments (the following being wanting and the twelfth often so), are each distinct. From the close relations of these species to the *Schizopods*, we might infer that the shell of the large anterior segment belonged mainly to the second antennary segment. But a suture and constriction in species of the genus *Pontia* separates a head segment which is properly the antennary. The rest of the large segment, from analogy with the *Daphnidæ*, might then be attributed to the mandibular ring. But in many species of the same genus, there is another suture or articulation intersecting this segment near its middle, between the sixth and seventh normal rings, the first of the two bearing the mandibles, a pair of maxillæ, and a pair of maxillipeds, and the second, two pairs of legs. There is in this case a very different relation of the shell, approaching that in the *Choristopods*. It appears therefore to be a fact, that in some cases when the shell grows with an attachment along the whole thorax, the annulations, corresponding to the members below, may reach the surface.

In the Caligacea, there is a subdivision of the carapax very similar to what is found in the Cyclopacea. There is sometimes a very narrow *first antennary* segment in front, distinctly articulated with the following part; then a large segment covering the second antennæ and the following four pairs of organs; next a segment bearing two pairs of legs, and then two segments each with a single pair,—the whole corresponding to eleven normal segments. The last four pairs of legs are very similar in form and structure to those corresponding in the Cyclopacea, and the only essential difference is, that a fifth pair (twelfth segment), often present in the latter for prehension in coition, is not found in the Caligacea.

The examples referred to, are sufficient to exhibit the varieties of composition in the carapax or shell of Crustacea of different tribes or families; and without pursuing the subject farther, we annex a table showing the normal relations of the segments and members for the predominant forms. In this table the normal segments are numbered in the first column with Roman numerals. The fact that the appendages of a segment are obsolete, is indicated by a zero; and that both a segment and its appendages are obsolete, by two zeros.

## A TABULAR VIEW OF

EUBRANCHIATA <i>vel</i> DECAPODA.					ANOMOB RANCHIATA.						
SEGMENTS.	CANCER.		SCYLARUS.		SQUILLA.		EUPHAUSIA.		LUCIFER.		
	Cephalo- thorax.	Artic. Append.	Br. Append.	Artic. Append.	Br. Append.	Artic. Append.	Br. App.	Artic. Append.	Br. App.	Artic. Append.	Br. App.
I.	Oculi.		Oculi.		Oculi.		Oculi.		Oculi.		
II.	Ant. I.		Ant. I.		Ant. I.		Ant. I.		Ant. I.		
III.	Ant. II.		Ant. II.		Ant. II.		Ant. II.		Ant. II.		
IV.	Mand.		Mand.		Mand.		Mand.		Mand.		
V.	Max. I.		Max. I.		Max.		Max.		Max. I.		
VI.	Max. II.		Max. II.		Maxd.		Maxd.		Max. II.		
VII.	Maxd. I.		Maxd. I.		P. ped. I.		P. bifid. I.		Maxd.		
VIII.	Maxd. II.	I. II.	Maxd. II.	I. II.	P. preh. II.		P. bifid. II.	I.	P. subped.		
IX.	Maxd. III.	III. IV. V.	Maxd. III.	III. IV. V.	P. preh. III.		P. bifid. III.	II.	P. subped.		
X.	P. preh. I.	VI. VII.	P. ped. I.	VI.-VIII.	P. preh. IV.		P. bifid. IV.	III.	P. subped.		
XI.	P. ped. II.	VIII.	P. ped. II.	IX.-XII.	P. preh. V.		P. bifid. V.	IV.	P. subped.		
XII.	P. ped. III.	IX.	P. ped. III.	XIII. XVI.	P. bifid. VI.		P. bifid. VI.	V.	P. subped.		
XIII.	P. ped. IV.		P. ped. IV.	XVII. XX.	P. bifid. VII.		o. P.	VI.	o. P.		
XIV.	P. ped. V.		P. ped. V.	XXI.	P. bifid. VIII.		o. P.	VII.	o. P.		
Abdomen.											
I.	App. I.		App. I.		App. I.	I.	App. I.		App. I.		
II.	App. II.		App. II.		App. II.	II.	App. II.		App. II.		
III.	App. III.		App. III.		App. III.	III.	App. III.		App. III.		
IV.	App. IV.		App. IV.		App. IV.	IV.	App. IV.		App. IV.		
V.	App. V.		App. V.		App. V.	V.	App. V.		App. V.		
VI.	App. caud.		App. caud.		App. caud.		App. caud.		App. caud.		
VII.	o. App.		o. App.		o. App.		o. App.		o. App.		

Obsolete.

\* In this table the following abbreviations are used:—*Ant.*, antennæ; *App.*, appendices; *Branch.*, branchiales; *caud.*, caudales; *Mand.*, mandibuli; *Max.*, maxillæ; *Maxd.*, maxil-

## THE HOMOLOGIES OF CRUSTACEA.\*

CHORISTOPODA.			ENTOMOSTRACA.				
SEGMENTS.	TALITRUS.	SPHEROMA.	CYCLOPS.	CALIGUS.	PENILIA.	DAPHNIA.	CYPRIS.
Cephalo- thorax.	Artic. Appendages.	Artic. Appendages.	Artic. Append.	Artic. Append.	Artic. Append.	Artic. Append.	Artic. Append.
I.	0.	0.	00.	00.	00.	00.	00.
II.	Ant. I.	Ant. I.	Ant. I.	Ant. I.	Ant. I.	00.	Ant. I.
III.	Ant. II.	Ant. II.	Ant. II.	Ant. II.	Ant. II.	Ant. II.	Ant. II.
IV.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.
V.	Max. I.	Max. I.	Max.	Maxd.	Max.	Max.	Max.
VI.	Max. II.	Max. II.	Maxd.	P. ped.	P. nat.	P. nat.	Maxd.
VII.	Maxd.	Maxd.	P. preh.	P. preh.	P. nat.	P. nat.	P. ped.
VIII.	P. ped. I.	P. ped. I.	P. nat.	P. nat.	P. nat.	P. nat.	P. ovar.
IX.	P. ped. II.— <i>Branch.</i>	P. ped. II.	P. nat.	P. nat.	P. nat.	P. nat.	00.
X.	P. ped. III.— <i>Branch.</i>	P. ped. III.	P. nat.	P. nat.	P. nat.	P. nat.	00.
XI.	P. ped. IV.— <i>Branch.</i>	P. ped. IV.	P. nat.	P. nat.	P. nat.	00.	00.
XII.	P. ped. V.— <i>Branch.</i>	P. ped. V.	0. vel 00.	00.	00.	00.	00.
XIII.	P. ped. VI.— <i>Branch.</i>	P. ped. VI.	00.	00.	00.	00.	00.
XIV.	P. ped. VII.	P. ped. VII.	00.	00.	00.	00.	00.
Abdomen.							
I.	App. nat.	App. I.— <i>Branch.</i>	0. v. P. rud.	0. v. 00.	P. rud.	0. v. P. rud.	0. v. 00.
II.	App. nat.	App. II.— <i>Branch.</i>	0.	0.	0.	0.	0.
III.	App. nat.	App. III.— <i>Branch.</i>	0.	0.	0.	0.	0.
IV.	App. styl.	App. IV.— <i>Branch.</i>	0.	0.	0.	0.	0.
V.	App. styl.	App. V.— <i>Branch.</i>	0.	0.	0.	0.	0.
VI.	App. styl.	App. VI. stylif.	App. caud.				
VII.	0. app.	0. app.	00.	00.	00.	00.	00.

lipedes; *nat.*, natatorii; *ovar.*, ovariani; *ped.*, pediformes; *preh.*, prehensiles; *rud.*, rudimentarii; *styl.*, styliformes; *subped.*, subpediformes.

*Limulus*.—In *Limulus*, the body consists of three segments, and they may be compared to the segments in *Caligus*. The anterior segment bears six pairs of members; the *first* appears to correspond to the second pair of antennæ (or third normal segment), the *second*, *third*, *fourth*, *fifth*, and *sixth*, to the mandibles and the four following pairs of members (or the fourth to the eighth normal segments inclusive). In the *Caligus*, the last pair here referred to is natatory, and the carapax is divided just anterior to it, instead of posterior.

The second segment of the body, which we consider as a continuation of the cephalothorax, and not abdominal, bears *six* pairs of foliaceous organs, analogous to the foliaceous appendages of the posterior part of the thorax, in certain *Caligidæ*, in some of which, one or two pairs of legs are combined into a broad thin plate, like an apron. These six pairs make up exactly the normal number of cephalothoracic segments,—*fourteen*. It is an objection to viewing this segment as abdominal, that in no Entomostracan is the abdomen provided with branchial appendages. Moreover, the close relation to the *Caligidæ*,—the resemblance as regards the general form and subdivision of the shell, supposing the two segments both cephalothoracic,—and the near resemblance between the foliaceous appendages and the cephalothoracic appendages, in certain *Caligi* as well as in *Apus* and the allied, are believed to be good reasons for adopting the opinion which we have here brought forward.

The *abdomen*, according to this view, is confined to the last or third segment.

7. *Homologies of the Phyllopoda*.—The Phyllopoda, in which the number of segments exceeds the normal number, offer a difficult problem to science, viz., the determination of the normal relations of the appendages. In *Branchipus*, the number of segments is twenty-two, of which *nine* belong to the abdomen, *eleven* to the body posterior to the second pair of maxillæ; *seven* being the normal number for the former, and *eight* for the latter. In *Limnadia*, there are eighteen or twenty-seven pairs of thoracic members following a pair of maxillæ and mandibles. In *Apus*, there is a pair of mandibles, then two of maxillæ, then a large series of legs, all of which are more or less foliaceous excepting the anterior. In *Nebalia*, the abnormal character is the same, although the members are not as much multiplied.

The most natural supposition, in view of the fact that the members of Crustacea consist normally of three parts or branches, a tigelus, a palpus, and a fouet, is that the multiplication consists in these several parts (two of them or the three) becoming separate legs and at the same time having separate segments in the body, the normal basal portions of each possibly corresponding to these segments; and possibly we see some analogy also in the multiplication of branchiæ, two or three being often appended to a single leg in the Decapods.

In Limnadia, there are eighteen or twenty-seven such legs, each number a multiple of three. The form of the animal, even to its abdomen and its thoracic members, is very much like a Daphnia. In the genus *Penilia* of the Daphnia group, the number of pairs of legs is six, and they occupy the sixth to the eleventh normal segments, the last three segments of the thorax being obsolete, as in *Caligus* and *Cyclops*. If now the number of legs of *Penilia* be multiplied by three, it gives the number in a species of *Limnadia*; and again, if the number of pairs of legs in *Penilia* be increased by three (the number of obsolete segments), and then the sum be multiplied by three, it gives twenty-seven, as found in another *Limnadia*. The arrangement will then be as follows:—

Normal Segment	I.	Obsolete.
"	"	II., III. Antennæ.
"	"	IV. Mandibles.
"	"	V. One pair of maxillæ.
"	"	VI.–XI. Six segments with eighteen pairs of branchial plates.
"	"	XII.–XIV. Three segments, obsolete.

Or, if the number of branchial plates is twenty-seven, the normal segments VI. to XIV. (nine in number) may correspond to them.

In *Nebalia*\* there are only the normal number to the thorax, if the four pairs of two-branched or natatory members are annexed to the abdomen, as so considered by Milne Edwards.† But by this arrangement, the abdomen is abnormal in number of segments when the

\* We here take under consideration the *Nebalia Geoffroyi*, well figured and described by Milne Edwards; see *Ann. des Sci. Nat.*, xiii. 297, pl. 15; *ibid.* [2], iii. 309; also *Illust. of Cuv. Règne Animal*, by M. Edwards, pl. 72, fig. 1. The species figured by Leach, and upon which the genus was founded, has not yet been described with full details; it appears to have five pairs of natatory feet.

† *Règne Animal, Crust.*, pl. 4.

thorax is not, a condition improbable. Moreover, as the animal is much like a Schizopod, it has some bearing on this question, that the carapax covers the segments to which the four pairs of natatory legs belong, as if these were thoracic members. Again, the following part of the body, consisting of four segments, resembles an abdomen, and seems to be complete in itself and has the number of articulations usual in the Cyclopidæ, another group to which *Nebalia* is related; and the appendages below to the first two of these joints are rudimentary and very different from those of the joints preceding. The natatory legs are very closely similar to the four pairs of the Caligidæ and Cyclops, appended to the posterior cephalothoracic segments. On this ground we conclude that the eight pairs of branchial plates, and eight segments in *Nebalia*, belong to the four normal rings, and suggest that the arrangement of the members may be as follows:—

Normal Segment I. Eyes.

“	“	II., III. Two pairs of antennæ.
“	“	IV. Mandibles.
“	“	V., VI. Two pairs of maxillæ.
“	“	VII.–X. Four segments and eight pairs of branchial legs or plates.
“	“	XI.–XIV. Four segments and four pairs of natatory legs.

In *Branchipus*, the eyes, antennæ, mandibles and two pairs of maxillæ, belong as usual to six segments. Then there are eleven segments remaining, instead of eight. We have no evidence sufficient for laying down decisively the true arrangement; we only suggest the following:—

Normal Segment I. Eyes.

“	“	II., III. Antennæ.
“	“	IV. Mandibles.
“	“	V., VI. Two pairs of maxillæ.
“	“	VII.–XI. (Five segments) ten pairs of branchial legs.
“	“	XII. Eleventh pair of branchial legs.
“	“	XIII. and XIV. Obsolete, as in <i>Pontia</i> among the Cyclopidæ, to which genus the <i>Branchipus</i> has relations in general form.

This subject has a high interest, on account of the fact that the earliest Crustacea (*Trilobites*) were abnormal in number of segments, like the *Phyllopora*. They correspond to some modification of the law which now prevails in this class of animals. The basis for con-

clusions upon the homologies of these species is so unsatisfactory, that all that is here brought forward, may be received as only hints by way of suggestion, and not as well-grounded conclusions.

The excessive number of joints in the Phyllopoda finds an analogy in the Vermes, and in the larves of Insects, and it is perfectly in harmony with the law laid down by Prof. Agassiz, who observes that the same peculiarity characterizes the Crustacea of the earliest geological epochs. This peculiarity is evidence of inferiority of grade, such as marks animal life of other kinds in the Palæozoic period.



## CRUSTACEA PODOPHTHALMIA.

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### ORDER I. EUBRANCHIATA.

THE subdivision of the EUBRANCHIATA or Decapoda into three groups, *Brachyura*, *Anomoura*, and *Macroura*, proposed by Milne Edwards, has been mentioned. This arrangement has been objected to by some authors, who recognise only the first and last groups as natural; the *Anomoura* being distributed between the others. On this subject we offer the following considerations. In the course of our observations we shall have to assume the correctness of the subdivisions of the *Brachyura*, which subject is discussed on the following pages.

The division *Anomoura*, was instituted for certain Decapoda having an intermediate character between the *Macroura* and *Brachyura*. When these two great groups are regarded in their embryogenic relations, the propriety of recognising such a division seems to be strikingly apparent. We observe, in this light, that the species are like marks along the several lines, between the lower and higher of these grades, some partaking nearly of the character of the higher grade, others nearly of the lower; yet they are so far distinct, that the relation of the whole is better apprehended, if they are arranged in a separate division—as a kind of transition class—than if the species are divided, and merged in the two grand divisions. Viewing the *Eubranchiata* in their relative grades, we naturally look upon the *Brachyura* as having the higher position—as higher in space, if we conceive the generic names as having a location; and, the *Macroura*, in a similar manner as having a lower position; while between the

two, partaking neither of the typical characters of the former or latter, a number of forms are arranged, that are as stepping-stones from one to the other. A subdivision into a higher, and a lower, and a transition group, is therefore, true to nature and convenient to the mind.

It is of great interest to trace out these relations; and, in order to appreciate their true value, we must first comprehend in what way, or by what characteristics, superiority of grade is exhibited. Concentration in the nervous system, has been well shown to be the basis of it. and simplicity (under certain limitations) in number of external members or parts, its exhibition. Prof. Agassiz has shown that the larger number of articulations in the body, and of limbs appended to them, form a mark of inferiority of grade. This characteristic is a mark of the vegetative quality prevailing over the animal. The caterpillar, with its long, many-jointed body and numerous legs, is an inferior grade or condition of the butterfly; in the former, the abdominal and digestive part predominates; in the latter, the cephalothoracic, or those parts by which the higher functions of the animal are performed, and the head is a single centre, in which the senses and organs of the mouth are closely grouped.

The Eubranchiata, among Crustacea, afford another illustration of this principle. It is well known, since the investigations of Thompson and Rathke, that the imperfect Crab has the long tail of the Macroura. The fact, that the Macroura are a lower grade, is therefore obvious from this analogy. Like the larvæ among insects, the abdominal portion of the body is largely developed and furnished with appendages; and usually this portion far exceeds in extent the cephalothoracic. But, in the Crab, the abdomen is reduced to its minimum, and in males is memberless; the whole force of the system is concentrated in the cephalothorax; and, even the nervous ganglia of the members, as Edwards and Audouin have well exhibited, are gathered into a single mass, while they are like distant knots in a long cord in the Macroura.

But there are other marks of superiority beside these well-known and often-mentioned facts; and the additional points to which we now allude must be understood, before we can explain the gradations among the Anomoura.

It is one distinction between Crustacea and true insects, that the former have no proper head. Among those Crustacea that rank highest, we ought to find the nearest approximation to the concentrated or

closely-grouped cephalic organs of Insecta. The MAIROID species are placed in the first rank by Edwards, and all facts sustain them in this position. Here we find the eyes and the two pairs of antennæ brought most intimately into conjunction. The narrow front of the species (unlike the broad Cancer), concurs to this end. The eyes, moreover, extend in deep orbits, nearly to the medial line; and directly beneath them, in the same line, lie the two pairs of antennæ; the inner on a narrow, longitudinal space, and the outer close alongside. The mouth-organs are much more posterior; and here Crustacea diverge from the Insecta. The Maiioidea are then the highest, as well from the organs of the senses, as the grouping of the thoracic ganglia.

This concentration is farther seen in the complete coalescence between the base of the outer antennæ and the shell below.

It is also observed in the insignificant size of the flagellum of these antennæ. With a highly sensitive nervous system, a long external appendage is not necessary. Such an elongation of these organs is to be found only as we descend in the scale. Among the Macroura there is the largest development, and there is often an appendiculate scale or lamella, by which the surface is still more enlarged.

Passing from the Maiioidea, to the CANCROIDEA, we find the eyes and antennæ still almost as nearly in the same transverse line; the outer (or second) antennæ are, however, a little more posterior, and the inner are almost always transverse, instead of longitudinal, separating widely the outer antennæ. The eyes, moreover, are more distant at base. We detect, therefore, less evidence of the concentration pointed out in the Maiioidea;—there is a partial dispersion of the forces which are most energetic when so grouped together as to add the force of each to all, with combined effect. Besides this, the base of the outer antennæ is bounded by a distinct suture on the outer side, instead of being soldered to the shell, and in some cases of lower grade, this first joint is quite free, and may even have motion. The abdomen and sternum is still narrow, as in the Maiioidea.

These observations would place the Cancers highest among the Cancroidea, since these species have the antennary space narrow, and the inner antennæ longitudinal,—and the Portunidæ or swimming species low, as here the outer antennæ are often free at base.

In the GRAPSOIDEA, which follow next as a class, the eyes are usually

still more distant. But there are Cancroidea that approach the Grapsoid species in the distant eyes, and there are Grapsoida which even exceed the Cancroid species in the approximation of the eyes at base. This character, therefore, would place the two groups on nearly the same level, or, we should rather say, that the grades are various in both groups, yet the average character is somewhat higher in the Cancroidea. The broader sternum and abdomen common in the Grapsoids, is proof of the lower grade of the class. The outer antennæ are small, as in the Cancroids.

In the LEUCOSOIDEA, we find the same narrow front, approximate eyes, and small antennary space, as in the Maioids, and their characteristics afford evidence of the high grade of the species. The more perfect character of the efferent channel of the branchial cavity appears to be a step beyond what is found in the other Brachyura. The prælabial plate in the *Macroura* and ordinary *Brachyura* is essentially the same; the improvement exhibited in passing from the lower to the higher grade consists in its more perfect limits anteriorly, and the more accurate adaptation of the outer maxillipeds to its borders. Another step occasionally observed, is the division of it by a low ridge separating an outer portion as the efferent channel. But in the Leucosoids, there is a higher perfecting of the branchial system, this channel being made a complete tube, through the modification of the prælabial plate—its elongation in front at middle—in conjunction with the elongation and adaptation of a branch of the first pair of maxillipeds. It is difficult to decide whether this peculiarity should be admitted as proving a higher grade in the species, or only in the branchial system alone. The existence of the ridge on the prælabial plate is not throughout a mark of superiority, since the *Maioida* have no such ridge, although unquestionably higher than the *Eriphinae*, in which species such a ridge exists. All the facts, however, combine to give the Leucosoids, especially the family *Leucosidæ*, a high rank—but little inferior, we believe, to that of the *Maioids*. They have a narrow, small abdomen, a well-compacted body, and often the hardest shells that occur among Crustacea. The broad form of the *Calappa* is only a lateral extension either side of the posterior part of the carapax.

The CORYSTOIDEA, the only remaining grand division of the *Brachyura*, has several marks of inferiority of grade. This inferiority is strikingly seen in the large outer antennæ, by which they approach

the Hippidea and the Macroura; and we find these antennæ longer as the body passes from the transverse to the narrow elongate form. In the broad Trichocera, they are but little longer than in some Cancridæ; but in Corystes, the length is as great as in Hippa, and the organ is fringed with hairs through all its length.\* We see in them, therefore, the degraded Cancroid, and no resemblance to the Leucosoids. Again, the outer maxillipeds are often prolonged over the epistome, and as this is most striking in the narrower species which bear other marks of degradation, this quality may be taken as another proof of their inferior grade; they approximate, in the ill-defined front margin of the epistome, to the Macroura.

This review of the relative rank of the different grand divisions of the Brachyura, prepares us to trace farther the gradations through the Anomoura to the Macroura.

The peculiarities of the Macroura which should be in mind, are as follows:—

1. A large, elongate, extended abdomen, with five pairs of appendages beneath, and another caudal pair (to the penult segment).
2. Carapax, with rare exceptions, free at the side, and not soldered anteriorly (as in the Brachyura) to the epistome.
3. Inner antennæ without fossettes, and elongated.
4. Outer antennæ posterior and often exterior to the eyes, elongated, and often having a lamellar appendage at base.
5. Front margin of buccal area not a distinct margin, and outer maxillipeds pediform, instead of opercular.
6. Vulvæ in coxæ of third pair of legs, and no copulative pouch.
7. No sella turcica or median apodeme.
8. The nervous cord elongated down the abdomen, and having a series of ganglions.
9. Branchiæ usually more than nine in number.
10. The carapax without a suture along the sides, but when any exists, it crosses the middle of the back; that is, as has been explained on a preceding page, the mandibular segment instead of forming only the margin of the carapax either side, constitutes its posterior half when any distinction of the segments is to be discovered.

\* It should not be understood that we consider small antennæ a necessary mark of higher grade; on the contrary, it is possible that the organs may be obsolescent, and so mark inferiority, as in *Acanthocyclus*. We allude only to a general principle, the point of which must be obvious without further explanation.

We here give only a summary of the prominent characteristics, in order to illustrate thereby the gradations into this type from the Brachyural.

From the high rank of the typical Maioidæ, the first point of degradation seen is in the Parthenopinea. They are the Cancroid forms of this group, having the short epistome of the Cancroidea, and the base of the outer antennæ usually bounded exteriorly by a suture, and commonly a rather broad front, though still rostrate.

The second step in degradation is to the Oncininea, the outer antennæ being here wholly free and cylindrical. Moreover the two posterior pairs of legs are prehensile. The other characters pertain to the Maioid type, and are in accordance with the typical Brachyura.

The grade next lower carries the series below the true Brachyural level. Either the branchiæ are more numerous; or the outer antennæ are posterior to the eyes; or the inner antennæ have no fossettes; and in connexion with one or the other of these marks of degradation, the vulvæ are peculiar in being situated in the basal joint of the third pair of legs, as in the Macroura, instead of in the sternal plate, as in the Brachyura; and the abdomen begins to show some traces of increase, either in its appendages, or size, or both. Besides, the posterior legs are more or less prehensile, as in *Oncinopus*, and also much smaller than the others,—this smaller size, both here, and where it occurs in the Macroura, being a mark of low grade. Internally, the sella turcica, median apodeme, and female copulative pouch, are wanting.

This degradation is seen in *Latreillia*, an Inachoid form; the posterior legs being shorter and prehensile—the anterior antennæ without fossettes—the posterior antennæ arising from behind the eyes—the vulvæ in the base of the third pair of legs—the sella turcica and median apodeme wanting. The species, however, have the Brachyural number of branchiæ, and the habit of a Leptopodia.

It is observed again in *Dromia*, a Trichia-like form. The genus *Trichia* is of the Parthenopinea group, and is Libinioid in aspect; it is a transition genus between the Parthenopinea and the Dromioids. Here the antennæ are as in the Parthenopinea; but the four posterior legs are prehensile, the branchiæ abnormal (fourteen) in number, the vulvæ, sella turcica, and median apodeme as in *Latreillia*. The abdomen in both these genera is small, yet in the last, there are traces of a transition character.

A still lower degradation of the Maioid type brings us to *Lithodes*

and Pagurus. In these genera, the eyes are anterior to the first antennæ, even pertaining to a separate annulus, and the second antennæ are still more posterior, and usually exterior to the eyes. Thus the concentration and close conjunction of the organs of the senses, so characteristic of the typical Maia, gradually fades, and these organs instead of being combined, begin to take on an arrangement in series like the posterior members of the body. The abdomen is also largely developed, and in Pagurus a pair of appendages to the penult segment unites with the last segment in forming a caudal termination to the body, like that of the Macroura. The posterior thoracic legs are short; and other characters show the grade of the species to be but little removed from the true Macroural type.

Descending still lower, we come into the range of the Macroura. The family which appears to represent the Paguri, is the Thalassina group. This is seen in the form and markings of the cephalothorax; the characters of several of the legs; the first and third pairs of maxillipeds; and the outer antennæ mostly without an appendicular plate. The abdomen has the true Macroural character, being fully elongated, and furnished with a range of appendages below, in both sexes. On a still lower level, we find this type again represented in the Squillidæ, to which group, certain of the Thalassinidea show an approximation. The Squillidæ, without thoracic branchiæ, are among the lowest of Crustacea with pedunculate eyes, and belong to the group *Anomobranchiata*.

We have thus followed the Maioid type in its degradations to the Macroura, or even below this level. We may pursue the same course, though not in all cases to the same extent, with the other grand divisions.

It was seen that the Maioidean series passes down from the Parthenopinea, the lower type of the division. An obvious series direct from the Cancroidea, passes through the Corystoidea, which have a relation to the Cancroids somewhat similar to that which the Parthenopinea have to the Maioids, excepting a wider separation. The group into which the Corystoidea leads is the Hippidea. The form of the narrower species approaches Hippa; the antennæ are very similar: the legs in the swimming species show an approach to this group; and in general aspect, also, there is much resemblance. But in the Hippidea, the abdomen is much elongated and has appendages either side of the last segment; the last thoracic legs are short, and the species present the various other characteristics which widely

separate them from the Brachyura. We do not attempt to point to any genus among the Macroura representing the Hippidea. Another line from the Cancroidea passes through *Acanthocyclus* to *Corystoides*, the latter genus having, like the Macroura, no fossettes for the inner antennæ, and both differing from the true *Corystoidea* in the outer antennæ being obsolete. *Bellia*, according to Edwards, has like characters nearly with *Corystoides*.

The Grapsoid species are represented of a degraded form in *Porcellana*, and the particular connecting genera appear to be *Grapsus* and *Plagusia*. The articulation of the fourth joint of the outer maxillipeds with the outer angle of the third joint, shows that the type is Grapsoid. But here the abdomen is enlarged and partly free; the lateral appendages of the caudal extremity are large; the outer antennæ are posterior and exterior to the eyes; the posterior thoracic legs are small and dorsal; and various other characters separate the species from the Brachyura. While, at the same time, the inflexed abdomen, with only a single pair of appendages in the male, the inner antennæ with fossettes, the outer maxillipeds covering tolerably well the buccal area, and the general habit, are far from Macroural in character.

A still lower grade of this type is seen in *Galathæa*. The general characters are similar to those of *Porcellana*; but both thorax and abdomen are more elongated, and the habit is rather Macroural than Brachyural, and there are even present in males, the full number of abdominal appendages. But, as De Haan with his usual acumen has detected, the carapax has the lateral suture of the Brachyura. It appears then to be a group closely on the confines of the Macroura, if not properly one of that division.

Through *Galathea*, we believe we may point out a passage into the Macroural dominion by *Æglea* to *Astacus*. *Æglea* has the branchiæ of the *Astacus* group, consisting of clusters of minute cylinders, and thus is not of the *Galathæa* family, although similar in habit and in the posterior thoracic legs. We should thus connect the Macroura with the Brachyura through two lines, one by *Callianassa* and *Pagurus*, and the other by *Astacus* and *Galathæa*.

The Leucosoid type is found only in a single degraded form,—that of the *Ranina* family. The species are nearly like *Brachyura* in many characters. Yet the inner antennæ have no fossettes; and the vulvæ are in the base of the third pair of legs. The mouth is nearly as in *Leucosia* or *Matuta*, and the feet are swimming feet, as in *Matuta*. The first step towards this degradation is seen in *Dorippus*,

in which the feet of the two posterior pairs are short and subdorsal, as in *Dromia*; yet the essential characters are all Brachyural. De Haan points out a relation between the *Ranina* group and *Homarus* among the *Macroura*, mentioning a resemblance in the inner branch of the first maxillipeds, which is narrow and elongate, and also in several other characters.\*

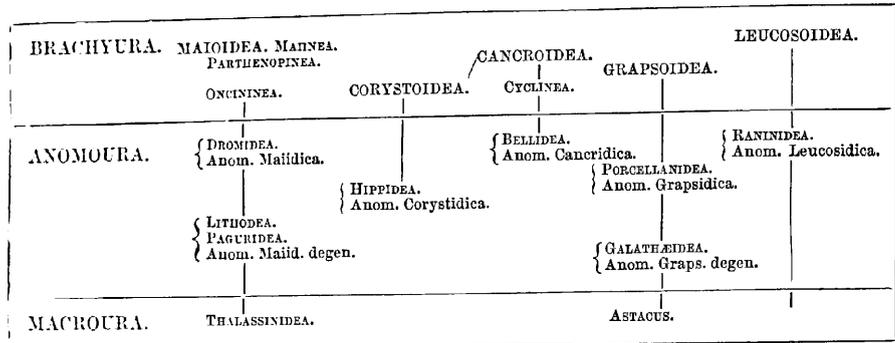
From these facts with regard to the gradations of the species, it is evident that we present a clearer view of the relations, if we keep the Brachyural and Macroural groups distinct, each at its own level and within its own circumscribed limits, and place the intermediate links in a separate group, as proposed by Edwards. We may thus more readily point out and exhibit these links and gradations. The mind in its conceptions of the range and relations of the several groups, imagining the interlinkings to take place among points in space, would thus locate them. We therefore believe, that the group *Anomoura* is established on philosophical grounds. Its diversities of types are not greater than are found among the *Brachyura*, although more striking as they occur among so small a number of species.

Some interesting points will be developed on a farther consideration of the subject.

We have found that the *Maioides* are connected with the *Macroura* through *three* distinct grades of degradation, following *Oncinopus* and *Trichia*,—i. e., the *Dromioid*, the *Lithodioid*, and the *Paguroid*. Below the *Corystoidea* we distinguish but one grade. Again, below the *Grapsoides*, we find but one (*Porcellana*) until we reach *Galathæa*, just on the confines of the *Macroura*. The greater number of distinct gradations between the *Maia* and Macroural type is a consequence, evidently, of the high pre-eminence of the *Maia* type. Counting *Parthenopinea*, and *Oncinopus*, as two proper grades in the descent, we may distinguish five in all. From the *Cancroids* (ranging in the same grade nearly with *Parthenopinea*), we pass to the *Corystoidea*, which is a longer step than from *Maia* to *Parthenopinea*; and thence to *Hippidea*, which ranges at a lower level than *Dromia*, and a little above *Pagurus*. From *Grapsoides*, still lower than *Cancroidea*, we pass to *Porcellana*, nearly on the same level with *Hippa*, and thence to *Galathæa*, but just above the *Macroura*. I have attempted to represent this relative grade by the relative level or height in the following table; and, although a rude representation of nature, it gives some

\* *Crust. Faun. Japon.*, p. vii.

idea of the gradal relations of the groups. I give only the prominent and obvious lines of relation, and not the many interlinkings of affinities or convergences between the several lines.



This system of arrangement gives a very different view of the affinities and gradations of species from the circles of De Haan, and, we think, one that is more just to nature. Indeed, we deem the "circular system," as it is called, a splendid failure, in the effort of mind to compass the kingdom of life. It was a brilliant scheme when first brought forward, embracing much respecting the relations or affinities of species that then seemed almost like a new revelation; but as the first glare has now passed, we can perceive that while it attempted to rid science of the straight and rigid bars of artificial systems, it only modified the mode of coercion, by bending the bars into circles. There are neither straight lines nor circles in nature, but main branching lines, with subordinate branches, and almost endless reticulations or anastomoses, by curves of all kinds and of all grades of divergence and convergence.

According to the above explanations, we may consider—

- The DROMIDEA, as the Anomoura Maiidica.
- The LITHODEA and PAGURIDEA, as the Anomoura Maiidica degenerata.
- The BELLIDEA, as the Anomoura Cancridica.
- The HIPPIDEA, as the Anomoura Corystidica.
- The PORCELLANIDEA, as the Anomoura Grapsidica.
- The GALATHEIDEA, as the Anomoura Grapsidica degenerata.
- The RANINIDEA, as the Anomoura Leucosidica.

We may distinguish thence four grades of the Anomoura.

I. ANOMOURA SUPERIORA.—*Dromidea*, *Bellidea*, and *Raninidea*: closely Brachyural in most characters; eyes not anterior to inner antennæ in

position; outer antennæ sometimes posterior to eyes, but not exterior; abdomen small and applied closely to sternum; caudal extremity without lateral appendages.

II. ANOMOURA MEDIA.—*Hippidea* and *Porcellanidea*: eyes not anterior in position to inner antennæ; outer antennæ posterior and exterior to eyes; caudal extremity with lateral appendages; abdomen rather large and free, or laxly applied to the sternum.

III. ANOMOURA SUBMEDIA.—*Lithodea*: eyes anterior in position to inner antennæ; abdomen broad and not symmetrical, without caudal appendages; second, third, and fourth pairs of feet, similar.

IV. ANOMOURA INFERIORA.—*Paguridea* and *Galathæidea*: eyes anterior in position to inner antennæ; abdomen large, hardly inflexed, and having lateral appendages to caudal extremity.

Reaching the Macroual level, we find no longer a few species only to a type, as in the Anomoura; there is a vast development of forms with even a smaller variety of types. A distinct system of structure is arrived at, which is not of the nature of a transition or mixed style of insect-architecture, but a perfect and simple style of itself, and upon this system as a basis, the number of modifications is exceedingly large. There is a surprising fertility in the expressions of the one idea exhibited in the Macroual structure, and we cannot fail to admire the infinity of resource displayed—which is the more wonderful as it is not developed where the diversity of types and grades favoured diversity of forms, as in the Anomoura, but in a single grade, and as the development of a single defined thought.

Among the Macroura there are not those marks of imperfection found in the Anomoura. The posterior thoracic legs are well developed; the abdomen is not a sluggish unwieldy mass, as in the Paguri, but has a graceful outline and members to aid in its motions; and the general figure of the body has not the half-finished aspect, the abortive appearance, and clumsy limbs, which are so unlike either the true Brachyura or Macroura. There is a balance in the forces, which gives perfection to every organ, and all portions are like the well-ordered parts of a harmonious structure.

In rising from the Macroual grade to a higher, the great point of progress lies in the more efficient or concentrated character to be given to the organs of the senses; as these are the centres of force, they are therefore highest in the power required for elevation.

Among the lower Brachyura, the Grapsoidea, the posterior legs are

often disproportionably smaller than the others, and it is this pair which takes the swimming character in the natatory species—this form being of a lower grade embryologically, than the gressorial. In a grade below the Macroura, the *Anomobranchiates*, these same legs are again found to fail of development.

It is a fact worthy of notice, that the genus *Dromia*, which is higher than *Latreillia* or *Homola*, in having fossettes to the inner antennæ, has a mark of a lower character in having two pairs of legs dorsal and abbreviated instead of one. But may not the condition of the cephalic functions have a relation to the latter? May not the cephalic progress towards the Brachyural type, show in what way or degree the forces were exerted in the different directions in these different Anomoural forms?

Taking the space between the mandibles and the first pair of antennæ, as the region which may be called the centre of development, since this part first appears in the progress within the egg, and looking upon the succeeding developments as going on anteriorly and posteriorly in the cephalothorax from this point as a centre, the actual distance to which such a development of members goes on, may be regarded as inversely as the force required for them. The greater the force required, the less the distance.\* The large amount of force required for the cephalic organs (the senses), is thus indicated by the shortness of the distance, and the more perfect the concentration or close conjunction of these members (which is equivalent to the shorter the space, provided the results are well perfected), the higher the grade of the species, and the greater the concentration of force expended in the result. The formation of the cephalic organs precedes that of the thoracic legs, yet not their completion. They have an earlier existence, but their perfection goes on in continued progress as with higher orders of animals, and they are not ordinarily finished until the whole form is complete. Hence, while the successive developments are going on posterior to the mandibles, there is successive progress anterior to them, and the centre still holds its first position. When then, as in *Latreillia*, we find the cephalic organs disjoined or separated, we observe in this fact, evidence of that same

\* That is, the distance to which the development of members goes on, and not mere development of the shell, as in the growth of the beak, or some analogous enlargement of vegetative character.

diminution of force which is exhibited by the partial development of the posterior pair of legs. The force is exerted in an animal modelled after the Brachyural type; and a failure or decrease of energy in one direction has its almost necessary parallel in diminished energy at the other extremity; the first antennæ without fossettes, and the second antennæ behind the eyes, balance the abbreviated posterior pair of legs. It is not until the grade of the senses is of a lower order, requiring less force for development, and a type is assumed which has the anterior or cephalic part more prolonged, that we find again the posterior legs fully formed; and this type is the Macroural. In the Macroura, as in the Brachyura, the forces are well balanced, and every part has its full development; they represent, as we have said, two distinct *styles* of structure, and the only two among the species under discussion: the Anomoura are a transition grade, or a mixed style.

In Dromia, the broader front and more distant eyes indicate, as in the Parthenopinea, some degradation from the high Maia rank. The senses are of a lower order, and their development, hence, requires less force; and consequently, although the antennæ, as regards the fossettes and relative position, are more as in the perfect type, this alone is not a mark of superiority. There is a sluggishness in the animal that is proof of the low condition of the senses. The progress of growth anterior to the centre of development, for these reasons, may actually require less force, as compared with that required posteriorly to finish out the full Brachyura, than in Latreillia; and hence the *two* posterior pairs of legs in Dromia are abbreviated. The abbreviation of the carapax behind in most Anomoura, is another mark of the same general principle—not a necessary though common fact.

It may be said, that the object of the shorter hind legs of the Dromia and allied species is sufficiently shown in the uses to which they are put,—their enabling the animal to cover its back with shells or foreign substances, and that we need not look to any principle like that here brought forward. But this resource is necessary to the animal only because of its inferior character. They have not the agility, or strength, or wit of the true Brachyura; and hence take the clumsy aid of some foreign body or material, for self-defence. They have an order of senses or a nervous force approaching that of the Macroura, but placed in a system, that of the Brachyura, which is wielded with vigour only when nerved after the full Brachyural mode.

The use of the hinder legs in these species is therefore additional evidence of their degraded system. The structure is not a primal idea of itself, but a result of the same cause which has degraded the senses, and given the whole character to the species.

In these observations we favour no monad theory: we simply endeavour to illustrate the general law or plan which the Infinite Creator exhibits in his works.

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#### TRIBE I. BRACHYURA.

BEFORE offering remarks on the special classification of the Brachyura, it is important to enter upon some general considerations with respect to the importance of different organs as a basis of classification.

It has already been explained that no *à priori* reasoning can prove satisfactory; for there must be a special study of the objects to be classified, before the value of the characters exhibited, even by one of the highest order of organs, can be accepted as of paramount importance. We have illustrated this on a preceding page, by alluding to the great discrepancies that exist among the different departments of Crustacea, as regards the organs of the vital functions. The nervous system is evidently the highest in its influence upon the vital energies of the species, and its characters afford the most striking distinctions between the several grand divisions in Zoology. Yet, general structure and plan of embryological development have a more exalted importance; and though no nerves may be detected in certain Radiata, they are Radiata still, and are not thereby removed from other species in which such nerves may be distinct. It might seem *à priori* very improbable, that species in which there is but one thoracic ganglion with radiating nerves, should be intimately related to species in which there are half a dozen or more ganglions, at intervals in a long cord; yet the nerves, though so unlike, are found to be indicative of only a narrow divergence, merely that which divides the Brachyura and Macroura. The general relations of structure, as exhibited in

the succession of parts forming the body, the similarity in the modes of aeration, in the organs of the senses and the mouth, are evidences of a common type, and a general resemblance of habit or mode of life; and a study of the embryology of these Crustacea, explains this close typical affiliation. The value of any characters is hence to be ascertained by a direct study of their bearing among the various species.

It should be remembered, moreover, that the characteristics mentioned in a description are not always the fundamental differences, though as far as possible they should so be. The several fundamental differences may be indicated perhaps by a mere angle in the shell; and hence, when this is found to be the case, the peculiarity of this angle is often mentioned, and the fact it indicates left untold. It is, therefore, a general truth, that external characters are often of value, not for what they are, but rather for what they indicate. In one division, a character may be of the very lowest importance, distinguishing, possibly, only species, when it separated families or tribes in another department. The pointed front of the Maioid Crustacea is characteristic; for there is a range of peculiarities at once suggested by it. But this form was allowed in the early stages of the science, to gather many species into the same division with the Maioidea, which have since been shown to be widely separate. The character is valuable for what it indicates, and not for itself alone. The long anterior legs of the Parthenope group afford an obvious characteristic for the group; but this is not the important characteristic, but only an external mark of actual peculiarities. The long posterior legs of certain Maioid species have been allowed to have the same value in Taxonomy; yet in fact, this character in itself indicates no other difference of any moment, and is, therefore, of little real value as a source of distinction. Yet if, in any subdivision of the Maioidea, this peculiarity should be found to be a regular attendant upon other important peculiarities, it would become a convenient and useful means of characterizing the group or groups.

In searching for characteristics of the natural groups among the Brachyura, we should, perhaps naturally, look first to the *nervous system*. Yet, it is generally true, that this system does not undergo variations correspondent with the minor subdivisions in Zoology. It has its several types of structure, and under these types it is accommodated in its character to the various forms of species, rather than to differences in other functions or in habits.

We next look to the *nutritive system*. But this system, among the Brachyura, is very uniform in character. The mandibles, the organs which should be the first to exhibit any fundamental distinctions, are of one type; having a simple cutting edge and but slight variations in form, or in the character of the jointed appendage. These organs are the earliest in embryologic development, preceding even the antennæ, and this fact would give to their distinctions, if there were such, a high value in classification.

With regard to the organs following the mandibles,—the maxillæ and maxillipeds,—there is no *à priori* ground for giving to their characters a primary rank. They are related normally to the legs which follow, and are not a necessary part of the nutritive system, and moreover, are subsequent to the antennæ and eyes in embryological development. In those of their peculiarities which have *especial reference to the functions of the mouth*, their variations of form are mostly of little value.

The exterior maxillipeds may vary widely in the same family or even genus, or may have the same characters through very different groups. The variations of the widest importance are in the articulation of the fourth segment with the third, which may take place at the inner apex of the latter, its summit margin, or outer apex. A large division of the Brachyura is characterized by the first of these three modes, and another group of natural limits (Grapsodea), by the second and third.

