

## MARINE CRUSTACEANS.

### III. THE XANTHIDAE AND SOME OTHER CRABS.

By L. A. BORRADAILE, M.A., *Lecturer in Natural Sciences at Selwyn College, Cambridge.*

(With Text-figures 41—60.)

THE instalment of the Marine Crustaceans of the Expedition described in this paper includes, besides the Xanthidae, two new genera, possibly allied to them, and a couple of small families—the Atelecyclidae and the Hapalocarcinidae—which are taken here for reasons of convenience. Some remarks on the natural history of the crabs will be found under the headings of the families, genera, etc. to which they belong.

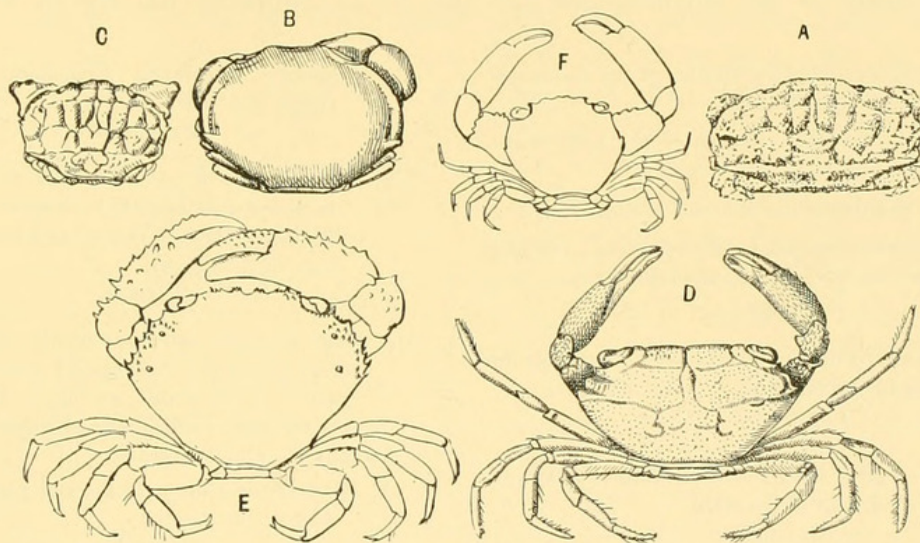


FIG. 41. Types of the Xanthid Crabs. *A. Actaea fossulata*, resembling water-worn coral pebbles and found in the lower parts of a coral stock or other situations into which pebbles could be washed. *B. Carpilius exsculptus*, adapted for passively withstanding surf and currents. *C. Euxanthus exsculptus* var. *rugosus*, found amongst stones, etc. on the reef. *D. Chlorodius barbatus*. *E. Domoecia hispida*, a coral crab. *F. Trapezia ferruginea*, also a coral crab. The drawings are not made to scale. *B* is a large crab, *C* and *F* of moderate size, and the others small.

#### Family **Xanthidae**.

Of all the families of crabs the Xanthidae are the most numerous in genera and species, and the most varied in form, though this preeminence is seen chiefly in the Tropics, and there best in the littoral belt, where they are to be found in every possible position.



Morphologically, the Xanthids are characterised, among the other round-fronted crabs (Cyclometopa), by the absence of a rostrum, the sloping or transverse first antennae and short second antennae, the sharp fore edge to the mouth, and the legs of the last pair not adapted for swimming, nor the branchial regions swollen. Bionomically they are harder to characterise, but, speaking broadly, we may say that they are not sand crabs, nor swimming crabs, nor land crabs, but essentially crabs of the reef surface and the coral stocks, though some of them may be found in other positions. Their division into subfamilies and genera depends on such characters as the shape of the orbits and antennae, and the relationships of these to one another, the ridges on the palate (endostome) which mark out the channels by which water leaves the gill-chamber, and the shape of the body<sup>1</sup>. The species are separated by details such as the shape of the front and the hands, the sculpture and areolation of the carapace, and the presence or absence of spines on the limbs or the sides of the body.