It should be observed, that there is a liability to error in referring some examples to the second of these modes. It not unfrequently happens that the third joint is much elongated along the inner side, and is also obliquely truncated, as usual towards the summit on this side; and in consequence, the summit margin, instead of being horizontal or nearly so, slopes very much outward, or may even be nearly longitudinal. In such a case, the fourth joint, to the view, is articulated with the summit of the third joint, although normally with the *inner apex*, the summit and inner apex being really the same part. There are many cases of this kind. Eurypodius is an example of this elongated third joint; while in the genus Oregonia, to which it is very nearly related, the third joint has the ordinary shorter form, and the articulation with the inner apex is distinct.

The relative lengths of the second and third joints of the outer maxillipeds afford distinctions often of generic importance, and so also

some peculiarities in the palpus; but even for generic distinctions, they may be too much relied upon.

We have observed above, that the mode of articulation between the third and fourth segments of the outer maxillipeds distinguishes the Grapsoidea. Yet it should be understood, that while this is true, this is not the most prominent characteristic of the Grapsoidea.

The mouth area, besides subserving the purposes of the mouth, is also, the place for the passage of the waters used by the branchiæ in aeration. The current flows over the prælabial plate, beneath the maxillipeds. This function involves modifications in the buccal organs which are of great importance. But the considerations connected with this point properly relate to the *system of aeration*.

The *branchial system* is one from which we should particularly expect important distinctions and valuable characteristics of the highest significance; and such distinctions exist. They are at the basis of some of the primary subdivisions, as exhibited in the system of Milne Edwards, and to a large extent, also, in the system of De Haan. A large group of species, the Leucosoidea (Oxystomata of Edwards), have the buccal area narrowing forward, sometimes nearly to a point; and this is not due to any peculiar modification of the nutritive system, but to an adaptation of the buccal area to certain peculiar modes of aeration. In these adaptations in different groups, the part of the buccal organs especially devoted to the branchial system (apart from the basal appendages or "fouets") is the inner branch of the first pair of maxillipeds (or third maxillæ). This lamellar branch covers the efferent branchial current, forming a covered passage for it, and, as well illustrated by De Haan, it is especially devoted to this purpose, the water flowing beneath it to the anterior margin of the buccal area, where it passes out. This thin plate, which is but a small appendage to the first maxillipeds, has hence a high functional importance.

This efferent passage from the branchial cavity, in a large part of the Brachyura, covers each half of the prælabial plate, or else the outer portions of each half; and in many species, when the latter is the case, there is a small longitudinal ridge on the prælabial plate, separating the efferent passage from the rest of the plate. The importance of such a ridge as a means of distinction, is hence obvious. It is of higher value than the greater or less breadth of the inner maxilliped branch that covers the passage, or the fact that this branch has a straight or sinuous margin, or some other like modification.

Most of the swimming Cancroidea have this ridge prominent, and the lamellar maxilliped branch is rather narrow. But in a *Lupa* (*L. cribraria*), this ridge is wanting, and the lamellar branch is quite broad, covering the praelabial plate to its centre. This is a striking instance of a wide discrepancy among species that have hitherto been referred to a single genus. The completeness with which this lamellar branch of the first maxillipeds is adapted to cover the efferent passage, varies much in different families; it is not always wide, as in the *L. cribraria*, when the ridge alluded to is wanting.

The larger part of the Brachyura have the characters just described. But in another part, the efferent passage, instead of passing over the *outer* portions of the praelabial plate, passes inward and makes its exit by the *middle* portion, which is prolonged forward. These are the Leucosoidea or Oxystomata (sharp-mouthed Crustacea). The narrow anterior limit of the mouth forms the place of exit for the pair of efferent passages; and by means of a ridge, and the same lamellar maxilliped branch, here much elongated and narrow, the efferent passage is made a complete tube, well inclosed. This passage, it will be perceived, passes *inside* of the ridge in the Leucosoidea, and *outside* of it (or *outside* of the position it would occupy, if there is none) in the other Brachyura. The afferent passage, in such cases, may occupy the outer portion of the buccal area (that is, the same part that is the efferent in all other Brachyura), or it may enter from a point posterior to the mouth, in which case it is like other Brachyura.

The branchial system also varies in the number of branchiæ, though not in their structure. But this variation in number is only a variation in the amount of surface exposed to aeration, or rather, in the number of subdivisions. It is of less moment than the striking difference in the mode of carrying on the branchial function, between the Leucosoidea and other Brachyura. The triangular mouth of the Oxystomes, is hence, a significant characteristic,—not as to mode of nutrition, but of aeration. De Haan, in his system, has well exhibited this prominent peculiarity of the Leucosoidea, and has drawn out with more strictness the limits of this group than is done by Edwards.

The *system of reproduction*, next to the branchial, affords characters of the widest bearing in classification. But these characters are observed in the position of the external parts, rather than in internal peculiarities. The connexion of the male verges with the posterior

segment of the thorax is universal. But in a large portion of the species, the verges proceed directly from the base of the posterior legs; while in another large group, they pass from the sternum inside of the base of the legs. This important distinction is well used in the classification of Crustacea by Milne Edwards, and is neglected in that by De Haan. In fact, the position of the verges is nearly the same in all, as regards distance from the medial line; and the difference in the external position arises from the greater or less width of the sternum behind, which in the Grapsoidea throws the posterior legs farther from the medial line. The female vulvæ are situated in the sternal plate.

Passing from the branchial system, we next appeal to the *organs of the senses* for distinctions. But here the differences among different groups are mostly small. The *eyes* may be longer or shorter pedunculate; but mere variations in length of peduncle is a character of a low grade. They may arise from near the medial line of the body, or remote from it,—sometimes a generic distinction and rarely of higher value. They may have distinct orbits for retraction, or be without such orbits,—a characteristic of considerable importance. They may have the eye at the extremity of the peduncle, or the peduncle produced beyond the eye,—a striking instance of an anomaly which is only trivial in value.

The two pairs of *antennæ* are organs of high rank, and afford important distinctions, as would be gathered from the remarks on the degradation of species, on a preceding page. The condition of these organs is one of the most prominent marks of grade or rank. Yet it should be noted, that in each of the several divisions of the Brachyura, similar variations of grade exist, and the characteristics they afford are not superior to those of general structure.

The *inner antennæ* may be longitudinal or transverse. When the former, it is owing to the narrowness of the space between the eyes, and the closer approximation of all the organs of sense, and as already explained, this position is often a mark of the higher grade, it characterizing preeminently the Maia group.

The *outer antennæ* vary in position with reference to the eyes, and also in the condition of the basal joint. They are sometimes so situated that when the animal is in its natural position, the first basal joint is directly beneath the eye and extends forward beyond it. Such species—the Maioidæ—have the front narrow, and the basal joint is soldered firm to the shell outside. Combined with the form, it is an

important distinction. In many other Crustacea, like the Cancroidea, the basal joint is situated inward of the eyes, and more posterior, and rarely projects beyond them; besides, instead of being soldered continuously with the shell outside, it is separated by a distinct suture, though still immoveable. In other species, still, the antennæ have free motion from their very base. These are both marks of a lower grade than that exhibited by the concentrated and consolidated condition in the Maia type.

The outer antennæ are usually quite small and naked, or nearly so, and extend forward and outward. But in one group (the Corystoidea), they are generally long and hairy or ciliate, and extend inward and forward.

In *structure, form, and organs of locomotion*, the differences are mostly of small value, characterizing genera rather than higher groups. Yet *form* is important, when sustained by other characters. Among the Leucosoidea there is a strange diversity of shape; the broad convex Hepatus, the still broader Calappa with thin extended sides, the globular Ilia, and narrow-snouted Leucosia, Ixa with its sides lengthened into cylinders, and the thorny Iphis, make a fantastic group; yet all are of one tribe. But among the other Brachyura there is much less variation. The oblong Maia, narrowing anteriorly, is widely diverse from the broad Cancer, with its arcuate front margin, and as diverse from the square Grapsus; and these several forms are characteristic of as many groups, though liable to variations of considerable amount. The narrow head of the Maia throws the bases of the eyes almost in contact, and places these organs over the base of the outer antennæ; at the same time, while the front is elongated, the epistome is long for its breadth, and a narrow, oblong space is left for the inner antennæ, which are therefore longitudinal. The broader form of the Cancer allows the eyes to be distant, the base of the outer antennæ to be interior to them instead of directly beneath, and as the front also is not produced, the epistome is very short, and the inner antennæ are usually transverse. Yet even with the broad form, the bases of the eyes may be nearly in contact, as in Ocypoda; and since in these species the front is not lengthened into a beak, it follows that the antennary space directly beneath or adjoining the narrow frontal piece is exceedingly reduced in size, and the antennæ are minute. This is also true of the Oxytomes, in which the front is very narrow.

Milne Edwards, with his usual acumen, has also pointed out pecu-

liarities in the sternal plate and abdomen, which are of considerable weight. While, in a large part of the species, the male abdomen is as broad behind as the sternum, there are others in which it is much narrower behind. The sternum may be narrow behind, with an abdomen equally narrow at base—broad with an abdomen narrow at base—broad with an abdomen broad at base; and these differences are of much use in certain divisions of the species.

From this review of the relative value of the distinctions among the Brachyura, we may pass to the use of these differences in classification. And, in the first place, we would express our high estimate of the vast labour and profound researches in this department, of Edwards, the eminent Zoologist of France, and first Crustaceologist of the age. And if we venture to differ from him in any point, it is with the consciousness of having been helped forward to our starting-point by the results of his investigations. And as science with the world, and least of all with him, is not at a stand-still, we may believe that his own labours, if recently bestowed on the subject, would have evolved many improvements, the long period of near twenty years having elapsed since his system was published.

We cannot omit to mention, also, the benefit derived from the magnificent work of De Haan. We have admired the wonderful fidelity of his plates, the thorough spirit of investigation displayed throughout his princely volume, and the judgment with which he has seized upon typical forms in instituting genera. We have observed the large addition of facts developed by his investigations, and the new light thrown upon the relations of many groups. Yet we shall have to object to a defective system of arrangement and description, especially as relates to the Brachyura, by which his types are often thrown into wrong associations, and the groups they typify are laid down with false limits.

Among the distinctions pointed out in the foregoing review, we place first those dependent on the branchial system. The characters based on the opening of the efferent channel are fundamental in themselves, and the species of the two groups thus indicated, have wider differences than any that may be found among the species in either group. The Leucosoidea are thus strikingly distinct from all other Brachyura.

But we exclude from this division, as done by De Haan, the *Corys-*  
*toid* species, placed in the group by Edwards; for these are Cancroid

in the efferent channel and branchial peculiarities, as well as in many other particulars, although some species have the buccal area a little narrower anteriorly than behind.

The *number* of branchiæ is less distinctive, as already explained.

The characters next highest in value, are those of the genital system, especially the position of the male appendages.

To a certain extent the general form is of great importance, inasmuch as the form is an indication of the position of the internal parts of species, and preeminently of the greater or less concentration of the organs of the senses. We perceive at once the wide distance between the Maiioidea,—in which the anterior, across the medial or stomach region is narrow, with the front narrow and prolonged, and the great bulk of the body is posterior to its middle,—and the Cancer or Grapsus, which forms have the body as broad before as behind, and no rostral elongation in front. The character of the epistome, and the relation of the outer antennæ to the eyes, are dependent on the form.

Of considerable weight may be the characters afforded by the *outer maxillipeds* and *outer antennæ*—the articulation of the third and fourth segments of the outer maxillipeds, whether at the inner apex of the former or remote from this apex—the size of the outer antennæ, whether small, naked, and flexed outward, or large, hairy, or flexed inward. The maxillipeds thus separate the MAIOIDEA and CANCROIDEA from the GRAPSOIDEA; and the outer antennæ remove the CORYSTOIDEA from the other groups, allying them at the same time to the Hippidea.

We thus arrive at the grand divisions instituted by Milne Edwards, with the exception of the separation of the Corystoidea from the Leucosoidea, of which we propose to make a separate group. In the Maia and Leucosia groups we agree nearly with De Haan, but not in the other groups.

The five subtribes into which the Brachyura are distributed, are characterized as follows:—

#### I. CRUSTACEA MAIOIDEA.

I. Via efferens partes palati laterales trajiciens; area buccalis subquadrata.

II. Pyramis branchialis novem branchiis instructus, septem branchiis superficiem pyramidis construentibus.

III. Appendices maris genitales basi pedum 5torum ortæ, abdomine semper celatæ.

IV. Articulus maxillipedis externi 3tius, 4tum apice interno aut summo sistens.

V. Carapax sæpissimè oblongus, antice augustus et sæpe subacuminatus aut rostratus. Epistoma sæpius grande. Antennæ internæ longitudinales. [Sæpius antennarum articulus 1mus externarum sub oculo insitus et antice productus.]

VI. Flagellum antennarum externarum parvulum nudum vel nudiusculum, extrorsum plus minusve flexum.

## II. CRUSTACEA CANCROIDEA.

Discrimina I., II., III., IV., VI., ut in Maiioideis.

V. Carapax sæpissimè transversus (interdum quadratus vel orbicularis), antice latus, arcuatus, nec rostratus, nec acuminatus. Epistoma breve. Antennæ internæ sæpissime transversæ. Antennarum articulus 1mus externarum infra oculum insitus, antice non productus, suturâ disjunctus.

## III. CRUSTACEA CORYSTOIDEA.

Discrimina I., II., III., IV., ut in Maiioideis.

V. Carapax paulo transversus, orbicularis vel oblongus, antice arcuatus, sæpissime triangulatè rostratus. Epistoma brevissimum. Antennæ internæ longitudinales.

VI. Antennarum externarum flagellum elongatum, sive ciliatum, sive paulo hirsutum, introrsum paulo flexum.

## IV. CRUSTACEA GRAPSOIDEA.

Discrimina I., VI., ut in Maiioideis.

II. Pyramis branchialis novem branchias raro habens, 4-6 oblongis superficiem pyramidis constituentibus.

III. Appendices maris genitales sive sterno ortæ sive basi pedum posticorum, deinde canaliculo sterni jacentes.

IV. Articulus maxillipedis externi 3tius 4tum apice externo margineve apicali sistens.

V. Carapax antice latus, sæpe subquadratus, interdum subglobosus,

antice transversus vel arcuatus, nunquam rostratus. Epistoma brevissimum.

#### V. CRUSTACEA LEUCOSOIDEA.

I. Via efferens medium palati trajiciens; area buccalis plus minusve triangulata.

II. Pyramis branchialis 7-9 branchiis instructus.

Discrimina III., VI., ut in Maioides.

V. Carapax sive transversus sive subglobosus. Frons angustissimus. Epistoma nullum. Antennæ minutæ.

The Maioidea pass into the Cancroidea through the Parthenope group, the species of which are mostly *transverse* in form, with a *short epistome*, and have the first joint of the outer antennæ situated *more inward* than the eyes, and *rarely produced beyond them*, besides being either free or bounded commonly by a distinct suture on the outer side, and occupying a hiatus in the orbital margin,—in all of which points they differ from the Maia type.

The Cancroidea pass into the Corystoidea through the genus Cancer (Leach), and Pirimela, which have the outer maxillipeds projecting somewhat over the epistome. Pirimela has also the narrow form of the Corystoidea. But neither genus has the outer antennæ of Corystes. There is also a passage into the Anomoura through Acanthocyclus, in which the form is circular, the outer antennæ obsolete, and the branchiæ less than the normal number; the line through Acanthocyclus leads to Corystoides and Bellia, genera of inferior grade, approaching the Macroura in having no fossettes for the inner antennæ, although Brachyural in form.

The Cancroidea and Grapsoidea are united, through Eriphia and Telphusa on one side, and the Gonoplax group on the other. Telphusa, although Grapsoid in form, has the same number of branchiæ as in the Cancroidea, a similar abdomen, and a like position for the male appendages, and belongs properly therefore with the Cancer group. In Gonoplax and some allied genera, the outer maxillipeds are Cancroid in character, and unlike the other Grapsoidea, the male verges are, in some cases, inserted in the basal joints of the two posterior legs, instead of the sternum; yet they are conducted in a channel in the sternum and so pass beneath the abdomen instead of being covered by the abdomen from their insertion, as in Telphusa and the true Cancroids.

We close these remarks on the Brachyura with some observations on the classification of De Haan. The exalted merit of his labours seems to forbid criticism on a matter of arrangement. Yet classification is of the highest importance; since it should exhibit the progress and condition of the science, and present in a single view its general truths. The defects in his system have arisen from a wrong principle, as we think, in its very foundation; and the results of the principle are seen, not only in many of the larger divisions, but also in laying down his genera. The objectionable point referred to, is his giving paramount importance in classification to the maxillipeds,—the true value of which has been already explained. In the Leucosoidea they have a strongly characteristic form, and this group is readily characterized by reference to them. Yet even in this they may be treated with undue importance. The true distinction of the Leucosoidea is exhibited not in the inner maxillipeds, but in the character of the efferent branchial channel: the peculiarity in this important function is the fundamental difference separating these from other Brachyura. The elongate form of the inner branch of the first maxillipeds is rather an indication of the difference, than correctly the great point of difference.

The grand divisions of the Brachyura in De Haan's system are as follows:—A. BRACHYGNATHA, including I. Cancroidea; II. Maiacea; III. Dromiacea; IV. Trichidea: B. OXYSTOMATA, including I. Dorippidea; II. Calappidea; III. Matutoidea; IV. Leucosidea: and the Cancroidea are subdivided into *Corystes*, *Cancer*, *Portunus*, *Ocypoda*, and *Grapsus* groups.

In the primary divisions, the Oxystomata (curtailed of the *Corystes* group, placed among them by Edwards, McLeay, and other authors) make a natural section among the Brachyura: they are the Leucosoidea of the system adopted. The character of the efferent channel affords a strongly-marked division. But in making out a natural classification, it is necessary to inquire whether there may not be other distinctions equally important; whether, among those species that are alike in the efferent channel, there may not be points of difference fully as essential, thus requiring the institution of other groups of like importance with that of the Leucosoidea. The arrangement which has been proposed contains our views on this point. The *Maia*, *Cancer*, and *Grapsus* types, have each important characteristics, based upon points

of structure, not less fundamental, or of less functional value, than that distinguishing the *Leucosia* section.

In the first of the grand divisions of De Haan, the Cancer and Grapsus groups are embraced under the tribe Cancroidea, while the Maia group is a distinct tribe. Yet it is evident that the Maia and Cancer groups have even closer relations than the Cancer and Grapsus groups. The former are related in most of the prominent characters,—the branchial, buccal, abdominal, and genital; although so unlike in the narrow front, the more posterior position of the parts within, the antennæ and other points, as to authorize a separation of the two. While the Grapsoid species are remote from the Cancroids, not only in general form, but more essentially in the number of branchiæ, the insertion of the male sexual appendages, and the articulations of the outer maxillipeds, which here take a peculiar character, sustained through nearly all the group.

Trichidea includes the single genus *Trichia*—in form near a slightly transverse *Mithrax* or a *Parthenope*; in number of branchiæ, male appendages, and abdomen, like the *Maioidæ* and *Cancroidea*; in the first basal joint of the outer antennæ being situated in a hiatus of the orbit, not projecting beyond it, bounded by a suture outside, and in the character of the orbit, like *Parthenope* and most *Cancroidea*, and unlike the *Maiinca*; in the longitudinal inner antennæ like *Parthenope* and other *Maioidæ*. In all its essential characters, it is related to *Parthenope*. The form of the maxillipeds is near the same in *Dromia*, which genus has also similar antennæ. But *Dromia* is also related to *Parthenope*; yet, unlike *Trichia*, it is a degraded form, verging towards the *Macroura*, as has been explained.

The *Dromiacea* are evidently intermediate between the *Brachyura* and *Macroura* in the characters alluded to; and although nearer the former than the latter, they are best retained in the tribe *Anomoura*. No species but these transition forms have the number of branchiæ larger than the normal number, or the vulvæ in the base of the third pair of legs. De Haan has transferred to *Dromiacea*, the genus *Latreillia*. He has greatly increased our knowledge of these species, showing that they have the posterior legs of a *Dromia*, and the same position to the vulvæ; moreover, they were known to have no fossettes for the inner antennæ, and the outer antennæ free and moveable to the base. These are all characters of the *Anomoura*; and there is but one essential point in which they are different.—

in the number of branchiæ being but *nine*, as in the *Maiinea*. The position of the genus between *Dromia*, and the long-legged *Maiinea* is evident, but its closest relations are with the former, as shown by De Haan. The genus *Oncinopus* is, in our view, a genus on the same line of transition, between *Latreillia* and the *Maiinea*, but belongs with the latter.

Such objections we are disposed to offer to the higher divisions in the system of De Haan. It is in the lower subdivisions that the maxillipeds are relied upon, to the exclusion, mostly, of more important characteristics.

In the subdivisions of the Cancroidea, the groups *Cancer*, *Corystes*, *Grapsus*, *Ocypoda*, and *Portunus* (called by De Haan genera), are characterized by reference to the first and third maxillipeds. The insertion of the fourth joint of the outer maxillipeds remote from the inner apex of the third, separates *Ocypoda* and *Grapsus* from the rest.

In his synoptical table of genera of the Cancroidea, *Corystes* and *Cancer* differ in the former having the third joint of the outer maxillipeds *oblong-quadrate* or *elongate*, and the latter *quadrate* or *transverse*. Yet in half the genera of the *Corystes* group, the form of this joint is not oblong, and in some genera of the *Cancer* group it may be elongate. In the genus *Cancer*, this joint is usually oblong, and it often overlaps somewhat the epistome, as in many *Corystidea*. Even in the genus *Xantho*, in which this joint is usually transverse or quadrate, it is sometimes much elongate, as is seen in *X. Orbignii* (Edw. and L.), in which it resembles what is seen in some *Corystes*, though not expanded over the epistome. When we consider that these outer maxillipeds are only modified legs, we feel at once the fact that such variations are of small moment,—nothing in fact, but the more or less extension of a margin; only the connexion of such a variation with the necessities of some vital function in the animal, could give it a wide value in classification.

The group *Portunus* is naturally distinguished by their having a peculiar lobe to the inner margin of the interior branch of the first maxillipeds. The detection of this important character is due to De Haan. *Platyonychus* and *Carcinus* are thus excluded from the group, and on account of the character of the outer maxillipeds, De Haan places these genera in his group *Corystes*, to the species of which they bear some resemblance in form. In our view, these and the allied genera more properly constitute a distinct family, near the *Portunus* group. The large outer antennæ of the *Corystes* group, flexed

inward at base, are so peculiar, and so evident an exhibition of a relation to the Hippidea, that we naturally give it a prominent place among the characteristics of the Corystoid Crustacea. We have remarked in a former paragraph upon its being a mark of degradation. We should, hence, exclude *Platyonychus*, and the allied, from direct association with *Corystes*, notwithstanding the similarity in the outer maxillipeds. Indeed, in all their characters they are so closely like many Cancroid species, that we find no means of distinction. If then they are Cancroid in character, and not Corystoid, they must be arranged, either in the *Portunus* group as a separate subdivision of it, or they should form a distinct division among the Cancroidea. We incline to make them a distinct division near the *Portunida*. The genus *Pirimela* is placed by De Haan in the *Corystes* group, for the same reason as *Platyonychus*, although essentially Cancroid in character. The genus *Cancer* has almost equal title to a place there, and on like grounds.

The importance allowed to the outer maxillipeds has led to other unnatural associations among his Cancroidea. The *Cancer* group contains species that have the general habit, branchiæ, and other characters of the *Grapsida*. I refer to the *Gonoplax* family, which is rightly placed with the *Grapsus* group by Edwards. They have the fourth joint of the outer maxillipeds articulated with the inner apex of the third joint, and this is the only character that would ally them with the *Cancer* division, rather than with *Grapsus*.

The distinction between *Ocypoda* and *Grapsus*, depending on whether the fourth joint of the outer maxillipeds is articulated with the summit, or with the outer apex of the third joint, is exceedingly difficult of application, and does not in all cases, lead to natural associations. *Cardisoma* and *Uca* are arranged by De Haan in the *Ocypod* group, and *Gecarcinus* in the *Grapsus* group.

The difficulties from relying so implicitly on the maxillipeds are still more strongly seen in the generic distinctions as given by De Haan. There are cases in which the distinctions are good; but they are used to such an extent as to be in the main bad. The genus *Xantho* is said to have the third joint of the outer maxillipeds subquadrate, a character which would exclude species in which it is oblong: and it embraces species that are not true *Xanthos*, if judged by the character of the antennæ, organs of higher importance than the maxillipeds. The genus *Eudora*, containing the *Rupellia tenax* of Edwards, is so characterized as to include a *Xantho*; that is, the character of the orbit of the *Rupellia*, which has no similar example except in the

related genus *Eriphia*, is disregarded, and species of different natural groups are brought together. It cannot be said on any ground that *Ruppellia* and *Eudora* are synonymes, and the latter name can be sustained only by sustaining also the system of De Haan. Again, the genera *Xantho*, *Liagore*, and *Galene* are described as having the inner branch of the first maxillipeds terminate in a short dilatate triangle. If we take *Xantho* with its typical species, and trace the genus through its range, we find it passing into narrower forms, of the same essential characters, (though referred by us to *Paraxanthus*,) in which this triangle is narrow-oblong instead of short-dilatate, and closely like that of *Pilumnus*, which is *narrow-trigonal*. Indeed, it is found that the form of this branch varies directly with the breadth of the species, and is equivalent in value, as a generic characteristic, to the breadth of the species, and of no value at all in itself. The same variations take place in Leach's *Chlorodius* as in *Xantho*. The character given for *Pilumnus* would, therefore, include true *Xanthos* or *Paraxanthi*, and also, true *Chlorodii*. Thus the true limits of groups are not defined, and perplexing ambiguities meet one at every step. Milne Edwards's system left the press the following year after the publication of De Haan's synopsis of genera; and it is obvious that no amount of study could have enabled him to comprehend all the genera of De Haan, so as not to have duplicated them in his own work. Such duplications actually took place, and if the names of either author are to be retained, science would most justly award the honour to him who characterized them so as to be recognised by others. Still, it should be remembered that the science is vastly indebted to De Haan for his researches. He has developed many important distinctions. It is of much interest to know, that while the broad *Cancroidea* have generally the inner branch of the first maxillipeds broad-triangular, the species of the genus *Cancer*, which are remarkable for their breadth, have the same branch narrow-triangular; for it shows a correspondence with the front and inner antennary areas, which are also narrow, the latter so much so, that the antennæ are *longitudinal*, while transverse in all other *Cancroidea*. The divergence of the genus *Cancer* from the other genera of *Cancroidea*, is thus rendered more apparent.

Among the *Portunidæ*, other discrepancies between species and the generic characters laid down in De Haan's system, may be briefly alluded to. *Amphitrite* is said to have the third joint of the outer maxillipeds *short and oblique*. This genus is a subdivision of *Lupa*.

corresponding nearly to Edwards's division "Lupées marcheuses." In one specimen in our collections, this joint is triangular and very slightly longer than its breadth at base; in another it is considerably oblong, with the summit truncate instead of obtusely pointed, and this summit is bent a little outward and upward. Both of these species have a long lateral spine, like that in *A. hastatoides* of De Haan, which they resemble, the same kind of teeth on the lateral margin, similar frontal teeth and eyes. Indeed, in every essential point they are congeneric. In another species (near *A. gladiator*, as figured by De Haan, pl. 18, f. 1), this third joint of the outer maxillipeds is still more oblong and concave on its surface, and is bent obliquely upward and outward over the summit of the palpus, so as to present its surface in this part to a front view, instead of its edge;—this peculiarity is but a farther development beyond that in the second of these three species alluded to. (See figures of these species, Plate 17.) Such are the wide variations in the outer maxillipeds in species which give no other grounds for generic distinctions.

Again, De Haan makes Neptunus and Achelous differ from Amphitrite in having the third joint of the outer maxillipeds more oblong, the reverse of which is actually the fact among many of the species examined by us. So, in Thalamita, this same joint is described as short, when, in fact, it is sometimes longer than broad. The form in *Thalamita integra* scarcely differs in relative length or in obliquity from that of *Lupa dicantha*. Again, Oceanus (*Thalamita crucifera* of authors), is said to have the inner branch of the first maxillipeds trilobate; and Thalamita is described as having the same margin unidentate. The latter has the *inner* lobe as in Oceanus; but the outer is straight at top (as in *Th. admetus*), or concave in outline (as in *Th. crassimana* and *crenata*), and this concavity is so deep and angulate in *Thalamita integra* that it approaches nearly the bilobate character of Oceanus, although the *integra* is otherwise very near the *admetus*. It seems evident, therefore, that too much importance is allowed to small variations in these organs—the shape of the triangle—its upper margin straight or sinuous, and the like; for such characters are of little value unless as indications or accompaniments of other peculiarities.

As an example of species having such accompanying characteristics, we have, in a preceding paragraph, alluded to the genus Cancer. *Eriphia* affords another example; the form of the maxilliped branch is

here narrow, because of the ridge on the praelabial plate. The absence of this ridge in *Lupa cribraria* while it is present in all other known *Lupas*, is attended by the opposite character, a great breadth to the inner branch, it reaching quite to the medial line. This last is a characteristic of real value, showing a generic distinction between *Lupa cribraria* and its supposed congeners. But we fail to find any good reason for putting the *L. dicantha* and *L. cribraria* into one genus, separate from *L. sanguinolenta*, as done by De Haan.

We are, therefore, fully sustained in pronouncing De Haan's genera as often either incorrect or ambiguous in their limits. We might pursue the subject farther; but these illustrations appear to be sufficient. The errors have arisen from assuming unimportant organs as a source of distinctions, and deriving the characters from the study of too few forms under each genus. The objections here brought forward do not affect the value of his facts as detailed, or his illustrations. Too exalted honours can scarcely be bestowed upon De Haan for the extreme fidelity of both his descriptions and plates, and the laborious research which they exhibit.

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#### I. CRUSTACEA MAIOIDEA, OR OXYRHYNCHA.

IN the subdivisions of the Maioidea, the comparative length of the legs has been assumed as an important characteristic, and on this ground, they have been divided into three groups:—1, those with their eight posterior legs very long; 2, those with all the legs of moderate length; 3, those with the anterior legs long—and these groups are designated by Edwards, respectively, *Macropodinea*, *Maiinea*, and *Purthenopinea*.

But many examples show the little importance of the comparative length of the posterior legs, a characteristic unsupported by any others in the species. There is a species of the Macropod genus *Eurypodius*, which but for its identity in other characters with this genus, would be arranged with the *Maiinea*, as the legs are no longer than in many species of that group. Again, the genera *Doclea* and *Libinia*, as they are now united by the genus *Libidoclea*, so shade into one another with regard to the length of the legs, that we cannot without violating the most obvious natural affinities, based on characters of real importance, separate them, placing part, as is done, with the

Macropodinea and part with the Maiinea. The three genera, in fact, form a natural group, as is at once obvious on slight inspection. A new genus, *Oregonia*, from the Oregon coast, is so closely related to *Eurypodius*, that but for the penult joint of the eight posterior legs they would form the same genus; yet the legs in *Oregonia* are not so long but the species under a different relationship might fall in with the Maiinea. This disposition to give high importance to the mere length of the legs was so strong in earlier authors, that on this ground mainly *Hymenosoma* was formerly united with the *Inachidæ*.

It seems obvious, therefore, that in this threefold subdivision of the *Maiioidea*, too much stress is laid on a mere variation of length in a single set of organs. This is especially true of the first two groups. The third is a more natural association of genera, and is borne out by other characters. There is a like objection to the basis on which De Haan has separated the *Inachus* group (in which Edwards's *Macropodinea* are included, excepting *Latreillia* and *Docelea*). His distinction rests on the third joint of the outer maxillipeds,—a part liable to important variations even in the same genus; the *Inachus* group having this joint articulated with the fourth by its summit, and the other *Maiioidea*, by the inner apex. But while *Eurypodius* exemplifies the former, *Oregonia* is an instance of the latter, and thus his character divides widely these related genera. In fact, *Eurypodius* is not essentially different in this respect from *Oregonia*. The articulation takes place with the same part normally in both, and this is true in other genera of the *Inachus* group.

The *Maiinea* and *Macropodinea*, therefore, properly form but a single group. The genus *Latreillia*, however, is excluded, as done by De Haan; its outer antennæ being moveable and cylindrical to their base, its inner antennæ without fossettes, its vulvæ in the base of the third pair of legs, and the dorsal position of its hind legs, show a close relation to *Dromia* and *Dynomene*. *Oncinopus* has similar outer antennæ, and prehensile legs behind, but these legs are not dorsal, and the vulvæ are in their normal position. This genus forms a group by itself, distinct from the true *Maiinea*.

The grand divisions of the *Maiioidea*, are therefore, as follows:—

Legio I. MAINEA. — Corpus sèpissimè oblongum, sapius anticè augustum et rostratum. Articulus antennarum externarum Imus sub oculo insitus, antèriusque productus, testâ externâ sine suturâ coalescens. Pedes formâ normales.

Legio II. PARTHENOPINEA.—Corpus sive breviter triangulatum sive valde transversum et antice arcuatum. Articulæ antennarum externarum Imus oculo interior, rarissime solutus sæpius suturâ infixus, raro sine suturâ externâ coalescens. Pedes antici longiores, toti formâ normales.

Legio III. ONCININEA.—Corpus triangulatum. Antennæ externæ e basi solutæ, cylindricæ. Pedes postici breviores, subdorsales, uncinato-prehensiles.

The Oncininea form a transition to Dromia, and the Parthenopinea to Corystes and Cancer.

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### I. CRUSTACEA MAINEA.

IN arranging the Maiinea according to their natural families, we are guided mainly by the characters presented by the orbits or eyes.

In a large number of species, the eyes are retractile into proper orbits; in others, they may be thrown back, or are retractile in fact, but there is no orbit to receive them, and they are either exposed when retracted, or are concealed beneath the carapax; in others, the eyes admit of no retraction. The following are the families or groups to which we are led:

Fam. I. MAIDÆ.—Oculi in orbitis retractiles.

Fam. II. TYCHIDÆ.—Oculi retractiles sed orbitis carentes, infra carapacem sese latentes.

Fam. III. EURYPODIDÆ.—Oculi ad carapacis latus retractiles, sese non latentes.

Fam. IV. LEPTOPODIDÆ.—Oculi non retractiles. Pedes prælongi.

Fam. V. PERICERIDÆ.—Oculi non retractiles. Pedes longitudine mediocres.

In farther subdivisions, the position of the external antennæ—the characters of the eyes—in some cases, the characters of the beak—the form of the fingers, whether excavate spoon-like or not—and the greater or less length of the eight posterior feet, afford proper means of distinction. The above families may thus be subdivided into sub-families. In the following synopsis of the known genera of Maiidea, we present these subdivisions and also the characters of the genera.

## FAM. I. MAIIDÆ.

## I. DIGITI ACUMINATI.

*A. carapax oblongus.*

a. OCULI PLUS MINUSVE TRANSVERSIM PORRECTI.

a. ANTENNÆ EXTERNÆ APERTÆ.

\* *Rostrum sive elongatum sive breve, porrectum, non tumidum.*

† Pedes 8 postici prælongi.

1. INACHINÆ. — Carapax triangulato-ovatus. Rostrum emarginatum aut integrum.

G. 1. INACHUS, *Fabricius*.—Carapax gibbosus, spinâ præorbitali sive parvulâ sive nullâ, rostro brevi. Pedes 8 postici filiformes, 2dis 3—4-plo longioribus quam carapacis pars post-rostralis.

G. 2. EGERIA, *Latreille*.—Carapax gibbosus, orbiculato-ovatus, rostro sat brevi, paulo reflexo. Pedes 8 postici filiformes longissimi (iis *Inachi* duplo longiores).

G. 3. MICRORHYNCHUS, *Bell.*\*—Carapax gibbosus, latitudine transorbitali parvâ, dente præorbitali nullo, post-orbitali parvulo. Rostrum parvulum, integrum. Pedes 8 postici corpore fere duplo longiores.

G. 4. CHIONÆCETES, *Kroyer*.†—Carapax vix longior quam latior, subtriangularis, antice truncatus, rostratus, rostro bifido, brevissimo. Pedes 2di carapace plus duplo longiores, 2di, 3tiii, 4tique compressi.

2. MACROCHEIRINÆ.—Carapax latè ovatus. Rostrum furcatum. Pedes prælongi. Articulus antennarum externarum Imus solutus.

G. MACROCHEIRA, *De Haan*.‡—Carapax gibbosus, orbiculato-ovatus, spinâ præorbitali parvulâ, rostro saliente, cornubus valde divaricatis. Pedes toti validi, longi.

†† Pedes 8 postici longitudine medioceres.

‡ *Pars antennarum externarum mobilis margine orbite orta.*

3. MAIINÆ. — Carapax orbiculato-ovatus, rostro prominente, profundè bifido.

G. MAIA, *Lamarck*.—Articulus antennarum externarum Imus spinis duabus longis

\* Zool. Trans., ii. 40.

† Tidsskrift, ii. 249. The species for which this genus was established is the *Cancer phalangium* of Fabricius, Faun. Groenl., n. 214, and *Cancer opilio* of the same author, in Det danske vid. Selsk. Skr. nye Saml., iii. 180, sequ. cum tabula.

‡ Crust. Fauna. Japonica, 88.

apice externo armatus. Spina inter-antennalis elongata, acuta. Tarsus infra non spinulosus.

‡‡ *Pars antennarum externarum mobilis orbitâ omnino exclusa.*

#### 4. PISINÆ.—Carapax triangulato-ovatus, rostro bifido.

1. Pedes 8 postici non valde compressi; articulus 5tus processu infra non armatus.
- G. 1. PARAMITHRAX, *Edwards*.—Carapax gibbosus, rostro elongato. Oculi graciles. Articulus antennarum externarum Imus spinis duabus longis apice externo armatus (coque *Maiæ* affinis).
- G. 2. PISA, *Leach*.—Carapax elongatè pyriformis, gibbosus, spinâ præorbitali saliente, rostro longo, vix depresso. Articulus antennarum externarum Imus angustus. Pedes 2di 3tiis valde longiores.
- G. 3. PELLA, *Bell*.\*—Carapax elongatè pyriformis, gibbosus, spinis præorbitali et post-orbitali carens, rostro longo, vix depresso. Articulus antennarum externarum Imus angustus. Pedes 1mi 2dis breviores.
- G. 4. LISSA, *Leach*.—*Pisæ* affinis. Carapax pyriformis, rostro longiusculo, cornubus laminatis, truncatis, dente præorbitali saliente.
- G. 5. RHODIA, *Bell*.†—Carapax pyriformis, paulo depressus, spinâ præorbitali saliente, rostro brevi, acuto. Articulus antennarum externarum Imus angustus, apice acutè productus, extus unidentatus. Pedes 1mi 2dis breviores.
- G. 6. HYAS, *Leach*.—Carapax ovatus, sæpe lyratus, depressus, spinâ præorbitali carens, rostro longiusculo, acuto, depresso. Articulus antennarum externarum Imus angustus, 2dus depressus. Tarsus infra non spinulosus.
- G. 7. PISOIDES, *Edw.* et *Lucas*.‡—*Hyadi* affinis. Carapax latè ovatus, spinâ præorbitali carens, postorbitali parvâ, rostro longiusculo, acuto. Articulus antennarum externarum Imus latissimus, 2dus depressus, densè ciliatus.
- G. 8. HERBSTIA, *Edwards*.—Carapax orbiculato-ovatus, depressus, spinâ parvâ præorbitali instructus, rostro brevi, cornubus paulo depressis, acutis. Articulus antennarum externarum Imus angustus, apice acutè productus, extus unidentatus. Pedes 1mi 2dis longiores.

2. Pedes 8 postici late compressi.

- G. 10. THOE, *Bell*.§—Carapax late ovatus, rostro parvulo, bifido, dente præorbitali saliente. Oculi breves. Articulus antennarum externarum Imus latissimus. Pedes 1mi *maris* 2dis longiores.

3. Articulus pedum posticorum 5tus processu infra armatus.

- G. 11. DEHAANIUS, *M Leay*.||—*Ilyadi* paulo affinis. Carapax latus, spinâ præorbitali saliente, rostro sat brevi. *Leucippæ* affinis, si oculi non retractiles.

\*\* *Rostrum saliens, porrectum, tumidum, apice emarginatum.*

#### 5. LIBININÆ.—Carapax latè pyriformis, tumidus, lateribus altis. Oculi perbreves. Pedes sive mediocres sive prælongi.

\* Zool. Trans., ii. 35.

† Zool. Trans., ii. 43.

‡ Crust. D'Orbigny's South America, 10, pl. 5.

§ Zool. Trans., ii. 47.

|| M'Leay, Smith's Illust. Zool. S. Africa.

- G. 1. LIBINIA, *Leach*.—Pedes medioeres. Carapax dente præorbitali parvulo instructus. Abdomen *maris* *feminæque* 7-articulatum. Articulus antennarum externarum Imus latiusculus, extus non dentigerus.
- G. 2. LIBIDOCLEA, *Edw.* et *Lucas*.\*—Pedes longi. Carapax spinis plus minusve armatus, dente præorbitali parvo. Articulus antennarum externarum Imus angustus, apice acutè productus, extus dentigerus.
- G. 3. DOCLEA, *Leach*.—Pedes prælongi. Carapax spinis plus minusve armatus, dente præorbitali carens. Articulus antennarum externarum Imus angustus. Abdomen *maris* 7-articulatum, *feminæ* 5-7-articulatum.

\*\*\* *Rostrum breve, latissimum, bilobatum, porrectum.*

6. PRIONORHYNCHINÆ.—Carapax ovatus, gibbosus. Oculi breves. Fossæ antennales marginem frontalem fere attingentes.

G. PRIONORHYNCHUS, *Hombroen* et *Jacquinet*.†

\*\*\*\* *Rostrum latum valde deflexum.*

7. MICIPPINÆ.—

G. MICIPPA, *Leach*.—Oculi longiusculi. Carapax anticè parce augustior, rostro laminato.

β. ANTENNÆ EXTERNÆ SUB ROSTRO CELATÆ.

8. CHORININÆ.—Carapax triangulato-ovatus. Rostrum furcatum. Pedes 8 postici vix compressi.

G. 1. CHORINUS, *Leach*.—Carapax gibbosus, spinis plus minusve armatus, rostro longo, cornubus acuminatis, spinâ præorbitali saliente. Margo orbitalis inferior largè interruptus. Articulus antennarum externarum Imus angustus. Pedes 2di 3tiis valde longiores.

G. 2. CHORILIA, *Dana*.—Carapax formâ rostroque *Chorino* affinis. Orbita infra latè interrupta, supra fissa, spinâ præorbitali acutâ. Articulus antennæ externæ Imus angustus, apice externo acutè productus. Pedes 1mi 2dis breviores, 8 postici similes, 2di 3tiis non multo longiores.

G. 3. LAHAINA, *Dana*.—Carapax formâ rostroque *Chorino* plerumque affinis. Cornua rostri gracillima valde divaricata. Articulus antennæ externæ Imus latus, parce longior quam latior, apice eum processu spiniformi armato. Orbita infra supraque sinu rotundato interrupta, dente præorbitali acuto. Pedes toti graciles.

G. 4. NAXIA, *Edwards*.—Carapax gibbosus, rostro mediocri, cornubus subcylindricis, truncatis, dente præorbitali brevi. Margo orbitalis inferior fissus, non late interruptus. Articulus antennarum externarum Imus latus, apice angustus.

G. 5. SCYRA, *Dana*.—Carapax gibbosus, rostro mediocri, laminato, cornubus acutis, dente præorbitali acuto. Margo orbitalis superior paulo unifissus. Articulus antennarum externarum Imus omnino angustus, 2dus depressus.

\* Crust. D'Orbigny's South America, 6, pl. 3.

† Voy. Astrolabe et Zélé au pôle Sud, pl. 1, f. 1.

- G. 6. HYASTENUS, *White*.\*—*Chorino* affinis. Rostrum prælongum, cornubus non depressis, ante poneque oculos directus. Margo orbitalis superior unifissus. Pedes 2di longiores.
9. PYRINÆ.—Carapax subpyriformis. Pedes 8 postici valde compressi.
- G. 1. PYRIA, *Dana*.—Carapax depressus, inermis, rostro lamellato, cornubus ovatis. Oculi perbreves, orbitâ spinis non armatâ.
- b. OCULI LONGITUDINALITER PORRECTI, CARAPACE ANTICE TRUNCATO.
10. OTHONINÆ.—Carapax antice late truncatus, rostro fere obsoleto. Oculi elongati, cylindrici.
- G. OTHONIA, *Bell*.†—Carapax parce oblongus, suborbicularis, rostro bifido. Antennæ internæ minutissimæ; externæ latæ, articulo 1mo lato, 2do valde depresso, inverso-subtriangulato.

B. *Carapax paulo transversus.*

11. SALACINÆ.—Carapax fere orbicularis. Pedes 8 postici crassi, longi, articulo penultimo infra recto. Rostrum fere obsoletum, integrum.
- G. SALACIA, *Edwards et Lucas*.‡—Carapax gibbosus. Fossa antennalis sub rostro partim excavata. Articulus maxillipedis externi 3tius medio apice emarginatus, hæcque emarginatione articulum proximum gerens. *Inacho Grapsoque* affinis.
2. DIGITI APICE OBTUSI, INSTAR COCHLEARIS EXCAVATI.
12. MITHRACINÆ.—Oculi mediocres. Carapax sive paulo oblongus, sive transversus.
- G. 1. MITHRAX, *Leach*.§—Carapax sæpe orbiculato-ovatus, interdum transversus. Rostrum aut saliens aut fere obsoletum, bifidum. Articulus antennarum externarum 1mus apice externo duabus spinis longis armatus.

\* Ann. Mag. Nat. Hist. [2], xx. 61, and Crust. Voy. of Samarang, p. 11. The species in Seba's fig. 12, pl. 18 of the Thesaurus.

† Zool. Trans., ii. 55.

‡ Crust. in D'Orbigny's S. Amer., 12, pl. 11.

§ The characters given by White for his genus *Schizophrys* (Ann. Mag. N. H. [2], ii. 282, 283, and Voy. Samarang, Crust., p. 16), do not serve to exclude the species from Paramithrax, Maia or Mithrax. The peculiarity of the orbit described and of the first joint of the outer antennæ, as far as understood by the writer from the description, are the same as in the genera just mentioned.

The genus *Dione* of De Haan (Fauna Japon. Crust., p. 82) differs from Mithrax only in not having the interior apex of the third joint of the outer maxillipeds project inward a little over the insertion of the fourth joint. It corresponds to "*Mithrax triangulaires*" of Edwards.

- G. 2. MITHRACULUS, *White*.—Carapax transversus. Articulus antennarum externarum 1mus duabus spinis longis non armatus.
13. CYCLACINÆ.—Oculi longi.
- G. CYCLAX, *Dana*.—Carapax paulo oblongus, orbiculato-ellipticus, rostro sat brevi, bifido, acuto. Pedes 8 postici longi.

## FAM. II. TYCHIDÆ.

1. CRIOCARCININÆ.—Rostrum valde deflexum. Carapax oblongus.
- G. CRIOCARCINUS, *Guerin*.—Oculi prælongi, orbitæ margo superior processu longo lamellato apicem armato instructus.
2. TYCHINÆ.—Carapax oblongus, anticè latus, latitudine trans-orbitali grandi, rostro non deflexo, sat longo, furcato. Oculi apice paululum exserti.
- G. TYCHE, *Bell*.—Carapax depressus, antice cornubus rostri spinisque duabus præ-orbitalibus totis parallelis et subæquis confectus, spinâ post-orbitali nullâ. Articulus antennarum externarum 1mus oblongus, inermis.
3. CAMPOSCINÆ.—Carapax oblongus, rostro fere obsoleto, emarginato. Pedes 8 postici longi. Oculi longè pedunculati et exserti.
- G. CAMPOSCIA, *Latreille*.—Carapax subpyriformis, non armatus. Pedes 8 postici subcylindrici, 2di 3tiis breviores.\*

## FAM. III. EURYPODIDÆ.

1. *Antennæ externæ apertæ.*

1. EURYPODINÆ.—Carapax triangulato-ovatus, rostro longo, furcato. Pedes longi, 4 postici non bene prehensiles. Oculi longi et longe salientes. Spina post-orbitalis oblonga.
- G. EURYPODIUS, *Guerin*.—Pedes 8 postici longi, articulo penultimo valde compresso, ensiformi.
- G. OREGONIA, *Dana*.—Pedes 8 postici sat longi, articulo penultimo subcylindrico.

2. *Antennæ externæ sub rostro celatæ.*

2. AMATHINÆ.—[An oculi retractiles, iis *Eurypodii* similes, eoque genus hac sede?] Carapax triangulato-ovatus, rostro furcato, latitudine trans-orbitali perangustâ. Pedes longi.

\* Zool. Trans., ii. 57.

G. AMATHIA, *Roux.*—Carapax gibbosus, valde armatus, rostro prælongo, cornubus divaricatis. Pedes filiformes, prælongi. Oculi parvi. Articulus antennarum externarum Imus perangustus. Epistoma fere quadratum.

## FAM. IV. LEPTOPODIDÆ.

A. *Antennæ externæ apertæ.*

1. ACHÆINÆ.—Carapax triangulato-ovatus, rostro perbrevis, bifido. Oculi longi longèque salientes. Pedes 4 postici subprehensiles.

G. 1. ACHÆUS, *Leach.*—Carapax gibbosus. Pedes 8 postici filiformes, longi, tarso pedum 4 posticorum falciformi, articulis penultimis subcylindricis.

2. INACHOIDINÆ.—Carapax triangulato-ovatus, rostro elongato, simplice.

G. INACHOIDES, *Edw. et Lucas.\**—Carapax valde gibbosus, rostro longiusculo, acuto, spinâ post-orbitali parvâ. Pedes 8 postici sat longi, gracillimi. Articulus antennarum externarum Imus angustus.

B. *Antennæ externæ celatæ.*

3. LEPTOPODINÆ.—Carapax triangulato-ovatus, rostro elongato, simplice. Pedes longissimi.

G. LEPTOPODIA, *Leach.*—Oculi sat salientes. Pedes toti gracillimi.

4. STENORHYNCHINÆ.—Carapax triangulato-ovatus, rostro breve, bifido.

G. STENORHYNCHUS, *Lamarck.*—Oculi sat salientes. Pedes antici crassiusculi.

## FAM. V. PERICERIDÆ.

A. *Antennæ externæ apertæ.*

1. PARAMICIPPINÆ.—Rostrum valde deflexum. *Micippæ* aspectu similes.

G. PARAMICIPPA.—Rostrum latum. Articulus antennarum externarum 2dus breviter cordiformis. Epistoma perbreve.

2. PERICERINÆ.—Rostrum profundè bifidum, non deflexum.

G. 1. PERICERA, *Iatreille.*—Carapax sæpe triangulatus, interdum orbiculato-ovatus, paucis spinis sæpius armatus, rostro divaricatè furcato. Articulus anten-

\* Crust. in D'Orbigny's S. Amer., 4, pl. 4.

narum externarum Imus apice latus et spinâ armatus. Orbita tubulata, oculum strictè includens, margine superiore subtiliter unifisso.

G. 2. TIARINIA, *Dana*.—Carapax subpyriformis, tuberculis plerumque pustuliformibus sæpeque aggregatis ornatus, rostri cornubus gracilibus contiguis. Articulus antennarum externarum Imus apice latus et inermis, angulo externo interdum saliente tantum.

G. 3. PERINIA, *Dana*.—Carapax orbiculato-ovatus, tuberculis paucis non acutis ornatus, rostri cornubus brevibus, discretis. Articulus antennarum externarum Imus oblongus, apice non latior, angulo externo valde producto. Orbita antice aperta, margine superiore non unifisso.

G. 4. HALIMUS, *Latreille*.—Carapax triangulato-ovatus, cornubus rostri grandibus, divaricatis. Articulus antennarum externarum Imus angustus. Articulus pedum 8 posteriorum 5tus valde compressus, processu infra non armatus.

G. 5. PUGETTIA, *Dana*.—Carapax triangulato-ovatus. Rostro antennisque externis *Halimo* affinis. Articulus pedum 8 posteriorum 5tus cylindricus.

### 3. MENÆTHINÆ.—Rostrum integrum aut subintegrum.

G. 1. MENÆTHIUS, *Edwards*.—Carapax triangulato-ovatus, depressus, regione antero-laterali plicis tribus plus minusve ornata. Pedes 8 postici cylindrici.\*

G. 2. ACANTHONYX, *Latr.*—Carapax depressus, non tuberculatus, sive subtriangulatus, sive subquadratus (dente post-orbitali dilatato), regionibus non conspicuis, dente præorbitali parvulo, rostro crasso, apice emarginato. Pedes 8 postici medioeres, articulo penultimo compresso, infra dilatato et sæpe dentigero.

G. 3. ANTILIBINIA, *M'Leay*.†—Carapax valde convexus, regionibus non conspicuis, latitudine transorbitali minore (lat. max. 3plo latiore), rostro crasso, apice emarginato. Articulus pedum 8 posteriorum penultimus infra non dilatatus nec dentigerus.

G. 4. PELTINIA, *Dana*.—Carapax depressus vix tuberculatus, dente præorbitali breviter instructus, latitudine transorbitali majore (lat. max. 2plo latiore), rostro lato, profundè bifido, sat brevi. Articulus pedum 8 posteriorum penultimus infra non dilatatus nec dentigerus.

### B. Antennæ externæ sub rostro celata.

#### 1. Oculi prælongi.

### 4. STENOCIONOPINÆ.—Rostrum longum, furcatum, cornubus styliformibus, divaricatis.

G. STENOCIONOPS, *Latreille*.—Carapax subpyriformis, gibbosus, spinâ præorbitali longissimâ. Articulus antennarum externarum oblongus.

\* The genus *Xiphus* of Eydoux and Souleyet, as figured in the plates of the Voyage of the Bonite, has the beak, præorbital spine or tooth, outer antennæ, and general form of Menæthius. But the eyes may be longer pedunculate, and as there is no description, it is not apparent whether they are retractile or not. The species is called *Xiphus margariferus*. The beak is pointed, and the third basal joint of the outer antennæ reaches to apex of beak.

† Smith's *Illust. S. Af. Zool.*

2. Oculi aut longitudine mediocres aut perbreves.

5. EPIALTINÆ.—Rostrum oblongum, crassum, sive integrum sive emarginatum. Antennæ externæ apicem rostri sæpius non attingentes. Pedes 8 postici subcylindrici.

G. 1. EPIALTUS, *Edw.*—Carapax inermis, vix tuberculatus, regionibus non conspicuis. Octo pedes postici nudi aut subnudi, articulo penultimo infra sæpe subdentigero.

G. 2. HUENIA, *De Haan*. \*—Carapax 2-4 tuberculis acutiusculis sæpius armatus, interdum inermis, regionibus inconspicuis, rostro simplice, angulo carapacis postero-laterali prominente. Articulus pedum 8 posteriorum penultimus plerumque infra dilatatus, dentigerus.

G. 3. XENOCARCINUS, *White*. †—Carapax tuberculis subacutis sparsim armatus, rostro simplice, truncato, margine postero-laterali non angulato, rotundato.

G. 4. LEUCIPPA, *Edw.*—Carapax subtriangulatus fere inermis, regionibus non conspicuis, spinâ præorbitali nullâ. Pedes supra carinati, articulo penultimo infra non producto. Dens postorbitalis prope oculum insitus, oculum vero non celante.

Genus ZEBRIDA, *White*, ‡ incertæ sedis; antennis externis obitâque *Eumédono* similis eoque Parthenopineis congruit.—Carapax depressus, non armatus, antice latior, dente post-orbitali portentose expanso, rostro latissimo, lamellato, profundè furcato. Oculi paululum salientes. Pedes compressi, angulati. Articulus antennarum externarum Imus *hiatum orbitæ occupans*, antice non productus.

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## FAMILY I. MAIIDÆ.

### SUBFAMILY MAIINÆ.

#### MAIA SPINIGERA, *De Haan*.

East Indies.

*Maia spinigera*, DE HAAN, Faun. Japon. 93, pl. 24, f. 4.

ADAMS and WHITE, Samarang, Crust. 15.

\* Crust. Faun. Japon. 73.

† Jukes's Voy. H.M.S. Fly; Ann. Mag. N. H. [2], i. 331; Crust. Voy. Erebus and Terror, pl. 2, fig. 1.

‡ Crust. Voy. of Samarang, p. 23.

## SUBFAMILY PISINÆ.

## HYAS LYRATUS.

*Carapax*\* *lyratus*, parce minutè tuberculatus, pone oculos alatè expansus marginibus alæ antico posticoque subæquis, parallelis, margine externo excavato, rostro lævi, cornibus acutis, rectis. Pedes antici subtiliter pubescentes, brachio carpoque margines pustulatis, manu gracili. Pedes 8 postici longi, graciles, subtilissimè pubescentes.

Carapax lyrate, sparingly minute tuberculate. behind the eyes alately produced, anterior and posterior margins of the winged expansion nearly equal and parallel, external margin long and a little concave. the anterior angle acute, posterior subacute. Beak smooth, of moderate size, horns acute, straight. Anterior feet inconspicuously pubescent, arm and carpus with pustulate margin, hand thin. Eight posterior feet long, slender, very short pubescent.

Plate I, fig. 1 *a*, male, natural size; *b*, under view of head, enlarged; *c*, abdomen, natural size; *d*, extremity of posterior pair of legs.

Puget's Sound, C. Pickering, U. S. Ship Vincennes.

Near the *Hyas coarctatus* in general form. The margin of the upper surface of the carapax posterior to the alate projection, is small tuberculate in a single series. The posterior margin has a small tubercle at middle. The medial region of the carapax is tumid and crossed by a series of small tubercles, and just behind these a tumid tubercle. The post-medial is prominent and has four or five small pustules at top, and either side there passes off obliquely backward across the postero-lateral region a line of small tubercles. The peduncle of the eyes has a small tubercle on the anterior side. The exterior maxillipeds are granulous or pustulous. The pterygostomial region has a transverse break in the osseous character of the surface, and is granulous, with the margin entire. Second pair of legs one and

\* The word carapax is not of Latin authority, yet it is so important to the science, that we need make no farther apology for introducing it into that tongue.

two-thirds the length of the carapax; posterior pair one and one-fourth times the same, and but little longer than first pair.

*Hyas lyratus*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 268.

PISOIDES EDWARDSII (*Bell*), *Dana*.

Plate 1, fig. 2 *a*, under view of head, much enlarged; *b*, outer maxilliped.

Valparaiso.

This species, as described by Bell and Milne Edwards, under different names, is short and thick hairy, and has a flattened pyriform shape. One specimen, a male, is sixteen lines long, and twelve lines greatest breadth, the beak four lines or one-fourth whole length. Another specimen nine lines long, had for its greatest breadth seven lines.

The beak is flattened, with the horns evenly and slightly divergent and setigerous within. The first joint of the outer antennæ is subquadrate nearly as in the Periceridæ, with the outer angle projecting as in *Tiarinia*. The second joint is full twice as long as the third, and both are flattened and ciliate on the outer side, the third being ciliate on both margins. The outer angle of the first joint is set with minute spinules or hairs, and a prominence at posterior angle is raggedly but minutely denticulate.

The exterior maxillipeds are pubescent, and the outer margin of the palpus has a re-entering angle a short distance from its upper extremity.

The legs have a fringe of rather short hairs on opposite (upper and lower) margins. The branchial regions are tumid, and there are two or three faint tubercles of small size. The cardiac region is a broad prominence with a rounded surface, and either side a little posteriorly there is a small tubercle. The stomach region is prominent with a low posterior tubercle, and another oblong one anteriorly equally distinct. Outer orbital acanthus acute. Intestinal region with a small tubercle, but all the tubercles concealed mostly by the villosity of the surface, so as not to be seen unless it is removed.

Inner edges of fingers of female denticulate throughout.

The genus *Pisoides* resembles *Hyas* in the flattened form of the moveable basal joints of outer antennæ, but the first basal joint is large quadrate and the epistome is very narrow.

*Hyas Edwardsii*, BELL, Trans. Zool. Soc. London, ii. 49, 1835, pl. 9, fig. 5.

*Pisoides tuberculatus*, M. EDWARDS, Crust. D'Orbigny's Voy. S. A., p. 11, pl. 5, fig. 1. This figure represents the animal without its villous coat, and hence differs from that by Bell.

#### SUBFAMILY LIBININÆ.

##### GENUS LIBIDOCLEA, *Edwards and Lucas.*

The genus *Libidoclea* was instituted by Milne Edwards and Lucas, in D'Orbigny's South America, Crustacés, p. 6. It has the general form, short beak and long legs of *Doclea*, but the inner angle of the orbit is prominent as in *Libinia*, which genus is similar also in form, though with much shorter legs. In the species described by Milne Edwards, the anterior margin of the third joint of the exterior maxillipeds is strongly notched, and this he lays down as a generic character. It fails, however, in our species, and cannot, therefore, be of this importance. The basal immoveable joint of the outer antennæ has a strong tooth on the outer side in both his species and ours; and in other characters of generic importance, the two appear to agree.

##### LIBIDOCLEA COCCINEA.

*Coccinea.* Carapax orbiculato-triangularis, sparsim tuberculato-spinosus et paulo subtiliter granulatus, rostro sat brevi. Pedes subtilissimè granulati, tenues, digito paris 1mi subulato et basin non tumido, articulo paris 2di 3tio valde brevior quam carapax, tarsoque parce brevior quam articulus quintus, articulo 4to pedum 8 posteriorum supra campanato et lævi. Articulus maxillipedis externi 3tius antice integer.

Scarlet. Carapax round triangular, sparsely tuberculato-spinous, and minutely sparse-granulous, beak shorter than in the *L. granaria*, feet finely granulous, slender; finger of first pair subulate, not tumid

at base; third joint of second pair much shorter than carapax, tarsus but slightly shorter than preceding joint; fourth joint of eight posterior feet flattened on upper side and smooth; third joint of outer maxillipeds anteriorly entire.

Plate 1, fig. 3 *a*, male, natural size; *b*, view of carapax from behind; *c*, under view, showing mouth and inner antennæ magnified two diameters; *d*, male abdomen, natural size.

Dredged up in thirty fathoms water, off the eastern coast of Patagonia.

Length, two and three-eighths inches; greatest breadth (excluding spines of sides), two and one-eighth inches; length of beak anterior to line of tips of orbital acanthi, three lines; distance between tips of orbital acanthi, five lines; length of second pair of legs, four and five-eighths inches; length of first pair, three and three-fourths inches.

This species differs from the figure of the *L. granaria* in the length of the beak and legs. The beak anterior to the orbital acanthi is much shorter than the distance between the acanthi, while the two distances are equal in the figure of the *granaria*; moreover, the distance from the tip of the third basal joint of the exterior antennæ to the tip of the beak is but little longer than this third joint, while it is more than twice this distance in the *granaria* as figured. The third joint of the second pair of legs is much longer than the carapax in the *granaria*, and much shorter in our species.

The carapax is covered with numerous spinous tubercles, the largest of which are the cardiac, and one postero-lateral on either side. Below and behind the last-mentioned spine there are several other prominent spines. On the median region there are three rows, as in the *granaria*, the inner containing three spines, and the outer two, with perhaps another, quite small, intermediate. There is a broad spinous tubercle on the antero-lateral region. The narrow space between the median region and the cardiac spine is depressed, being bordered with a curving ridge, convex inward, which is set with three or four small low spines.

The granules of the legs are half smaller than in the figure of the *granaria*. The outer angle of the basal joint of the outer antennæ is

prolonged and subacute. The pterygostomian region has its border strongly and irregularly dentate. The exterior maxillipeds have the anterior margin of the third joint entire and not notched, with the outline rounded.

*Libidoclea coccinea*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 268.

#### SUBFAMILY MICIPPINÆ.

##### MICIPPA HIRTIPES.

*Carapax minutè pustulatus, marginibus lateralibus irregulariter paulo inciso-dentatis; rostro fere verticali, sub-polygonato, justa antennam externam profundè constricto, apice triangulatè emarginato, superficie seriatim pustulatâ, pustulis setigeris. Oculi longè exserti. Pedes hirsuti.*

Carapax minutely pustulate, wholly without spines. lateral margins irregularly small inciso-dentate; beak nearly vertical, sub-polygonate. adjoining outer antennæ deeply notched, and triangularly emarginate at apex, surface seriately pustulate, and pustules setigerous. Eyes long exsert. Feet hirsute.

Plate 1, fig. 4 *a*, female, enlarged two diameters; *b*, front view of beak, enlarged four diameters; *c*, female abdomen; *d*, under view of head; *e*, hand of female.

Reef of the Island of Tongatabu, Pacific.

Length of carapax, seven lines; greatest breadth (across the cardiac region), six lines; post-orbital breadth, five and one-third lines: greatest breadth of beak, three lines.

The eyes project from a large rectangular emargination of the lateral margin, and the length of the eyes exposed in an upper view. is equal to nearly three times the diameter of the peduncle. Posterior to the eyes, there are four or five irregular teeth, and the rest of the margin is uneven. The surface of the beak, either side of the

medial line, is somewhat raised longitudinally, and bears minute tubercles, which give origin to tufts of setæ. The part of the front below the outer antennæ is broader than long, and the breadth by the second of the lateral angles is greatest. The female abdomen, excluding the first two joints, is orbicular and ciliate. The outer antennæ, as exposed in a front view, have the first of the two moveable basal joints oblong and stout and densely hirsute on either side, the second about half shorter and slender. The flagellum is five or seven jointed. Anterior legs slender; others stout and somewhat compressed. The hand is slender, tapering somewhat from the base, and the fingers are mostly contiguous, or touch only along outer half.

*Micippa hirtipes*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 268.

#### SUBFAMILY CHORININÆ.

##### GENUS CHORILIA, Dana.

Pisæ Chorinoque affinis. Carapax angustus, triangulatè ovatus, gibbosus, paulo armatus, rostro longo, furcato, cornubus gracilibus. Oculi in orbitis retractiles. Antennæ externæ sub rostro latentes, articulo primo angusto, apice externo acuto. Orbita infra interrupta, supra angustè unifissa, spinâ præorbitali acutâ. Pedes 1mi 2dis breviores, 8 postici similes, 2di 3tiis non multo longiores.

This genus differs from Pisa in having the outer antennæ concealed, and from Chorinus, in the second feet not being much longer than the third, and the first shorter than the second.

##### CHORILIA LONGIPES.

Carapax nec villosus nec pubescens, latitudine trans-orbitali perangustâ, triplo minore quam latitudo carapacis maxima, spinâ præorbitali tenui, acutâ, margine orbitali superiore angustè unifisso; rostro longo, pubescente, cornubus fere rectis, parce divaricatis; regione medianâ 4 spinis brevibus armatâ aliisque paucis brevissimis; regione cardiacâ parvâ, inermi, 2-4 tuberculis parvulis ornatâ; regione postero-laterali

*spinâ crassâ mediocri armatâ aliisque tuberculis parvulis ornatâ. Pedes antici longi, brachio trigono, margines spinuloso; carpo polygonato, margines spinuloso; manu subcarinatâ, subtilissimè tomentosâ.*

Not villous or pubescent. Trans-orbital breadth small, hardly one-third the greatest breadth of carapax; anterior orbital acanthus very slender, acute; superior orbital margin with a single small fissure. Beak long, pubescent, horns nearly straight and but slightly divergent. Median region of carapax armed with four short spines and a few others much smaller; cardiac region small, unarmed, but bearing two to four small tubercles; postero-lateral armed with a strong spine, not long, along with some small tubercles. Anterior feet long, arm trigonal, margins spinulous; carpus polygonal, margins spinulous; hand flattened, subcarinate, with a dense and very short tomentose coat.

Plate 1, fig. 5 *a*, female, natural size; *b*, under view of head, enlarged two diameters; *c*, side view, enlarged four diameters; *d*, abdomen of female.

Length of carapax, one inch and seven lines; greatest breadth, ten lines; trans-orbital breadth, three and one-third lines; length of beak, anterior to eyes, seven lines; length of anterior legs, one inch and six lines; length of third pair of legs, two inches; length of second pair, two inches and two and a half lines; length of posterior pair, one inch and eight lines.

The outer antennæ with the flagellum extend very nearly to apex of beak. There are a few short spinules at apex of peduncle of eye. The pterygostomial region is denticulate. The female abdomen consists of seven joints and is round-elliptical, the last joint the longest. The third joint of the outer maxillipeds is broader than long.

*Chorilia longipes*, DANA, Siliman's Amer. Jour. Sci., 2d Ser., xi. 269.

#### GENUS LAHALNA, Dana.

*Choriliæ quoad pedes antennisque externas celatus affinis. Carapax elongatè ovatus, tumidus, parce armatus; rostri cornibus elongatis,*

*gracillimis, divaricatis. Articulus antennarum externarum 1mus latus, parce longior quam latior, apicem processu spiniformi armatus. Orbita infra supraque sinu rotundato interrupta, dente præorbitali acuto. Pedes toti graciles.*

In the feet, and in the outer antennæ concealed by the beak, near *Chorilia*. Carapax long ovate, tumid, sparingly armed; horns of beak long, very slender, divaricate. First joint of outer antennæ broad, slightly longer than its breadth, armed with a spiniform process at apex. Orbit below and above interrupted with a rounded sinus, præorbital tooth acute. Feet all slender.

## LAHAINA OVATA.

*Carapax vix spinosus, subvillosus, papillis postero-dorsalibus rectè flexis, spinâ postero-laterali parvulâ, aliâque posticâ; rostri cornubus corpore paulo brevioribus, tenuibus, valde divaricatis, margine orbitali superiore latè fisso, spinâ anticâ brevi acutâ et lateraliter unidentatâ. posticâ prominenter rectangulatâ non acutâ. Articulus antennarum externarum 1mus apice spinigerus. Pedes tenues, longi, manu perangustâ, nudâ.*

Carapax hardly spinous, only a small postero-lateral spine, and another behind; surface subvillous or papillose, papillæ of posterior half of carapax bent at a right angle; horns of beak very long (a little shorter than rest of body), slender, much divaricate. Breadth across the eyes about half greatest breadth. Upper margin of orbit with a broad, rounded sinus; anterior spine short, acute, and having a tooth on its outer side over the eye; posterior part of orbital margin salient, not acute, rectangulate. First joint of outer antennæ having an elongate spine at apex. Pterygostomial margin armed with a long, curved spine or horn, and another short spine. Feet slender, long; hand very narrow, nude, fingers contiguous.

Plate 2, fig. 1 *a*, male, enlarged three diameters; *b*, orbital margin and eye (1, base of beak; 2, apical spine of base of outer antennæ; 3, præorbital spine; 4, eye; 5, posterior part of orbit); *c*, under view of head; *d*, hand; *e*, papilla of posterior half of dorsum; *f*, papilla of the apex of the third joint of one of the legs.

Dredged at Lahaina, Maui, Hawaiian Islands.

Length, six and a half lines; greatest breadth, nearly three lines.

The specimen is in the soft-shell state, and it is difficult to say how far its papillose condition is, owing to its age or its moulting, and what of it is characteristic of the mature animal. The appearance of the individual, and especially the small size of the eyes, seem to show that it is nearly mature if not quite so. The orbit of the eye is very imperfect, the emargination or fissure in its upper and under sides being so great that the eye is not concealed when thrown back, except at its tip. The legs are nearly naked, but have a few hairs, and also a few papillæ similar to that figured in fig. 1 *f*. There are two such papillæ on the anterior side of each eye; one at apex, and the other a short distance from the apex. The horns of the beak are hairy, and very slender, and quite divergent. Behind the orbit, the body is abruptly narrower, and there is here a small spine on either side. The tarsi are very slender and red, with minute spinules.

GENUS SCYRA (*Dana*).

*Naxiæ antennæ orbitæque affinis. Rostrum laminatum, acutè furcatum. Articulus antennarum externarum primus undique angustus, apice externo ultra rostrum parce saliente; secundus depressus, tertio valde longior.*

Related to *Naxia* in the antennæ and orbit. Beak rather short, acutely furcate, laminate. First joint of outer antennæ narrow throughout, outer apex projecting a little either side of beak; second joint depressed, much longer than third. Feet of moderate length.

This genus has laminate antennæ like *Lissa*, but they are acute, and the outer antennæ are concealed beneath, excepting the tip of the flagellum. The outer margin of the first joint of these antennæ is straight and parallel with the medial line of the body; and at its outer basal angle there is a tooth, while the outer apical angle lies directly beneath the præorbital spine. There is no opening through the lower orbital margin. The epistome is transverse.

## SCYRA ACUTIFRONS.

*Ovata, fere inermis, rostro lamellato, cornibus ovato-lanceolatis, acutis, integris; spinâ præorbitali acutâ; regionibus carapacis valde prominentibus; regione medianâ per suturam profundam discretâ, postero-laterali tumidâ; cardiacâ simpliciter rotundato-tuberculiformi; margine carapacis postico medium tuberculo parvulo. Pedes antici elongati, manu carinatâ, brachio angulis pustuloso, carpo 3-4 carinato.*

Ovate, nearly unarmed; beak short, lamellar; horns ovato-lanceolate, acute, entire; superior præorbital spine acute; regions of carapax strongly pronounced; the median region divided from cardiac and lateral by a deep suture; postero-lateral region tumid, transversely indented, and posterior part rising into an obtuse point; cardiac region simply round-tuberculiform; posterior margin of carapax with a small tubercle at middle. Anterior feet rather long, hand carinate, arm with the angles pustulate, carpus with three or four carinæ.

Plate 2, fig. 2 *a*, male, natural size; *b*, under view of head; *c*, hand; *d*, female abdomen.

Oregon, C. Pickering, Exp. Exp.

Length of carapax, one inch and one line; greatest breadth, eight and a half lines; breadth across præorbital spines, three lines; length of beak, three and a half lines.

The outer antennæ have the outer angle of first basal joint acute or nearly so, but not produced into a spine; the second and third joints are flattened and oblong, the third little more than half the length of the second, and its apex not reaching to apex of beak. Pterygostomian region with the margin obtusely dentate. Eyes quite small. Legs somewhat pubescent.

*Scyra acutifrons*, DANA, Silliman's Amer. J. Sci., 2d Ser., ix. 269.

## SUBFAMILY II. PYRINÆ.

GENUS PYRIA (*Dana*).

*Oculi retractiles, breves, spinâ præorbitali carentes. Carapax sub-pyri-formis depressus. Rostrum lamellatum, bifidum, sat breve. Antennæ externæ sub rostro celatæ. Pedes sat curti; antici tenues, reliqui valde compressi articulis tertio, quarto, quintoque complanatis; tarso tenui.*

Eyes retractile, short, without a præorbital spine. Carapax subpyri-form in outline. Beak lamellar, two-horned, rather short. Outer antennæ concealed beneath the beak. Feet short; the anterior pair slender; eight posterior much compressed; third, fourth, fifth joints widely flattened; tarsus slender.

The carapax in the species on which this genus is founded, is but little convex, and but slightly uneven, with the different regions indistinct. The outline is even and convex from the angle just behind the eyes around by the posterior margin; the eyes are quite short and project but little from a shallow emargination just within this angle. The beak starts from the level of the eyes, and each part is ovate, being narrower at base than it is a short distance above. The eight posterior legs are remarkable for their flattened form; the fourth and fifth joints taken together, have an oblong, elliptical outline.

The outer antennæ have their moveable part arising just each side of beak, but it is generally directed inward and forward under the beak. The buccal area is broader than long. The second joint has the inner apex much produced. The epistome is quite short.

This genus is near *Herbstia* in its short, lamellar, divided beak; but is peculiar in its very much compressed legs, and in having its outer antennæ concealed beneath the beak.

## PYRIA PUBESCENS.

*Pubescens, inermis, omnino depressa, subpyriiformis, latitudine post-orbitali valde majore quam dimidium latitudinis maximæ, marginibus*

*post-orbitalibus omnino integris nunquam constrictis, cornubus rostri ovatis, acutis, margine pubescentibus et subtiliter erosis. Pedes antici pertenues; 8 postici marginibus hirsuti, articulo quinto vix duplo longiore quam latiore.*

Pubescent, unarmed, depressed, subpyriform, breadth just behind the eyes much greater than half the greatest breadth; margin of carapax behind the eyes entire, without any constriction; horns of rostrum ovate, acute, pubescent, and irregularly denticulate or uneven at margin. Anterior feet very slender; posterior eight with the two opposite margins very hairy, fifth joint scarcely twice as long as broad.

Plate 2, fig. 3 a, animal, enlarged.

Feejee Islands or Tongatabu; there is some uncertainty as to which of these neighbouring groups afforded the specimen.

Length, one-fourth of an inch. The eight posterior legs are subequal, and the tarsus is naked or nearly so. The fingers of the hand are tapering and acute, and the hand narrows towards its extremity.

#### SUBFAMILY MITHRACINÆ.

##### MITHRAX ASPER (*Milne Edwards*).

*Rostrum usque ad diametrum orbitalem divisum, cornubus bilobatis, divergentibus; carapace pubescente, granuloso, superficie plerumque inermi, tuberculis parvulis paucis ornatâ; marginibus lateralibus valde 7-spinoso-dentatis, dentibus duobus posticis minoribus et sub-dorsalibus. Pedes antici mediocres, brachio carpoque spinulosis; 8 postici apice articuli tertii uni-spinigeri. Antennæ externæ interdum sub rostro partim celatæ, articulis 2do 3tioque subæquis. Margo orbitalis inferior unidentatus. Regio pterygostomiana margine spinulosa.*

Rostrum divided to orbital line, horns divergent, deeply two-lobed at apex; carapax pubescent, granulous, mostly unarmed with spines,

but having a few tubercles; lateral margin strongly seven-toothed; teeth spiniform, two posterior smaller and subdorsal. Anterior feet of moderate size; arm and carpus spinulous; eight posterior with a spiniform tooth at apex of third joint. Outer antennæ often partly concealed by the beak; second and third joints subequal, hardly reaching to furcation at apex of either horn. Lower orbital margin one-toothed. Pterygostomian region spinulous or pustulate.

Plate 2, fig. 4 *a*, male of a specimen from the East Indies, natural size; *b*, under view of head.

Balabac Passage, north of Borneo; also from Peru?

Length of carapax of specimen from Balabac Passage, one inch; greatest breadth, ten lines; hand, six and a half lines long, or a little more than half the length of the carapax.

Length of the supposed South American specimen, three inches and two lines; same, excluding beak, two inches and seven lines; breadth across from tip to tip of sixth lateral spine, two inches and nine lines; breadth across, excluding these spines, two inches two lines. Length of longest lateral spines, nearly half an inch.

Below the outer spine on the margin of the orbital cavity there is an obtuse spine, and another exists on the surface, between the upper angle of the buccal area and the second tooth of the margin of the carapax. Outer maxillipeds and surface adjoining granulous. Posterior margin of carapax nearly straight, and with a small, prominent tubercle or spine at each angle; also a small spine or tubercle on the intestinal region.

#### SUBFAMILY CYCLACINÆ.

#### GENUS CYCLAX.

*Suborbicularis, paulo armatus, rostro parrulo, furcato, non lamellato. Oculi prælongi, retractiles, orbitis obliquo-transversis spinâ externo-posticâ longâ, anticâ parvulâ. Antennæ externæ rostro remota, longæ, articulo primo apice bi-spinoso, spinâ externâ longâ. Fossæ anten-*

*narum externarum sub rostro partim excavatæ. Pedes longi parce secundo sesquies longiore quam carapax, toti tenues, fere cylindrici.*

Nearly round, somewhat armed; beak small, furcate, not lamellar. Eyes very long, retractile, orbits somewhat obliquely transverse; outer posterior spine long, præorbital small. Outer antennæ remote from beak, long, first joint with two spinous processes at apex, the outermost long. Inner antennary cavity extends beneath the beak. Feet long, second pair one and a half times length of body, all quite slender, nearly cylindrical.

This genus is near *Mithrax*, but has the long legs and something of the habit of *Camposcia*. The eyes have quite long peduncles, as in *Camposcia*, but fold back into distinct orbits, which are nearly transverse. The buccal area is much wider in front than behind. The third joint of the outer maxillipeds is about as long as broad, and the next joint is articulated with its inner angle.

#### CYCLAX PERRYI.

*Carapax paulo oblongus, convexus, parce pustulatus, rostri cornubus subconicis, acutis, margine orbitæ superiore tri-spinoso, spinâ anteriore longiore et reflexâ, spinâ præorbitali parvulâ, post-orbitali crassiusculâ; marginibus carapacis antero-lateralibus 5-spinulosis, spinulis remotis, anteriore duplice; margine postico 2-spinuloso. Antennæ externæ dimidio carapacis longiores, pilosæ. Pedes carapace valde longiores, 8 posticis sparsim pilosis, tarso infra paulo piloso.*

Nearly orbicular, slightly oblong, convex, sparingly pustulate; beak short, horns subconical acute, superior margin of orbit with three spines, the anterior longest and reflexed, præorbital spine small, post-orbital, rather stout, and transverse in position; antero-lateral margins of carapax with five rather distant spinules, the anterior one double; also two on the postero-lateral margin. Outer antennæ longer than half the carapax, hairy. Feet much longer than carapax, eight posterior sparsely pilose, tarsus somewhat hairy within.

Plate 2, fig. 5 *a*, animal, enlarged; *b*, under view of head.

Pitt's Island, the northern island of the Kingsmill Group; collected from coral reef, April 30th, 1841, by Lieutenant O. H. Perry.

Length, two and a half lines. The surface of the carapax is uneven and the regions are distinct. In an upper view the outer antennæ appear to arise near the orbits, and quite distant from the beak. The second joint (the first moveable), is a little longer than the third. The eyes are much longer than half the space intervening between the two orbits.

The anterior pair of legs is about two-thirds the length of the second pair; the hand is long and slender; the second and third pairs are the longest, the second about one and a half times the carapax. The horns of the beak are separated by a narrow triangular interval.

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#### FAMILY EURYPODIDÆ.

#### SUBFAMILY EURYPODINÆ.

#### GENUS EURYPODIUS, *Guerin*.

IN the Eurypodii, the carapax is triangular, rounded behind, with in front a prominent, slightly arcuate beak, divided into two slender approximate horns, the furcation extending quite to the antennary fossæ. The upper surface of the carapax has a protuberant median region, and a prominence over the cardiac region, which is partly continued over the lateral regions. Each species known has on the medial line of the carapax two spines on the median region, one (or two on a transverse line) on the posterior part of the cardiac, and one on the posterior margin, besides sometimes others; also laterally there are one or more spines. There is a prominent post-orbital spine, and a small prominence, sometimes acute, just anterior to it.

The eyes form an oblong, ovoid prominence at the extremity of the pedicel, the longest diameter being vertical.

The septum between the inner antennæ is prominent, and is

often elongated into a spiniform process. The epistome is broader than long. The legs are long and rather slender, the thigh of the second or third pair of legs being usually not far from the length of the carapax, though sometimes considerably shorter. The fifth joint is flat, subfalciform, and the tarsus closes against the inferior margin.

## EURYPODIUS SEPTENTRIONALIS.

*Carapax* obsoletè villosus, spinis paucis, in regione cardiacâ posteriorius duabus anterioribus unâ; spinâ post-orbitali acutâ et anteriore minori vel acutâ vel obtusâ; rostro supra complanato. *Articulus antennarum externarum* 1mus dente subacuto ectus ad basin armatus et juxta dentem processu subacuto. *Pedes* toti fere nudi; *antici* crassiusculi, brachio carpoque parce tuberculato-spinosis, manu scabro-granatâ, paulo tumidâ, digito mobili cum dente parvulo tuberculiformi intus armato polliceque juxta basin cum dente simili. *Pedes* 8 postici longi, articulo pedis tertii tertio tuberculis setiferis parvulis biseriatis infra ornato, 5to longiore quam quartus, subtilissimè hirsuto, ejus margine inferiore versus apicem brevissimè hirsuto.

Carapax obsoletely villous; spines few, on the cardiac region two posteriorly and one anteriorly; the post-orbital acute, and another smaller just anterior, either acute or obtuse. Beak flattened above. Immoveable basal joint of outer antennæ with a subacute tooth on outer side at base, and below this tooth, near by, a subacute prominence. Feet all nearly naked. Anterior feet rather stout; arm and carpus small spinoso-tubercular; hand scabro-granulous, rather tumid; moveable finger armed on inner margin with a small tuberculiform tooth just inside of middle, and immoveable finger with a similar one near articulation. Eight posterior feet long and slender; thigh with two series below of small setiferous tubercles; fifth joint longer than fourth, minutely hirsute; the lower margin towards apex short hirsute.

Plate 2, fig. 6 *a*, under view of head, enlarged two diameters; *b*, outer view of right hand, natural size; *c*, extremity of second pair of feet, natural size; *d*, male abdomen, natural size.

## Nassau Bay, Fuegia.

Length of carapax, two and five-eighths inches; of beak, five-eighths of an inch; anterior pair of legs, exclusive of hand, nearly as long as carapax; hand, two-thirds as long as carapax; thigh of second pair of legs, very nearly as long as carapax; whole leg, nearly two and a half times as long as carapax. The carapax has the two spines of the medial region prominent, and one small spine either side of the anterior. The lateral regions have a spine nearly in a line with the post-cardiac, and another smaller, forward and inward of this one; also, over the base of second pair of legs, two small spines. Posterior to the post-orbital spine, there is a tumid prominence in the sides of the carapax, and a small obtuse spine on the upper side of this prominence. Between the post-cardiac spine and the marginal behind, occupying the intestinal region, there is a low prominence with two obsolescent spines. The rounded tooth on the inner edge of the finger stands isolated; the rest of the edge is thin and denticulate. The third joint of the eight posterior legs is thinner below and has a series of small rounded points or tubercles. The posterior margin of the inner-antennary cavity, next to the outer antennæ, is reflexed downward, and a process from the base of the outer antennæ extends inward just anterior to this reflexed piece.

This species is near the *Audouinii*;\* but the upper surface of the beak is flattened, and the fifth joint of the eight posterior legs is longer than the fourth, instead of shorter. The length of the hairs on the lower edge of the fifth joint of the eight posterior legs, is not one-fourth the breadth of the joint, while it is one half the breadth in the *Audouinii*. The third and fourth joints of these legs also are not as nearly cylindrical.

*Eurypodius septentrionalis*, DANA, Sill. Am. J. Sci., 2d Ser., ix. 270.

\* D'Orbigny, Voy. dans L'Amerique Merid., Crust., p. 3, pl. 1. The specific description of the *E. Audouinii* and the drawing, represent the fifth joint as shorter than the fourth; while the remarks following the specific description make it longer; the last is evidently an error.

## EURYPODIUS BREVIPES.

*Carapax valde tumidus, spinis paucis, brevibus, in regione cardiacâ posterius duâbus antèrius unâ; rostro supra complanato breviorè. Articulus antennarum externarum 1mus extus ad basin dente armatus et juxta dentem processu subacuto. Pedes breves, hirsuti, primi subtenuës, brachio carpoque cum 3-4ve tuberculis minutis supra armatis, manu lineari, tenui, lævi, margine digiti interno denticulato. Pedes octo postici crassiusculi, valde breviores, articulo 3tio pedis secundi valde breviorè quam carapax, articulo 5to lato et crasso, longiorè quam quartus, non duplo longiorè quam tarsus.*

Female: carapax very tumid, with few spines, two little prominent on the cardiac region posteriorly, and one anteriorly. Beak flattened above, rather shorter than in preceding species. Outer side of basal joint of outer antennæ with a small prominence near base, and another just posterior. Feet short; hairy on the margins of all the joints. First pair rather small; arm and carpus with three or four small tubercles above; hand narrow linear, rather thin; inner margin of finger denticulate. Eight posterior feet rather stout, third joint of second pair much shorter than carapax, fifth joint broad and stout, longer than fourth joint, and not twice as long as sixth (tarsus).

Plate 2, fig. 7 *a*, animal (female), natural size; *b*, abdomen of female; *c*, under view of head.

Nassau Bay, Fuegia.