The body of a typical Xanthid—a *Xantho*, for instance (Fig. 50), or an *Actaea* (Figs. 41 A, 53, 54), or *Carpilius* (Fig. 41 B), is of a transversely oval shape, heavy and compact, with a hard cuticle and short legs, which can be folded up close under the body<sup>2</sup>. The chelae are usually large and powerful, and the habits sluggish. Such crabs live almost anywhere on the reef, sometimes showing a preference for some particular kind of shelter, such as holes or cracks in the rocks, but more often, I think, adapting themselves to any that can be found. Specimens are thus often taken in coral stocks, though the crabs cannot be said to be characteristically coral crabs, being equally, if not more often, found under stones, which afford the most favourite hiding-place of all; some of the larger species are restricted to the reef, but many of the smaller ones are also to be found in the lagoon wherever coral

<sup>1</sup> In the following key the sub-families of the Xanthidae are defined by means of these features:

I. Endostome ridges wanting. Shape of the body transversely oval or rounded.

A. Flagellum of antenna not shut out of orbital gap.

1. Second joint of antennal stalk cylindrical, reaching the front but not entering the orbital gap.

*Xanthinae*.

2. Second joint of antennal stalk as in *Xanthinae* but entering the orbital gap.

*Carpilinae*.

B. Flagellum of antenna shut out of orbital gap by part of the second joint of the stalk.

*Etisinae*.

II. Endostome ridges present. Shape of the body often square or squarish.

A. Front less than half, and fronto-orbital edge (front and orbits together) not more than two-thirds the greatest breadth of the carapace. Front usually makes an arch with the anterolateral edge. Flagellum of antenna usually not shut out of orbital gap.

1. Second joint of antennal stalk cylindrical, and may or may not reach the front, with which it is not

broadly in contact. Endostome ridges vary in shape and size.

*Menippinae*.

2. Second joint of antennal stalk somewhat irregular in shape and broadly in contact with the front. Endostome ridges strong, and project on the fore edge of the mouth.

*Oziinae*.

B. Front at least half, and fronto-orbital edge more than two-thirds the greatest breadth of the carapace. Front makes an angle with the anterolateral edge. Flagellum of antenna always shut out of orbital gap.

1. Endostome ridges strong, and project on the fore edge of the mouth.

*Eriphiinae*.

2. Endostome ridges moderate, and make no projection on the fore edge of the mouth.

*Trapeziinae*.

The genera will be found ranged under these sub-families below.

<sup>2</sup> The figure (41 c) of *Euxanthus exsculptus* gives an excellent example of the way in which the limbs are often folded up so as to form with the body a compact mass. Fig. 47 shows how the legs are sometimes specially shaped for folding into a small compass.



grows. The massive, compact form of body and the strong cuticle are, no doubt, adaptations to a life spent in positions where they are surrounded with hard, stony objects, and exposed at times to surf and strong currents, and at others to enemies which they are unable to escape by swimming like the Portunidae.

From this typical body-form there are, of course, deviations in various directions, of which a few only can be mentioned here. Such genera as *Chlorodius* (Fig. 41 *D*) and *Pseudozius* (Fig. 45) are flatter and lighter built, with longer legs, though the cuticle is still strong, and they are more often to be found in situations like the interstices of coral stocks, where they must maintain their position by the use of their limbs, rather than by their weight or by wedging themselves fast, like the heavier genera. Yet even these<sup>1</sup> are far from being true coral crabs, restricted to the living parts of the stock, like *Melia* (Fig. 49), *Domecia* (Fig. 41 *E*), or the Trapeziinae (Figs. 41 *F*, 58), on which some remarks will be found below<sup>2</sup>. Another very characteristic *habitus* is that of *Pilumnus* (Figs. 46—48), slightly built, very hairy, and often with squarish, rather than oval, bodies, falling very steeply in front.