Length, one and five-eighths inches; of beak, three and a half lines; of third joint of second pair of legs, one inch; of fifth joint of same pair, eight lines, and breadth of same, two and a half lines (or about one-third the length); length of tarsus of same pair, five and one-third lines.

The carapax has only two spines on the median region, and these are prominent; also a prominent acute, postero-lateral, in the same line with the post-cardiac, besides one or two minute, near by, forward and inward, also two spines on the lateral region, over base of second

pair of legs; also, one or two spines on the antero-lateral region, anteriorly. The outer maxillipeds are hairy throughout. The inter-antennary septum is produced into a long spine, and the margin behind the fossettes, next to the base of outer antennæ, is reflexed as in the *E. septentrionalis*.

*Eurypodius brevipes*, Sill. Am. J. Sci., 2d Ser., xi. 270.

#### EURYPODIUS AUDOUINII (*Edwards and Lucas*).

We refer here, with hesitation, a specimen (male), which is in an imperfect condition in our collections, owing to its having been taken while the shell was in the soft state. It has the fifth joint of the eight posterior legs about as long as the fourth, or a little shorter in the two posterior pairs. The hand is stout and tumid, and the finger has a rounded prominence on the inner margin, inside of middle, which is thin and denticulate like the rest of the edge, and not a rounded tubercle like that of the *septentrionalis*. The surface below is covered with an exceedingly short but rough down; the legs are nearly bare. It is probably from Nassau Bay, Fuegia.

#### EURYPODIUS LATREILLII.

Plate 3, fig. 1 *a*, under view of head, enlarged four diameters; *b*, exterior view of right hand, *ibid.*; *c*, extremity of third pair of legs, *ibid.*

Valparaiso, Chili.

This species differs from the preceding in having the fingers of the hand without any appearance of a tooth-like prominence on the inner edge, the edges being simply and evenly denticulate. Moreover, the margin of the antennary fossettes behind, is not reflexed adjoining the immoveable basal joint of the outer antennæ.

A specimen an inch in length has the following characters. The beak is about one-fourth the whole length of the carapax; it is flattened above, but the flat surface is placed a little obliquely. The

edges are hairy, and in the specimen, the hairs are longer than the breadth of the beak. The second post-orbital spine is prominent and obtuse; the first quite short and obtuse. The carapax has two spines on the medial region, one on the cardiac region, one either side in the same line nearly on the postero-lateral region, and another, forward of this, a little more outward; also one on the middle of posterior margin. The lateral portions of the carapax are somewhat hairy.

The immoveable basal joint of the outer antennæ has no spinous process on outer side, near base, and no distinct tooth just posterior.

The first pair of feet is about as long as the carapax. The others are much longer and more slender. The arm has two small tubercles on the upper side; the next joint a few more; the hand is linear and rather thin, with the upper and under margins hairy. The following legs have the thigh nearly cylindrical, with a few hairs above and below; the fifth joint is longer than the fourth.

The abdomen of the male is narrow, with the last joint subtriangular.

*Eurypodius Latreillii*, GUERIN, Mem. du Mus., xvi. pl. 14, and Iconogr. Crust., pl. 11, f. 1.

—, EDWARDS, Crust., i. 284.

—, Voyage de la Coquille, pl. 2, f. 1. This figure represents the first post-orbital spine of nearly the same size as the first; while in Guerin's figure and our specimens it is very short, and the second very much longer.

#### GENUS OREGONIA, Dana.

*Rostro, antennis, oculis, spinâ postorbitali pedibusque elongatis Eurypodio affinis. Pedes tenues, octo postici articulum quintum aliosque subcylindrici, nunquam compressi.*

Resembling *Eurypodius* in beak, antennæ, eyes, post-orbital spine, and feet. Feet slender, the anterior little shorter than second pair, the eight posterior pairs, with the fifth joint, as well as others, cylindrical.

The main distinction between this genus and *Eurypodius*, consists in the fact, that the fifth joint of the eight posterior legs is slender

cylindrical, instead of compressed and broad, and consequently, the tarsus does not shut against this joint.

The beak is bifid and long, with the horns in contact, and not arcuate in a vertical plane like *Eurypodius*; though sometimes with a slight curve in a horizontal plane. The eyes and post-orbital spine are rather long, and the former closes back, reaching to the spine, though not concealed in this position scarcely more than in *Eurypodius*. The distance between the orbits is about twice the breadth of the beak at base. The carapax has a triangular form, rounded behind; it has the medial region tumid and prominent; a transverse low post-medial region; a small cardiac region, and a large swelling lateral region. The surface is rough, with minute granules or obsolete tubercles, and short hairs arising from them, but without any prominent spines, as far as the species have been observed.

The septum between the inner antennæ is prolonged into a spinous process. The epistome is large, but transverse. The buccal area is nearly square, the breadth slightly exceeding the length. The third joint is triangular. The abdomen has seven joints in the male.

#### OREGONIA GRACILIS.

*Carapax breviter sparsimque pubescens, rostro valde longiore quam latitudo inter-orbitalis. Pedes breviter sparsimque pubescentes, tenues; primi secundis paulo breviores, brachio tuberculis minutis supra infraque ornato, manu fere lineari, digito intus prope basin unidentato alioque denticulato. Abdomen maris sublineare, margine laterali versus apicem excavato, apice truncato.*

Carapax short and thin pubescent, beak much longer than distance between the orbits. Feet short and thin pubescent, slender; first pair a little shorter than second, arm with minute tubercles above and below, hand nearly linear, finger having a small tooth within, near base, and the rest of the edge denticulate. Abdomen of male sublinear, margin either side towards apex excavate, apex truncate.

Plate 3, fig. 2 *a*, animal (male), natural size; *b*, under view, enlarged; *c*, abdomen, natural size.

Puget's Sound, C. Pickering. Exp. Exp.

Length of carapax (including beak, as usual), one and seven-twelfths inches; of beak, five and one-third lines; breadth between the orbits, four lines; greatest breadth of carapax, ten lines; first pair of legs, a little longer than carapax; posterior pair, one and one-third the carapax; second pair over one and a half times carapax. The hand is compressed, and the upper edge is obtuse, with hairs in minute tufts. The fifth joint of eight posterior legs is closely covered with very short hairs, besides tufts of hairs a little longer and divergent; tarsus rather longer than half the preceding joint. The horns of the beak have hairs or setæ above in a longitudinal range. The pedicel of the eyes has a small prominence on anterior side. The immoveable basal joint of outer antennæ has the outer anterior angle rounded and spinulous. The septum between the inner antennæ is elongated, spine-like.

*Oregonia gracilis*, DANA, Sill. Am. J. Sci., 2d Ser., xi. 270.

#### OREGONIA HIRTA.

*Carapax pedesque sparsim hirti, rostro tenui, brevior quam latitudo inter-orbitalis. Pedes paulo breviores, digito pedis antici intus æque denticulato. Abdomen maris subellipticum, apice transversim triangulatum, feminæ fere orbiculatum.*

Carapax and feet sparsely rough hairy, beak slender, shorter than inter-orbital space. Feet rather shorter than in preceding species. Finger of anterior feet with inner edge evenly denticulate and no prominent tooth. Abdomen of *male* subelliptical, at apex transversely triangular; of *female*, nearly orbicular.

Plate 3, fig. 3 *a*, front of carapax, natural size; *b*, abdomen, enlarged two diameters.

Puget's Sound, C. Pickering.

This species is near the preceding, but has a more rough hairy look, is less slender and shorter in its beak, with a different abdomen.

*Oregonia hirta*, DANA, Silliman's Am. J. Sci., 2d Ser., xi. 270.

## FAMILY PERICERIDÆ.

## SUBFAMILY PERICERINÆ.

## PERICERA TRIGONA.

*Feminae*:—*Carapax bene triangulatus, triangulo equilaterali, spinâ postero-laterali longâ, crassâ, complanatâ; superficie supra infraque breviter densissimèque villosâ, villis defrictis vero nitidè porcellanâ; spinis dorsalibus duobus, unâ medianâ, alterâ cardiacâ; rostro mediocri, cornubus divergentibus; spinâ præorbitali perbrevis, subacutâ. Regio pterygostomiana uni-spinosa. Articulus pedum 3tius minutè tuberculatus et apice plerumque spinoso-productus; manu tenui, digitis omnino contiguis.*

*Female*:—Equilaterally triangular, postero-lateral spine long, very stout, flattened; upper and under surface dense and short villous, on removing the villous coat, shining porcelainous; back with two median spines of moderate size, one to the medial region, one to the cardiac; beak of moderate length; horns divergent. Præorbital spine very short, subacute. Pterygostomian region with a single tooth. Third joint of feet minutely tuberculous, and the apex for the most part prolonged and subacute; hand slender, finger and thumb in contact within.

Plate 3, fig. 4 *a*, animal (female), natural size; *b*, under view of head; *c*, female abdomen, enlarged two diameters; *d*, hand of female, ditto.

Feejee Islands.

Length from tip of beak to posterior apex, one and one-fourth inches; breadth across from tip to tip of lateral spines, one and one-fourth inches; breadth across the eyes, half an inch; distance between tips of beak, one-sixth of an inch; distance between stomach and cardiac dorsal spines, four lines; and the same between the cardiac spine and the posterior apex.

Resembles closely the *trispinosa*, but differs widely in its proportions, the breadth across the lateral spines being much greater in proportion to the length. The surface is very strongly porcelainous after removing the villous coat, and in the specimen thus examined, it had a whitish flesh colour. There is a very minute point on the sides of the anterior part of the stomach region. The horns of the beak are divergent, but not widely so. The anterior spinous process of the basal joint of the outer antennæ projects its whole length beyond the margin of the carapax, between the beak and the eyes. The anterior legs are much longer than the second pair, and the second and following pairs are subequal, the second a little the longest. The female abdomen is round-elliptical.

GENUS TIARINIA, Dana.

*Oculi non retractiles, orbitâ tubiformi inclusi. Rostrum bifidum, cornibus plerumque contiguus. Carapax subpyriformis, tuberculatus aut pustulatus, tuberculo cardiaco tuberculis tribus aut pluribus facto. Articulus antennarum externarum 1mus latissimus, spinâ apicali non armatus, angulo externo-apicali interdum paulo saliente et subacuto. Spina præorbitalis prominens. Pedes 1mi 2dis non longiores.*

Eyes not retractile, enclosed in a tubular orbit. Beak bifid, horns for the most part contiguous. Carapax subpyriform, tubercular or pustulous above, the cardiac tubercle or prominence consisting of three small tubercles. Basal joint of outer antennæ very broad, not armed anteriorly with a spine, outer angle sometimes a little salient and subacute. Præorbital spine prominent. Anterior feet not longer than second.

The genus *Tiarinia* includes the *Pericera cornigera* and some other species of *Pericera*. They differ from *Pericera* in the beak, the character of the surface, the basal joint of the outer antennæ, and also in less tendency to a triangular form in the outline. Moreover the anterior legs are not longer than the second pair; and the cavity for the pair of inner antennæ is not wider than long. When the first basal joint of the outer antennæ has a spine anteriorly, it is a prominence of the outer angle, and not a process near the articulation with the next joint.

The regions of the carapax are well pronounced. The medial region is large and oblong, and embraces several small tubercles which are sometimes nearly obsolete. The tubercles are often as follows, beginning anteriorly: two, distant from one another, in a line between the eyes; then, one medial; then four, two either side of the medial line more or less distant from it; then, on the medial line, two; next, two in a transverse line; next, two minute in a transverse line, just on the posterior limits of the medial region. The post-medial region is small and has one transverse tubercle, with sometimes others subsidiary; the cardiac region has three tubercles forming a single prominence, sometimes with two others smaller anteriorly, and others smaller posteriorly; the intestinal region is low without tubercles, or has three tubercles clustered, smaller than those of the cardiac region. The lateral regions are rounded and tumid, and embossed with small tubercles; a part either side of the post-medial region forms a separate prominence, consisting of a few clustered tubercles.

The two anterior pairs of legs are nearly of the same length, and the finger and thumb of the hand may be in contact throughout or only at their tips.

The abdomen of both sexes is seven-jointed.

The tarsus has minute corneous points on the inner surface, and longer hairs.

TIARINIA CORNIGERA? (*M. Edwards.*) Dana.

*Maris*:—*Crassiuscula, supra tuberculata pustulata et granulata, pone oculos paulo constricta, regione gastricâ prominente, latitudine maximâ longitudinem post-orbitalem æquante, latitudine trans-orbitali dimidiò minore quam latitudo maxima; rostro multo breviorè quam latitudo transorbitalis, cornubus omnino contiguis. Antennæ externa rostro multo longiores, articulo primo subquadrato angulo externo prominente, subacuto, articulis duo sequentibus longè ciliatis. 2do parce longiore quam tertius, subspatulato. Pedes secundi sequentibus duplo longiores. Pedis antici manus tumidula, oblonga, lris, digitis latissimè hiantibus, articulo tertio tuberculato. Pedes octo postici subtilissimè hirsuti, articulo tertio parce tuberculato.*

*Male*:—Rather stout, above tuberculate, pustulate and granulate.

somewhat constricted behind the eyes, median region prominent, greatest breadth equalling post-orbital length, and more than double trans-orbital breadth; beak much shorter than trans-orbital breadth, horns throughout contiguous. Exterior antennæ much longer than the beak, having outer angle of basal joint prominent and subacute, following part of organ long ciliate, second joint subspatulate, sparingly longer than the third joint. Hand of anterior feet oblong, somewhat tumid, smooth, fingers very widely gaping, third joint tubercular; second pair twice as long as either of the following; all four posterior pairs very minutely hirsute, third joint more or less tuberculate.

Plate 3, fig. 5 *a*, male, enlarged two diameters; *b*, under view of head; *c*, abdomen, enlarged two diameters; *d*, hand, enlarged two diameters; *e*, extremity of third pair of legs, left side, inner view.

Length of carapax, of specimen examined, ten and a half lines; greatest breadth, eight lines; breadth between tips of orbital acanthi, three lines; length of beak two lines.

The *T. cornigera* is stouter than either of the following. The cardiac prominence consists of three prominent tubercles, the posterior one of which is subdivided, besides two others anteriorly, and others small and granulous posteriorly. The tubercles are smooth at summit, but are set around with granules, or more properly hairy points, like the hirsute points of the legs, though shorter. The beak, just back of the orbits, and the sides of the carapax, are hairy, and there is also a tuft or two either side of the posterior part of the stomach or median region.

*Pisa cornigera?* LATR., Encyc., x. 141.

*Pericera cornigera?* EDW., Crust., i. 335.

—, ADAMS and WHITE, Samarang Crust., 18.

#### TIARINIA GRACILIS.

Maris:—*Carapax pone oculos paulo constrictus, latitudine carapacis maximâ longitudinem post-orbitalem fere æquante, latitudine trans-orbitali sat majore quam dimidium latitudinis maximæ; rostro antennis externis brevior, cornubus apice parce divergentibus, lateribus*

*non dentigeris. Antennæ externæ ciliatæ, articulo primo angulum externum producto, subacuto, articulis secundo tertioque angustis, ad apicem parce latioribus. Manus tenuis, digitis omnino contiguis. Pedes 8 postici sparsim pubescentes, articulo tertio plus minusve tuberculato.*

Carapax somewhat constricted behind the eyes; greatest breadth of carapax nearly equalling post-orbital length; trans-orbital width considerably greater than half the greatest breadth; beak shorter than outer antennæ; horns a little divergent at apex; sides without teeth. Outer antennæ ciliate; first joint with outer angle projecting and subacute; second and third joints narrow, slightly broadest at apex. Hand slender; fingers throughout contiguous, or very nearly so. Eight posterior feet sparsely pubescent; third joint more or less tuberculate.

Plate 3, fig. 6 *a*, male, enlarged three diameters; *b*, under view of head; *c*, male abdomen, enlarged three diameters; *d*, female abdomen, natural size.

Dredged up in the Sooloo Sea.

Length of male, six lines; greatest breadth, three lines; breadth between orbital acanthi, two lines; length of female, eight lines.

In the female the tubercles of the medial region and generally of the anterior half of the carapax were rather indistinct; but other characters are the same as for the male.

This species differs in its proportions from the *cornigera*; in the divergence of its rostral horns at tip, from the *cornigera* and *setigera*; in not having the legs fringed with long, reddish-brown, woolly hair, from the *tiarata*. The male has its tubercles prominent, but the medial region is not much raised as a whole above the rest of the surface; the tubercles of the posterior part of lateral region are conical. The abdomen of the male resembles that of the other species described (See fig. 6 *c*). That of the female is oblong elliptical with the extremity obtuse.

## TIARINIA ANGUSTA.

*Maris*:—*Carapax angustior, pone oculos vix constrictus, latitudine maximâ multo brevior quam longitudo post-orbitalis, latitudine trans-orbitali parce minore quam latitudo maxima; rostro longo, cornubus apice conspicuè divergentibus et latera cum 3-4 dentibus minutis remotè armatis. Antennæ externæ rostro dimidio breviores, articulis 2do 3tioque tenuibus. Manus tenuis, digitis omnino contiguis. Pedes 8 postici pubescentes, secundi 3tiis duplo longiores; articulus 3tius parvis antici plus minusve tuberculatus.*

*Male*:—Narrow, tuberculate and granulous above, hardly constricted behind the eyes, medial region hardly prominent, greatest breadth much shorter than post-orbital length, and but one-fourth greater than trans-orbital breadth; beak long, horns rather strongly divergent at apex, three or four minute teeth remote from one another, set along the outer side of lower half of beak. Outer antennæ half shorter than beak, second and third joints slender. Hand slender, fingers throughout contiguous or nearly so. Eight posterior feet pubescent; second pair twice as long as following; third joint of anterior pair sparingly small tuberculate.

Plate 3, fig. 7 *a*, male, enlarged three diameters; *b*, outer antennæ.

Dredged up off Sooloo Harbour.

Length, six lines; greatest breadth, two and a half lines; beak, two lines long; distance between tips of orbital acanthi, two lines.

This species is much narrower than the others, and has the beak one-third the whole length, with the tips much divergent. The distance across the eyes, instead of being half the greatest breadth, is about three-fourths the same. Behind the cardiac prominence, which consists of three tubercles, there is another similar but smaller prominence on the intestinal region. The beak is hairy as usual, and there are a few short hairs at the tip of the orbital acanthus. The teeth on the outer side of the beak are minute and hardly seen without special care on account of the hairs.

GENUS PERINEA (*Dana*).

*Pericerae affinis.* Orbita antice paulo aperta coque non bene tubulata, margine superiore non unifisso. Articulus antennarum externarum 1mus oblongus, antice non latior, apice externo paulo productus. Rostrum breviusculum, cornubus dicaricatis. Carapax tumidus, paucis tuberculis tumidis ornatus.

Near *Pericera*. Orbit, anteriorly somewhat open and not shut in as in *Pericera*; superior margin without a fissure. First joint of outer antennæ oblong, not broader at apex. Beak rather short, furcate, horns separated. Carapax tumid, having a few tumid tubercles.

The orbit in this genus is not so completely tubular as in *Pericera*, the anterior side being more open, so that the eye has some forward motion. The posterior side only projecting, there is some resemblance to the orbit in *Leucippa*. Moreover, the first basal joint of the exterior antennæ is oblong, not broad at apex. The body of the species seen is very tumid, and the tubercles are prominent on the posterior half, though not acute.

## PERINEA TUMIDA.

*Carapax valde tumidus, brevis (lat. maximâ long. post-rostralem æquante), lateribus rotundatis, regione medianâ convexâ minutè bi-tuberculatâ, regione cardiacâ largè tuberculiformi, laterali tumidè tri-tuberculatâ. Rostrum brev. latitudine trans-orbitali fere duplo brevius. Spina præ-orbitalis brevis, subacuta. Pedes brevis, articulis 3tio 4toque spinosè tuberculatis, manu crassâ, digitis latissimè hiantibus, digito mobili prope basin unidentato.*

Very tumid, short (post-rostral length about equal to greatest breadth), sides rounded and thick, medial region convex, with two minute tubercles, cardiac region with a large prominent tubercle, and the lateral with three prominent tubercles either side. Beak short, nearly twice shorter than the trans-orbital breadth. Præorbital spine short, subacute. Feet short, third and fourth joints spinoso-

tuberculate; hand very stout, fingers very widely gaping, the upper unidentate near base. First joint of outer antennæ produced at apex, but not acute.

Plate 4, fig. 1 *a*, male, enlarged four diameters; *b*, under view, twelve diameters; *c*, abdomen of male, four diameters; *d*, anterior legs; *d'*, *d''*, views of hand and fingers; *e*, one of the eight posterior legs; *f*, tarsus of the same.

Dredged at Lahaina, Maui, Hawaiian Islands.

Length, three and a half lines; greatest breadth, a little more than three lines. The body is very short and thick, with rounded sides, and the posterior margins are villous. Just anterior to the cardiac tubercle, at some little distance from the medial line, there is on either side a very small tubercle in addition to those above mentioned. The fingers of the hand have on the inner margin a few tufts of setæ towards apex, as shown in fig. 1 *d*. The posterior legs have the margins densely villous. The first joint of the outer antennæ has a prominent line, extending from the outer apex obliquely backward and inward to the inner basal portion, so as to appear to have a triangular under surface, at first sight, with the apex very narrow; but it widens within somewhat, where it gives insertion to the next joint.

#### HALIMUS TUMIDUS.

*Rostrum cornua subconica, latè divaricata. Carapax valde tumidus, latere 4-6 spinulis minutis armato; regione medianâ tribus tuberculis parvulis triangulatè ornatâ, alio tuberculo obsolescente posteriore; regione cardiacâ tuberculis obsolescentibus notatâ. Pedes pubescentes, sat breves; manu tenui, basin latiore, digitis fere contiguus, tenuibus; articulo 5to pedis postici duplo longiore quam latiore. Articulus antennarum externarum 1mus apice externo valde productus extusque 2-3-spinulosus.*

Horns of beak subconical, of moderate length, widely divaricate. Carapax tumid, sides armed with four to six spinules; stomach region with three small tubercles triangularly placed, and another faint

one behind; cardiac region with obsolescent tubercles. Feet pubescent, moderately long; hand slender, broader at base; fingers nearly or quite contiguous, slender; fifth joint of posterior feet twice as long as wide. First joint of outer antennae spiniform at outer apex, and on outer side 2-5 spinulous.

Plate 4, fig. 2 *a*, female, enlarged two diameters; *b*, under view of head, enlarged six diameters; *c*, side view; *d*, female hand; *d'*, male; *e*, extremity of last pair of legs; *f*, male abdomen, five diameters; *g*, female abdomen, *ibid*.

Shores of New South Wales, Australia.

Length of carapax, seven lines; greatest breadth, four and a half lines; breadth of beak at tips, one and three-fourths lines.

The buccal area is a little broader than long; the third joint of the outer maxillipeds is as long as broad, with the anterior margin entire and rounded; the fourth joint articulating in a large emargination of the inner anterior angle of the third. The pterygostomian area has a single spine on the margin. The beak extends forward in the line of the surface posterior to it, and owing to the tumid character of this part of the carapax, the direction of the beak is inclined downward and forward. It almost covers the outer antennae throughout. Of the lateral spinules of the carapax the first is the post-orbital; then there are two, one nearly over the other; then, posterior to these on the sides of the branchial region, two or three others. The surface of the carapax bears a few tufts of setae on its small tubercles.

#### GENUS PUGETTIA (*Dana*).

*Carapax depressus, superficie fere inermis, spinâ praeorbitali prominenti instructus, margine pone orbitam utrinque expanso. Articulus pedum 4 posteriorum 5tus cylindricus.*

Carapax depressed, nearly unarmed above; a stout praeorbital spine on either side behind the orbit, sides much expanded; fifth joint of the four posterior feet cylindrical.

This genus differs from *Leucippa*, which it resembles in appearance,

in its prominent præorbital spine, and also in having the outer antennæ properly exposed, although usually lying inward under the beak. The species are still nearer Halimus in form and structure, but the four posterior legs have the penult joint cylindrical. The surface is smooth or nearly so; there are traces of two distant tubercles in the same transverse line on the median region, similar to those of some Epialti.

#### PUGETTIA GRACILIS.

*Carapax lyratus, paulo convexus, latus, pone oculos utrinque largè triangulato-expansus cum angulo acuto, margine postero-laterali spinâ crassâ armato, latitudine ante-medianâ vix minore quam latitudo post-mediana, regione medianâ tumidâ, minutè bituberculatâ. Pedes antici crassi, longi, brachio supra carinato, dentato, carpo bicarinato, digitis fere omnino contiguus. Pedes octo postici nudiusculi, articulis 3tio 5toque subcarinatis, 4to dorsum depresso, 5to versus apicem inferiorem penecillum setarum brevissimum ferente.*

Carapax lyrate, somewhat convex, broad; on either side behind the eyes a large triangular expansion with angles acute; outer margin of postero-lateral region armed with a stout spine; gastric diameter but little less than the cardiac. Beak setigerous, horns somewhat divaricate. Medial region tumid, minutely tuberculate, and anterior to each tubercle a series of curled setæ. Anterior feet stout and long, arm carinate above and dentate, carpus bicarinate, fingers mostly contiguous within. Eight posterior feet nearly naked, third and fifth joints subcarinate, fourth depressed on upper side, fifth with a short pencil of setæ below, towards apex.

Plate 4, fig. 3 *a*, male, natural size; *b*, under view of head, enlarged four diameters; *c*, abdomen of male, natural size.

Puget's Sound.

Length of largest specimen seen, a female, one inch and four lines; breadth across from angle to angle of projection behind the eyes, ten and one-fourth lines; breadth across from tip to tip of lateral spine, eleven and one-fourth lines; length of beak, nearly four lines; length

of anterior feet, one inch and four and a half lines; length of hand, seven and a half lines; length of second pair of feet, one inch and eight lines; length of third pair of feet, one inch and two lines; length of posterior feet, one inch.

The carapax is smooth and naked. The cardiac region is very slightly tumid, and in younger individuals, it has at centre a minute tubercle, which is wanting in the largest, and there is in all a trace of a tubercle between this and the lateral spine. The margin of the pterygostomial region has three or four small teeth. The outer angle of the first joint of outer antennæ is subacute. In an under view, the peduncles of the eyes are visible for more than twice the distance they are in an upper view. The palpus of the outer maxillipeds has a re-entering angle on outer margin below the apex of the long joint. There are two or three setæ to apex of peduncle of eyes.

#### PUGETTIA RICHII.

*Sat grandis.* Carapax subtriangulato-oratus, post oculos alatus, alâ bilobatâ, lobis acutis, posteriore elongato et fere transverso; spinâ laterali subposticâ grandi; regione medianâ 4 tuberculis spiniformibus armatâ, cardiacâ uno, intestinali uno, postero-laterali utrinque duobus. Pedes antici longi, crassi, brachio paulo tuberculato, margine antico subtilissimè scalpto, carpo valde cristato, digitis (maris) latè hiantibus, apice denticulatis, digito mobili versus basin infra unituberculato.

Rather large. Carapax subtriangulato-ovate, an alate expansion behind the eyes, which is bilobate, lobes acute, the hinder long, and nearly transverse, postero-lateral tooth large, horns of beak quite long, narrow, convex above, hirsute, median region with four spiniform tubercles, cardiac region with one, intestinal with one, postero-lateral either side with two, one some distance in advance of the other. Feet long; anterior pair in male stout, arm a little tuberculate, anterior margin very finely scratched, carpus strongly cristate, fingers (of male) widely gaping, denticulate at apex, moveable finger having an isolated tubercle towards base.

Plate 4, fig. 4 *a*, male, natural size; *b*, abdomen, *ibid.*; *c*, outer antennæ; *d*, exterior maxillipeds; *e*, fingers of hand, outer view.

From California. William Rich, Esq.

Length of carapax, one inch and eleven lines; breadth between tips of teeth across stomach region, one inch and three and a half lines; breadth between tips of teeth across cardiac region, one inch and five lines; length of anterior legs, three inches and five lines.

In the specimen before us, the eight posterior legs are mutilated. The third joint of the second pair is slender subcylindrical, not at all carinate, and measures one inch and one line long. The pterygostomian region has three small spiniform teeth. The first joint of the outer antennæ has a tooth on the outer side near middle. The tubercles of the carapax, the more unequally-lobed alate expansion behind the eyes, and the form of the anterior legs, distinguish this species readily from the preceding. This species is named in honour of its discoverer, the Botanist of the Exploring Expedition.

#### SUBFAMILY MENÆTHINÆ.

#### GENUS MENÆTHIUS.

The specimens of this genus collected by the author have the following characters in common, in addition to those stated as generic by Milne Edwards.

Carapax subtriangular. Beak narrow and edged with short curled setæ, simple, sometimes emarginate at apex. Præorbital spine elongate, subacute. Sides of carapax with three largish teeth, the two anterior often bilobate, so as to make in such cases *five* teeth alternately unequal. Surface of carapax more or less uneven or tuberculate. Cardiac region prominent and showing at top three small tubercles triangularly placed; one or two small prominences between the cardiac protuberance and the lateral spine, forming a nearly straight range across the carapax. The medial region is prominent, with two tubercles anteriorly, often nearly coalescent into one, and usually having anteriorly a small tuft of setæ; also another tubercle posteriorly, or else three small tubercles placed triangularly. Behind the cardiac prominence often a small tubercle; and posterior margin of carapax either entire or with a small prominence near base of posterior legs and sometimes another medial one.

Eyes project laterally but little. Immoveable basal joint of the

outer antennæ narrow anteriorly, the outer angle prolonged into a spine, which is usually obtuse. Cavity of the inner antennæ with the posterior margin obliquely sloping forward towards the cavity, and the outline of the whole, this part included, elliptical. Exterior maxillipeds with the third joint subtriangular, the outer anterior angle being prolonged outwards much beyond the line of the outer margin of the second joint, and subacute.

In the males (with one exception?) the abdomen is quite narrow; the penult segment is longer than the preceding, and has a low salient angle on its opposite sides.

Hand of the first pair of legs, with the fingers either in contact throughout, or only at the extremity; inner margins wholly or partly denticulate; in some males, a broad tooth near articulation.

Area either side of mouth with the margin bidentate.

#### MENETHIUS ANGUSTUS.

*Carapax sat tuberculatus, perangustus (latitudine multo minore quam longitudo post-rostralis), dentibus lateralibus tribus, duobus anticis bilobatis; rostro longo, emarginato; regione medianâ tumidâ, posticè bituberculatâ et antè arcu triangulatâ notatâ; regione post-medianâ brevi, unituberculatâ; regione intestinali grandi unituberculatâ, margine postico rotundato, integro.*

Carapax tuberculous, quite narrow (greatest breadth much less than length of post-rostral part), lateral teeth three, the two anterior bilobate; beak long, emarginate, medial region tumid posteriorly, having two small tubercles, and just anterior to them an area slightly prominent of a triangular shape, post-medial region short, unituberculate, intestinal region large, with one tubercle, posterior margin of carapax rounded, entire.

Plate 4, fig. 5 *a*, carapax, enlarged three diameters; *b*. under view of mouth, &c., enlarged six diameters.

Locality doubtful. Expedition collections.

Length, five and one half lines; greatest breadth, three lines; length

of post-rostral part of carapax, four lines. A much narrower species than the *subserratus*, though resembling it. The first moveable joint of the outer antennæ is hardly one-sixth the length of the beak, while it is between a third and a fourth part in the *subserratus*. In the same transverse line with the post-medial tubercle there are either side two small tubercles.

#### MENÆTHIUS DEPRESSUS.

*Carapax breviter tuberculatus, latus (latitudine vix minore quam longitudo post-rostralis); dentibus lateralibus tribus obtusis, nullis bilobatis; rostro longo apice emarginato; regione medianâ tumidâ, postice tumidulâ; regione postmedianâ fere obsoletâ vel parce uni-tuberculatâ, regione intestinali uni-tuberculatâ. Abdomen latum, oblongo-subellipticum. Manus tenuis, digitis omnino contiguus, brachio parce tuberculato.*

Carapax low tubercular, broad (breadth hardly less than post-rostral length); three lateral teeth obtuse, none bilobate; beak long, emarginate at apex; median region tumid, posterior part prominent, but not divided into two or more tubercles; post-medial region nearly obsolete, or with a trace of a tubercle; intestinal region with one tubercle. Abdomen broad, oblong subelliptical. Hand slender, fingers in contact throughout by their inner margins; arm with a few small tubercles.

Plate 4, fig. 6 *a*, specimen from the Sooloo Sea, enlarged four diameters; *b*, right hand; *c*, outline of abdomen (segments not determined); *d*, beak of specimen from Upolu; *e*, abdomen of Sooloo specimen.

Dredged up in the harbour of the large island of Sooloo; also found at the Samoan Islands, about the coral reefs of Upolu.

Length, three lines; greatest breadth, two lines.

The abdomen resembles much that of females, but is only about half the usual width, not being probably fully developed. The articulations are all distinct in the Samoan specimen, but they may be in part only sutures. The Sooloo specimen has the posterior margin of the carapax slightly pointed at centre, and either side near base of

legs there is a small setigerous prominence. In the Upolu specimen, this character is apparent, but not very distinct. The anterior medial tubercles are furnished with a tuft of short, curled setae.

It seemed probable at first that the Samoan specimen might be the young of the *subserratus*. But the characters given appear to separate them.

MENETHIUS SUBSERRATUS, *Adams and White*.

Plate 4, fig. 7 *a*, carapax of male, enlarged two diameters; *b*, under view of same, enlarged four diameters; *c*, female, enlarged two diameters; *d*, male abdomen, enlarged two diameters; *e*, female do.; *f*, hand of female; *g*, moveable finger of male.

Feejee and Samoan Islands.

Carapax rather strongly tuberculate, stout, greatest breadth hardly great as length excluding beak: beak at tip emarginate: posterior lateral tooth subacute, the two others bilobate: medial region with three small tubercles posteriorly, arranged triangularly: post-medial region with a small tubercle: intestinal uni-tuberculate: posterior margin of carapax not tuberculate or bearing a prominence. Abdomen of male very narrow, towards base suborbicular. Fingers of hand a little apart at base; the lower of *f* *male*, denticulate along its whole inner margin, the upper near base bare in *f* *male*, but having a broad tooth in *male*.

Length of male, eight and one half lines; greatest breadth, six lines. Length of female, seven lines; greatest breadth, five lines. Male a little more slender than the female, but otherwise similar, and not differing in the manner shown in the figures of Adams and White. The large tooth of the finger in the male was not observed in the female. Only four segments were distinguished in the female abdomen, as seen in figure 7 *e*.

In some specimens, the two anterior of the lateral teeth are very nearly simple, or scarcely bilobate. The beak, when broken at tip, as often happens in species of this genus, fails of course of showing the emargination. The outer antennae in one of the specimens were

thrown forward beneath the beak, so as to be concealed by it, although capable of being spread either side of the beak. Arm of anterior legs with a few small tubercles.

*Menæthius subserratus*, ADAMS and WHITE, Crust. Samarang, p. 18, pl. 4, fig. 1.— Also fig. 2? which is supposed to represent a female.

MENÆTHIUS TUBERCULATUS, *Leach*.

Maris:—*Carapax valde tuberculatus posticè latiusculus (latitudine majore longitudinem carapacis post-rostralis æquante); dentibus lateralibus simplicibus, postico subacuto; regione medianâ posticè uni-tuberculatâ; regione post-medianâ obsoletâ, regione intestinali uni-tuberculatâ; margine postico utrinque prominulo; rostro longo, simplice. Abdomen perangustum, versus basin suborbiculare. Manus oblonga, digitis basin plane hiantibus.*

Male:—*Carapax* very strongly tuberculate, rather broad behind, (breadth equalling length of carapax excluding beak); lateral teeth simple, the posterior subacute; median region with but one tubercle on the posterior part; postmedial region obsolete; intestinal region uni-tuberculate; posterior margin of carapax with a small prominence near base of legs. Abdomen very narrow, towards base sub-orbicular. Hand oblong, fingers gaping, in contact only at apex.

Plate 5, fig. 1 *a*, animal (male), enlarged three diameters; *b*, under view, showing antennæ, enlarged six diameters; *c*, hand.

Paumotu Islands, Pacific Ocean.

Length, four lines; greatest breadth, two and two-thirds lines, which equals the length of post-rostral part of carapax.

The posterior part of carapax has the appearance of being orbicular in outline, owing to the fact that the sides along the lateral region, situated below the outline of the upper surface of the carapax, are in view when seen from above, as shown in the figure. Third joint of

the first pair of legs with a few minute tubercles, and a few similar tubercles usually on the same joint of other pairs, each tubercle bearing setæ.

*M. tuberculatus* (LEACH), ADAMS and WHITE, Crust. Samarang, p. 19.

#### MENÆTHIUS AREOLATUS.

*M. subserrato affinis.* Carapax paulo tuberculatus, tuberculo cardiaco simplice, quoque post-mediano intestinalique simplicibus; rostro integro, mediocri, margine laterali dentibus tribus, primo simpliciter, secundo paulo dupliciter. Oculi apice rotundati et spinâ anticâ alterâque posticâ instructi. Manus oblonga, superficie subtilissimè areolatâ, digitis plerumque contiguis, denticulis sex. Pedes 2di Antis longiores.

Near *M. subserratus*. Carapax slightly tuberculate; cardiac tubercle simple, postmedian and intestinal also distinct and simple; second of the lateral teeth slightly double, the first and third simple; beak entire, of moderate length; lateral margin with three teeth; the first simple, the second a little double. Eyes rounded at apex, having at apex, both anteriorly and posteriorly, a small spine. Hand oblong, surface very minutely areolate, fingers for the most part contiguous, teeth six in number. Second pair of feet longer than the first.

Plate 5, fig. 2 *a*, beak and eye of male; *b*, teeth of lateral margin; *c*, hand.

Sooloo Sea.

Length, slightly over two lines.

The character of the eyes and the areolate character of the surface of the hands, as observed under a high magnifier, distinguish this species from the *subserratus*. The same areolate character is seen in the exterior maxillipeds, upon the other joints of the legs, and appears at first sight to be a granulation of the surface. Each minute areola appears to have a prominent point at centre, looking like an obsolete spine. The teeth of the fingers only extend along the apical half of the inner margin, the rest being very nearly a straight line.

## MENÆTHIUS INORNATUS.

*Carapax latus, latitudine trans-orbitali dimidio minore quam sive latitudo maxima sive longitudo post-rostralis, pone oculos non constrictus; marginibus lateralibus 3-dentatis, dentibus triangulatis subacutis; rostro brevi, integro; spinâ præorbitali latè triangulatâ; superficie dorsali paululum gibbosâ, regione cardiacâ simplicissimè tuberculatâ, medianâ tumidâ, vix subdivisâ, regione laterali fere planâ. Oculi parce salientes, apice bene truncati.*

Carapax broad, trans-orbital breadth half less than either the greatest breadth or post-rostral length, not constricted behind the eyes; lateral margins with three low triangular teeth, which are somewhat obtuse or subacute; beak short, entire; præorbital spine broad triangular; dorsal surface, but slightly gibbous, the cardiac region with a single simple tubercle, the median tumid and hardly subdivided into three parts, the lateral nearly flat, and not plicate. Eyes sparingly salient, truncate at apex.

Plate 5, fig. 3 *a*, male, enlarged three diameters; *b*, under view of head, six diameters; *c*, part of antennæ, right side; *d*, under view of eye; *d'*, upper view of extremity of eye.

Dredged at Lahaina, Hawaiian Islands.

Length, five lines; exclusive of beak, four lines; greatest breadth, four lines; trans-orbital breadth, two lines. The specimen examined was without legs. The carapax is peculiar in having its breadth across the eyes as great as half its post-rostral length; and also having no constriction behind the eyes, and in having few tubercles, and but very slight undulations on the lateral region. The lateral teeth, moreover, are nearly acute, and each is tipped with setæ. The apex of the third joint of the outer antennæ projects as far as the apex of beak, or even beyond it. The eyes are singular in their truncate character, and a slight tumidity at the anterior and posterior apex. The carapax rather abruptly declines back of a line that crosses by the cardiac tubercle.

## ACANTHONYX SIMPLEX.

Feminae:—A. *Petiverii affinis*. Carapax parce convexus, tuberculis omnino carens, marginibus lateralibus parallelis, posterius cum dentibus duobus obsoletis ornatis, dente post-orbitali nullo. Pedes antici reliquis parce crassiores, digitis plerumque contiguis, 7–8-denticulatis, denticulis triangulatis, carpo supra cristato, subacuto; paris postici articulus penultimus angustior, angulo inferiore basi nec apici propinquiore. Tarsus 8–10 spinulis armatus.

Female:—Near *Petiverii*. Carapax sparingly convex, without a trace of tubercles; lateral margins parallel; no post-orbital tooth, but having posteriorly two obsolete teeth. Anterior feet sparingly stouter than the following; fingers contiguous, except near base; seven or eight triangular teeth; carpus cristate and subacute above. Angle on inferior side of penult joint of posterior legs nearer base than apex. Tarsus armed with eight to ten spinules.

Plate 5, fig. 4 *a*, female, enlarged two diameters; *b*, first pair; *c*, extremity of second pair; *d*, extremity of posterior pair.

Sandwich Islands.

Length of carapax, seven lines; width, five lines; breadth across the eyes, two lines. A very minute and sparse pubescence is seen, with a lens, on the legs, after the specimen is dry. The anterior angles of the carapax and the teeth posteriorly on the margin, seem, at first sight, to be prominent and acute; but this, as in other species, is owing to the setæ with which they are furnished. The distance between the two teeth referred to, is a little more than half the distance from the anterior of the two to the angle of the carapax. The spinules of the tarsus are less numerous and not as close as in the *Petiverii*, which species it resembles in its cristate carpus. The outer antennæ lie alongside of the beak, and do not project beyond the setæ at the apex of the beak. The abdomen of the female is broad elliptical, but larger and more nearly circular when with eggs beneath. In one specimen, possibly a different species, the carpus is not cristate.

The distance between the angle on under side of penult joint of legs and base of same joint, is about half the distance from the same angle to the apex; while in the *Petiverii*, this angle is nearer the apex than the base.

ACANTHONYX DEBILIS.

Maris:—*Petiverii affinis*. *Carapax paulo convexus, marginibus lateralibus parallelis, regione medianâ obsoletè bi-tuberculatâ, tuberculis setigeris. Pedes antici maris reliquis vix crassiores, digitis parce hiantibus, carpo non cristato. Tarsus pedis postici 12–14 spinulis seriatim armatus; articulus penultimus latè triangulatus, infra obliquè truncatus.*

Near *Petiverii*. Carapax a little convex; lateral margins parallel; stomach region with two setigerous points. Anterior feet but little stouter than the following; fingers slightly gaping, and meeting only at the extremity; teeth triangular; carpus not cristate. Tarsus of posterior feet, with twelve to fourteen spinules in a row; penult joint broad triangular; truncate margin oblique.

Plate 5, fig. 5 *a*, hand of male, enlarged five diameters; *b*, extremity of posterior legs.

Valparaiso, Chili.

Length of carapax of male, nine lines; breadth, five and two-thirds lines; distance between first and second lateral teeth, two and one-eighth lines; distance between second and third lateral teeth, one and one-eighth lines.

Differs from the *Petiverii* in the small hands of the males, the teeth of the fingers, the cristate carpus, and the two obsolete tubercles on the stomach region; from the *lunulatus*, in the small hands in the males; from the *simplex*, in the stomach tubercles, the spinules of the tarsi. The abdomen has only six joints, and not seven, as in the *MacLeayi* of Krauss; it has the same shape as in the *Petiverii* (Plate 5, fig. 6).

## ACANTHONYX PETIVERII?

Valparaiso, Chili.

Plate 5, fig. 6 *a*, hand of male, enlarged four diameters; *b*, extremity of second pair, enlarged five diameters; *c*, extremity of fifth pair, *ibid.*; *d*, abdomen of male.

The specimens agree with the description of the *Plicarii*. It is very near, also, the *Mac Leayi* of Krauss. but the male has only six segments to the abdomen. The two sides of the carapax are very nearly parallel, and the two posterior teeth of the margin are quite small, although appearing prominent through the setae. The hand of the male is very stout, the breadth being nearly equal to the length from the base to the fingers. The setigerous crest on the carpus of the anterior legs is distinct and prominent. The two setigerous tubercles on the stomach region are wanting.

The following are measurements of males:—Specimen A. Length of carapax, seven lines; breadth of carapax, four and a half lines; distance between the first and second lateral teeth, one and three-fourths lines; distance between the second and third, one line. Specimen B. Length of carapax, eleven and one-fourth lines; breadth of carapax, seven lines; distance between first and second lateral teeth, three and one-fourth lines; distance between second and third, one and one-half lines.

The tarsus in the eight posterior legs is oblong triangular. In the second pair, the two margins regularly and evenly diverge from the base, and the oblique truncation is very nearly transverse. In the fifth pair, the oblique truncation is more oblique; but the distance from the angle to the base of the joint is much the greater part of the joint, and the margin inside of this angle, that is, between it and the articulation of the tarsus, is far from parallel to the dorsal margin of the joint. The number of teeth in a row on the inner margin of the tarsus is about fourteen.

In the male hand, the fingers are a little open, and close entirely only at tip, and the inner margin has seven or eight broad teeth,

which are quadrate with a straight or truncate summit, but are scarcely at all prominent.

In the female the anterior feet are not stouter than the following. The fingers are denticulate, the teeth triangular and about seven in number. The penult joint of the posterior legs has the truncate margin more oblique; but the angle is rather nearer the apex than the base, and the number of teeth in a row on the tarsus is twelve to fourteen.

*Acanthonyx Peiverii*, EDW., Crust., i. 343.

GENUS PELTINIA, Dana.

*Epialto Acanthonycique affinis. Carapax latus, sublævis, depressus, rostro brevi complanato, bifido, latitudine transorbitali grandi, quam dimidium carapacis vix angustiore, dente præorbitali prominente, antero-laterali valde producto, postero-laterali parce prominente. Antennæ externæ rostro non celatæ, articulo primo angusto, apicem non denti-gero. Oculi non retractiles, breves. Pedes 1mi 2dis breviores. Articululus 8 pedum posticorum penultimus fere cylindricus infraque non gibbosus.*

Carapax broad, depressed, smooth or nearly so; beak short, flat, bifid; transorbital breadth scarcely less than half that of carapax; præorbital tooth prominent; antero-lateral angle very much enlarged, and postero-lateral also slightly prominent; outer antennæ not concealed by the beak, first joint narrow, not dentate at apex. Eyes not retractile, short. First pair of feet shorter than second. Penult joint of eight posterior feet nearly cylindrical, not gibbous below.

This genus differs from *Epialtus* in having the front as in *Acanthonyx*, the outer antennæ being exposed alongside of the beak; and from *Acanthonyx*, in having the penult joint of the legs subcylindrical, and without a gibbous prominence for the tarsus to close against. Instead of this prominence, there is sometimes a small cluster of short setæ, and in other instances the setæ are wanting. It is near *Antilibinia*; but the breadth across the eyes is much greater, being nearly or quite half the greatest breadth of the carapax, while it is only a third in that genus.

## PELTINIA SCUTIFORMIS.

*Carapax subscutiformis, paulo oblongus, laevis, rostro eie longiore quam latiore, bilobato, angulis antico-lateralibus valde productis, setigeris, diametroque gastrico maximo, margine postero-laterali dentibus duobus obsolescentibus setigeris notato, regione medianâ bi-tuberculatâ. Antennæ externæ rostro valde longiores. Pedes tenuis, antici inermes, digitis contiguis.*

Subscutiform, a little oblong, smooth; beak hardly longer than broad, bilobate; carapax widest in a line across the stomach. antero-lateral angles much produced, setigerous, postero-lateral margin with two obsolescent setigerous teeth, medial region minutely bi-tuberculate. Outer antennæ projecting much beyond the beak. Feet slender; second pair longest; first pair unarmed, fingers contiguous.

Plate 5, fig. 7 *a*, male, enlarged six diameters; *b*, under view of head; *c*, hand.

Bay of Rio Janeiro.

Length, two lines. Colour ochreous yellow; legs flesh-red: a narrow longitudinal spot with rectilinear outline, near middle of back, having a light yellow colour; two setæ just anterior to this spot; one or more near middle of posterior margin, and another over the base of posterior legs. The surface of the carapax is somewhat flexuous. The carapax may be considered as consisting of three parts:—the rostral, the orbital, and the thoracic part. The rostral part of the carapax is about half as wide as the orbital, and the orbital a little more than half the width of the thoracic. A narrow transverse line between the two latter portions, had a light yellow colour, and the gradual slope between the two portions appeared, owing to this colour, to be an abrupt descent. The two minute tubercles of the medial region are situated just posterior to the line between these parts of the carapax. The beak is furnished with setæ.

The flagellum of the outer antennæ is not shorter than the two preceding basal joints. The male abdomen is narrow; from the

fourth joint it gradually narrows, and at apex it is rounded; above the fourth joint it is wider, and the margin either side is rounded.

PELTINIA NODULOSA.

*Carapax suboctagonus, parce oblongus, lævis, angulis duobus lateralibus utrinque productis, obtusis, rostri cornubus triangulatè sejunctis, triangulatis, subacutis; dente præorbitali subacuto, post-orbitali obsolete, margine postico inermiti. Pedes nudi, mediocres, articulis totis, manu tarsoque exceptis, plus minusve nodulosi, tarsi infra minute spinulosi. Antennæ externæ apicem rostri parce superantes.*

Suboctagonal, sparingly oblong, smooth, somewhat uneven, on either side two prominent angles which are obtuse; horns of beak triangular, and separated by a triangular interval, lamellar, subacute; præorbital tooth subacute, post-orbital obsolete. Posterior margin unarmed. Feet naked, of moderate length, second pair longest, all joints of legs, excepting the hand and the tarsi, nodulose, tarsi below spinulous. Outer antennæ extending slightly beyond apex of beak.

Plate 5, fig. 8 *a*, animal, enlarged; *b*, under view of head.

Coral reef of Vanua Lebu, Feejee Islands.

Length, one-fourth of an inch. Breadth between the eyes, about half the greatest breadth. The surface is finely granulated, and without tubercles or spines. The horns are short pubescent on inner side. The extremity of the eye alone, is visible in an upper view. The second and third basal joints of the outer antennæ are but little longer together than the first basal, and the apex of the third reaches only to base of beak; flagellum extends slightly beyond apex of beak. Buccal area nearly square. Last three pairs of legs subequal. Hand slender, oblong, curved a little at apex; fingers slender, in contact throughout their length.

## SUBFAMILY EPIALTIINÆ.

## EPIALTUS BRASILIENSIS.

*Parvulus, subhexagonus, parce convexus, laevis, regione medianâ minutè bituberculatus, pone oculos dente parvulo appresso notatus; rostro fere equilateraliter triangulato, integro; lateribus angulatè salientibus angulis obtusis, longitudine post-orbitali latitudinem majorem æquante. Pedes sex postici breviores, articuli dente inferiore quinti juxta basin maximo. Abdomen maris 6-articulatum; feminæ 5-articulatum, orbiculatum.*

Small, subhexagonal, sparingly convex, smooth, stomach region with two minute tubercles, a small close appressed tooth just behind the eyes; beak entire, nearly equilaterally triangular; sides angularly salient, angles obtuse, post-orbital length equalling greatest breadth. Six posterior feet shorter than others, tooth on lower side of fifth joint very prominent and proceeding from near the base of the joint. Abdomen of *male*, six-jointed; of *female*, five-jointed, orbicular.

Plate 6, fig. 1, male, enlarged three diameters.

Rio Janeiro, along sea-shore, among the sea-weed.

This species is very near the *bituberculatus* of Chili, and corresponds with the brief description of this species by Milne Edwards (Crust., i. 345). But his figure (Plate 15, fig. 11), represents a species of narrower proportions, and beak, and the very prominent tooth on the fifth joint is not given; the greatest breadth, instead of being equal to the distance from the posterior margin to the eyes, is shorter than this by very nearly the distance between the eyes and the tubercles. Moreover, the tooth on the margin behind the eyes, is not represented in the figure of the *bituberculatus*. The tubercles are almost obsolete in the *brasiliensis*, and the anterior angles of the carapax, posterior to the eyes, are short truncate.

EPIALTUS PRODUCTUS, *Randall*.

Puget's Sound, and Upper California.

Plate 6, fig. 2 *a*, female, natural size; *b*, abdomen.

This species has the exterior maxillipeds and the adjoining parts pubescent. The emargination of the beak is set with setæ, and other setæ tip the tooth anterior to the eyes, and the margin anterior to this tooth. There are also two series of curled setæ on the upper surface of the beak. The female abdomen is oblong elliptical. The last (seventh) segment is transverse triangular, abruptly a little narrower than the preceding, and the apex is obtuse. The cutting edges of the fingers are denticulate, with twelve to fifteen teeth. The breadth across the middle of the carapax, between the apices of the medio-lateral teeth, is equal to the distance from the posterior margin to a line between the eyes; and the breadth immediately anterior to these medio-lateral teeth, equals the distance from the posterior margin to a line between the antero-lateral teeth. The thoracic region bears two minute or obsolescent tubercles.

*E. productus*, J. W. RANDALL, Jour. Acad. Nat. Sci., viii. 110.

## HUENIA SIMPLEX.

*Maris*:—*Carapax lævis, valde elongatus, angustè subtriangularis, lateribus antero-lateralibus longis, anticè convergentibus, fere rectis et integris, in latera rostri rectè productis, dente præorbitali nullo; rostro oblongo, valde obtuso; angulo postero-laterali subacuto; margine postico integro; superficie 4-tuberculatâ (regione medianâ 3-tuberculatâ, cardiacâ 1-tuberculatâ). Pedes antici validi, manu crassâ, digitis latissimè hiantibus; articulus pedum 8 posticorum penultimus subcylindricus.*

*Male*:—Carapax smooth, much elongate, narrow subtriangular, having four low tubercles, antero-lateral sides long, converging forward nearly straight and entire, produced directly into the sides of the beak, no præorbital tooth; beak oblong, obtuse; postero-lateral

spine subacute, posterior margin entire, medial region with three tubercles, cardiac region with a single tubercle. Hand stout, fingers very widely apart except at tips, moveable finger with a single tooth near base; penult joint of eight posterior feet subcylindrical.

Plate 6, fig. 3 *a*, male, enlarged two diameters; *b*, side view of beak, *ibid.*; *c*, abdomen, *ibid.*

Sandwich Islands (Oahu or Maui).

Length, nine and a half lines; greatest breadth, six lines; part posterior to cardiac tubercle, about one-fourth as long as part anterior to the same. The absence of all teeth or spines on the sides, and the nearly straight line from the tip of the beak to the cardiac lateral spine, mark at once this species. The beak, or part anterior to the eyes, is longer than one-fourth the whole length of carapax. In a lateral view, the sides of the beak are seen to be excavate from just anterior to the eyes, and the front margin is rounded and entire.

#### HUENIA BREVIROSTRATA.

*Feminae*:—*Carapax latus, paulo oblongus, breviter rostratus, utrinque 2-angulatus, angulis salientibus, lateribus inter angulos laterales valde excavatis; superficie carapacis breviter 4-tuberculatâ, rostro ad basin valde angustiore quam frons, acuto, non longiore quam latitudo trans-orbitalis, dente præorbitali vix saliente, obtuso. Munus tenuis, digitis versus basin paulo liantibus, carpo inermi; articulus pedum 8 posteriorum penultimus subcylindricus.*

*Female*:—Carapax broad (a little longer than breadth), brevirostrate, two-angulate either side, the angles salient and separated by concave intervals; surface of carapax with four low tubercles; beak abruptly narrower than part of carapax posterior, acute and quite short; præorbital tooth, hardly salient, obtuse. Hand slender, fingers towards basin somewhat separate. Carpus unarmed. Penult joint of eight posterior feet subcylindrical.

Plate 6, fig. 4 *a*, female, enlarged two diameters; *b*, side view of anterior portion, *ibid.*; *c*, extremity of abdomen, *ibid.*

Sandwich Islands, Oahu or Maui.

Length of carapax, seven and one-half lines; greatest breadth, six lines; length of beak, hardly one line; part of carapax posterior to cardiac tubercle, about half as long as the part anterior.

In the outline of the carapax, there is a slight excavation marking the limit of the orbit; and the breadth of the beak at base is not over one-third the distance across in the line of the eyes. The large posterior lateral tooth or spine has anterior to it a slight swelling of the margin. In a lateral view of the head, the height in the line of the eyes is much longer than the beak. The beak in this view is slightly emarginate at apex.

LEUCIPPA LÆVIS.

*Carapax subtriangulatus, lævis, regione medianâ parce tumidâ, rostro elongato, furcato, cornibus triangulatis et triangulatè sejunctis, acutis; marginibus carapacis lateralibus pertenuibus, paulo expansis et sub-reflexis, 4-dentatis (aut angulatè undulatis), dentibus inæquis, dente posteriore posticè arcuato; margine laterali in superficiem regionis postero-lateralis producto. Regio pterygostomiana 3-dentata (aut instructa uno dente in sinu grandi insito). Pedes nudi, articulo 3tio cristato.*

Carapax subtriangular smooth, median region sparingly tumid; beak elongate, furcate, horns triangular, acute, and with a triangular interval; lateral margins of carapax very thin, and a little reflexed, four-toothed or angulately undulate, the teeth unequal, posterior tooth arcuate behind, and produced upon the postero-lateral surface of the carapax. Pterygostomian region three-toothed, or having a single tooth situated in a large depression. Feet naked, third joint cristate.

Plate 6, fig. 5 *a*, male, enlarged two diameters; *b*, under view; *c*, part of anterior legs.

From Rio Janeiro.

Length, four and a half lines; greatest breadth, three and a half lines.

This species might be embraced under the description of *Leucippa Ensenadæ* of Milne Edwards and Lucas (D'Orbigny's S. America, Crust., p. 9, pl. 5, fig. 3); but the figure represents a species with different characters. The *Ensenadæ* in this figure, has proportionally a shorter beak, with the two horns in contact and obtuse; the carapax is less perfectly triangular, and the several regions are much more pronounced. The lateral margin in the *lævis* is thin, slightly bending upward, and the teeth are notches in the thin margin, or subacute undulations in its outline, and not tubercles, "dont les trois postérieurs sont arrondis." The legs have a narrow crest or a trenchant edge. The outer edges of the basal joints of the outer antennæ are parallel or very nearly so, and not divergent backward as in the figure of the *Ensenadæ*; and the beak is open at the furcation. The posterior lateral tooth of the carapax has the margin behind curving around, so as to terminate against the surface of the carapax.

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## II. PARTHENOPINEA.

THE PARTHENOPINEA, as stated on a preceding page, are intermediate between the Maia and Cancer groups, having the characters there mentioned. The anterior legs are usually the longest. The form may be transverse, or slightly oblong. The genus *Trichia* agrees nearly with Parthenope in the character of the orbit, the position of the base of the outer antennæ, and in many other characters; and although its anterior legs are but little longer than the following pairs, it evidently pertains to this group, being in some points intermediate between it and *Dromia*.

### LAMBRUS RHOMBICUS.

*Carapax non oblongus, rhombicus (fere quadratus), ad medium latior, posticè et lateraliter rotundatus, anticè triangulatus, pone oculos non constrictus, superficie superiore inæquali, tuberculis parvulis parce ornatâ, in regione laterali super basin pedum 2dorum tuberculo*

*prominente subacuto armatâ, et pone hunc tuberculum tuberculo altero minore. Rostrum apice pubescens; quoque carapacis quidam tuberculi pubescentes. Pedes antici margines hirsuti, manu trigonâ, marginibus salientibus, inæque dentatis, brachio marginem anticum minutè eroso et superficiem minutè spinuloso. Pedes 8 postici tenuissimi, breviter pubescentes.*

Carapax not oblong, rhombic in outline or nearly square, broadest at middle, behind and laterally rounded, anteriorly triangular, not narrowed behind the eyes, upper surface uneven, with small tubercles, over base of second pair of feet in branchial region a prominent subacute tubercle, and another smaller just posterior. Beak hairy at apex, also some of the tubercles of the carapax pubescent. Anterior feet with the margins hairy, hand trigonal, edges salient and unequally dentate, arm with the front margin minutely erose, as well as hairy, surface minutely spinulous. Eight posterior feet very slender, short pubescent.

Plate 6, fig. 7 *a*, animal, natural size; *b*, under view.

Feejee coral reefs, near Mathuata, island of Vanua Lebu; found under loose stones on the reef; not abundant.

Length, three-fourths of an inch. Carapax moderately convex. Tufts of hairs on some of the tubercles, at apex of beak and over the eyes. Obtuse triangular prominence on margin, a short distance behind the eyes. Setaceous portion of exterior antennæ not longer than last joint of base. Basal joints nearly equal. Some of the teeth of the hand obtuse, and others acute, edge hairy; carpus with a few minute spiniform tubercles.

#### LAMBRUS GRACILIS.

*Carapax paulo oblongus, subdeltoideus, posticè latior, anticè angustè elongatus, pone oculos constrictus; regione medianâ non tuberculatâ, cardiacâ unispinosâ et in eâdem lineâ transversâ spinulâ remotâ; rostrum non latiore quam longiore, deflexo, obtuso, lateraliter prope medium angulato; marginibus carapacis lateralibus rotundato, utrinque 6-7-*

*denticulatis postico-lateralibus subito convergentibus, et posticè medio breviter bi-spinuloso. Pedes 8 postici gracillimi, læves, nudi. Pedes antici nudi, manu trigonâ, angulis inæqualiter spinoso-denticulatis, superficiebus lævibus, brachio marginibus spinoso-denticulato.*

Carapax a little oblong, subdeltoid, posteriorly broadest, anteriorly narrow and elongate, constricted behind the eyes, medial region not tuberculate, cardiac with one spine, and in same transverse line another remote spinule; beak not broader than long, deflexed, obtuse at apex, an angle either side near middle; lateral margins of carapax rounded and 6-7-toothed, the anterior tooth much the largest, postero-lateral margins rapidly convergent, and at middle behind, two short spines. Eight posterior feet very slender, smooth, naked. Anterior feet naked, hand elongate trigonal, angles unequally spinoso-denticulate, surfaces nearly or quite smooth, margins of arm spinoso-denticulate.

Plate 6, fig. 6 *a*, animal, enlarged three diameters; *b*, abdomen, enlarged six diameters.

Coral reefs of the island of Ovalau, Feejee Group.

Length, three lines.

The one spine of the cardiac region, and the one either side near the margin, are the only ones of the upper surface, except that anterior to the latter there is a range of minute obsolescent tubercles or spinules; outside of this range the sides of the carapax fall off rather rapidly. Either side of the two posterior spines of the carapax there is another smaller spine, besides some others still smaller. The abdomen of male is shown in figure *b*. Two of the teeth on the outer edge of the hands are more prominent than the others. The eight posterior feet are quite long and very slender, and without tubercles or spines.

This species has many of the characters of the *L. lamellifrons* of Adams and White (Voy. Samarang, p. 26, pl. 5, fig. 1). But in that species, the posterior legs, as represented by these authors, are much less slender and have small tubercles, and the form of the carapax is different in important points, although having a general resemblance.

GENUS CERATOCARCINUS (*Adams and White*).

In the species referred below to this genus, and resembling much that described by Adams and White, we observe the following generic characters :—

Outer antennæ free from the first basal joint, and cylindrical, inserted in a fissure in the under side of the orbit, and arising just anterior to the outer anterior angle of the buccal area; second basal joint much longer than first or third. Inner antennæ folded in shallow fossettes under the front very obliquely, making nearly an angle of  $50^\circ$  with the medial line. Buccal area nearly square. Front transverse, without a beak. Præorbital teeth salient beyond the line of the front. Eyes but little salient; orbit entire above. Carapax hexagonal in outline, the sides projecting triangulately, and nearly acute at the prominent angle. Abdomen of male seven-jointed. First pair of legs elongate, a little shorter than second; hand quite long, broadest at the commencement of the fingers.

## CERATOCARCINUS SPECIOSUS.

*Carapax hexagonus, fere equilateralis, depressus, regionibus partim conspicuis, fronte lato, rectè transverso, subtiliter crenulato, medium emarginato, utrinque juxta oculum valde saliente. Manus digitusque mobilis spinulosi; carpus parce spinulosus; digiti contigui. Pedes 8 postici breviter pubescentes, inermes.*

Carapax hexagonal, nearly equilateral, depressed, regions partly distinct; front broad, transverse, minutely crenulate and emarginate at middle; præorbital tooth salient, obtuse. Hand and moveable finger spinulous, carpus sparingly spinulous, fingers contiguous. Eight posterior feet short pubescent, not armed with teeth or spines.

Plate 6, fig. 8 *a*, male, enlarged; *b*, under view of head; *c*, male abdomen.

Taken from a *Comatula* brought up in twelve fathoms water, north of Viti Lebu, within the coral reefs.

Length, one and a half lines. Colour flesh-red, with two large hollow half moons marked transversely on carapax, the two placed in opposite positions, so that the convexity of the anterior is towards the front, and that of the posterior behind.

Antero-lateral margin concave and scabrous; lateral angle acute or nearly so. Third joint of exterior maxillipeds nearly square, breadth little greater than length. Flagellum of outer antennæ projects a little beyond apex of præorbital tooth. Eyes on short peduncles, and directed straight transversely, and in an upper view only the reticulate part is seen. A minute spine on anterior apex of peduncle.

CRYPTOPODIA FORNICATA (*Fabricius*).

Singapore.

*Male*.—Carapax broad subtriangular, arcuate behind, an angle in either lateral margin which is nearly a right angle; surface smooth, antero-lateral portion depressed, near middle a concave triangular area; beak small, broad triangulato-ovate subacute, faintly denticulate; posterior margin entire or nearly so; antero-lateral margin nearly straight, subsinuuous, irregularly denticulate. Hand somewhat three-sided, upper edge spinoso-dentate; arm widens behind towards apex, hinder margin denticulate, anterior margin erose and denticulate. Finger of hand with two spines above. Joints of eight posterior feet with an alate margin on upper side; third joint alate above and below, and also denticulate; tarsus styliform, alate, acute. Abdomen minutely tuberculous.

Length of carapax, nine lines; greatest breadth, one inch and two lines; breadth of beak, one and three-fourths lines; length of beak, one and a half lines.

*Cancer fornicatus*, FABR., Ent. Syst., ii. 453.  
*Cryptopodia fornicata*, EDW., Crust., i. 362.

EURYNOLAMBRUS AUSTRALIS (*Edwards and Lucas*).

Plate 6, fig. 9 *a*, animal (male), natural size; *b*, front view, enlarged two diameters; *c*, profile of a longitudinal medial section; A, the front extremity.

Bay of Islands, New Zealand.

The features of a human face are quite strongly marked on the carapax of this species, although in but faint relief. The form is broad triangular, with the lateral margin rounded but somewhat polygonal, and the general outline anteriorly, is approximately semi-circular. Where the polygonal margin terminates anteriorly, opposite the middle of the stomach region, there is a short fissure in the margin. The surface through its greater part is nearly horizontal: there is a broad shallow depression either side of a low stomach region; another depression posterior to the stomach region, somewhat uneven; and another much larger, upon the alate portion of the carapax either side of the cardiac region. In the middle of each of the anterior of these depressions, there is a rounded punctation, and posteriorly three others in a curving line, the last two being in the depression posterior to the stomach region; this curving line traced forward, would terminate in the short marginal fissure above alluded to. The front is declivous, and the anterior part of it quite abruptly so; the posterior part of the carapax is also declivous and slightly concave, and rounds laterally into the sides under the alate portion of the carapax. The frontal margin between the eyes consists of two small, rounded lobes; and outside of these, there is, on either side, a knob but little smaller, which is the extremity of the basal joint of the outer antennæ. It is separated from the lobes of the front by a small fissure from which the following joint proceeds.

The carapax has a minutely uneven or somewhat warty surface (between pitted and minute warty), especially around the frontal parts. Below, the carapax is very tumid either side anterior to the middle of the buccal region, and then follows a deep rounded concavity of large size. The surface of the exterior maxillipeds and abdomen is very closely and finely pitted.

The first joint of the outer antennæ is narrow in its apical half, but

widens much below on its outer side, and where this side terminates adjoining the orbits, there is a small fissure in the orbital margin. The second and third joints are small and nearly cylindrical. The flagellum is about fourteen-jointed. On the upper side of the orbit there is another small fissure, which furcates a short distance above and passes either side of a triangular piece, which is free at summit.

The anterior legs are wholly unarmed; the fingers are pointed and very finely and evenly denticulate. The hand and other joints have a pitted surface. The following legs are alate and angulate on the margins.

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## II. CRUSTACEA CANCROIDEA.

IN the distribution of the Cancroidea, a division into two groups is obvious on the most superficial inspection,—the *swimming* and the *gressorial* species; and the subdivisions *Cancrinea* and *Portuninea* corresponding to this distinction, are those ordinarily adopted. These are the only groups of this grade adopted by Edwards or M'Leay.

Edwards arranges the genera under these divisions without any reference to their higher family relations, and makes for the Cancrinea the three groups,

- (1.) *Cryptopoda*, including *Æthrus*.
- (2.) *Arcuata*, including *Cancer*, *Xantho*, and the allied broad species.
- (3.) The *Quadrilaterales*, including the narrow or quadrate species *Eriphia*, *Trapezia* and *Melia*.

According to this arrangement, *Ruppellia*, which is closely allied to *Eriphia*, is placed in the second subdivision; and *Cancer*, which is peculiar in its longitudinal inner antennæ and narrow front, falls between *Etisus* and *Pilumnus*. The arrangement is in fact, simply such as is convenient for a determination of the genera, and not that based on natural affinities; and this appears to have been the object of its distinguished author.

M'Leay divides his "Canceriæ" into three families,—

1. The *Xanthidæ*; carapax broad, with an arched front; inner branch of first maxillipeds dilated at apex.

2. *Canceridæ*; carapax broad, with an arched front; inner branch of first maxillipeds narrow at apex.

3. *Eriphidæ*; carapax subquadrilateral; inner branch of first maxillipeds narrow at apex.

The groups here indicated are of real importance. But the characteristics laid down do not affix to them their true limits. There are true *Xanthidæ* in which the inner branch of the first maxilliped is not dilated at apex; for there are those that have as narrow a carapax as any of the *Eriphidæ*, and a similar branch to the first maxillipeds. According to the characteristics mentioned, the *Eriphidæ* properly include *Pilumnus*; and not only *Pilumnus*, but also the narrow *Chlorodii*, some of which are nearly as narrow as long, and which are widely removed from *Pilumnus* in important characters. The distinctions of narrow and broad, happens in the family to be of little general value in classification, except when viewed under certain restrictions required by qualities of higher importance.

In the study of these species, there are actual difficulties in the way of arriving at natural subdivisions with conveniently circumscribed limits. The difficulties arise mostly from the fact, that no such limits exist as the systematist often looks for. Nature has made her fields without fences; and although there are some mountain ranges, in general, the blendings among the lower subdivisions in the kingdoms of life are by gentle gradations. The true object of classification, consists in tracing out gradations and inter-reticulations among groups. Keeping this in view, we shall not be dissatisfied if the groups laid down are found to shade into one another, instead of standing apart in bold relief. Such trenchant subdivisions are necessarily artificial, and although the simplicity with which they are characterized may gratify, they are to be looked upon with distrust, and generally as sure evidence that but a small portion of the field of study has actually been surveyed.

We have already (page 68), stated the reasons for including *Telphusa* and the allied genera with the *Cancer* group; and have alluded also in the same place, to the relations of *Acanthocyclus* to this group. The *Telphusa* family are fresh-water Cancroids, and mark the transition to the *Grapsoidæ*; while the *Acanthocyclus* is related to the *Corystoidea*. We are thus led to arrange the *Cancroidea* in three

grand divisions; one of which may be called the *typical*, another the *Grapsoid*, and the third the *Corystoid* division, as follows:—

Legio I. CANCRINEA, or Cancroidea typica.

Legio II. TELPHUSINEA, or Cancroidea Grapsidica.

Legio III. CYCLINEA, or Cancroidea Corystidica.

The second and third divisions contain but few genera. The first includes several families and subfamilies, based on important characteristics.

The structure of the efferent canal leading from the branchial cavity, as already explained, has a high value in classification. By means of it, the Leucosoidea are separated from all other Brachyura; the distinction has been shown to be wide, and to attend striking characteristics of other kinds. The inner branch of the first pair of maxillipeds undergoes a corresponding modification, and, therefore, becomes itself important as a means of distinction.

Among the Cancroidea, there are peculiarities of a somewhat analogous kind. Although the efferent passage covers uniformly the outer part of the prælabial plate or palate, it is in some species found with better defined limits than in others. In a large number of genera, there is no separation from the rest of the prælabial surface; but in other genera there is a longitudinal ridge, giving this canal distinct bounds. This ridge is very perfectly developed in *Eriphia*, and the narrow inner branch of the first maxillipeds covers the canal as in the Leucosoidea. It is equally complete or nearly so, in *Ruppellia*, *Æthrus*, *Ozius*, a genus separated from *Xantho* on this ground, and in several other genera. It is distinct also in *Pilumnus*. But in *Cancer*, *Xantho*, and many of the ordinary genera, there is no such ridge, or if traces of it exist (as in *Pseudocarcinus Rumphii*, some *Carpilii* and others), it is short, and does not extend to the front margin of the palate. This character affords therefore a natural division among the Cancroidea, though not the sole character at the basis of a natural classification.

The natatory character of the posterior legs is another important characteristic.

Moreover, among the natatory species, De Haan has pointed out a character of much value: that in many of them the inner branch of the outer maxillipeds has a small lobe attached to the inner margin, which lobe is wanting in the rest of the swimming species, and in all

the non-swimming Cancroidea. The true value of this peculiarity in classification, has been remarked upon on pages 71, 72.

With these characters in view, we distribute the Cancroidea as follows:—

LEGIO I. CANCRINEA, *vel* CANCROIDEA TYPICA.

1. *Pedes postici gressorii.*

Fam. I. CANCRIDÆ.—Palatum colliculo utrinque non bene divisum. Carapax sæpius late transversus, interdum angustus.

Fam. II. ERIPHIDÆ.—Palatum colliculo utrinque bene divisum. Carapax sæpius angustus, interdum latus, margine antero-laterali raro longiore quam postero-lateralis, latitudine ante-medianâ sæpissime longiore, oculis remotis.

2. *Pedes postici natatorii.*

Fam. III. PORTUNIDÆ.—Ramus maxillipedis lmi internus lobo interno instructus. Palatum sæpius colliculo utrinque divisum.

Fam. IV. PLATYONYCHIDÆ.—Ramus maxillipedis lmi internus non lobatus. Palatum colliculis non divisum.

LEGIO II. TELPHUSINEA, *vel* CANCROIDEA GRAPSIDICA.

Fam. I. TELPHUSIDÆ.

LEGIO III. CYCLINEA, *vel* CANCROIDEA CORYSTIDICA.

Fam. I. ACANTHOCYCLIDÆ.

In all the species, excepting some Eriphidæ, the orbit has a hiatus at the inner side, which is occupied wholly or in part by the base of the outer antennæ, or a process from it. The portion of the Eriphidæ alluded to (the subfamily *Eriphinæ*), are, in fact, the only examples among the Brachyura in which the orbit is entirely enclosed by the shell, so as to exclude wholly the base of these antennæ from forming any part of the circuit. *Ruppellia* and *Eriphia* are hence related in a character of prominent importance; and the former of these genera

as thus characterized, is widely different from *Eudora* of De Haan, although both include the same species as type; for *Eudora* is so described and used by its author, as to embrace, also, other species having the orbit of *Xantho*.

The importance of making the ridge bounding the efferent passage a distinguishing family characteristic, instead of mere form or width of carapax, is abundantly illustrated among the species. From *Xantho*, the transition, in general form and other characters, is very gradual to *Xanthodes*, another genus of *Cancridæ*, so gradual indeed, that only a slight difference in an antennary joint separates the genera; and the latter genus, includes species having the narrow form common among the *Eriphidæ*. Through the genus *Chlorodius*, there is the same passage to closely-related species having a narrow *Eriphoid* or *Pilumnoid* form; and *Cyclodius*, which is identical with *Chlorodius*, except in having a triangular form to the third joint of the outer maxillipeds, has nearly an orbicular form, while *Cymo*, is still more nearly orbicular, the breadth equalling the length. Such narrow species might be supposed, from the form, to be related to *Pilumnus* and *Pilumnoides*; yet the latter are distinguished by the ridge on the palate. Even the narrow *Cymo* has not this ridge, while in *Pilumnoides* and *Actumnus* it is very prominent.

The *Platyonychidæ*, although without the palate ridges, are narrow species, with the antero-lateral margin shorter than the postero-lateral, as in the *Eriphidæ*. In the palate and outer maxillipeds, they are related to *Cancer* and *Perimela* on one side, and also to the *Corystoidea* on the other.

Although the *CYCLINEA* have but *five* branchiæ in the exterior of the branchial pyramid, this does not seem necessarily to exclude these from the *Cancroidea*; for the *Grapsoids* admit of a like variation, the number being at times as great as in the *Cancroids*. They are related to the *Corystoids*, as explained, in being a low grade of *Cancroids*, rather than in having the prominent characteristic of the *Corystoids*. The inner antennæ in *Corystoides*, a genus near *Acanthocyclus*, have no fossettes, and this is an example of a still lower state of degradation Anomoural in character.\*

The genus *Cymo* has the circular outline of *Acanthocyclus*. But the number of branchiæ in the exterior of the branchial pyramid is

\* See page 54.

*seven*, the full Cancroid number, and other characters are as in the Chlorodinæ.

The conflict between the genera of Edwards and De Haan has been alluded to, and the difficulty of adopting all those of the latter without also using his system. The case of *Eudora* and *Ruppellia* has been mentioned. In this and other similar instances, we are forced to retain Edwards's generic name, if we retain his genus as to limits. Moreover, we see no reason for substituting De Haan's *Ægle* in place of *Zozymus* of Leach, any more than his *Chlorodius* for *Atelecyclus* of Leach, or *Anisopus* for *Platyonychus* of Latreille.

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## I. CANCRINEA, OR CANCROIDEA TYPICA.

### FAMILY I. CANCRIDÆ.

*Pedes postici gressorii. Palatum colliculo ad marginem anticum producto non bene divisum.*

Posterior feet gressorial. Palate not divided either side of middle by a longitudinal ridge reaching to its anterior margin.

The genera of Cancridæ are naturally arranged into a series of groups or subfamilies, based partly upon the inner antennæ,—the relation of the base of the outer antennæ to the orbits,—the character of the fingers, whether pointed, or excavated spoon-like. The following synopsis includes these subfamilies, and the known genera pertaining to them, with their characteristics. It is a general fact with regard to the species, that the antero-lateral margin is longer than the postero-lateral, which is not true of the Eriphidæ. There are some few exceptions, however, as in the genera *Liagora*, *Menippe*, and *Panopæus*.

1. CANCRINÆ. — Antennæ internæ plus minusve longitudinales. Frons interorbitalis perangustus. Digi acuminati.

- G. 1. *CANCER*, *Leach*.—Pars antennæ externæ mobilis hiatu orbitæ omnino exclusa. Carapax latissimus.
- G. 2. *PERIMELA*, *Leach*.—Pars antennæ externæ mobilis hiatu orbitæ non exclusa. Carapax perangustus.
2. *XANTHINÆ*.—Antennæ internæ plus minusve transversæ. Antennæ externæ basi firmè infixæ, parte mobili hiatu orbitæ non exclusâ. Frons interorbitalis latior. Digi acuminati.

1. *Regio carapacis postica convexa. Orbita hiatu externo non interrupta.*

- G. 1. *ATERGATIS*, *De Haan*.—Margo antero-lateralis postero-laterali longior. Pedes 8 postici compressi, cristati.
- G. 2. *CARPILIUS*, *Leach, De Haan*.—Margo antero-lateralis postero-laterali longior. Frons sæpissime bene 4-lobatus. Ramus maxillipedis 1mi internus lobato-furcatus. Pedes 8 postici nudi, subcylindrici, non cristati.
- G. 3. *LIOMERA*, *Dana*.—Frons leviter 2-lobatus aut rectiusculus. Margo antero-lateralis postero-laterali non brevior. Ramus maxillipedis 1mi internus non lobatus. Pedes 8 postici nudi, subcylindrici, non cristati.
- G. 4. *LIAGORA*, *De Haan*.—Margo antero-lateralis postero-laterali brevior. Frons leviter 2-lobatus aut rectiusculus. Pedes nudi, tarsi exceptis. Ramus maxillipedis 1mi internus non lobatus.

2. *Regio carapacis postica transversim non convexa.*

a. Carapax versus margines frontalem antero-lateralemque curvatim declivis.

- G. 5. *ACTÆA*, *De Haan, Dana*.—Margo postero-lateralis brevis, sæpius concavus. Orbita hiatu externo non interrupta.

b. Carapax versus margines frontalem antero-lateralemque parce declivis.

a. *Orbita hiatu externo non interrupta.*

- G. 6. *XANTHO*, *Leach*.—Margo antero-lateralis postero-laterali longior. Articulus antennæ externæ 1mus oblongus, frontem bene attingens, articulo sequente e apicis medio articuli 1mi orto.
- G. 7. *EUXANTHUS*, *Dana*.—*Xantho* formâ similis: articulus antennæ externæ 1mus hiatum ad summum implens, articulo sequente e latere excavato apicis orto.
- G. 8. *XANTHODES*, *Dana*.—*Xantho* formâ similis: carapax depressus, ad latera non dilatatus. Articulus antennæ externæ 1mus abbreviatus, processum frontis oblongum attingens tantum. Abdomen maris 5-articulatum.
- G. 9. *PARAXANTHUS*, *Lucas*.—*Xantho* formâ fere similis: carapax depressus, fronte productus, ad latera dilatatus. Articulus antennæ externæ 1mus abbreviatus. Abdomen maris angustum, 5-articulatum.
- G. 10. *MENIPPE*, *De Haan*.—Margo antero-lateralis postero-laterali brevior. Articulus antennæ externæ brevis nec frontem nec frontis processum attingens. Abdomen maris 7-articulatum.

*β. Orbita hiatus externo interrupta, infra integra.*

G. 11. PANOPÆUS, *Edwards*.—Margo antero-lateralis tenuis, postero-laterali sæpius brevior, ad orbitæ angulum externum directus.

*γ. Orbita infra extusque tribus dentibus instructa, uno externo, duobus inferioribus.*

G. 12. MEDÆUS, *Dana*.—Angustus, paulo transversus, nudus, fronte sat brevi. Margo antero-lateralis sub orbitâ productus. Abdomen *maris* 5-articulatum, segmento ultimo brevi. Pedes antici crassi, iis *Xanthi* similes.

G. 13. HALIMEDE, *De Haan*.—Angustus, parce transversus, fronte brevior. Abdomen *maris* 7-articulatum, segmento ultimo valde elongato. Pedes antici crassi, iis *Xanthi* similes.—An *Pilumnis* propinquior?

3. CHLORODINÆ.—Antennæ internæ transversæ. Antennæ externæ basi firmè infixæ, parte mobili hiatus orbitæ raro exclusâ. Frons interorbitalis latior. Digi instar cochlearis excavati.—[Quoad genera, *Xanthinæ* et *Chlorodinæ* ferme parallelæ.]

1. *Hiatus orbitæ internus processu basis antennæ externæ occupatus, articulum 2dum occludens.*

G. 1. ETISUS, *Leach*.

2. *Hiatus orbitæ internus basi antennæ externæ occupatus, articulo 2do non occluso.*

1. Regio carapacis postica convexa.

G. 2. CARPILODES, *Dana*.—Carapax latus, nudus, margine antero-laterali crassè rotundato. Pedes 8 postici subcylindrici, nudi. *Liomeræ* habitu similis.

G. 3. ZOZYMUS, *Leach*.—Carapax mediocriter latus, margine antero-laterali tenui. Pedes 8 postici valde compressi, cristati aut subcristati. *Atergati* habitu similis.

2. Regio carapacis postica fere plana.

*a. Carapax versus margines frontalem antero-lateralemque curvatim declivis.*

G. 4. ACTÆODES, *Dana*.—Pedes 8 postici non cristati. *Actææ* aspectu similis. Articulus maxillipedis externi 3tius apicem vix excavatus.

G. 5. DAÏRA, *De Haan*.—Pedes 8 postici non cristati. Articulus maxillipedis externi 3tius apice valde emarginatus.

*b. Carapax versus margines frontalem antero-lateralemque vix declivis.*

G. 6. CHLORODIUS, *Leach*.—Carapax plus minusve transversus. Articulus antennæ externæ 1mus oblongus frontem bene attingens. Articulus maxillipedis externi 3tius subrectangulatus. *Xantho* aspectu similis.

G. 7. PILODIUS, *Dana*.—Carapax paulo transversus. Articulus antennæ externæ abbreviatus, processum frontis oblongum attingens tantum. *Xanthodi* aspectu similis.

- G. 8. CYCLODIUS, *Dana*.—Carapax parce transversus. Articulus antennæ externæ oblongus frontem bene attingens. Articulus maxillipedis externi 3tius triangulatus, latere inferiore brevissimo.
- G. 9. CYMO, *De Haan*.—Carapax non transversus, fere orbiculatus, disciformis. Antennis *Chlorodio* affinis.
4. POLYDECTINÆ.—Antennæ internæ transversæ. Antennæ externæ basi solutæ, liberæ.—An *Pilumnis* propinquior?
- G. POLYDECTUS, *Edw*.—Orbita dentibus tribus infra instructa. Manus elongata, digitis prælongis, attenuatis, uncinatis, cum dentibus tenuiter spinuliformibus sæpe armatis.

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SUBFAMILY I. CANCRINÆ.

*Antennæ internæ plus minusve longitudinales. Frons interorbitalis perangustus.*

Inner antennæ more or less longitudinal. Inter-orbital front very narrow; and median region somewhat narrower than the breadth of the carapax across the orbits.

The Cancrinæ, unlike the other families of this division, have the inner antennæ longitudinal, and this is connected with a narrow interval between the orbits. This inter-orbital distance in Cancer is, at times, less than one-tenth of the whole breadth of the carapax, and is seldom greater than one-eighth. The singularity of this ratio is evident, when we consider that in the other Cancridæ, it varies from one-sixth to one-half, and is usually one-fourth. The median region, although broader anteriorly than the breadth across the orbits, is seldom one-third as broad as the carapax. The narrowness of the inter-orbital space accounts for the inner antennæ being longitudinal.

The carapax is convex, with the lateral portions often somewhat dilated. The buccal area is usually longer than broad; and the third joint is commonly a little oblong, and at times projects forward somewhat beyond the limits of the buccal area; the epistome is very short, and sometimes obsolete. The second joint of the outer maxillipeds

have the inner margins parallel, but the sulcus near the margin is not parallel to the margin, the two sulci diverging posteriorly.

This family is closely related to the Corystoidea, and forms one of the connecting links between that group and the Cancroidea; the outer maxillipeds in *Cancer* and *Perimela* in projecting over the epistome, approach those of *Corystes* and *Atelecyclus*, and the narrow form of *Perimela* has led to its reference in some systems to that group. Through *Perimela* there is also a transition to *Polybius* and other genera of *Portunidæ*, in which the outer maxillipeds have a like character, and the general form is also similar. In general outline and convex form the species of *Lupa* are related to those of *Cancer*, and our genus *Arenæus* fails in the prelabial ridge, and thus approximates quite closely to that group.

#### GENUS I. CANCER (*Leach*).

In addition to the remarks already made on this genus, we observe that the postero-lateral margin is very oblique inward, approximating sometimes to transverse. The regions are indicated by undulations of the surface, and not by trenchant sulci. The area either side of the anterior part of the median region is often somewhat concave.

The outer antennæ have a very broad basal joint, which sets down upon the anterior margin of the buccal area, or with only a very short intervening space; and the two leave between them a narrow interval which is occupied by the inner antennæ. The whole breadth occupied by the pair of outer antennæ is less than the breadth of the buccal area. The following joints proceed from the inner side of the basal joint. There is a tooth adjoining the orbit, and three between the outer antennæ, the medial of the three largest. In one species the lobes are nearly equal crenatures of the margin.