As to the meaning of the numerous, and often very beautiful, features by which the Xanthids are distinguished in detail, it is as yet impossible, in most cases, to say anything. Why, for instance, are the species of *Actaea* bejewelled with the most beautiful pearly granules (Figs. 53, 54)? And why do these granules become sharp thorns in some species (Fig. 56), and flatten themselves into leaflets in others (Fig. 55)? Why should the back of *Euxanthus* (Fig. 41 *C*) be rough and uneven, or that of *Carpilius* (Fig. 41 *B*) glassy smooth? Why is *Liomera* barrel-shaped (Fig. 52) and *Pseudozius* often as flat as a board (Figs. 43, 44)? Before these questions can be answered, much more must be known about the habits of the crabs. We may, however, indicate some directions in which it will be well to look for the answer. The texture of the back and legs, and their nakedness or hairiness, will perhaps be found to depend on the necessity of friction with the surrounding objects when the animal wedges itself firmly into its hiding-place, or of presenting a smooth surface to waves and currents, so that they may pass over the animal without sweeping it away; or again to the need of disguise, either by a covering of fine silt, held by hairs or bristles (often a very effectual device) or by adherent organisms which will not grow on a smooth surface, or even [*Actaea cavipes* and *fossulata* (Fig. 41 *A*)] by a likeness to water-worn pebbles of coral. The shape of the hands may be adapted to the food, or to defence against some special enemy, or—in correspondence with that of the front—to breathing among foreign particles of various grades of coarseness<sup>3</sup>, or in some cases seems to be a sexual character. The remarkable hoof-like ends to the fingers (Fig. 57 *C*), which turn up again and again in different genera<sup>3</sup>, may serve to give their owner a foothold among the rough coral branches, or may gather food in some special way, like the tufted, spoon-like fingers of the prawn *Atya*. The shape of the front depends on the way in which the antennae are used, and on the need of keeping open a way for the breathing stream, a function which it shares with the chelipeds<sup>4</sup>. And lastly the shape of the end-joints of the walking legs, which shows a

<sup>1</sup> Except, probably, *P. coralliophilus* and *P. triungiculatus* (p. 241 ff.).

<sup>2</sup> pp. 249, 263.

<sup>3</sup> Garstang, *Q. J. M. S.* XL. p. 211.

<sup>4</sup> This phenomenon of the occurrence of the same feature in groups which cannot be related to one another is not uncommon among Decapods, and is worthy of more attention

than it has yet received. Another instance of it, mentioned below (p. 242), is the pulley arrangement at the end of the walking legs. Of course the closure of the orbital gap has happened over and over again in various groups of Crabs, and the loss of the mandibular palp and the epipodites among Prawns is a similar case.



very great diversity, will be found, I believe, to be connected with the nature of the ground on which the animal's life is passed, whether it live among stones or in sandy places or in coral stocks, and to its habits, whether it crouch with folded limbs under shelter or hold fast with its legs.

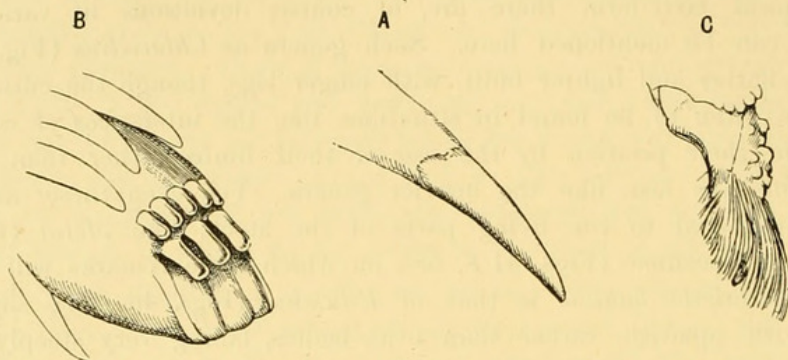


FIG. 42. Ends of the walking legs of Xanthid Crabs. *A.* Tip of the end-joint in *Carpilius convexus* (Fig. 41 *A*). *B.* Same part in *Trapezia ferruginea* (Fig. 41 *F*). *C.* Whole end-joint in *Actaea speciosa*. The drawings are not made to scale, *A* being much less enlarged than *B* or *C*.

A number of examples of this feature may be found in the illustrations scattered through the present paper, but in the accompanying figure (Fig. 42) three of the most unlike of them are shown enlarged. *Carpilius convexus* is a heavy-bodied, spindle-shanked crab, too big and clumsy to climb among the branches of coral stocks, which leads a sluggish and uneventful life among objects on the bottom, and has even been found enclosed as in a cage by the growth of coral<sup>1</sup>. Its legs (*A*) accordingly end in a very simple claw. *Trapezia ferruginea* is a typical crab of the living coral, and we may suppose that the remarkable ending of its legs (*B*) is in some way connected with this fact. But what can be the meaning of the curious brush of hairs at the end of the first walking leg of *Actaea speciosa* (*C*), and why this structure is not found on the other legs, cannot as yet be even guessed. Some remarks on the different ways in which the last joint may be hinged on to that before it will be found below on p. 242.

According to Henderson [*Tr. Linn. Soc. Zool.* (2) v. p. 332] the colour markings of shore Decapoda are generally protective in their nature, but this is certainly not always the case, as, for instance, in *Trapezia* and *Carpilodes*.