*Platycarcinus*, M. EDWARDS, *Crust.*, i. p. 412.

#### CANCER MAGISTER.

*Carapax nudus, granulatus, paulo convexus, superficie paulo undulatâ, lateraliter triangulatus et acutus, margine postero-laterali fere recto, an-*

*tero-laterali 10-dentato, dentibus paululo prominentibus, margine utriusque postero longissimo et fere recto, subtiliter crenulato, dente postremo triangulato; fronte inter-antennali tri-dentato; articulo antennarum externarum primo apicem crassè producto. Pedes antici subæqui, manu supra cristatâ, multi-dentatâ, extus costatâ, digito mobili supra denticulato. Pedes 8 postici valde compressi, tarso paulo lato, articulis supra granulatis, quarto supra canaliculato, tarso articuloque quinto pelis quinti infra bene ciliatis. Articulus maxillipedis externi tertius oblongus, apicem externum obliquè truncatus.*

Carapax naked, granulate, a little convex, surface somewhat undulate, laterally triangulate, acute, postero-lateral margin nearly straight, antero-lateral ten-toothed, teeth slightly prominent, hinder margin of each very long, and almost straight, and finely crenulate, last tooth triangular; inter-antennary front three-toothed. First joint of outer antennæ stoutly produced at apex. Anterior feet subequal; hand above cristate and many-toothed, exterior surface costate, moveable finger above denticulate. Eight posterior feet much compressed, tarsus a little broad, joints granulate above, fourth canaliculate above; tarsus and preceding joint of fifth pair prominently ciliate below. Third joint of outer maxillipeds oblong, obliquely truncate at outer apex.

Plate 7, fig. 1 *a*, carapax, natural size; *b*, part of outer maxilliped; *c*, hand of small specimen (male), enlarged two diameters; *d*, extremity of posterior legs, enlarged two diameters.

Bay of San Francisco, C. Pickering, Exp. Exp.

Length of carapax, four and three-fourths inches; greatest breadth, seven inches; ratio 1 : 1.47. The areolets are but faintly marked, yet the surface is undulate. 2 M is scarcely at all prominent above the surface either side. In a small specimen the length is thirteen lines; greatest breadth, nineteen lines; ratio, 1 : 1.46. The characters of the anterior legs and the tarsi of the posterior legs are taken from this small specimen. The flattened tarsi and the long ciliation of the inner margin of this and the preceding joint, is a striking character. The outer margin of the third joint of the outer maxillipeds is not long ciliate as in the *C. gracilis*.

## CANCER GRACILIS.

*Carapax nudus, partim minute granulatus, valde convexus, non distinctè areolatus, superficie non undulatâ, lateraliter triangulatus et acutus, margine postero-laterali fere recto, antero-laterali 9-dentato, dentibus regularibus, acutis, paulo prominentibus, dente primo vix longiore quam secundus, totis margine postero fere rectis et longis et subtiliter denticulatis; fronte inter-antennali tridentato. Maxillipedes externi pubescentes, articulo tertio apicem externum valde arcuato aut rotundato, marginem apicalem et externum longè ciliato. Pedes antici subæqui, manu subcristatâ, cristâ 1-2-dentatâ, superficie externâ costatâ. Pedes 8 postici nudi, tarso longo, tenuissimo, nudo.*

Carapax nude, in part minutely granulate, much convex, not distinctly areolate, surface not undulate, laterally triangulate and acute, postero-lateral margin nearly straight, antero-lateral nine-toothed, teeth regular, acute, a little prominent, first tooth hardly longer than second, all with the hinder side nearly straight, long and minutely denticulate; inter-antennary front three-toothed. Outer maxillipeds pubescent, third joint at outer apex arcuate or rounded. Apical and outer margin long ciliate. Anterior feet subequal; hand subcristate, crest 1-2-dentate, outer margin costate. Eight posterior feet nude, tarsus long, very slender and naked.

Plate 7, fig. 2 *a*, male, natural size; *b*, outer maxilliped; *c*, outer view of hand, natural size; *d*, abdomen, natural size.

San Francisco.

Length of carapax, thirteen lines; greatest breadth, nineteen lines; ratio, 1 : 1.46. This species is very similar to the large one from San Francisco. But the different shape of the outer maxillipeds is sufficient evidence of their difference of species.

CANCER EDWARDSII (*Bell*).

Ophthalmic breadth not greater than medial region, outline in front hardly projecting at all beyond line of orbits.

Valparaiso; also Illawarra, New South Wales?

This large species is well described and figured by Bell (*Trans. Zool. Soc.*, i. 335). The ratio of length to greatest breadth of carapax in two females, 1:4.5 and 1:1.5. The colour of a living specimen, four inches in breadth, was deep reddish brown, the legs inclining towards purple. The third joint of the eight posterior legs in the same specimen has a line of short hairs along its upper edge, and the pterygostomian region is pubescent. The regions and areolets are faintly apparent. The frontal region is very short; 1 M and 2 M are not separate, and together they form a slightly-swelling prominence either side of the medial line; 3 M is also distinct, but is hardly separate from 4 M, which is rather large; two minute punctations mark the limits between them. 5 L, 6 L are also distinct, although not shown in Bell's figure, and barely distinguishable in the largest specimens, such as afforded his description. 1 P is nearly rhombic approaching quadrate. The antero-lateral margin is unevenly dentate; but the teeth pertain to ten broad and short lobes. Of these lobes the ninth is S, or the fifth normal tooth; and the carapax has its greatest breadth as usual, in this line. The fourth normal (T), corresponds to the eighth, seventh, and sixth lobes; the third normal (N), to the fifth and fourth; the second normal (E), to the third and second; and the first (D), to the first or orbital tooth. The dentations on the margin of the lobes are fewest and much the largest on the largest individuals. The peduncle of the eyes is continued upward on one side to the tip nearly, where it terminates in a low point.

The Illawarra specimen is only a carapax; but shows all the characters of the *Edwardsii* both in its surface and the marginal teeth. The limit of the posterior tooth (or tenth), is scarcely observable from above, but is apparent on the under side. The length is one and three-fourths inches; greatest breadth, one and two-thirds inches; ratio of length to breadth, 1:1.5. The granulation of the surface is precisely of the same character as in the *Edwardsii*, and the eyes are tipped in the same manner. The marginal dentation is smaller, but this appears to be due to the smaller size of the specimen. This is the *Cancer Novi-Zelandiæ* of A. White (*Crust., Erebus and Terror*, Plate 1, fig. 5).

CANCER DENTATUS (*Bell*).

Valparaiso.

Length of carapax of a male, in this hairy species, two inches; greatest breadth, two and seven-eighths inches; making the ratio of length to breadth 1:1.44. The figure by Bell affords the ratio 1:1.57. In his figure, the sides of the carapax are not as broadly rounded as in our specimens; which hardly make an approach to an angle at the last of the prominent teeth. The medial region is distinct in its outline, and 3 M and 2 M separate. The antero-lateral region has imperfectly the usual areolation, 5 L and 6 L being faintly separate, and 2 L also somewhat distinct. The ten triangular teeth of the margin appear to correspond,—the first to D; the second and third to E; the fourth and fifth to N; the sixth, seventh, and eighth to T; the ninth to S; and the tenth is a posterior tooth. The areola 1 P is somewhat rhombic, a little oblong, and well defined.

*Cancer dentatus*, BELL, Zool. Trans., i. 339, pl. xlv., 1835.

*Cancer polyodon*, PÖPPIG, Wieg. Arch., 1836, p. 133.

CANCER PLEBEIUS, *Pöppig*.

Valparaiso.

Length of carapax of one specimen (male), two and three-fourths inches; greatest breadth, four and five-eighths inches; ratio of length to breadth, 1:1.67. A young male gave for the length, 8.1 lines; breadth, thirteen lines; ratio of length to breadth, 1:1.6. The regions are mostly indistinct, but may be partly distinguished; Bell's figure fails of representing what actually appear. They are in general very nearly as in the *Edwardsii*, and the ten lobes of the antero-lateral margin have the same relations.

The *Cancer irroratus* of Say is recognised by Dr. A. A. Gould as a distinct species from the *C. irroratus* of Bell, in his Report on the Invertebrata of Massachusetts, 1841, and is named *Cancer Sayi*. But

as the Valparaiso species was first made distinct from the other species by Pœppig, his name is adopted above.

*Cancer irroratus*, BELL, Zool. Trans., i. 340, 1835.

*Cancer plebeius*, PŒPPIG, Wieg. Archiv., 1836, p. 134.

#### CANCER PRODUCTUS (*Randall*).

Plate 7, fig. 3 *a*, animal, natural size; *b*, under view of head; *c*, outer view of hand of right side; *d*, abdomen; *e*, outline of part of front of a large specimen, natural size; *f*, outer maxilliped of same; *f'*, part of foucette; *g*, second pair of maxillipeds; *h*, first pair of maxillipeds.

Puget's Sound, N. W. America, C. Pickering. Exp. Exp.

Length of carapax, thirteen lines; greatest breadth, twenty lines; and ratio of length to breadth, 1 : 1.54. The carapax is faintly areolate in part, and has a broad shallow depression either side of the arcolet 2 M. The front is slightly arcuate in outline, and is very evenly crenate with five nearly equal low crenatures. The antero-lateral margin has nine teeth, with none posterior to S, though there is a slight emargination; the transverse line connecting the two posterior of the teeth, is twice as far from the front as from the hinder margin of the carapax. The teeth are very even, though low or like lobes, and increase in size rather regularly from the second to the posterior, and at the bottom of the interval, between each there is a short suture marked on the carapax. The postero-lateral margin is concave and short. The hand is cristate; above, the surface is small tuberculous, externally it is somewhat carinate. The posterior legs are naked excepting the tarsus. The outer maxillipeds have the inner angle of the third joint rounded, with an acute emargination below it.

The first joint of the outer antennæ is thin and oblong, with the sides nearly parallel, and the summit somewhat truncate; it reaches as far forward as the edge of the front.

The furrow on the second joint of the outer maxilliped is placed obliquely as in the Cancers, and not parallel to the margin as in most of the Xanthinæ, &c.

A large specimen from Puget's Sound, appearing to be the same species (figs. *e, f, g, h*), is much more convex, the front more deeply crenate, and the margin thicker and more deeply dentate. The posterior lateral teeth are not quite so far back as in the *productus*, being in the line with the median punctures, and not posterior to them. It has similar outer maxillipeds, and excepting the characters just mentioned is like the *productus*. Length of carapax, two inches and five lines; breadth, three inches and nine lines; ratio 1 : 1.55.

*Cancer productus*, J. W. RANDALL, Journ. Acad. Nat. Sci. Philad., viii. 116.

#### SUBFAMILY XANTHINÆ.

In the Xanthinæ, the distance between the orbits is seldom less than one-sixth of the breadth of the carapax, and is sometimes more than one-half; one-fourth is nearer the common ratio. The anterolateral margin is usually longer than the postero-lateral; though somewhat less in species of *Panopæus*, *Menippe*, and *Liagora*. The third joint of the outer maxillipeds is seldom oblong, and never projects beyond the proper limit of the buccal area; its anterior margin is commonly truncate, either somewhat obliquely or transverse, and it is either arcuate in outline or slightly excavate, with occasionally a well-marked emargination. But the joint is occasionally oblong, the apex being produced and oblique at its terminal margin.

#### GENUS ATERGATIS, *De Haan*.

The genus *Atergatis* of De Haan (*Faun. Japon.*, 17, 1833) corresponds to *Cancer* of Edwards (*Crust.*, i. 372, 1834), and *Platypodia* of Bell (*Zool. Trans.*, i. 335, 1835). Each of these authors characterizes it as having the eight posterior legs of the species cristate.

#### ATERGATIS LIMBATUS.

From the Feejee Islands; also from the Sooloo Sea.

Length of carapax of a male, 1.05 inches; greatest breadth 1.55 inches; ratio of length to breadth, 1 : 1.47. In another male, length,

0·94 of an inch; breadth, 1·38 inches; ratio, 1 : 1·46. The granulations of the surface are somewhat elongated on the antero-lateral region. The areolets are distinct. 2 F is narrow; 1 M is nearly quadrate and distinct from 2 M; 2 M is divided longitudinally; 5 L, 6 L are hardly separate and coalesce nearly with 4 L; 3 L, 2 L, 1 L are distinct. The posterior region is flat without subdivisions. The eight posterior legs are very prominently crested, and the outer surface is granulous, as figured by Rüppell. The lateral outline of the carapax is nearly regularly rounded, there being but a slight angle where the border terminates.

- Xantho granulosus*, RUPPELL, Krabben des rothen Meeres, 24, pl. 5, f. 3.  
*Egla granulosus*, DE HAAN, Faun. Japon., 17.  
*Cancer limbatus*, EDWARDS, Crust., i. 377, pl. 16, f. 1.

ATERGATIS MARGINATUS (*Rüppell*), *De Haan*.

From the Sooloo Sea.

The specimen is a small one, of a reddish colour, with a white, entire border. Length of carapax, nine and a half lines; greatest breadth, fourteen and a half lines; ratio of length to breadth, 1 : 1·53. The fingers are quite short, and the hands are very nearly equal. The tarsus has a few hairs below, and there is a short tuft on the angle of the lower margin of the preceding joint.

- Carpilius marginatus*, RUPPELL, Krabben des rothen Meeres, p. 15, pl. 3, f. 4.  
*Cancer marginatus*, EDWARDS, Crust., i. 375.  
*Atergatis marginatus*, DE HAAN, Crust. Faun. Japon; KRAUSS, Südaf. Crust., p. 28.

ATERGATIS INTEGERRIMUS, *Lamk*.

East Indies.

Length of carapax of a male, two inches and five lines; greatest breadth, three inches nine and one-fourth lines; ratio of length to breadth, 1 : 1·56.

*ATERGATIS FLORIDUS* (*Rumphius*), *De Haan*.

Plate 7, fig. 4, male, natural size.

From the Paumotu Archipelago, Society and Friendly Islands, and Feejees, in the Pacific.

Carapax smooth and shining, faint areolation anteriorly, colour deep green, passing into and covered with a network of white or yellowish white. Crests of joints of legs bluish purple. Hand and carpus same colour as carapax externally, fading below to white; following legs clouded and dotted with umber, excepting the purple crests. Length, one to one and a half inches: one male specimen fourteen and a half lines long, twenty-two lines broad; ratio of length to breadth, 1 : 1.51. The antero-lateral margin is thin, and is faintly divided by very minute emarginations into three lobes. Crest of hand entire, outer surface nearly smooth or faintly reticulated. Eight posterior legs naked, excepting a small tuft on fifth joint near middle of lower margin, and tarsus pubescent.

*Cancer floridus*, RUMPHIUS, Amb., pl. 8, f. 5.

*Atergatis floridus*, DE HAAN, Faun. Japon., 46.

*Cancer ocyroe?* HERBST, iii., pl. 54, f. 2.

GENUS *CARPILIUS*, *Leach*.

The smooth and nearly terete legs, the four-lobed front, the smooth carapax, and antero-lateral longer than postero-lateral margin, with something of an angle between, give the *Carpilii* a peculiar look. The group would hardly admit of division, even if the furcate character of the inner branch of the first pair of maxillipeds should fade out in some species. We should rather conclude that this character is not as important as supposed.

*CARPILIUS CONVEXUS*.

Plate 7, fig. 5 *a*, animal, natural size; *b*, abdomen.

From the Feejee Reefs; also from the Sandwich Islands.

Length of carapax, about one and three-fourths inches; greatest breadth, two and one-fourth inches.

In a vertical view the front appears nearly straight, and the margin is not deeply lobed. The antero-lateral margin is obtusely rounded, and terminates in a low obtuse tooth.

Colour, deep flesh-red, with irregular blotches on the carapax of deep carmine and brownish red. Legs of a uniform flesh-red tint; tarsus with brown tips.

*Cancer convexus*, FORSKAL, 88, No. 34.

*Carpilius convexus*, RUPPELL, Krabben des rothen Meeres, 13, pl. 3, f. 2. M. EDWARDS, Crust., i. 382, pl. 16, figs. 9, 10.

#### CARPILIUS MACULATUS (*Linn.*)

Raraka, Paumotu Archipelago, and the Navigator and various other islands in the Pacific; also Manilla, Philippine Islands.

Length of carapax of one specimen, four and one-eighth inches; greatest breadth, five and three-eighths inches; ratio of length to breadth, 1:1.3. The bright-red spots on the carapax are eleven in number, and look like red wafers: there are two on each antero-lateral region; three across the middle; and four smaller across the posterior part of the carapax. The surface is somewhat shining and smooth, though a little wrinkled along the rounded antero-lateral margin. The front is very projecting, showing the lobes quite prominent in an upper view, the two middle projecting a little beyond the outer, and all much beyond the line of the orbits.

*Cancer maculatus*, LINN., Mus. Lud. Ul., p. 433; HERBST, pl. 6, f. 41, and pl. 21, f. 118, and pl. 60, f. 2.

*Carpilius maculatus*, EDWARDS, Crust., i. 382; Illust. Cuv., pl. 11, f. 2.

#### GENUS LIOMERA, *Dana*.

*Carpilio aspectu, pedibus nudis margines obtusis, antennisque similis. Carapax valde transversus, subellipticus, lateribus rotundatis, margine antero-laterali non brevior quam postero-lateralis, fronte brevissimè*

*bilobato. Ramus maxillipedis 1mi internus non lobatus, apice fere rectus. Pedes usque ad tarsos nudi.*

Resembles *Carpilius* in general appearance, in naked feet with obtuse margins, and in the antennæ. Carapax very transverse, elliptical, the sides being rounded; front very short, two-lobed. Inner branch of first maxillipeds not lobed, the anterior margin nearly straight. Feet even to the tarsi, naked.

*Liomera* has not the four-lobed front, nor the furcate inner branch of the first maxillipeds which characterize *Carpilius*. The carapax is very transverse and elliptical, with the inner branch entire. The *Carpilius cinctimanus* of White (Samarang, pl. 7, f. 4), is evidently of this genus.

The genus *Liagora* has the characters of *Liomera*, but yet a different aspect, as the carapax, although with rounded sides, is not very broad, and the antero-lateral margin is shorter than the postero-lateral. The tarsi, moreover, are hirsute in lines.

#### LIOMERA LATA.

*Carapax nitidus, valde transversus, transversim bene ellipticus, anticè versus marginem anticum subareolatus, in medio areolis inconspicuis; fronte brevi, perpendiculariter deflexo, superne viso fere recto et super orbitas vix saliente, leviter emarginato; margine antero-laterali crasso et crassè rotundato, 4-lobato, lobis secundo tertio quarto validis, rotundatis, tertio majore. Pedes antici æqui, mediocres, manu lævi, digitis brevibus.*

Carapax shining, oblong transverse and neatly elliptical, anteriorly towards front margin subareolate, but about middle, areolets indistinct; front short, vertically deflexed, nearly straight as seen from above, and hardly more salient than the orbits, emarginate; antero-lateral margin thick and rounded, four-lobed, lobes rounded, second, third, fourth stout, the third largest. Anterior feet equal, of moderate size; hand smooth, fingers short.

Plate 7, fig. 6 *a*, female, natural size; *b*, under view, of front showing outer antennæ; *c*, outer maxilliped; *d*, abdomen of female.

Feejee Islands.

Length of carapax, seven lines; greatest breadth, thirteen and one-half lines; ratio of length to breadth, 1 : 1.93, or nearly 1 to 2. The colour is red, excepting a white band to the tarsus just anterior to the claw, which is brownish black. The surface is polished and smooth. The areolet 1 M is convex, and so the front margin of 2 M to the right of 1 M; but 1 M fades into 2 M, and the latter is hardly distinct behind. A large areolet corresponding to 2 L, 3 L, is the only distinct one in the antero-lateral region, although a depression extends inward from the limits of the penult tooth. The upper and lower margins of the hand are parallel, and the fingers are short. There is no trace of a tubercle at the external angle of the orbit; the first lobe of the antero-lateral margin has a straight margin, and is but slightly divided from the second lobe.

GENUS ACTÆA, *De Huan.*

*Regio carapacis postica plana, antero-lateralis frontalisque declives. Orbita hiatu externo non interrupta. Articulus antennarum externarum 1mus frontem attingens.*

Posterior part of carapax flat, the frontal and antero-lateral regions rounded and much inclined. Orbit not interrupted by a hiatus at the external angle. First joint of outer antennæ reaching the front and affixed to it.

This genus is closely allied to Actæodes, the difference consisting in the character of the fingers; and in some instances it is difficult to determine whether the fingers are pointed and not excavate, owing to the transitions between the two genera. It differs from *Zozymus* in the pointed fingers, and also in not having the eight posterior legs cristate.

ACTÆA AREOLATA.

X. *hirtissimo vel specioso affinis. Carapax latior, valde transversus, infra omnino brevissimè hirsutus, supra omnino areolatus, subtilissimè hirsutus, capillis vix longioribus quam granuli, areolâ 2M subdivisâ,*

*ejus portione externâ etiam partim subdivisâ, 3 M tripartitâ, 1 P tripartitâ; margine antero-laterali longo, leviter 5-lobato, postero-laterali brevi, valde concavi. Pedes brevissimè hirsuti; antici subæqui, granulosi, manu carpoque paulo nodosis, digitis striatis, scabris, brevissimè hirsutis, bene triangulato-dentatis. Pedes postici granulosi densè brevissimèque hirsuti.*

Near *X. hirtissimus* or *speciosus*. Carapax broader transverse, below very short hirsute, above areolate throughout and very minutely hirsute, the hairs hardly longer than the granules, areola 2 M subdivided, and its outer part also in part subdivided; 3 M tripartite; cardiac tripartite; antero-lateral margin long, faintly five-lobed, postero-lateral short, very concave. Feet very short hirsute; anterior pair subequal, granulous, hand and carpus somewhat nodose, fingers striate, very short hirsute, regularly triangulato-dentate. Posterior feet granulous, densely and very short hirsute.

Plate 8, fig. 1 *a*, outline of carapax, enlarged two diameters; *b*, surface more enlarged, showing tubercles and hairs.

Sooloo Sea, or Balabac Straits.

Length of carapax of a female, 5.9 lines; greatest breadth, 9.33 lines; ratio of length to breadth, 1 : 1.58. This is a much broader species in proportion to its length than either the *hirtissimus* or the *speciosus*, and is smoother than the former, though not as smooth as the latter. The granulations of the eight posterior legs are scarcely apparent unless the dense hirsute covering is removed, yet this hirsute covering is extremely short. The furrows appear to be hirsute, unless examined with care, when the hairs of the furrow are found to proceed mostly from the edges of the areolets. The lobes of the antero-lateral margin are rather indistinct. The fingers have six or seven teeth, which, excepting the terminal, are thin and triangular, and just equal the intervening spaces, into which the teeth of the opposite finger fit. The pterygostomian region has furrows as in the *hirtissimus*.

The *rufopunctatus*, according to Edwards, has five large rounded teeth to the antero-lateral margin, and the postero-lateral margin is nearly straight; moreover, the pterygostomian region is without furrows.

## ACTÆA CELLULOSA.

*Carapax anticè posticèque malè areolatus, omnino cellulosus, nudus, margine antero-laterali imperfectè 3-4-lobato et cellulis excavato, margine postero-laterali perbrevis, concavo. Pedes antici subæqui, manu carpoque superficie cellulosis, manu extus infraque subtiliter villosâ, digitis scabris, etiam villosis. Pedes 8 postici cellulis excavati, breves.*

Carapax throughout imperfectly areolate, and surface cellulous, naked, antero-lateral margin imperfectly three to four lobed and excavated with cellules, postero-lateral margin very short, concave. Anterior feet subequal, hand and carpus with a cellulous surface, hand inside and out fine villous, fingers scabrous and also villous. Eight posterior feet short, surface excavated with cells.

Plate 8, fig. 2, female (having eggs under the abdomen), enlarged four diameters.

From Tutuila, Samoan Group.

Length of carapax of female, 3 lines; greatest breadth, 4·3 lines; ratio of length to breadth, 1 : 1·43. The animal looks like a worn pebble of cellular coral. The whole surface of the carapax is cellular; and the legs, when drawn up, may be mostly concealed beneath the carapax. Traces of the areolets may be made out over the back, but they are not well defined. The surface between the low prominences of the antero-lateral margin has in each case a deep hollow excavated in it. The postero-lateral margin is quite concave, and the surface against which the posterior legs rub is flat, making an angle with the surface of the carapax above. The under surface of the body is very short villous throughout, the outer maxillipeds included.

ACTÆA HIRSUTISSIMA (*Rüppell*), *De Huon*.

Upolu, Samoan Group.

The specimens from Upolu are closely like Rüppell's figure (Op. cit., 26, pl. 5, f. 6).<sup>\*</sup> The whole surface is rough with short bristles, rather shorter than in Rüppell's figure (projecting above the granules about as much as the diameter of the granules), and the legs have the same hirsute character. The under surface of the body is very short hirsute throughout. The fingers of the hand are striate and scabrous, and also minute hirsute, like the hand. Length of carapax of a female, 6.15 lines; greatest breadth, 9 lines; ratio of length to breadth, 1 : 1.46. There is no long ciliation to the upper margin of the posterior legs, this margin being short and rough hirsute, like the lateral surface of these legs. Fingers channeled, and inner margin denticulate. The intervals between the areolets are not pubescent. The antero-lateral margin is five-lobed, as observed after removing the hairs, and not before (Plate 8, fig. 3). These lobes are the normal ones, D, E, N, T, S. They are broad and truncate (excepting S), with the margin irregularly denticulate. Between D and E, but on a lower level, there is another small prominence, *d'*. This description does not agree entirely with that by Milne Edwards (Crust., i. 389); but the specimens answer so well to Rüppell's figure and description, that we forbear naming it anew. It has many of the characters of the *rufopunctatus* of Edwards; but the postero-lateral margin is very concave, and its proportions are those of Rüppell's figure, instead of being "beaucoup moins ovoïde;" and the pterygostomial region is sulcate, very distinctly so, the sulci corresponding to the intervals between the marginal lobes.

Another smaller specimen from the Sooloo Sea has similar characters. The length of the carapax is but 2.6 lines; and the ratio of length to breadth, is 1 : 1.43. The under side of the body appears smoother, and the outer maxillipeds nearly naked; but this may be owing to its younger state. The general colour of the carapax is light, yet the short hairs are dark. The specimen resembles much the figure referred to *Ægle rugata* by Adams and White (Crust. Samarang, pl. 8, f. 5), but the fingers are pointed.

#### GENUS XANTHUS.

The groups Xantho, Paraxanthus, Euxanthus, and Xanthodes, are

<sup>\*</sup> Not pl. 4, fig. 8, as in Milne Edwards's Crust., i. 389.

properly subgenera of the genus *Xanthus*. Through *Xanthodes* there is a passage to the narrow form in *Pilumnus*; yet the species, as in other *Xanthi*, have the male abdomen always five-jointed. Though *Paraxanthus* has the first basal joint of the outer antennæ quite short, the front does not send down a narrow process to meet it; and in this particular, as also the expanded and rounded sides of the carapax, and produced front, it differs from *Xanthodes*.

## SUBGENUS XANTHO.

1. *Pedes 8 postici cristati*.

## XANTHO NITIDUS.

*Carapax lævis, paulo nitidus, anticè partim leviter areolatus, areolis 2 M, 5 L, 6 L, posticè vix circumscriptis; fronte fere recto, non emarginato, margine antero-laterali leviter 3-4-lobato, lobis subtriangulatis, angulo orbitali externo non saliente. Pedes antici subarqui, inermes, fere læves (subtilissimè corrugata), manu bene cristatâ, digito mobili subcristato et dente basali magno carente. Pedes 8 postici bene cristati, fere nudi, marginibus integris, apice margineque inferiore articuli 5ti brevissimè hirsuto-villosis, tarso supra infraque etiam villosi.*

Carapax smooth, a little shining, anteriorly in part faint areolate, areolets 2 M, 5 L, 6 L, hardly circumscribed behind; front nearly straight, not emarginate, antero-lateral margin faint 3-4-lobed, lobes subtriangulate, outer orbital angle not salient. Anterior feet subequal, unarmed, nearly smooth (very minutely corrugate); hand neatly cristate, moveable finger subcristate, not having a large inner tooth. Eight posterior feet neat cristate, nearly naked, margins entire, apex and under margin of fifth joint very short hirsute, villous, tarsus above and below villous.

Plate 8, fig. 4 *a*, male, enlarged three diameters; *b*, abdomen of male.

Feejees or Tongatabu.

Length of carapax of male, 3.2 lines; greatest breadth, .5 lines; ratio of length to breadth, 1 : 1.56. The areolets 2 F are distinct, also the anterior or outer limits of 1 M, 2 L, 4 L; 2 L and 3 L are not

separated, and the posterior limits of the areolets are indistinct. The legs are smooth and shining, not at all granulous. Under the microscope, the hand and carpus appear a little corrugate. The apex of the fifth joint of the eight posterior legs has a triangular surface, which is very short hirsute. The first of the four lobes of the antero-lateral margin has a nearly straight outline, and is but faintly separated from the following, the others are very low triangular.

## XANTHO SUPERBUS.

*Carapax paulo convexus, anticè sed non medio areolatus, areolis 3 M, 4 M, 5 L, 6 L fere coalitis et posticè vix circumscriptis, sulcis anterioribus villosis; fronte paulo sinuoso, emarginato; margine antero-laterali crassè 4-dentato, dentibus duobus anticis subrotundatis. Pedes cristati, manu extus subseriatim minutè tuberculatâ, supra valde cristatâ; pedibus posticis margines densè hirsutis, tarso villosa.*

Carapax but little convex, anteriorly areolate but not at middle, areolets 3 M, 4 M, 5 L, 6 L, almost coalescent and posteriorly hardly circumscribed, anterior sulci villous, front a little sinuous, emarginate; antero-lateral margin coarsely four-toothed, two anterior teeth subrotund. Feet cristate; hand externally subseriately small tuberculate, above strongly cristate; posterior feet with the margins densely hirsute, tarsus villous.

Plate 8, fig. 5 *a*, female, natural size; *b*, abdomen.

From Raraka Island, Paumotu Archipelago.

Length, thirteen lines; greatest breadth, twenty-one lines; ratio of length to breadth, 1 : 1.6. Colour of carapax, large vermilion blotches neatly shaded on a whitish ground; anterior margin and parts of the antero-lateral bluish purple; upper margin of joints of legs in part bluish purple, and the rest of the legs clouded with vermilion and flesh-red; fingers brownish black. The areolets 1 M and 2 M are united, and the anterior margin is abrupt, the furrow or surface just anterior being villous; but posteriorly the areolet 2 M is lost, and the same is true of 5 L, 6 L, which are in one. 4 L is distinct and prominent; and 2 L, 3 L, are united. The outer surface of the hand is imperfectly beaded in lines. The hairs of the legs are yellow.

2. *Pedes 8 postici non cristati.*

## XANTHO DISPAR.

*Carapax fere planus, ellipticus, latere rotundatus, non nitidus, anticè non bene areolatus, prope marginem impressus, margine antico areolarum 1 M, 2 M paulo impresso, lineis duabus regionem antero-lateralem intersectantibus; fronte fere recto, non producto, margine antero-laterali crassiusculo, subacuto, fere integro, levissimè trilobato, lobo antico (D, E, N respondente) plus duplo longiore quam secundus (T), angulo post-orbitali non saliente. Pedes antichi valde inæqui, manu supra latè rotundatâ, corrugatâ et partim granulosa, digito mobili non canaliculato, dente magno basali. Pedes 8 postici breves, subnudi, articulis 4to 5to supra granulosis, 5to tarsoque minutè villosis.*

Carapax nearly flat, elliptic in outline, surface not shining, sides rounded, anteriorly not distinctly areolate, but with impressions near the margin, anterior margin of areolets 1 M, 2 M a little impressed, two elevated lines cross the antero-lateral region; front nearly straight, not produced; antero-lateral margin rather stout, subacute, nearly entire, very faintly trilobate, anterior lobe (corresponding to D, E, N), more than twice as long as the second, post-orbital angle not salient. Anterior feet very unequal, hand broad rounded above, corrugate and somewhat granulous, moveable finger not channeled, having a large basal tooth. Eight posterior feet short, nearly naked, fourth and fifth joints granulous above, fifth and tarsus minutely villous.

Plate 8, fig. 6 *a*, female, enlarged two diameters; *b*, front view of part of front; *c*, side view of large hand; *d*, abdomen of female.

## Rio Janeiro?

Length of carapax of female, five and a half lines; breadth, eight and one-fourth lines; ratio of length to breadth, 1 : 1.5. This species is near the *planus*; but the front is not projecting and is far more inclined; the outline is more elliptical; the fourth joint of the eight

posterior legs is not naked on its lateral surface; the carpus and hand have an uneven surface; the margin just posterior to the orbits is very thick; and the antero-lateral region is crossed by two lines slightly raised. These lines last alluded to, run from the emarginations separating the lobes of the margin, and pass inward and a little forward with a curve; the anterior is the front margin of areolets 2 L, 3 L united, and the posterior, the same of 5 L. Part of the outline of 2 M is distinct. The fingers of the small hand are quite long and slender. The third joint of the outer maxillipeds is shorter than wide. The front as seen in a vertical view is but very slightly sinuous.

In the *X. Gaudichaudii*, according to Milne Edwards, the distance between the orbits is very small; and in his figure (D'Orbigny's S. A. Crust., pl. 5, fig. 4), the distance is about two-ninths of the whole breadth; while in the species here described it is nearly one-third. From the *X. punctatus* it differs in the hands not being smooth.

#### XANTHO MINOR.

*X. parvulo affinis. Carapax anticè areolatus, areolis leviter elevatis 2 M, 3 M, 5 L, 6 L posticè circumscriptis, 2 M cum rugâ transversim divisâ; fronte fere recto, leviter emarginato; margine antero-laterali tenui, 4-dentato, dentibus tribus posticis subtriangulatis. Pedes antici mediocres, carpo manûque supra paulo granulosis, manu extus leviter granulato-costatâ et supra sulcatâ, digito mobili cum dente magno basali non armato. Pedes 8 postici sparsim pubescentes.*

Near *X. parvulus*. Carapax anteriorly areolate, areolets slightly raised, 2 M, 3 M, 5 L, 6 L circumscribed behind; antero-lateral margin thin, four-toothed, three posterior teeth subtriangular. Anterior feet of moderate size, subequal, carpus and hand above slightly granulous, hand exteriorly faint granulato-costate, and above sulcate, moveable finger not armed with a large basal tooth. Eight posterior feet sparsely pubescent.

Plate 8, fig. 7, female (with eggs), enlarged four diameters.

Probably from Madeira; possibly the Cape Verdes.

Length of carapax, 2.1 lines; greatest breadth, 3.1 lines; ratio of length to breadth, 1 : 1.48. This species has the transverse linings of the *parvulus*, arising from the very thin trenchant or harsh edge bounding or crossing transversely some of the areolets. But the form is narrower, and more convex; the antero-lateral teeth are somewhat peculiar, and the hands are also different, besides wanting the large basal tooth of the moveable finger. The female, although so small, is well furnished with eggs, proving that it has nearly or quite its adult size. The fifth joint of the eight posterior legs is not properly hirsute on both margins, as in the *parvulus*.

*XANTHO PARVULUS (Fabr.), Edwards.*

Cape Verdes.

The following are the characters of the specimens referred to this species. Length of the carapax of a male, five lines; greatest breadth, seven and two-thirds lines; ratio of length to breadth, 1 : 1.53. Front nearly straight, emarginate. Carapax not shining, anteriorly areolate, but areolets slightly prominent, and 2 M, 3 M, 5 L, 6 L, hardly distinct posteriorly, or altogether indistinct. Surface of areolets with some interrupted transverse lines, like the anterior edges of the areolets. Antero-lateral margin thin, four-toothed or lobed, corresponding to D, E, N, T, S; the first lobe most elevated in its posterior half and rounded, and its inner angle (at the orbit) not salient; second lobe truncate; third, subtriangular, but the posterior side much the longer; fourth, more dentiform and narrower; all the lobes having the surface somewhat granulous or uneven in surface, as seen under a lens. Hand rounded above, surface faintly corrugate or uneven under the microscope, and the same is true of the carpus; outer surface not at all costate. Moveable finger not channeled, and having in both sexes a large oblique basal tooth. Posterior eight legs rather slender, fourth joint somewhat hirsute above, fifth hirsute above and below, tarsus hirsute.

*Cancer parvulus*, FABR., Ent. Syst., ii. 451.

*Xantho parvulus*, EDW., Crust., i. 395.

XANTHO FLORIDUS, *Leach.*

Madeira.

The areolets are distinct over the anterior part of the carapax. 1 L, however, is wanting or nearly so, 2 L, 3 L, are coalesced, and 1 M, 2 M, are hardly separated. 2 M is simple. The teeth are the normal ones, E, N, T, S; the outer angle of orbit (D) is not raised into a tooth. A good figure of this species is given in Bell's *British Crustacea*, p. 51, and another in Edwards's *Illust. Cuv. Crust.*, Pl. 11 bis, f. 3.

XANTHO PLANUS (*Edw.*)

Valparaiso.

Colour of specimens a dull brownish purple, at times spotted with white or yellowish white posteriorly. None of the regions of the carapax are distinct, yet a faint outline of the medial may be perceived. The lateral tooth of the carapax is S, and another less distinct is T; a faint fissure anteriorly separates the regions of E and N, but there is no mark between D and E; and D itself is not at all projecting.

Length of carapax of a male, two inches and eleven lines; greatest breadth, four inches and three lines; ratio of length to breadth, 1:1.46. In another male, length, one and thirteen-sixteenths inches; greatest breadth, two and thirteen-sixteenths inches; ratio, 1:1.55. In a female, length, two and five-sixteenths inches; greatest breadth, three and a half inches; ratio, 1:1.51.

*X. planus*, M. EDWARDS, *Hist. Nat. des Crust.*, i. 397, and *Crust.*, D'Orbigny's *S. America*, 14, pl. 6, fig. 1.

## XANTHO ORBIGNYI.

Callao, Peru.

Length of carapax of a female, one and seven-sixteenths inches; greatest breadth, two and one-sixteenth inches; ratio of length to breadth, 1:1.43. The areolation is rather faint, yet the medial

region may be distinguished. In the figure in D'Orbigny's Crustacea of S. America, the margin appears to be reflexed, which is not the fact with the species. The front is two-lobed, with each lobe emarginate or bidentate. The antero-lateral margin consists of ten teeth, the two preceding the last being partly double (or *nine*, considering the last three as double). The last is the fifth normal (or S). The species is remarkable for the unusual length of the third joint of the outer maxillipeds, the apex being prolonged forward and narrowing. In our specimen—a dried, weathered one—the first joint of the outer antennæ does not reach the front, and is like that of *Pseudocarcinus*.

*X. Orbignyi*, M. EDWARDS and H. LUCAS, D'Orbigny's Crust. S. A., 14, pl. 7, fig. 1.

#### SUBGENUS PARAXANTHUS, Lucas.

If the group *Paraxanthus* is retained as distinct, the following species should be referred to it. It has the horizontally-produced front, the rounded and expanded sides, the narrow abdomen, and the short antennary joint of the typical species of *Paraxanthus*.

#### PARAXANTHUS SEXDECIMDENTATUS (*Edw. and Lucas*), Dana.

Callao, Peru, or Valparaiso.

Length of carapax of a male, one inch five lines; greatest breadth, two inches; ratio of length to breadth, 1 : 1.41. The areolets are about as distinct as represented in the figure of *Elisus leximanus* (Pl. 10, fig. 1), and are wholly misrepresented in the figure in D'Orbigny's work. The nine teeth of either margin of the carapax (*eight* exclusive of the orbital), correspond normally as follows: the eighth to S; the seventh and sixth to T; the fifth and fourth to N; the third and second to E; and the first or orbital is D. This arrangement is apparent, as in other cases, from their position with reference to the areolets 2 L, 3 L, 4 L, adjoining. The ninth tooth is a posterior one (*s*), and the species thus approximates in form to some *Cancers*.

*Xantho sexdecimdentatus*, M. EDWARDS and H. LUCAS, in Crust., D'Orbigny's S. A., 15, pl. 7, f. 2.

## SUBGENUS EUXANTHUS.

*Xantho affinis.* *Articulus antennarum externarum primus orbitæ fissuram ad summum implens, cavitate in ejus apicis latere antico articulum proximum gerente. Margo antero-lateralis sub orbita anticè productus.*

Near *Xantho*. The first joint of the outer antennæ quite filling the orbital fissure, and a cavity in the anterior side of the apex bearing the next joint. Antero-lateral margin continued forward beneath the orbit.

The orbital fissure occupied by the basal joint of the outer antennæ is quite filled with this joint, and the summit of the joint, instead of giving insertion to the next joint from near its middle, has a cavity in the anterior margin, from which the second joint of the antennæ proceeds, and in the two species observed, this second joint scarcely projects above the outline of the cavity. In one species this cavity is elongated towards the orbit, and is scarcely separated from it, while in the other it is nearly circular, and is wholly separated from the orbit. The hands are equal, and rather small.

## EUXANTHUS SCULPTILIS.

*Carapax anticè posticèque profundè areolatus, areolâ 2 M bipartitâ ejus partibus transversim subdivisis, totisque areolis plus minusve rugatis aut incis; fronte inter-antennali bilobato, paulo prominente, margine orbitæ sub antenna saliente; margine antero-laterali 6-7-dentato, dentibus sat crassis, pyramidicis, obtusis. Pedes antici æqui, carpo crassè nodoso, manu supra tuberculatâ, extus costatâ, digito mobili supra denticulato. Pedes postici mediocres, articulo tertio granuloso, 4to 5to supra rugatis aut tuberculosi, tarso villosi. Abdomen valde areolatum.*

Carapax anteriorly and posteriorly profound areolate, areolet 2 M

bipartite, its halves transversely subdivided, and all the areolets more or less rugate or incised; inter-antennary front 2-lobed, little prominent, margin of orbit below the antennæ salient; anterolateral margin 6-7-toothed, teeth rather stout, subpyramidal, obtuse. Anterior feet equal, carpus coarse nodose, hand tuberculate above, costate without, moveable finger denticulate above. Posterior feet of moderate size, third joint granulous, fourth and fifth joints rugate above or tuberculous, tarsus villous. Abdomen strongly areolate.

Plate 8, fig. 8 *a*, animal, natural size; *b*, front view of base of outer antennæ and eye; *c*, view of orbit seen perpendicularly, and showing summit of base of antennæ; *d*, hand, natural size.

Feejees, or Tongatabu.

Length of carapax of a female, eleven and a half lines; greatest breadth, seventeen and a half lines; ratio of length to breadth, 1:1.52. The furrows of the surface are deep, and the whole carapax has a rough look. A male in the collections is a little smaller, measuring ten and a half lines in length; and fifteen and a half in breadth; ratio of length to breadth, 1:1.5. The abdomen is very much embossed, and the sternum also, in the male. The teeth are somewhat irregular. On one side of the male there are the five D, E, N, T, S, and another *d'*, just below the level of D, E. On the opposite side, there is an extra tooth just posterior to T. The line of the lateral margin extends forward to a point some distance below the orbit. On the outer surface of the carpus there are two large rounded tubercles. The costæ of the outer surface of the hand are irregularly granulate. The fingers are channeled.

#### EUXANTHUS NITIDUS.

*E. sculptili quoad pedes anticos et posticos, marginem carapacis anterolateralem, et frontem similis. Carapax omnino ralde areolatus, areolis plerumque levibus, interdum leciter rugatis, angulo orbitæ externo tenui et non tuberculiformi nec angulato.*

Near *E. sculptilis* in the anterior and posterior feet, antero-lateral margin of the carapax and front. Carapax throughout strong areolate, areolets for the most part smooth, sometimes slight rugate, outer angle of orbit thin and not tuberculiform nor angulate.

Plate 8, fig. 9 *a*, animal, natural size; *b*, view of orbit from above, showing summit of outer antennæ.

Feejees, or Tongatabu.

Length of carapax, nine lines; greatest breadth, fourteen lines; ratio of length to breadth, 1:1.55. The two posterior teeth of the antero-lateral margin are distant, and a nearly straight margin intervenes between them. The areolets are smooth, with only faint wrinkles, where any, and the surface is a little shining.