In another respect, besides those of structure and habits, the Xanthids offer a contrast to the swimming crabs, described in the last number of this publication, which, next to them, are the most conspicuous family of crabs in the Tropics. They are, with some striking exceptions, not very variable, and are not varietal, save in a few cases. In the Trapeziinae, however, varieties appear, and the genus *Pilumnus* shows a remarkable plasticity of constitution, which leads to the formation of numerous local species and will be alluded to again below<sup>2</sup>.

<sup>1</sup> Coutière, *Bull. Mus. hist. nat.*, 1898, 5, p. 238.

<sup>2</sup> p. 244.



Subfamily **Menippinae.**Genus *Pseudozius* Dana, 1851.1. *Pseudozius dispar* Dana, 1852.*Pseudozius dispar*, Calman, *Tr. Linn. Soc.* (2) VIII. p. 14 (1900)<sup>1</sup>.

The granular field on the larger hand of the male of this species grows relatively smaller with age.

Taken on the reef in Male, Goifurfehendu and Fadifolu Atolls, and in Funadu Velu, Miladumadulu Atoll.

2. *Pseudozius caystrus* (Ad. and Wh.), 1848. Alcock, III. p. 181.

This very common species, which is recorded by Alcock from the Laccadives, almost certainly occurs at Minikoi, though unfortunately no specimens of it have reached England<sup>2</sup>.

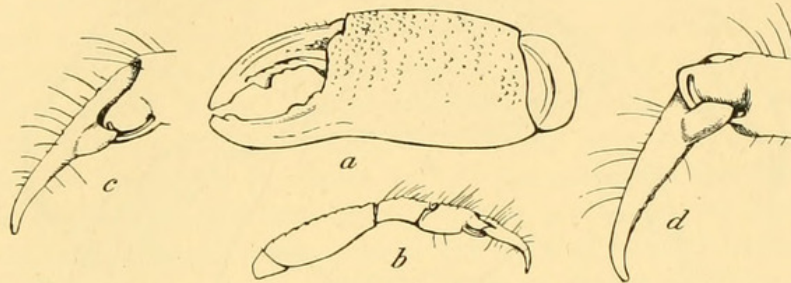


FIG. 43. Limbs of *Pseudozius coralliophilus*; a. outside of greater hand, b. walking leg, c, d. end of the same enlarged.

3. *Pseudozius coralliophilus*, n. sp. (Fig. 43).

Diagnosis: "A *Pseudozius* with the carapace finely granular, bearing a few scattered hairs, the regions faintly marked out; the front sloping gradually downwards, cleft into two low, rounded lobes, the furrow between the front and the orbit ending on a small lobe; the antero-lateral edge with three very low humps, from the last of which a fine ridge runs inwards on the back; the chelipeds unequal, finely granular, their fingers widely gaping, especially on the large hand, furrowed and subcylindrical, with a few isolated blunt teeth, the arm and wrist (meropodite and carpopodite of the cheliped) without spines, the fore edge of the arm finely toothed; and the walking legs fairly stout, with a long end-claw."

Length: 3 mm. Breadth: 4 mm. Colour in spirit: cream, with pale brown, cream-tipped fingers.

A single male specimen was taken from a block of the brain-coral *Leptoria tenuis* growing in the lagoon at Minikoi. It was sheltering at the bottom of one of the holes in the coral made by another little crab—*Cryptochirus coralliodytes*<sup>3</sup>. Whether the first owner of the hole had died, or left willingly, or had been ousted by the *Pseudozius* there was nothing to show, nor can we tell as yet whether the latter lives always in *Cryptochirus*-holes or had merely retreated into one in this case as the water drained off the surface of the coral. In another of these holes there was found a female *Pseudozius*, sheltering in the same way, and it was

<sup>1</sup> Where synonyms will be found. For the principle on which references are given in this paper see p. 192 of Part II. of the present publication.

<sup>2</sup> See footnote to p. 191 of Part II. of this publication.

<sup>3</sup> See below, p. 271.



natural to suppose at first that this was the female of the crab whose male we have just described. Further examination, however, showed differences between the two so great that they must belong to different species. The second specimen is described below under the name of *P. triunguiculatus*.