#### SUBGENUS XANTHODES.

In this group, the first joint of the outer antennæ is rather short, though meeting the front, a frontal process being elongated towards it. The form of the carapax in our species approaches that of *Pilumnus* and *Eriphia*. The genus has the same relation to *Xantho*, as our *Pilodius* to *Chlorodius*. The carapax in the species described has the normal number of teeth, except that E is sometimes wanting, and D or the margin of the orbit is often not elevated into a tooth. At tooth S, the margin has an abrupt angle, as in most species of *Xantho*, and is not rounded as in the species of the genus *Paraxanthus*. The third joint of the outer maxillipeds is shorter than wide, and is shorter at the outer margin than at the inner, with the terminal margin nearly straight.

#### XANTHODES GRANOSO-MANUS.

*Carapax lævis, prope margines anticum et antero-lateralem granulosus, anticè parce areolatus, areolis 2 M 3 M postice sæpius vix circumscriptis, 4 L 5 L 6 L coalitis et posticè non circumscriptis; fronte fere*

*recto, emarginato, margine antero-laterali non tenui, 5-dentato, dentibus sat isolatis, vix acutis, D vix prominente, E parvulo, granuliformi. Pedes antici fere æqui, manu supra rotundatâ supra infraque granulosa, extus latè costatâ, costis granulosis, carpo granuloso, digitis canaliculatis. Pedes postici fere nudi, articulis quarto quintoque supra granulosis, tarso brevissimè villosa.*

Carapax smooth, granulous near anterior and antero-lateral margins, anteriorly slightly areolate, areolets 2 M, 3 M behind usually hardly circumscribed, 4 L, 5 L, 6 L coalescent and posteriorly not circumscribed; front nearly straight, emarginate, antero-lateral margin not thin, 5-dentate, teeth rather separate, hardly acute, D scarcely prominent, E small, granuliform. Anterior feet nearly equal, hand rounded above, above and below granulous, outer surface with a few wide granulous costæ, carpus granulous, fingers channeled. Posterior feet nearly naked, fourth and fifth joints granulous above, tarsus very short villous.

Plate 8, fig. 10 *a*, female, enlarged two diameters; *b*, front view of front, showing its antennary process and the outer antennæ; *c*, hand, outer view.

Tutuila and Upolu, Samoan Islands; also probably from the Society, or Paumotu Islands.

Length of carapax of a female, four and one-fourth lines; breadth, six and one-fourth lines; ratio of length to breadth, 1 : 1.47; in another specimen, a male, length, two and three-fourths lines; breadth, four and one-tenth lines; ratio, 1 : 1.49. Colour (believed to be of this species), irregularly blotched and spotted with brown on a grayish or yellowish white base. Anterior legs yellowish white, fingers brownish black. The hand is granulous below as well as above, and the costæ of the outer surface, instead of being single rows of granules, are low longitudinal ridges closely covered with granules. The teeth of the antero-lateral margin are not properly acute. The absent one of the normal teeth is E. The outer angle of the orbit is not at all elevated, the thin rim of the orbit being evenly continuous around the other side. The carpus has an indentation on the outer surface, a short distance from the anterior margin. The orbit is very nearly circular with an entire (or nearly entire) and even margin.

The palate is not divided longitudinally either side of the middle by a ridge, and the species is thus remote from the Eriphidæ.

## XANTHODES NITIDULUS.

*Carapax lævis, nitidus, anticè partim areolatus, areolis 1 M 2 M 3 M vix discretis, 2 L 3 L extus abruptis, 2 L cum 4 L 5 L 6 L sæpius coalitis, hisque posticè non bene circumscriptis, 3 L circumscriptâ; fronte leviter arcuato, emarginato; margine antero-laterali 4-dentato, dente D obsoleto, dentibus E, N, T, S, subconicis, subacutis, nitidis. Pedes antici paulo inæqui, inermes, læves, manu supra obtusâ, prope marginem supernum uni-canaliculatâ; carpo prope articulationem apicalem paulo exarato. Pedes 8 postici margine superno articulorum 3ti, 4ti, 5ti valde hirsuti, tarso hirsuto, articulo tertio supra non denticulato.*

Carapax smooth, shining, anteriorly somewhat areolate, areolets 1 M, 2 M, 3 M hardly separated, 2 L, 3 L, on their outer limits abrupt, 2 L with 4 L, 5 L, 6 L usually coalescent, and not well circumscribed behind, 3 L circumscribed; front slightly arcuate, emarginate; antero-lateral margin four-toothed, tooth D being obsolete, teeth E, N, T, S, subconical, subacute, shining. Anterior feet a little unequal, unarmed, smooth, hand above obtuse, a single channel in upper margin, carpus near its articulation with the hand somewhat excavate. Eight posterior feet with the upper margins very hirsute, tarsus hirsute, third joint not denticulate above.

Plate 8, fig. 11 *a*, male, enlarged two diameters; *b*, front view of front, showing base of outer antennæ; *c*, outer view of hand.

From the Paumotu Archipelago.

Length of carapax of male, five lines; greatest breadth, seven and two-thirds lines; ratio of length to breadth, 1:1.53. The hairs of the legs are unequal or uneven, and the legs appear quite hirsute, although only so on the outer margin and part of inner surface, excepting the inner margin of the fifth joint. On the outer surface of

the carpus there is an impression, near the anterior margin, which is in shape nearly like a V reversed.

XANTHODES NOTATUS.

*Carapax anticè bene areolatus, areolis planis, fere lœvibus vel subtilissimè erosus, sulcis abruptis, fronte fere recto, emarginato; margine antero-laterali 5-dentato, dente D fere obsoleto, E, N tuberculiformi, T, S, acutis, spiniformibus. Pedes antici valde inœqui, manu carpoque majoribus minutè tuberculatis, manu infra lœvi, nitidâ, manu carpoque minoribus spinulis densè armatis. Pedes 8 postici hirsuti, articulo tertio supra denticulato.*

Carapax anteriorly neat areolate, the areolets flat with abrupt sulci between and surface nearly smooth or very minutely crose; front nearly straight, emarginate, antero-lateral margin five-toothed, tooth D, nearly obsolete, E, N, tuberculiform, T, S, acute spiniform. Anterior feet quite unequal, larger hand and carpus small tuberculate, hand smooth above, shining, smaller hand and carpus densely armed with spines. Eight posterior legs hirsute, third joint above denticulate.

Plate 8, fig. 12 *a*, female, enlarged three diameters; *b*, part of front, as seen in a front view, with part of base of outer antenna.

Paumotu or Society Islands; also Sandwich Islands.

Length of carapax of female (with eggs), three and two-thirds lines; greatest breadth, five and a half lines; ratio of length to breadth, 1:1.5. The sulci are abrupt and the areolation neat and complete, excepting posteriorly. 3 M is very distinct; but 4 M is very narrow and indistinct. In a Sandwich Island specimen (a female), the left hand is very much the larger, and the reverse is true of the other specimen from south of the equator, which also is a female. The moveable finger of the large hand is not channeled. The posterior or outer surface of the fifth pair of legs is smooth and naked, while the margin is denticulate and towards apex hirsute. The following joints are hirsute throughout.

GENUS MENIPPE, *De Haan*.

In the genus Menippe of De Haan (*Pseudocarcinus* of Edwards), the antero-lateral margin is usually rather shorter than the postero-lateral, yet the difference is often but slight. The prælabial plate is undivided, as in other Xanthinæ; but there are related species, similar in the base of the outer antennæ, which belong with the Eriphidæ, and constitute the genus Pseudozius.

The genus Pelæus of Eydoux and Souleyet, figured in the Voyage of the Bonite, appears, from the figure and from specimens examined by us, to be identical with Menippe. The species *P. armatus* is from the Sandwich Islands.

## MENIPPE RUMPHII.

## Rio Janeiro?

Length of carapax of female, two and one-half inches; greatest breadth, three and three-fourths inches; ratio of length to breadth, 1 : 1.5. The general characters are well given by M. Edwards (Crust., i. 408). The teeth of the antero-lateral margin are simply the normal teeth, D, E, N, T, S. The breadth of the carapax from T to T is hardly less than from S to S. The areolation is anteriorly quite distinct. 2 F is a rounded prominence either side of the medial line. 1 M is still more prominent and coalesces with 2 M. The areolets of the antero-lateral region are about as distinct as in our figure of *Etismus levimanus* (Plate 10, fig. 1). The tarsi have a dense hirsute coating, excepting along a narrow line on either side; and the upper margin of the preceding joint is in part similarly hairy.

The outer maxillipeds have the third joint widest on the inner side, the anterior margin inclined and somewhat concave.

*Cancer Rumphii*, FABR., Supp., 336.

*Menippe Rumphii*, DE HAAN, Faun. Japon. (1833), 21.

*Pseudocarcinus Rumphii*, EDWARDS, Crust., i. (1834), 408.

GENUS PANOPÆUS, *Edwards*.

In the characteristic species of this genus, the antero-lateral mar-

gin is thin and terminates in the outer orbital angle; and moreover it is shorter than the postero-lateral margin. The aspect of the species is neat.

PANOPÆUS LÆVIS.

*Carapax lævis, vix nitidus, non bene areolatus, fronte fere recto, non producto, minutè emarginato, margine antero-laterali tenui, 4-lobato, lobis 2do 3tio bene dentiformibus et acutis, margine eorum postico arcuato, 4to angustiore. Pedes antici valde inæqui, inermes, supra rotundati, manu lævi, extus paulo nitidâ, digito mobili lævi, dente magno basali carente. Pedes 8 postici tenues, marginibus pubescentibus, articulo tertio fere nudo.*

Carapax smooth, scarcely shining, not distinctly areolate, front nearly straight, not produced, minutely emarginate, antero-lateral margin thin, four-lobed, second and third lobes neatly dentiform and acute, the posterior margin of these teeth arcuate, fourth narrower. Anterior feet very unequal, unarmed, rounded above, hand smooth, a little shining on outside, moveable finger smooth, without a large basal tooth. Eight posterior feet slender, margins pubescent, third joint nearly naked.

Plate 8, fig. 13 *a*, male, enlarged two diameters; *b*, front view of front; *c*, right hand, front view.

Locality doubtful.

Length of carapax of male, five and a half lines; greatest breadth, seven and a half lines; ratio of length to breadth, 1:1.36. The anterior lobe of the antero-lateral margin has a thin margin and is arcuate posteriorly; the outer angle of the orbit is scarcely salient. The large hand is quite large, and there is a shallow sulcus near the upper side. Faint traces of areolets 2 M may be made out. The third joint of the outer maxillipeds is shorter than long, and has the anterior margin concave.

PANOPÆUS CRENATUS (*Edwards and Lucas*).

Callao, Peru.

Length of carapax of a male, ten and a half lines; greatest breadth, fifteen lines. The regions are very indistinct, yet the outline of the medial may be made out; it is somewhat narrower than a line connecting the outer orbital angles. 1 M is slightly apparent and so also 2 F. Very faintly also, 5 L and 6 L may be distinguished through a slight bending of the surface. The four teeth into which the thin margin is divided by slight incisions, represent all the normal teeth excepting the second (E), which is coalesced with the first or orbital. The tooth S is subacute, and the outline of the carapax declines backward in an oblique and nearly straight line directly from the summit of the tooth.

One female, with eggs under the abdomen, was only six lines in length.

*P. crenatus*, M. EDWARDS and H. LUCAS, Crust., D'Orbigny's S. A., 16, pl. 8, f. 1.

GENUS MEDÆUS, *Dana*.

*Carapax angustus, paulo transversus. Orbitæ margo inferior externus-que dentibus tribus instructus. Frons sat brevis. Margo carapacis antero-lateralis sub orbita productus. Articulus antennæ externæ 1mus uti in Xantho. Abdomen maris 5-articulatum, segmento ultimo brevi. Pedes antici crassi.*

Carapax narrow, somewhat transverse. Outer and lower margin of orbit formed of three teeth. Front rather short. Antero-lateral margin of carapax extending far below the line of the orbit. First joint of outer antennæ as in Xantho. Abdomen of male five-jointed, last segment short. Anterior feet stout.

This genus is very near Xantho,—the characters of the orbit, its very narrow form, and the fact that the lateral margin instead of extending towards the orbit takes a course much below it, being the

only peculiarities of importance. It has the form nearly of some *Pilumnus*, yet has no ridge to the praelabial plate, excepting an obsolete one over its posterior half. It is near *Halimede* of De Haan, but the male abdomen is only five-jointed and the last joint has not the unusual length seen in De Haan's species. The front, moreover, is not so narrow. The species is very deeply areolate and not villous.

#### MEDÆUS ORNATUS.

*Carapax paulo transversus, profunde areolatus, areolis asperatis præcipue in parte anteriore, nec 2 M nec 3 M subdivisâ, margine antero-laterali 5-6-dentato, dentibus D, d, E, N, T, S designatis, scabris, orbitâ 4 dentibus circumdatâ; fronte producto, latiore, bene emarginato, lobis margine concavis. Pedes antici asperè tuberculato, manu tuberculis asperatis fere oblongis nec acuminatis armatâ, digitis asperatis. Pedes postici pubescentes, articulo 3tio supra spinuloso.*

Carapax slightly transverse, deeply areolate, areolets asperate especially on anterior part of each, neither 2 M nor 3 M subdivided, antero-lateral margin five or six-toothed, the teeth being D, d, E, N, T, S, scabrous; orbit with four teeth on its margin, front rather broad, produced, deeply emarginate, lobes with a concave front margin. Anterior feet with rough or asperate tubercles, those of the hand a little oblong, not pointed, fingers asperate. Posterior feet pubescent, third joint spinulous along the upper margin.

Plate 9, fig. 1 *a*, male, enlarged two diameters; *b*, side view, showing relation of orbit and antero-lateral margin; *c*, front view of base of outer antennæ; *d*, outer maxillipeds; *e*, flagellum of outer antennæ, much enlarged; *f*, extremity of tarsus; *g*, one of the pectinated setæ of the tarsus, showing its setules.

Dredged at Lahaina, Island of Maui, Hawaiian Group.

Length of carapax, 5.1 lines; greatest breadth, 7 lines; ratio of length to breadth, 1 : 1.37.

The prominent areolets with an asperate surface, and the prominent tubercles of the oblong hand, give the species a peculiarly rough

though neat aspect. The species is broader than the *Halimede fragifer* of De Haan; the ratio of the length of the carapax to the breadth, in which, according to De Haan's figure, is 1:1.16. The antero-lateral teeth are somewhat reflexed, and T is the largest, and they are all scabrous. The carpus and hand are armed seriatly with oblong tubercles, which are rough with spinules. The tarsus is spinulous near the extremity; but more posteriorly, the spinules are setæ more or less setulose, and the hairs of the legs have a rough look, from their setulose character.

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#### FAMILY CHLORODINÆ.

THE genera in this family run parallel with those of the subfamily Xanthinæ. Thus *Zozymus* is allied to *Atergatis*, *Carpilodes* to *Carpilius* or *Liomera*, *Etisus* to *Cancer* (in part), *Actæodes* to *Actæa*, *Chlorodius* to *Xantho*, *Pilodius* to *Xanthodes*, *Cyclodius* to *Medæus*. In some instances it is difficult to decide whether the fingers should be described as pointed or excavate, the transitions are so gradual. It is obvious, therefore, that the allied genera of the two groups might be arranged in a single group. Yet the relations of the series are best shown by placing them in distinct divisions, so that they may be viewed in their true parallel relations.

*Etisus* is the only known genus in this family, in which the moveable part of the outer antennæ is excluded from the orbital hiatus, a process from the first joint filling this hiatus.

#### GENUS ETISUS, *Leach*.

In the following species of this genus, the carapax is more or less areolate, the medial and lateral regions being subdivided, and in some instances also the posterior. The lateral areolets become less distinct with age, and in the adult *Etisus levimanus*, are indicated only by undulations of the surface, although well marked in an individual not

fully grown. The front is four-lobed, the two outer lobes adjoining the eyes short, the two inner long and either straight or arcuate in outline. The antero-lateral margin has the five teeth D, E, N, T, S, and in the *E. levimanus*, one or more smaller teeth appear between N and T, and T and S.

The genus includes two groups—one having the arm long and much exsert beyond the carapax, the carapax quite broad and not deeply areolate;—the other with the arm short and little exsert, if at all, the carapax narrow, and in these and other characters approaching Actæodes. This second group may be named ETISODES.

#### ETISUS DEFLEXUS.

*Carapax leviter bene areolatus, lævis, fronte inter-antennali 4-lobato, tenui, valde deflexo, setigero; margine antero-laterali 5-dentato, dentibus subacutis, secundo minore. Pedes antici sat longi, manu carpoque extus supraque bene granulosis, digitis lævibus; reliqui angusti, valde pilosi. Abdomen maris 5-articulatum, eoque levimani simile.*

Carapax distinctly but lightly areolate, smooth, front between outer antennæ four-lobed, thin, much deflexed, setigerous, antero-lateral margin five-toothed, teeth subacute, second smaller than the others. Anterior feet rather long, hand and carpus with the outer and upper surface neatly granulous, fingers smooth; following feet narrow, very pilose. Abdomen of *male* five-jointed and like that of *levimanus*.

Plate 9, fig. 2 *a*, male, enlarged two diameters; *b*, under view of front; *c*, front view of front, showing its deflexed character; *d*, right arm, enlarged two diameters; *d'*, hand of same, outer view; *e*, left arm, enlarged two diameters; *f*, leg of second or third pair, *ibid.*; *g*, outer maxilliped, *ibid.*; *h*, abdomen of male, *ibid.*

Feejee Islands.

Length of carapax, six lines; breadth, nine and a half lines; ratio of length to breadth, 1:1.6. The deflexed front with its sinuous or four-lobed margin between the antennæ, and the granulous hands are

characteristic. The posterior outline of the deflexed portion is nearly straight, except either side, and is neatly set with rounded granules; and there are a few short transverse rows of such granules on areolets 1 M, 2 M, and some other parts. The posterior legs are quite hairy. The inner margin of the arm is fringed with hairs, and the flattened surface under the sides of the carapax is covered with short hairs, as well as the under surface of the body, against which it rubs in its motions. The interval in the orbital margin filled by a process from the base of the outer antennæ is rather broad. The margin of the front inside of the antennæ (the outer of the inter-antennary lobes of the front), projects horizontally considerably beyond the insertion of the moveable part of these antennæ.

The specimen, an alcoholic one, has a pale brown colour, and the fingers are also brown, showing that they were not originally black.

ETISUS DENTATUS (*Herbst*), *Edwards*.

Plate 10, fig. 2 *a*, male, from Feejees, natural size; *b*, abdomen of male.

Feejee Islands; also Balabac Passage, north of Borneo.

The Feejee specimen measured five and one-fourth inches in greatest breadth of carapax, and three and one-eighth inches in length of same. The colour was a maroon brown; of fingers, chestnut brown, excepting tips, which were white. Eight posterior legs with both margins densely pilose in one or two ranges, the hairs deep red; tarsi with shorter tufts also on the sides, claw of tarsus black. Abdomen of male seven-jointed, last segment half shorter than penult. Antero-lateral margin of carapax nine-toothed, one of these the post-orbital. The fourth and fifth, and seventh and eighth, smaller than the intermediate.

*Cancer dentatus*, HERBST, i. 186, pl. 11, fig. 66.

*Etiusus dentatus*, EDWARDS, Crust., i. 411.

ETISUS LEVIMANUS (*Randall*).

*Carapax latus, leviter bene areolatus, lævis, fronte inter-antennali fere*

*recto, tenui, non deflexo, margine antero-laterali latè 5-dentato, dentibus brevibus, secundo valde obtuso. Pedes antici crassi, manu extus supraque lævi; reliqui compressi, marginibus pilosi, articulis quarto quinto et præcipue sexto (tarso) dorsum spinuloso-granulatis. Abdomen maris 5-articulatum articulo tertio triplici, quarto paulo oblongo, quinto triangulato, obtuso; feminae 7-articulatum.*

Carapax broad, distinctly but lightly areolate, front between the outer antennæ nearly straight, thin, not deflexed; antero-lateral margin with five broad teeth, teeth not very prominent, the second very obtuse. Anterior feet stout, hand on upper and outer sides smooth; following pairs of feet compressed, margins fringed with hairs, fourth, fifth, and especially sixth joint spinuloso-granulate above. Abdomen of male five-jointed, third segment consisting of three normal segments, fourth a little oblong, rectangular, fifth (last) triangular, obtuse; of female, seven-jointed.

Plate 10, fig. 1 *a*, male, natural size, from the Feejees; *b*, hand, left side, natural size; *c*, hand of a smaller individual, natural size; *d*, abdomen; *e*, female abdomen, natural size. Figure 1 *f*, young female, natural size; *g*, hand, much enlarged; *g'*, same, natural size; *h*, abdomen, natural size.

Reefs of Feejee Islands; also Sandwich Islands.

Length of carapax of large specimen, one inch and seven lines; greatest breadth, two inches and seven lines; ratio of length to breadth, 1:1.6. Of another specimen, the female from which fig. *c* was taken, length, nine and one-fourth lines; greatest breadth, fourteen lines, and ratio, 1:1.52. The posterior region of carapax is nearly even. The two teeth T and S are somewhat prominent and subacute, even in the adult, and more prominent in young individuals. E and N, are obtuse in adults, and N, always so in the young. The front is lamellar and projecting. The areolets 2 L, 3 L, 4 L are distinct, except in full-grown adults; 2 F is hardly seen. The insertion of the outer antennæ is in the notch between the outer and inner lobes of the front, and the inner lobe adjoining it projects forward considerably beyond the insertion. In the large specimen, the fingers have

each a rounded tooth on the inner margin, and no other dentation. In a small individual, ten lines long, otherwise similar, the fingers have each three subacute teeth on the inner margin.

The female abdomen is elliptical, with the penult joint longer than either the preceding or the following.

Figures 1*f, g, h*, pl. 10, represent a young female of this species. The outline is more fully semicircular in front, and the lateral angles are hardly as prominent. There is a slender but strong sulcature on the outer side of the dorsal margin of the moveable finger, and another below on the thumb, both of which are obsolescent in adults; the teeth of the fingers are as in the small specimen of the male alluded to, each finger having three teeth. The abdomen is broadest at the third joint, and from this, narrows somewhat towards the apex; the penult segment is the longest.

Length of carapax, six lines; greatest breadth, eight and three-fourths lines; ratio of length to breadth, 1 : 1.46.

*Etisus levimanus*, Jour. Acad. Nat. Sci. Philadelphia, viii. 115.

#### ETISODES FRONTALIS.

*Carapax vix nitidus, minus transversus; antice areolatus, postice planus, areolis fere planis, areolâ 2 M simplice; fronte producto, horizontali; margine antero-laterali 5-dentato, dentibus subtriangulatis, dente posteriore (S) minore. Pedes antici inermes, manu supra non levi, digito mobili supra fere tricarinato, carpo granuloso, prope articulationem manus prominente. Pedes 8 postici paulo pubescentes, articulo tertio inermi.*

Carapax less transverse in form than in preceding species, hardly shining; anteriorly areolate, posteriorly plane, areolets nearly flat, 2 M simple; front much produced, horizontal; antero-lateral margin 5-toothed, teeth subtriangular, posterior tooth (S) much smaller than preceding. Anterior feet unarmed, hand not smooth above, moveable finger somewhat tricarinate above; carpus granulous, and having a prominence adjoining the articulation with the hand. Eight posterior feet somewhat pubescent, third joint unarmed.

Plate 9, fig. 3 *a*, animal, enlarged four diameters; *b*, under view of front; *c*, outer maxilliped; *d*, extremity of abdomen.

Sooloo Sea, from a small island off the harbour of the principal Sooloo island.

Length of carapax, three lines; greatest breadth, three and three-fourths lines; ratio of length to breadth, 1 : 1.25.

The species is narrow for its length, and has the last of the teeth on the margin less prominent than the preceding. Moreover, the front is very projecting. The carapax appears granulous over the antero-lateral areolets and also anteriorly, and some interrupted lines of granules or depressions corresponding, are observed on the medial areolets. The inner orbital fissure is quite small, and the process from the base of the outer antennæ is so small, that without care the species might be taken for a *Chlorodius*, from which genus it is, however, distinct in the straight anterior margin to the third joint of the outer maxillipeds.

#### ETISODES CÆLATUS.

*Carapax valde convexus et areolatus, areolis tuberculiformibus, parce granulosus, areolâ 2 M longitudinaliter subdivisâ, 3 M tripartita, 4 M tripartita, 1 P et 2 P, valde disjunctis et bene circumscriptis, transversis; fronte inter-antennali 4-lobato, lobis externis parvulis, non salientibus; margine antero-laterali 5-dentato, dentibus obtusis. Pedes antici sat crassi, carpo tuberculoso, manu extus seriatim spinulosâ, aut spinulo-tuberculosâ, digito supra spinuloso. Pedes reliqui compressi, obsolete pubescentes, marginibusque valde hirsuti. Abdomen feminae 7-articulatum.*

Carapax strongly convex and areolate, areolets tuberculiform, sparingly granulous, areolet 2 M longitudinally divided, 3 M and 4 M each tripartite; 1 P and 2 P strongly separated and circumscribed, narrow transverse; front between the outer antennæ four-lobed, outer lobes quite small, not salient; antero-lateral margin five-toothed, teeth obtuse. Anterior feet rather stout, carpus tuberculous, hand externally spinulous in series, or spinulo-tuberculous, moveable

finger spinulous above. Following feet compressed, surface with a hardly distinguishable pubescence, and margins set with rather stiff hairs.

Plate 9, fig. 4 *a*, female, enlarged two diameters; *b*, front view of front; *c*, right hand; *d*, female abdomen, enlarged two diameters.

Wakes Island, Pacific Ocean.

Length of carapax, ten lines; greatest breadth, fourteen lines; ratio of length to breadth, 1 : 1.4.

The areolets are all very prominent, and rounded above, with the surface, as seen under a magnifier, dotted with a few rounded granules or minute tubercles, which on areolet 1 P form the whole surface. Besides these there are more minute black dots, which appear to be minute hairs like those that form the exceedingly short pubescence of the legs. The acute points on the outer surface of the hand are in four or five series, but above they are more scattered. Areolet 1 P has a pointed prominence at middle of posterior side, and an emargination corresponding on the anterior margin. The fissure in the inner angle of the orbit is exceedingly small, and the antennary process filling it is short. The margin of the front just inside of the antennæ does not project, but it is continued downward with a nearly vertical surface.

The abdomen has a pubescent surface and ciliate edge.

#### GENUS ZOZYMUS, *Leach*.

*Carapax undique convexus, margine antero-laterali tenui, cum angulo post-orbitali coalito. Pedes 8 postici valde compressi, articulis acie acutâ supra instructis. Habitu Atergati Actææque affinis.*

Carapax convex in every direction; antero-lateral margin thin and terminating anteriorly in the outer angle of the orbit. Eight posterior feet much compressed, joints thin and having an acute edge above. In habit, resembling Atergatis and Actæa.

The type of *Zozymus* of Leach, as well as *Ægle* of De Haan, is the *Zozymus æneus*, in which the legs are cristate; and the genus is here

restricted to species having this cristate character, as was done by De Haan, but excluding such of De Haan's species as have not spoon-shaped fingers.

ZOZYMUS GEMMULA.

*Carapax nudus, non granulatus, nitidus, anticè bene areolatus, areolis paulo monticulosus, 1 M, 2 M, discretis, 2 M subdivisâ, fronte fere recto, emarginato, margine antero-laterali tenui, leviter 4-lobato, lobis tribus posticis fere æquis. Pedes antici æqui, non carinati, manu carpoque tuberculatis, tuberculis cum granulis acervatis instructis; manu extus partim seriatim granulata. Pedes 8 postici bene carinati, carinâ articulorum 3ti 4ti prope apicem profundè incisâ, tarso sparsim hirsuto.*

Carapax naked, not granulate, shining, anteriorly distinctly areolate, areolets a little monticulose, 1 M, 2 M, distinct, 2 M subdivided; front nearly straight, emarginate, antero-lateral margin thin, faintly four-lobed, three posterior lobes nearly equal. Anterior feet equal, not carinate, hand and carpus tuberculate, tubercles made of aggregated granules, outer surface of hand in part seriate with granules. Eight posterior feet neatly carinate, carina of third and fourth joints near apex profoundly incised; tarsus sparsely hirsute.

Plate 9, fig. 6 *a*, outline of antero-lateral margin, magnified four diameters; *b*, front view of part of front, showing part of base of outer antennæ; *c*, outer view of right hand; *d*, posterior leg.

Shores of a small island off the principal harbour of Sooloo.

Length of carapax, 2.6 lines; greatest breadth, 3.9 lines; ratio of length to breadth, 1:1.5. The areolets are somewhat marked with interrupted cross lines, sometimes crenulate, and in some parts of the antero-lateral the surface consists of low points. The lobes of the antero-lateral margin are separated by a minute fissure, and are but slightly prominent. Between the beaded tubercles of the hands and carpus there is a slight imperfect velvety appearance. The third joint of the posterior legs is naked, except two or three hairs at apex, and the following joint is nearly the same; the fifth has some short hairs

both above and below. The abdomen has a naked margin. The fingers have a spoon-shape extremity, the margin being very thin; in the lower the apical margin is slightly concave, and the extremity of the upper finger, which is somewhat acuminate, shuts against the concavity.

#### ZOZYMUS LÆVIS.

*Carapax latus, lævis, paulo nitidus, areolis plerumque obsoletis, 2 L et 1 M prominulis, margine antero-laterali dilatato et tenui, obsoletè 2-3-lobato, dente nullo. Pedes antici æqui, inermes, manu latâ, supra rotundatâ, digitis canaliculatis, bene 4-dentatis, dentibus tenuibus, digito mobili valde uncinato. Pedes postici subcristati fere nudi.*

Carapax broad, smooth, somewhat shining, areolets mostly obsolete, 2 F and 1 M a little distinct, antero-lateral margin dilatate, thin, obsoletely two to three-lobed, but without teeth. Anterior feet equal, unarmed, hand broad, rounded above, fingers channeled, each neatly four-toothed, the teeth thin, moveable finger strongly uncinatè. Posterior feet subcristate, nearly naked.

Plate 9, fig. 5 *a*, male, enlarged two diameters; *b*, outer maxilliped; *c*, fingers of hand, outer view.

Balabac Passage.

Length of carapax, 5.1 lines; greatest breadth, nine lines; ratio of length to breadth, 1 : 1.75. The surface of the carapax shows traces of the areolets towards the front and antero-lateral margin. The appearance of two lobes in the antero-lateral margin is distinct but faint, but the subdivision of the anterior of the lobes into two others is less obvious, though visible in the bending of the outline. The postero-lateral side is rounded. The eye has a thin, prominent orbit, which is quite entire, and when shut back lies deep within, not projecting at all above the outline. The outer surface of the hand is a little uneven. The fingers touch only at apex, the moveable finger being very strongly uncinatè, so that the extremity of the short hand may be said to be broad truncate. The carpus has the inner margin thin. The posterior legs are very thin, with a trenchant upper margin to the joints. The male abdomen consists of five segments.

*ZOZYMUS ÆNEUS* (Linn.), Leach.

Plate 10, fig. 3  $\alpha$ , animal, natural size.

Islands of the Paumotu Archipelago, Samoan Islands, and East Indies.

This widely-distributed species, when alive, is exceedingly beautiful, and very unlike in its tints the figures hitherto published. The figure by Quoy and Gaimard, in Freycinet's Voyage (Plate 76, fig. 1), is evidently from a dead specimen, the colouring being very much faded and altered. The subdivisions of the areolets are somewhat remarkable. 2 M is divided longitudinally nearly through, and from the anterior end of each part a segment is cut off. 5 L is divided into two parts, and each portion is again partly divided. 3 M is divided almost completely into three parts, and from each lateral segment a small subareolet is separated anteriorly; 4 M is united to 3 M between the two intermediate punctures. 1 P consists of four or more parts, two anterior either side of the medial line (sometimes subdivided), and two posterior on the medial line, the former of these triangular and lengthened anteriorly, the latter small and suboval. 2 O has a small tubercle at its base, and the same is true of 3 O.

The spoon-cavity of the fingers is not circumscribed on the inner side.

*Cancer æneus*, LINN., Mus. Lud. Ulr., 451; Fabr. Supp., 335.

*Zozymus æneus*, LEACH; DESMAREST, 105; EDW., i., 3830.

*Ægla æneus*, DE HAAN, Faun. Japon., 17.

## GENUS CARPILODES, Dana.

*Carapax latus, undique convexus, nudus, marginibus crassè rotundatis. Pedes nudi, fere læves et subcylindrici. Aliis Zozymo similis; Carpilio, Liomeræque habitu affinis.*

Carapax broad, convex in different directions, nude, margins stout and rounded. Feet naked, nearly or quite smooth and subcylindrical. In other characters like *Zozymus*; in habit near *Carpilius* and *Liomera*.

The species referred to this genus would fall in with *Liomera*, were it not for the form of the fingers, in which respect they are like the *Zozymi*. *Xantho obtusus* of De Haan, pl. 13, f. 5, appears to be included.

## CARPILODES TRISTIS.

*Carapax latior, latè subrhombicus, lævis, non nitidus, anticè sat areolatus, areolis 1 M 2 M conjunctis, 2 L 3 L conjunctis, 4 L 5 L 6 L conjunctis; fronte brevi, fere recto, levissime emarginato; margine antero-laterali 4-lobato, lobis rotundatis; latere postero-laterali recto, convexo. Pedes antici æqui, breves et parvi, nudi et inermes, læves. Pedes postici vix compressi, nudi.*

Carapax broad subrhombic, smooth, not shining, somewhat areolate anteriorly, areolets 1 M and 2 M united, so also 2 L and 3 L, and also 4 L, 5 L, 6 L; front short, almost straight, very slightly emarginate, antero-lateral margin four-lobed, lobes rounded; postero-lateral side straight, convex. Anterior feet equal, short and small, naked and unarmed, smooth. Posterior feet hardly at all compressed, naked.

Plate 9, fig. 7 *a*, female, natural size; *b*, front view of front, showing outer antennæ, enlarged; *c*, outer maxilliped; *d*, female abdomen, natural size.

Paumotu Archipelago?

Length of carapax, 6.15 lines; greatest breadth, 10.5 lines; ratio of length to breadth, 1:1.7. The surface has a smooth, dull look, and the furrows though neat are not deep. The fingers are channeled, and the hand is seen to have the outer surface a little uneven when magnified. The antero-lateral sides are nearly parallel to the diagonally opposite postero-lateral, and this gives an approach to a rhombic form to the outline. The base of the outer antennæ is continued to the same height as the outline of the orbit.

## GENUS ACTÆODES, Dana.

*Carapax postice fere planus, versus margines anticum antero-lateralemque*

*curvatim declivis. Digiti instar cochlearis excavati. Pedes 8 postici articulo 3tio non cristati.*

Carapax posteriorly flat or nearly so, towards the anterior and antero-lateral margins curvately inclined. Fingers excavate spoon-like. Eight posterior feet not having the third joint cristate.

These species are like Actææ in form and aspect, but the fingers are those of the Chlorodinæ. The front and sides curve downward, and the outline in a vertical view is a regular semicircular arc. Moreover, the species are often granulous as in Actæa, and the two genera pass into one another by insensible gradations. The granulous species graduate into those that are nearly smooth, or are granulous only anteriorly and laterally, and also, into other species that have a cellular surface. Some species have the fourth or fifth joints of the posterior legs more or less cristate, but not the third, like the Zozymi.

This genus includes *Zozymus* in part, of Edwards. The *Z. tomentosus* may be considered its type.

1. *Carapax lævis sive vix granulatus, nec tomentosus.*

ACTÆODES AREOLATUS.

*Carapax bene areolatus, lævis, areolâ 2 M simplice, 1 R, 3 R discretis, 1 P vix circumscriptâ; margine frontali fere recto, emarginato; margine antero-laterali 5-dentato, dente quinto parce minore. Pedes antici æqui, manu extus parce rugatâ, digitis canaliculatis, 2-3-dentatis, digito mobili valde uncinato. Pedes postici paulo nudi, articulis compressis, tertio supra fere acuto.*

Carapax areolate, smooth, areolet 2 M simple, 1 R and 3 R separate, 1 P hardly circumscribed; frontal margin nearly straight, emarginate, antero-lateral margin five-toothed, fifth tooth the smallest. Anterior feet equal, outer surface of hand hardly rugate, fingers channeled, 2-3-dentate, moveable finger strongly uncinuate. Posterior feet nearly naked, joints compressed, the third nearly acute above.

Plate 9, fig. 8 a, outline of antero-lateral margin, enlarged; b, hand,

enlarged; *c*, front view of front, showing outer antennæ; *d*, male abdomen.

Raraka Island, Paumotu Archipelago.

Length of carapax, two and one-fourth lines; greatest breadth, three lines; ratio of length to breadth, 1:1.33. The surface is a little shining and not granulous under the microscope. The areolets are quite distinct and convex, and the furrows neatly pronounced. 2M is lobed anteriorly, though not subdivided throughout. All the normal antero-lateral areolets are present, and the posterior are partly distinct,

#### ACTÆODES FABA.

*Carapax transverso-ellipticus, valde convexus, non granulosus, anticè bene areolatus, regione posticâ simplicissimâ cum regione postero-laterali coalitâ, areolâ 2M fere bisectâ, areolis 2L 3L coalitis, superficie areolarum depressâ; fronte interantennali fere recto, medium parce emarginato, margine antero-laterali parce expanso, 5-angulato aut obsolete 5-dentato. Pedes antici mediocres, carpo manique subtiliter erosis et interdum areolatis, digitis inermibus. Pedes 8 sequentes fere nudi, compressi, articulo tertio supra paulo carinato, articulis quarto quintoque paulo granulosi. Abdomen maris 5-articulatum, feminae 7-articulatum, nudum præter marginem ciliatum.*

Carapax transverse-elliptical, very convex, not granulous, anteriorly neat areolate, posterior region undivided and coalesced with the postero-lateral; areolet 2M nearly bisected, 2L and 3L coalesced, surface of areolets flattened, front between outer antennæ very nearly straight, sparingly emarginate at middle, antero-lateral margin slightly extended, five-angled or obsoletely five-toothed. Anterior feet of moderate size, carpus and hand minutely erose, and sometimes areolate with granules, fingers unarmed. Following eight feet nearly naked, compressed, third joint somewhat carinate above, fourth and fifth joints a little granulous above. Abdomen of *male* five-jointed, of *female* seven-jointed, naked except the edge, which is ciliate.

Plate 11, fig. 1, female, enlarged four diameters.

Cape Verdes? Atlantic Ocean.

Length of carapax, three and one-fourth lines; breadth, five lines; ratio of length to breadth, 1 : 1.5. The male specimen in the collections has the surface smooth, while in the two females the lens discloses a fine granulation over the anterior part of the surface. The channeling is neat and distinct; moreover, in the female the arm and hand above are areolate, rugose and granulous, and in the male only corrugate. The antero-lateral margin is thin. Behind the posterior tooth, the margin is arcuate but entire. The abdomen of the female is obtuse at extremity, or very slightly emarginate; that of the male is narrow, as in *A. tomentosus*.

It is possible that the male specimen belongs to a distinct species; yet the character of the antero-lateral margin, and the general proportions of the body and also of the hands, are the same in the two.

#### ACTÆODES BELLUS.

*Carapax latior, anticè bene arcuatus, non nitidus, lævis, anticè et latera-liter subtilissimè granulosus, anticè areolatus, sulcis angustis, areolis 1 M 2 M conjunctis, 4 L 5 L 6 L et regione postero-laterali totis conjunctis; fronte fere recto, emarginato; margine antero-laterali crasso, 4-lobato, lobis 3 posticis dentiformibus, obtusis. Pedes antici æqui, manu supra rotundatâ extus subtiliter granulosâ et granulis partim seriatis, digitis canaliculatis, carpo intus obtuso. Pedes 8 postici sat compressi, fere nudi.*

Carapax quite broad, anteriorly neat arcuate, not shining, smooth, anteriorly and laterally very fine granulous, anteriorly areolate, sulci narrow, areolets 1 M and 2 M united, 4 L, 5 L, and 6 L, and all the postero-lateral region, coalescent; front nearly straight, emarginate; antero-lateral margin stout, four-lobed, three posterior lobes rounded, dentiform, obtuse. Anterior feet equal, hand above rounded, exteriorly very fine granulous, and granules partly seriate, fingers channeled, carpus obtuse within. Eight posterior feet much compressed, nearly naked.

Plate 11, fig. 2, animal, enlarged three diameters.

Tutuila and Upolu, Samoan Group, and Wakes Island Pacific; also Paumotu Archipelago?

Colour purplish red, or deep red. Length of carapax in one specimen (male), 2.9 lines; greatest breadth, 4.8 lines; ratio of length to breadth, 1 : 1.66; in another specimen (female), length  $3\frac{1}{2}$  lines; breadth,  $5\frac{1}{2}$  lines; ratio, 1 : 1.65. This is a very neat, smooth-looking species, with narrow, even furrows between the areolets. Under a lens, the anterior part of the carapax is decidedly granulous, and somewhat uneven, and the hands and carpus are similarly granulous, the granules on the outer surface of the hands partly in series.

2. *Carapax granulatus aut tomentosus.*

ACTÆODES TOMENTOSUS (*Edwards*), *Dana*.

From the Samoa and Feejee Islands, Pacific Ocean; also from the Sooloo Sea, East Indies, and the Mangsi Islands.

In this species, areolet 2 M is longitudinally divided into two nearly equal parts, each showing, through the tomentose covering, about a dozen points or minute tubercles having a smooth surface; areolet 3 M is divided into three parts, the narrow anterior portion being one, and the rest being medially bisected; areolets 1 L, 2, 3, 4, 5, 6, are all distinct and simple, and 2 L is nearly of the same size as either half of 2 M. 1 P and 2 P are oblong transverse and rather broad, and separated by a depression. 1 R, 2 R are simple, the former about twice as large as the latter, yet in small specimens they appear coalesced.

The whole under surface of the body has a tomentose coat like the upper, and it covers densely the outer maxillipeds, which are coarse granulous. The fingers of the hand are enveloped by it nearly to the tips, beside being very closely set with minute points.

ACTÆODES AFFINIS.

A tomentoso areolis fere similis, areolâ cardiacâ fere bisectâ; carapax

*paulo angustior, minutius granulosus parce tomentosus. Margo antero-lateralis 4-dentatus. Digiti manus spinulosi, spinulis majoribus quam in tomentoso et paucioribus. Maxillipedes externi nudi, læves. Abdomen sparsim pubescens.*

Like the *tomentosus* in areolets, but the cardiac areolet nearly bisected; carapax a little narrower, more minutely granulous, sparingly tomentose. Antero-lateral margin 4-dentate. Finger of hand spinulous, spinules larger and fewer than in the *tomentosus*. Outer maxillipeds naked, smooth. Abdomen sparsely pubescent.

Plate 11, fig. 3, cardiac areolet, enlarged two diameters.

Probably from the Paumotu or Society Islands.

Length of carapax, five and a half lines; breadth, seven and a half lines; ratio, 1 : 1.37.

This species has not the tomentose outer maxillipeds of the *tomentosus*, nor the unarmed fingers of the *rugatus*, besides differing in other particulars. On either half of the cardiac areolet near forty granules may be counted, while there are hardly a dozen in the *tomentosus*. The inferior surface of the hand is naked and mostly smooth.

#### ACTÆODES SPECIOSUS.

*Carapax paulo angustior, undique granulosus, fere nudus, pilis interstitialibus brevioribus quam granuli, anticè bene arcolatus, sulcis perangustis, subtiliter tomentosus, areolis planis, areolâ 2 M partim subdivisâ, 3 M tripartitâ, margine antero-laterali bene 4-lobato, postero-laterali concavo, brevi. Pedes toti omnino granulosis et fere nudi, marginibus non ciliatis, manu carpoque superficie irregulariter areolatis; manu granulis seriatis extus ornatâ, digitis perbrevis, malè excavatis, digito mobili clauso fere verticali; articulo quarto pedum 2di 3ti 4ti superficie tripartito.*

Carapax rather narrow, granulous throughout, nearly naked, interstitial hairs shorter than the granules, anteriorly regularly arcolate,

the sulci very narrow, minutely tomentose, areolets flat, 2 M partly subdivided, 3 M tripartite, antero-lateral margin four-lobed, postero-lateral concave and short. Feet all granulous and nearly naked, margins not ciliate, hand and carpus with the surface irregularly areolate, outer surface of hand with the granules seriate, fingers very short, imperfectly excavate, moveable finger when shut having nearly a vertical position; fourth joint of second, third, and fourth feet with the surface tripartite.

Plate 11, fig. 4 *a*, male, enlarged three diameters; *b*, right hand; *c*, male abdomen.

Tutuila, Samoa Group, Pacific.

Length of carapax of male, 3.66 lines; greatest breadth, 5 lines; ratio of length to breadth, 1 : 1.37. The carapax has a bare look, as the pubescence between the sulci and between the granules is very short, even shorter than the granules, and the granules of the areolets are very crowded. The surface of the areolets is flat, and the sulci very narrow. Areolet 2 M is divided about half way through. The upper surface of the hand is a little broad, and is divided obliquely by a depression, and a parallel depression extends from the hinder margin of the same surface. The outer surface of the carpus is divided into three parts by vertical depressions, and there is an imperfect longitudinal depression above. The moveable finger has some granules on its upper side, so also the under surface of the hand; and similar granules cover the under side of the third joint of the four posterior legs. The outer maxillipeds are naked on the outer surface or nearly so; the sternum is in part slightly villous. The tarsus is very short and stout, and granulous, with a slender claw.

#### ACTÆODES CAVIPES.

*Carapax latior, infra omnino villosus, supra fere nudus, granulosus, omnino areolatus, sulcis nudis aut vix tomentosus, areolis minutè granulosus, valde convexis et paulo irregularibus, 2 M subdivisâ, 3 M tripartitâ, margine antero-laterali irregulariter 5-dentato. Pedes granulosi; antici subæqui, manu carpoque partim granulosus et superficie*

*cavernosis, manu extus seriato-granulosâ, subtiliter tomentosâ, digitis malè excavatis, scabris, striatis, partim subtiliter tomentosis; postici paulo hirsuti, articulis 4to 5toque supra valde cristato, cristâ integrâ, lunulatâ, sublaterali, hac cristâ et margine pedis superno cavitatem grandem includentibus.*

Carapax quite broad, below villous throughout, above granulous, nearly naked, throughout areolate, sulci naked or hardly tomentose, areolets minutely granulous, very convex, and a little irregular, 2 M subdivided, 3 M tripartite, antero-lateral margin irregularly five-toothed. Feet granulous; anterior subequal, hand and carpus in part granulous, and with deep cavernous excavations, hand seriato-granulous on outer surface, finely tomentose, fingers imperfectly excavate, scabrous, striate, in part minute tomentose; posterior legs a little hirsute, third and fourth joints above strongly cristate, crest entire, lunulate, sublateral, this crest and the upper margin of the feet including a large cavity.

Plate 11, fig. 5 *a*, female. enlarged two diameters; *b*, right hand.

Feejees; also Upolu, Samoan Group.

Length of carapax of a female, five lines; greatest breadth, seven and three-fourths lines; ratio of length to breadth, 1 : 1.55; a smaller female, length, three and three-fourths lines; breadth, five and three-fourths lines; ratio, 1 : 1.53. In the larger specimen, the sulci are rather broad and naked or nearly so, and the areolets are very prominent and gibbous. In the smaller, the sulci are quite narrow, the granules extending nearly to meeting from the opposite sides. In neither are there any hairs on the carapax longer than the granules, and but slight traces of any villosity can be detected. The cristate posterior legs give a peculiar look to the species, the crest being curved and sublateral, and enclosing between it and the upper margin of the leg, an oblong cavity. The anterior legs have pits or cavities excavated in the upper part of the hand, and in the outer surface of the carpus. In the smaller specimens the eight posterior legs are not as hirsute as in the larger one, being but slightly so. The outer maxillipeds, pterygostomial region, sternum and abdomen are all short hirsute. The fingers are not very perfectly spoon-shaped. The

granules of the hand extend over its under surface. This species forms a passage to *Actæa cellulosa*.

ACTÆODES SPONGIOSUS.

*Carapax posticè vix areolatus, areolâ 2 M subdivisâ, superficie, sulcis exceptis, breviter et rigidè velutinâ, aspectu spongiosâ; margine antero-laterali simplicissimè 5-dentato, dentibus gracilibus, acutis. Pedes breviter rigidèque pubescentes, antici paulo armati.*

Carapax posteriorly hardly areolate, areolet 2 M subdivided, surface with a very short, rigid covering of setules, giving it a spongy appearance; antero-lateral margin with five simple, slender acute teeth. Feet with a short stiff pubescence, anterior pair somewhat armed on upper side with small pointed tubercles.

Plate 11, fig. 6 *a*, carapax, enlarged four diameters; *b*, front view of front; *c*, profile of front part of carapax, as seen in a direct side view, *m* being the front edge.

Sooloo Sea, or Balabac Passage.

Length of carapax, two and one-third lines; greatest breadth, three and a half lines.

This species has much the aspect of a *Pilodius*, though somewhat more convex. Like the *A. tomentosus*, the areolet 2 M is divided longitudinally, and the peculiar stiff and close setules of the surface, looking like a spongy covering, are confined to the surface of the areolets, and do not occur in the intermediate furrows. The front adjoining the front margin (areolet 1 F), is nearly vertical. The margin posterior to tooth S is not rounded, but instead is nearly straight, as in *Pilodius*.

APPENDIX.—ACTÆODES? INTEGERRIMUS.

*Carapax convexus, lævis, anticè leviter areolatus, margine antero-laterali integro, non dilatato. Pedes antici inermes, manu extus scabrâ, supra*

*rotundatá, carpo intus uni-angulato; postici paulo compressi, inermes, pubescentes.*

Carapax convex, smooth, anteriorly faint areolate, antero-lateral margin entire, not dilatate. Anterior feet unarmed, hand scabrous without, rounded above, carpus with an angle on inner side; posterior feet somewhat compressed, unarmed, pubescent.

Plate 11, fig. 7, animal, enlarged four diameters.

Oahu or Maui, Sandwich Islands.

Length of carapax, one and three-fourths lines; greatest breadth. two and a half lines. The specimen is evidently a young individual. The carapax has some scattered short hairs, giving it a ragged look. and the hairs of the legs are similarly irregular. The carpus and hand are partly pubescent.

#### GENUS DAIRA, *De Haan.*

The deep emargination in the anterior margin of the outer maxillipeds in *Daira*, by which it is especially distinguished, is the aperture for the efferent channel from the branchiæ. Although so distinct in the common species, the same character, less strongly marked, is found in some *Chlorodii*; and the species *nodosus*, instituted by Dr. Randall (*J. Acad. Nat. Sci. Philad.*, viii. 111), appears to be more properly a *Chlorodius*.

*Daira*, DE HAAN, *Faun. Japon.*, 18, 1833.

*Lagostoma*, EDWARDS, *Crust.*, i. 386, 1834.

#### DAIRA VARIOLOSA (*Fabr.*), *Dana.*

*Carapax valde convexus, nitidus, baccato-tuberculosus tuberculis pisiformibus, fronte inter-antennali bilobato, lobis salientibus, margine laterali et antero-laterali 13-14-denticulato. Pedes antici tuberculati, manu brevi, digito mobili spino-tuberculato. Pedes octo sequentes compressi*

*valde armati et dorsum densè pilosi, tarso infra supraque spinoso et infra ad medium duo penecilla setarum ferente.*

Carapax very convex, baccato-tuberculous, the tubercles large pisi-form; front between outer antennæ two-lobed, lobes prominent; lateral and antero-lateral margin 13-14-denticulate. Anterior feet tuberculate, hand short, moveable finger spino-tuberculate. Following four pairs of feet compressed, strongly armed, and above densely pilose, tarsus above and below spinous, and having below, near middle, two tufts of setæ.

Plate 10, fig. 4 *a*, carapax, coloured to show the relation of the tubercles to the areolets; *b*, leg of fourth pair; *c*, hand, first pair, left side, natural size; *d*, abdomen, natural size.

Upolu, Samoan Islands, Pacific Ocean.

Length of carapax, one inch one and a half lines; breadth, one inch and seven lines; ratio of length to breadth, 1 : 1.4; length of hand, about ten lines; of carpus, six lines.

The relation of the tubercles to the normal areolets is shown in the figure. 2 F consists of two tubercles placed transversely; 1 M of one tubercle; 2 M of seven in two longitudinal rows, the inner of three, the outer of four; 1 L of one; 2 L of two; 3 L and 4 L each of one; 5 L of three; 6 L of three, one of them much smaller than the others.

The teeth of the margin are increased beyond the number five by intermediate teeth, which are a little smaller than the others, and also by a prolongation of the dentate margin backward. In the intervals D, E, and E, N, there is one intermediate tooth, and in the interval N, T, and T, S, two intermediate each, so that the teeth are as follows, representing the supernumerary by dots, D . E . N . . T . . S.

Beyond S, posteriorly there are two prominent teeth, the first of which is separated from S by two denticulations; but these teeth are proper tubercles, and the line is continued backward, upon the surface by two or three tubercles. The upper margin of the hand consists of four large tubercles; and the outer surface has the tubercles short conical and seriate. The tarsus has two dorsal rows of spines, two or three in a series often on the outer surface, and two or three on the inferior side. The preceding joint is hardly longer than broad. The

dorsal spines are in two series of two or three each; besides which there are two or three below towards apex, and others on the outer surface, which are obsolescent except in the fifth pair.

*Cancer perlatus*, HERBST, i. 265, pl. 21, f. 122.

*Cancer daïra*, HERBST, iii. pl. 53, f. 2.

*Cancer variolosus*, FABR., Supp., 338.

*Lagostoma perlata*, EDWARDS, Crust., i. 387.

*Cancer (Daïra) perlatus*, DE HAAN, Faun. Japon., 18.

As the word *perlatus* in Latin signifies very broad, and not pearly, as intended by it, we have rejected it for *variolosus* of Fabricius.

#### GENUS CHLORODIUS, *Leach*.

The carapax in the Chlorodii varies in the number of marginal teeth, either by the *subdivision* of the normal teeth, or by the *obsolescence* of some of them. The normal number *five* prevails. In the *nudipes*, each of the normal teeth consists of two or three teeth, and the whole number is thus ten or eleven; in the *sanguineus*, the number is *seven*, there being an intermediate inferior tooth between D and E, and a posterior tooth back of S; in the *niger* there are *four*, the tooth E being obsolete; and in the *cytherea* both E and S are obsolescent, though still distinguishable.

The areolation of the carapax differs widely; in some, as the *ungulatus*, all the normal areolets are very distinct, and in the *monticulosus* they are much subdivided; while in the *levissimus* all are wanting, and the surface is quite smooth. The process beneath the front adjoining the outer antennæ is broader than long, and the first joint of the outer antennæ reaches forward so as to fill very nearly the orbital hiatus. The third joint of the outer maxilliped has the anterior margin concave or emarginate, and is subrectangular in form.

The genus Chlorodius of De Haan (Faun. Japon., 13), is the same with Atelecyclus; this author, however, supposed his genus identical with Leach's when it was adopted by him.

The genera Pilodius and Cyclodius are properly subgenera along with Chlorodius, in the same manner as Xanthodes and Paraxanthus are subgenera with Xantho.

1. *Carapax antice posticeque bene areolatus, areolâ 2 M bipartitâ. Articulis pedum posticorum 3tius superne spinulosus.*

CHLORODIUS UNGULATUS, *Edwards.*

Plate 11, fig. 8 *a*, hand of common variety; *b*, same of var. *gracilis*.

Navigator Islands; Tahiti; Mangsi Islands; Balabac Passage.

*Common variety.*—Length of carapax of a male, six and two-thirds lines; breadth, nine and a half lines; ratio, 1:1.43. Colour pale or dark brown, reddish brown, usually more or less clouded or in blotches. The arms project full half their length beyond the carapax. The carpus and hand are covered by rounded flattened tubercles of small size. The areolation is very deep and the areolets not decomposed. 3 M (intramedial) is hardly subdivided into three parts. 5 L is simple, and but slightly, if at all, indented; 2 L, 3 L, 4 L are subconical in form; 1 R, 2 R and 3 R are separated by distinct sulci. The teeth are D, E, N, T, S; and upon the surface of S there is a slight prominence.

The fingers are long, and when closed there is considerable space between them. The anterior margin of the third joint of the outer maxillipeds is excavate.

*Var. β gracilis.*—Hand and legs more slender, the upper and lower margins of hand nearly parallel, and the lower finger somewhat reflexed; while in the common variety, the margin of the lower finger is nearly or quite in the same line with the hand, and the hand is much the broadest at the articulation with the moveable fingers.

*Var. ? γ curtimanus.*—From Tahiti, Navigator Islands, Balabac Passage. The areolation and all the characters as in the common variety, but arms projecting but little in males as well as females.

Length of carapax of a male, 5.2 lines; breadth, 7.5 lines; ratio, 1:1.44. The surface is somewhat granulous posteriorly, and so is the sternum. Adams and White in the Crustacea of the Samarang\* have figured and described a Chlorodius, as the *C. areolatus* of Ed-

\* Page 41, pl. 11, f. 3.

wards, which much resembles our *curtimanus*. The specimens we describe differ from Edwards's *areolatus* in having the same number of antero-lateral teeth as the *ungulatus* (that is, *five* and not *four*), the posterior legs are not "presque lisses," but granulous, and the anterior legs are small tuberculous.

#### CHLORODIUS MONTICULOSUS.

*C. unguolato affinis, areolis valde distinctis, margine antero-laterali 5-dentato, fronte inter-antennali 4-lobato, pedibus 8 posticis paulo pubescentibus et supra spinulosis. Areola 2 M decomposita, 4 L plus minusve divisa. Pedes antici tuberculis parvulis subcutis armati, digito mobili inermit. Segmentum abdominis maris penultimum parce oblongum.*

Related to *ungulatus*, the areolets being very distinct and prominent, antero-lateral margin five-dentate, front between outer antennae four-lobed, eight posterior feet pubescent and spinulous above. Areolet 2 M decomposed, 4 L more or less divided. Anterior feet armed with very small pointed tubercles, moveable finger unarmed. Penult segment of male abdomen a little oblong.

Plate 11, fig. 9 *a*, male, natural size; *b*, male abdomen; *c*, hand, natural size; *d*, under view of carapax (see page 24); *e*, front view of front, showing process *p*; *f*, part of maxilliped.

Feejee Islands; Tahiti, Society Islands; Upolu, Navigator Islands; Balabac Passage north of Borneo.

Length of carapax, eight lines; greatest breadth, eleven and a half lines; ratio of length to breadth, 1:1.44. Other specimens are smaller. They are all characterized by very small pointed tubercles on the arm and hand, instead of obtuse warts like the *ungulatus*; and the areolets of the surface are usually much broken into subordinate elevations, which is especially seen in 2 M and 4 L. The young in *ungulatus* appear to resemble the *monticulosus* in the acute points of the hand; but in specimens five or six lines in length the prominences are obtuse and wart-like. The arm projects but little more than in the *curtimanus*.

*Chlorodius obscurus?* Plate 11, fig. 10 *a*, represents a front view of the hand of a *Chlorodius* from Upolu, which approaches the *monticulosus* in its areolets, but has much stouter hands and a more exsert arm, and both the hands and carpus are smooth, or with obsolete prominences. It appears to be the *Chlorodius obscurus* of Hombron and Jacquinot, Voy. au. pole Sud, pl. 3, f. 4. The specimen is ten and a half lines long; the greatest breadth, fifteen lines; ratio of length to breadth, 1 : 1.43. Another smaller specimen, eight lines long (same length as for a characteristic *C. monticulosus*), has the hand as figured in figure *c*. The fingers in the older specimen are without teeth, evidently owing to age, the disappearance being due to wear. But the absence of tubercles or spinules from the hand and carpus does not seem to be due to age. Moreover, the hand is much stouter in proportion, the width in the longer hand of a male being much greater than half the length of the carapax, while it is about equal to half the length in the *C. monticulosus*. The areolets anteriorly and posteriorly are distinct, but are not separated by as deep furrows, and are therefore less prominent. The third joint of the posterior pair of legs is less decidedly spinulous along the upper margin. The front and the lateral margins are as in the *ungulatus* and *monticulosus*. The inner margin of the carpus also projects in two low obtusish points. The male abdomen is well represented by the figure of the abdomen of *monticulosus*.

Figure 10 *b*, represents an upper view of the arm and carpus of this *Chlorodius*, of the same leg to which fig. 10 *a* belongs.

2. *Carapax anticè areolatus, posticè planus aut imperfectè divisus, areolâ 2 M non subdivisâ. Pedes antici inermes; articulus pedum 8 posticorum 3tius supra non spinulosus.*

#### CHLORODIUS SANGUINEUS? *Edwards.*

*Carapax non nitidus, anticè bene areolatus, posticè fere planus, areolâ 2 M non omnino divisâ, 3 M simplicissimâ, 3 L 4 L sejunctis, coalitis, fronte subtiliter emarginato, juxta antennas viz saliente, margine antero-laterali 7-dentato, dentibus subacutis, uno pone dentem S. Pedes 8 postici ad margines dense ciliati, articulo tertio valde compresso supra subacuto; manu carpoque inermibus, supra subtiliter exesis.*

Carapax not shining, neatly areolate anteriorly, posteriorly nearly plane, areolet 2 M but partly divided, 3 M quite simple, 3 L, 4 L separated; front emarginate, near antennæ scarcely salient; anterolateral margin seven-toothed, teeth subacute and prominent, one of them posterior to S. Posterior eight feet densely ciliate at margins, third joint much compressed, above subacute; hand and carpus unarmed, above minutely erose.

Plate 11, fig. 11 *a*, male, natural size; *b*, right hand, *ibid.*; *b'*, fingers of right hand of another specimen; *c*, front view of part of front, showing process *p*, &c.; *d*, part of outer maxilliped.

Feejee Islands; Waterland Island, one of the Paumotus; also Sandwich Islands, at Oahu, Maui, and at Hilo in Hawaii.

Length of carapax of largest specimen, nine lines; greatest breadth, fourteen and a half lines; ratio of length to breadth, 1 : 1.6.

The proportion of length to breadth is very closely the same as in the *nudipes*, and the anterior legs are similar in the pitted or irregular surface. The hairy margins of the eight posterior legs at once distinguish it. The teeth D, E, N, T, S have the normal character, the two supernumeraries are one just posterior to S, and another between D and E, a little below the level of these teeth. The surface of the posterior part of the carapax is very nearly even. The male abdomen is closely like that of *C. nudipes*; the penult segment is very slightly if at all oblong; the last segment is not oblong, and is rounded at apex. The areolation of the carapax is usually very distinct, as shown in the figure, though sometimes somewhat fainter.

#### CHLORODIUS EXARATUS, *Edwards*.

Pacific Ocean, but particular island doubtful.

Length of carapax, six and one-fourth lines; greatest breadth, nine and one-half lines; ratio, 1 : 1.5. The species differs from the *sanguineus* in wanting the tooth posterior to S. The areolation is similar and equally distinct.

## CHLORODIUS NUDIPES.

*Carapax non nitidus, anticè bene areolatus, posticè fere planus, areolâ 2 M non omnino divisâ, 3 L, 4 L sejunctis, 1 P, 2 P coalitis aut vix sejunctis, fronte emarginato, juxta antennas saliente, margine antero-laterali 10-11-denticulato, uno dente pone S. Pedes toti nudî; antici crassi, manu carpoque supra subtiliter exesis, carpo spinâ brevi intus armato. Pedes 8 postici sat breves, articulo tertio dorsum non acuto.*

Carapax not shining, anteriorly neatly areolate, posteriorly nearly plane, areolet 2 M not divided through, 3 L, 4 L separate, 1 P, 2 P united or but faintly separate; front emarginate, near antennæ salient; antero-lateral margin 10-11-toothed, one tooth being posterior to S. Feet all naked, anterior pair stout, hand and carpus unarmed, surface finely erose above, carpus armed within with a short spine. Eight posterior feet rather short, third joint not having a sharp upper edge.

Plate 11, fig. 12 *a*, male, enlarged two diameters; *b*, abdomen, *ibid.*; *c*, part of outer maxilliped.

Mangsi Islands.

Length of carapax, four and one-half lines; greatest breadth, seven and one-fourth lines; ratio of length to breadth, 1 : 1.6. Like the preceding species, the carapax is not shining. It differs from them in having the posterior surface but very slightly depressed transversely between areas 1 P and 2 P. It is peculiar in having naked legs and an unusual number of teeth on the antero-lateral margin. The surface of the carapax is somewhat pitted as seen under a microscope, and the carpus and hand are decidedly pitted or erose, or a little uneven: in this last point it resembles the following species. The ten or eleven teeth of the antero-lateral margin are divided as follows: one corresponds to D, two to E, three to N, two or three to T, and two to S, the second of S being a posterior tooth, and sometimes having another smaller behind it. Of the three to N and T, the middle one is the largest. The penult segment of the male abdomen

is not at all oblong; and the same is true of the last segment, which is obtuse.

CHLORODIUS GRACILIS.

*C. sanguineo affinis.* Carapax non nitidus, anticè areolatus, posticè non areolatus, sulcis non profundis, areolis 2 R, 3 R non discretis, margine antero-laterali bene 5-dentato. Manus carpusque crassi, læves, nec rugati nec exesi. Pedes 8 postici compressi, inermes, pubescentes.

Near *C. sanguineus*. Carapax not shining, anteriorly areolate, posteriorly smooth, sulci not deep, areolets 2 R, 3 R not separated, antero-lateral margin neatly 5-toothed. Hand and carpus stout, smooth and even. Eight posterior feet compressed, unarmed, pubescent.

Plate 11, fig. 13 *a*, male, enlarged two diameters; *b*, extremity of male abdomen; *c*, female abdomen; *d*, tarsus of fourth pair; *e*, part of outer maxilliped.

Wakes Island, Pacific Ocean.

Length of carapax, five lines; greatest breadth, seven and one-fourth lines; ratio of length to breadth, 1 : 1.45.

Differs from the *sanguineus* in having but five marginal teeth, there being none posterior to S, and no inferior tooth between D and E, which characterizes that species; also, unlike the *exaratus*, the carpus and hand are not uneven in the upper surface, and the teeth are thin and even. In the male, the areolets are rather faint, and 4 L and 5 L are coalesced, and of about equal width; in a female, 4 L and 5 L are faintly separated, and the latter is the broader, as in the *sanguineus*.

CHLORODIUS NODOSUS (*Randall*), *Dana*.

Carapax anticè valde areolatus, areolis totis conspicuis, superficie minutè punctatis, 1 M, 2 M subcoalitis, 2 M non subdivisis; fronte paulo producto, emarginato, lobis margine concavis; margine antero-laterali crassiusculo, 6-7-dentato, dentibus D, d', E, N, T, S, s', D viz

*saliente, d' minimo, E, N, T, S, subconico, obtuso. Pedes antici inæqui, inermes manu carpoque minutè corrugatis aut areolatis, digito mobili non canaliculato, dente magno basali carente, apice obtuso, parce excavato. Pedes 8 postici fere nudi, tarso supra nudo, infra paulo hirsuto.*

Carapax anteriorly strong areolate, areolets all distinct, surface minutely punctate, 1 M and 2 M partly coalescent, 2 M not subdivided; front somewhat produced, emarginate, lobes with the margins concave; antero-lateral margin rather stout, 6-7-toothed, the teeth being D, *d'*, E, N, T, S, *s'*, D but slightly projecting, *d'* smallest, E, N, T, S, subconical, obtuse. Anterior feet unequal, unarmed, hand and carpus minutely corrugate or areolate, moveable finger not channeled, apex stout obtuse and but little excavated within, and having no large basal tooth. Eight posterior feet nearly naked, tarsus naked above, somewhat hirsute below.

Plate 11, fig. 14 *a*, male, natural size; *b*, front view of front, showing base of outer antennæ; *c*, outer maxilliped, enlarged two diameters; *d*, right hand, natural size; *e*, surface of carapax, enlarged; *f*, another portion of carapax; *g*, part of branch of first maxillipeds.

#### Sandwich Islands.

Length of carapax of a male, ten and a half lines; breadth, seventeen lines; ratio of length to breadth, 1:1.62. The species resembles closely the *C. sanguineus* in form, arcolation, teeth, and the uneven surface of the hand and carpus. But the eight posterior legs are nearly naked, the anterior margin of the third joint quite so; the tarsus is naked on its upper margin; moreover, the surface of the carapax is fine punctate. The areolet 2 M has on the front of the outer half a V-shape depression. The tooth D is obsolete; the orbit has a small tooth-like prominence just below D, which is more prominent. The third joint of the outer maxillipeds has a small emargination on the anterior margin near the inner apical angle, and this margin is pubescent; the surface of this joint, moreover, is granulous and uneven.

The extremity of each finger is rather small and rounded, and there is but a slight spoon-shape excavation, the edge being thick,

and at first sight the species appeared to be a Xantho, yet the points shut on one another.

*Lagostoma nodosa*, J. W. RANDALL, J. Acad. Nat. Sci. Philad., viii. 111.

#### CHLORODIUS CAVIPES.

*Carapax non nitidus, latere rotundatus, superficie anticè areolatus, areolis partim granulosis et imbricato-granulosis; fronte fere recto, emarginato, margine antero-laterali crassiusculo, 8-9-dentato, dentibus D, d', E, E, N (vel N, N), T, S, s', totis parvulis, D vix saliente. Pedes antici inæqui, valde granulosi et corrugati, manu infra breviter villosâ et granulosa, digito mobili canaliculato, supra denticulato. Pedes 8 postici paulo asperati, articulo tertio breviter pubescente, 4to bene bicristato, cristis tenuibus cavitatem elongatam includentibus, 5to tarsoque omnino breviter hirsuto, tarso brevi.*

Carapax not shining, rounded either side, surface anteriorly areolate, areolets partly granulous and imbricato-granulous; front nearly straight, emarginate, antero-lateral margin somewhat stout, 8-9-toothed, teeth D, *d'*, E, E, N (or N, N), T, S, *s'*, all small, D scarcely salient. Anterior feet unequal, strongly granulous and corrugate, hand short villous and granulous below, moveable finger channeled and denticulate above. Eight posterior feet rather rough, third joint short pubescent, fourth prominently bicristate, the crests thin and including an oblong cavity between them, fifth joint and tarsus throughout short hirsute, tarsus short.

Plate 12, fig. 1 *a*, female, enlarged two diameters; *b*, abdomen of female.

Locality uncertain.

Length of carapax of female, seven lines; greatest breadth, ten and one-fourth lines; ratio, 1:1.46. The carapax is rather rough and uneven about the antero-lateral region towards the margin, and the other areolets have interrupted rugæ of granules, or scattered isolated granules. The most striking character is in the bicristate fourth joint

to the eight posterior legs, the thin crests enclosing a cavity; the crest along the proper dorsal margin of the joint is much the widest. The hands have an uneven surface, the upper side looking a little tuberculous, but the prominences run into rugæ below, and are all granulous. The front has a granulous margin. The teeth of the antero-lateral margin are small, and rather isolated. The outer maxillipeds, pterygostomian region, abdomen, and sternum, are short pubescent, and so the under surface of the third joint of all the pairs of legs.

The fingers of the smaller hand (left in specimen) are spoon-shape. Those of the larger are only imperfectly so, the two terminating in a stout edge nearly semicircular, which two shut upon one another.

3. *Carapax posticè non areolatus, anticè vix areolatus, fere planus aut paulo convexus, 5 L, 6 L nunquam circumscriptis.*

#### CHLORODIUS CYTHEREA.

*C. nigro affinis.* Carapax fere lævis, areolis mediis indistinctis, antero-lateralibus melioribus, angulatis, margine antero-laterali 5-dentato, dentibus N, T subacutis, E, S minoribus, T valde prominentiore quam S, ideoque carapacis latitudine T majore quam latitudo S. Pedes anteriori iis C. nigri similes, digitis nigris, fere contiguis. Pedes 8 postici inermes, margine pubescentes.

Near *C. niger*. Carapax nearly smooth, medial areolets indistinct, antero-lateral distinct and rather prominent and angular, antero-lateral margin five-toothed, teeth N, T subacute or acute, E and S smaller than the others, and S much less prominent than T (hence carapax much broader across from T to T than from S to S). Anterior feet as in *C. niger*, fingers black, nearly contiguous. Posterior eight feet unarmed, margin pubescent.

Plate 12, fig. 2 *a*, female, three diameters; *b*, extremity of male abdomen; *c*, part of outer maxilliped.

Island of Raraka, Paumotu Archipelago; also Tahiti and Sandwich Islands.

Length of carapax, three and one-third lines; greatest breadth, five

and one-third lines; ratio of length to breadth, is 1 : 1·6. Differs from *C. niger* in having the tooth S much less prominent than tooth T; also E is distinct, so that there are distinctly five teeth in all; moreover the areolets 1L, 3L, 4L are more angular, instead of being smooth and continuous with the lateral teeth, and the teeth N, T are nearly or quite acute.

CHLORODIUS NEBŪLOSUS.

*C. nigro affinis.* Carapax lævis, anticè obsoletè areolatus, fronte parce emarginato, regione antero-laterali rugato et subtilissimè granulato, margine antero-laterali 4-dentato (D, N, T, S), dentibus tribus posticis acutè spiniformibus. Pedes antici subæqui, sat breves, brachio paululo saliente, carpo subtiliter granulato, intus acuto aut subacuto, manu compressâ, lævi, digitis paulo canaliculatis. Pedes postici mediocres, paulo pubescentes.

Near *C. niger*. Carapax smooth, obsoletely areolate anteriorly or not at all, front sparingly emarginate, antero-lateral region rugate, very fine granulous, antero-lateral margin four-toothed (D, N, T, S), three posterior teeth like acute spines. Anterior feet subequal, rather short, the arm projecting but very little beyond the carapax, carpus granulate, acute at inner angle or subacute, hand compressed, smooth, fingers somewhat channeled. Posterior feet of moderate size, a little pubescent.

Plate 12, fig. 3, part of animal, much enlarged.

Sooloo Sea.

Length of carapax of male, 2·2 lines; greatest breadth, 3 lines; ratio of length to breadth, 1 : 1·36. Colour clouded with reddish brown or brownish black. The short arm of this species distinguishes it from the *cytherea*, which it most resembles; moreover the carpus is granulate as seen under a lens. The teeth of the lateral margin are quite sharp, the orbital is very short, and there is a trace of E, in a slight ruga; S is smaller than T, yet acute. The areolation is not quite as distinct as shown in the figure of the *C. cytherea*. On the

front margin of the arm there is an acute spine, and the carpus is acute on the inner side on the right arm, and subacute on the left arm. The extremity of the tarsus is like that of the *lævissimus*.

An imperfect specimen from the Feejees or Tongatabu, has the lateral teeth of this species, and may be identical with it: see figure 3*b*, plate 12, which represents the antero-lateral margin. The carpus is prominent acute at its inner angle, and there is a prominence on the anterior margin of the arm.

#### CHLORODIUS LÆVISSIMUS.

*C. nigro affinis.* Carapax *perlævis, nec ad medium nec versus latera areolatus, margine antero-laterali 4-5-dentato, dentibus N et T paulo remotis, E sæpe obsoleto, S minore, T et S obtusis, carapacis latitudine T majore quam latitudo S. Pedes antici longi, pervalidi, læves, digitis multo hiantibus. Pedes 8 postici paulo pubescentes.*

Near *C. niger*. Carapax very smooth, not areolate either at middle or towards the sides; antero-lateral margin four to five-toothed, tooth E often obsolete, S smaller than T, T and S obtuse, breadth of carapax across from T to T greater than from S to S. Anterior feet long and very stout, smooth, fingers much gaping. Posterior eight feet somewhat pubescent.

Plate 12, fig. 4 *a*, male, enlarged three diameters; *b*, extremity of male abdomen, enlarged; *c*, female abdomen, enlarged; *d*, right hand, enlarged three diameters; *e*, left, *ibid.*; *f*, part of outer maxilliped; *g*, extremity of tarsus, much enlarged.

Sandwich Islands.—Probably the same from Tutuila, of the Samoan Group, and from the Straits of Balabac.

The absence of all areolation, even near the lateral teeth, distinguishes this species from the *niger* or *cytherea*. Some young specimens of the preceding species appear to approach the *lævissimus*. But the hands afford another distinctive character, they being very stout, and the fingers less slender and more gaping than in the *niger*. The specimens are of a pale colour, not even the fingers having a dark

shade; while in the specimens of the other species that approach this, the fingers are black or dark brown. The two posterior teeth of the margin (T and S) are very much nearer one another than N and T, and they are small conical teeth, somewhat obtuse, differing much in appearance from those of the *niger*. The fingers of the smaller hand in the male leave a wide space between them when closed, and each has two very small teeth or salient angles on the margin; the right hand has three small teeth on the moveable finger, rather distant from one another, and on the immoveable finger, three or four teeth towards base, and one half way from these to the apex.

The *Menippe Martensii* of Krauss resembles this species in the outline of the carapax, but not in its long arm and in other characters.

#### CHLORODIUS NIGER.

Feejee Islands; Tongatabu; Wakes Island; Upolu; Sooloo Sea, and Mangsi Islands.

Plate 12, fig. 5 *a*, antero-lateral portion of carapax, enlarged two diameters; *b*, larger hand, enlarged two diameters; *c*, front view of front.

The carapax is not narrower across from S to S than from T to T, the teeth T and S being about equally prominent, and T, S not nearer than N, T. All the teeth in adults are obtuse. It is owing to E being obsolete that the number of the teeth is only four; there is usually a slight trace of E in a swelling of the surface. The areolets adjoining the margin are smoothly rounded, and the surface in that part, hence appears as if made up of a few wrinkles. The rest of the surface is smooth, with faint traces of the medial areolets.

*Cancer niger*, FORSKAL.

*Chlorodius niger*, RUPPELL, Krabben des rothen Meeres, p. 20, pl. 4, f. 7; EDWARDS, Crust., i. 401.

*Chlorodius hirtipes*, var. (?) ADAMS and WHITE, Crust. Samarang, p. 40, pl. 11, f. 4.

#### GENUS PILODIUS, Dana.

*Pilumno aspectu similis; pedibus antennisque Chlorodio affinis. Arti-*

*culus antennarum externarum primus eo Chlorodii brevior, ad processum oblongum frontalem attingens tantum. Articulus maxillipedis externi 3tius paulo transversus, subrectangulatus.*

Resembling *Pilumnus* in general form, and near *Chlorodius* in feet and antennæ. First joint of outer antennæ shorter than in *Chlorodius*, and just reaching to an oblong process of the front. Third joint of the outer maxillipeds somewhat transverse, subrectangular.

Although the species have the spoon-shaped fingers of *Chlorodius*, in form they are usually narrower, much like *Pilumnus*, and one species of *Chlorodius* here included has been named *C. pilumnoides*, by Adams and White, in allusion to this resemblance. In *Pilodius*, the process that reaches from the front or its under surface to the first joint of the outer antennæ, passing just inside of these antennæ, is oblong and narrow, while in *Chlorodius* it is broader than long; moreover, in the former, the joint, although soldered to the front, does not reach so high up in the orbital fissure; moreover, in *Pilodius* this process seems but a bending down of the outer edge of the front itself, while in *Chlorodius* the process is usually from the under surface of the front. This is the same distinction that exists between *Xantho* and *Xanthodes*. The body is usually thicker at the sides than in *Chlorodius*, and the latero-posterior margin is somewhat less oblique.

#### PILODIUS PUBESCENS.

*C. pilumnoidi similis. Carapax breviter pubescens, anticè leviter areolatus, margine antero-laterali simplicissimè 5-dentato, dentibus tenuibus, acutis. Pedes antici validi, minutè tuberculosi et pubescentes, digitis subspinulosi, brachio anticè dentigero. Pedes 8 postici pilosi, articulo tertio supra spinuloso.*

Near *C. pilumnoides*. Carapax short pubescent, faint areolate anteriorly, antero-lateral margin simply five-toothed, teeth slender acute. Anterior feet stout, small tuberculous and pubescent, fingers subspinulous, arm with two or three prominent teeth on the anterior margin. Posterior eight feet pilose, third joint spinulous above.

Plate 12, fig. 6 *a*, male, enlarged three diameters; *b*, extremity of abdomen, enlarged; *c*, front view of front, showing process *p*, &c.; *d*, outline of back.

Sooloo Sea, or Balabac Passage.

Length of carapax, three and two-thirds lines; greatest breadth, five and one-half lines; ratio of length to breadth, 1 : 1.5. The hairs of the surface and legs are much finer than in the *pilumnoides*, and have a brown colour. The anterior legs are very similar to those of that species; but the areolation of the carapax is much less distinct, and the antero-lateral teeth are simple and slender.

#### PILODIUS NITIDUS.

*Carapax bene nitidus, anticè optimè areolatus, areolis plerumque planis, 1 R, 2 R sulco discretis, 1 R 2-3 tuberculis anticè ornatâ; margine antero-laterali bene 5-dentato, dentibus duobus posticis acutis. Pedes antici spinis valde armati, digito mobili prope basin interdum spinuloso, carpo intus duobus spinis tenuibus acutis armato. Pedes 8 postici pubescentes, articulo tertio supra armato.*

Carapax shining, anteriorly very distinctly areolate, areolets very neat, and mostly with a flat surface, 1 R, 2 R separated by a furrow, 1 R having two or three tubercles on its anterior margin; antero-lateral margin five-toothed, the two posterior acute. Anterior feet strongly armed with spines, moveable finger sometimes spinulous near base, carpus having two slender spines on inner angle. Posterior eight feet pubescent, third joint armed along upper margin.

Plate 12, fig. 7 *a*, male, enlarged three diameters; *b*, right arm, enlarged four diameters; *c*, extremity of abdomen; *d*, leg of third or fourth pair, enlarged three diameters; *e*, front view of front.

Reef of Tutuila, Samoan Group.

Length of carapax, three and one-third lines; greatest breadth, five lines; ratio of length to breadth, 1 : 1.5. The polished surface of this

species is a striking character; also the deep, narrow furrow between the areolets, which are all flat excepting the three near the margin. Upon the posterior part of the carapax the areolets 1 P and 2 P are imperfectly separated. The right anterior leg, which is the smallest of the pair in the specimen examined, has the carpus and hand both spinous, and the moveable finger spinulous near base; while the left or large hand has the moveable finger not spinulous and the spines of the carpus are reduced to short tubercles. The fourth and fifth joints of the eight posterior legs are somewhat spinulous above, and so also the tarsus.

#### PILODIUS PUGIL.

*Carapax paulo nitidus anticè areolatus, posticè fere planus, areolis 5 L 6 L discretis, 1 L 2 L 3 L subconicis, 1 R 2 R paulo discretis; margine antero-laterali 4-dentato, dente E fere obsoleto, dentibus tribus posticis valde acutis. Pedes antici validi, manu carpoque bene tuberculosus tuberculis plerumque conicis, manus minoris spiniformibus, angulo carpi interno duobus spinis tenuibus acutis armato, brachio apicem anticum spinoso. Pedes postici pilosi, articulo tertio supra armato.*

Carapax somewhat shining, anteriorly faint areolate, posteriorly nearly flat, areolets 5 L, 6 L faintly separated, 2 L, 3 L, 4 L distinct, 1 R, 2 R separated; antero-lateral margin four-toothed, the tooth E being obsolete or nearly so, the three posterior prominent and acute. Anterior feet stout, hand and carpus neatly tuberculous, tubercles mostly conical, inner angle of carpus armed with two slender acute spines, arm having a spine at anterior apex. Posterior leg pilose, third joint armed with spinules along upper margin.

Plate 12, fig. 8 *a*, male, enlarged four diameters; *b*, extremity of male abdomen, enlarged; *c*, front view of front, showing process *p*; *d*, fingers of same male, enlarged; *e*, abdomen of a female, from Balabac Passage, enlarged; *f*, fingers of larger hand, *ibid.*; *g*, front view of front, *ibid.*; *h*, enlarged view of one of the hairs of the posterior legs; *i*, part of outer maxilliped.

Reefs of Upolu, Samoan Group, Pacific; also Balabac Passage, north of Borneo.

Length of carapax of a male, two and a half lines; greatest breadth, four lines; ratio of length to breadth, 1 : 1.6. The obsolescence of tooth E reduces the number to four, of which the posterior three are equally prominent. The tubercles of the larger hand are either neatly rounded or subacute and conical; those of the carpus are partly lengthened into cones, or are verging towards spiniform tubercles. The prominence at the apex of the arm which covers the articulating process of the following joint bears one or two spines, which is not true of the *nitidus*. The hairs or setæ of the posterior legs are naked at base, but through all their length except the lower fourth, it is enlarged and is densely setulose, as shown in figure *f*. The female has a few setæ like those of the posterior legs on the carapax, one or two being situated at a point in the anterior margin of several of the areolets, as 1 M, 2 M, 4 L, 5 L in two points, 4 M also, at a point either side of 3 M. The third, fourth, fifth, and last joints of the posterior legs are spinulose. Surface of carapax under a microscope, granulous, and anterior edges of frontal areolets fine crenulate, owing to granulations.

#### PILODIUS SCABRICULUS.

*Carapax fronte latus, anticè leviter areolatus, paulo scabriculus, areolis 1 L, 3 L, 4 L subacutis et scabrieulis, margine antero-laterali fere longitudinali, 4-dentato (dente E fere obsoleto), dentibus tribus (N T S) acutis, spiniformibus. Pedes antici fere aequi, manu carpoque subtilissimè tuberculatis, tuberculis partim seriatis, digitis canaliculatis, paulo scabriculis, articulo tertio anticè denticulato. Pedes postici sparsim pubescentes, articulo tertio supra minutè spinuloso, tarso longo.*

Carapax with a broad front, anteriorly faint areolate, a little scabrous, areolets 1 L, 3 L, 4 L subacute and minute scabrous, antero-lateral margin nearly longitudinal, four-toothed, tooth E nearly obsolete, teeth three (N, T, S) acute, spiniform. Anterior feet nearly equal, hand and carpus very minutely tuberculate and in part seriatly so, fingers channeled, minute scabrous, third joint anteriorly den-

ticulate. Posterior feet sparsely pubescent, third joint above minutely spinulose, tarsus long.

Plate 12, fig. 9, animal, enlarged four diameters.

From Balabac Passage; also a similar species from Raraka Island, Paumotu Archipelago.

The specimen from Balabac Passage is quite small, the length of the carapax being 1.7 lines, and the greatest breadth, 2.6 lines; ratio of length to breadth, 1 : 1.53. The Raraka specimen (a female), is two and two-thirds lines long, and four broad; ratio, 1 : 1.5. The carapax anteriorly is minutely rough under the microscope, especially near the antero-lateral teeth; and in this part the areolets are somewhat prominent and pointed or scabrous. In the Raraka specimen, one or two of the antero-lateral teeth have a spine on the outer side, and the obsolescent tooth E is a minute spinule. The minute points or tubercles of the hand extend half way down its inner surface. The fingers are black or nearly so.

This species resembles the *P. pugil*, but the front is much less projecting, the outline being more nearly straight, and the tubercles of the hand are far smaller and more numerous; moreover, the areolation is not as bold.

*PILODIUS PILUMNOIDES?* (*White*) *Dana*.

*Carapax anticè leviter areolatus, et breviter hirsutus, margine antero-laterali brevi, 4-5 acervato-spinuloso, spinulis fere æquis vix conspicuis, superficie subtiliter hirsutâ. Pedes antici scabriculi et partim subtiliter hirsuti, granulis manus externis vix seriatis, superficie manus inferiore glabrâ, digitis canaliculatis, superiore supra spinuloso. Pedes 8 postici hirsuti lateribus articuli 3tii exceptis, margine superno spinuloso.*

Carapax faint areolate anteriorly and short hirsute, antero-lateral margin short, with four to five clusters of nearly equal spinules, which are hardly seen without removing the hirsute covering. Anterior feet scabrous and in part minute hirsute, granules of outer