I am much obliged to Mr Edwin Wilson, F.E.S., for calling my attention to a very interesting structure which he discovered on the legs of this crab (Fig. 43 *b—d*). As usual, the last joint (dactylopodite, end-joint) is held in a deep notch at the end of the one before it (propodite). But in the present case it bears on the hinder side a flange, and on the flange a knob, which works in a groove on the propodite. At the inner end of this groove is a small pit, into which the knob slips when the joint is fully flexed, so that the end-joint is held firm in this position, thus providing the crab with a hook, by which, no doubt, it keeps its position on the coral. *P. triunguiculatus* has a less perfect form of the same apparatus (Fig. 44 *c*). In it, the flange on the last joint works against a special process of the one before

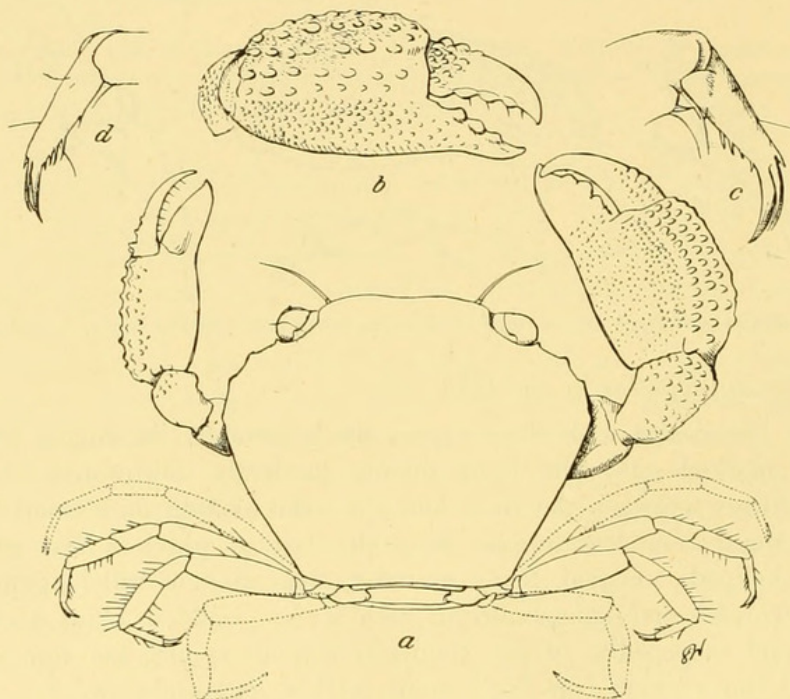


FIG. 44. *Pseudozius triunguiculatus*, symbiotic with a coral; *a*. whole animal, *b*. outside of greater hand, *c*. hinder side of end of walking leg, *d*. fore side of the same.

it, but this process has only a smooth surface and no groove. A small spine under the propodite seems placed in this position to prevent the end-joint from being unduly flexed, and no doubt the other spines give a foothold to the animal. On the whole, these structures, as well as the general appearance of the body and limbs, give the impression that the crabs are indeed symbiotic with the coral, living always on its surface, but take refuge in the *Cryptochirus* holes at times only.

Interestingly enough, the same structure, in its simpler form of a flange on the end-joint working along a smooth path on the joint before it, turns up again in the coral crabs of the Trapeziinae and in *Domecia*, though not in *Melia*, which crooks the whole leg and not the last joints only, and is also present in *Chlorodopsis* (Fig. 57 *c*) and *Phymodius*, which, without



being true coral crabs, are often found in coral stocks, and in the *Actaeas* of the *flosculata*-group, of whose habits as yet nothing is known, since they have only been taken with the dredge. *Actaea speciosa* (Fig. 42 C) is an example of a species in which the flange is not found. The object of the apparatus is, no doubt, to enable the end-joint to be moved more evenly and accurately and held fast in any position; and it is only an elaboration of structures found in most crabs, which have usually a small facet on the hinder side of the last joint for the end of the propodite. Its absence is, nevertheless, particularly interesting in the case of *Eriphia*, which is allied to *Domecia*, and of *Pseudozius* other than the two species mentioned above. A single glance at the orbits of these latter species is enough to show that they have no place among the Trapeziinae, Eriphiinae, or Etisinae, so that the formation of the legs in question must have arisen, like so many other characters of the crabs, independently in two or more cases<sup>1</sup>. It is probably an adaptation to clambering.

4. *Pseudozius triunguiculatus*, n. sp. (Fig. 44).

Diagnosis: "A *Pseudozius* with the carapace flat, smooth (microscopically roughened) and hairless, the regions not marked out; the front sloping slightly downwards, standing well forward beyond the eyes, with a wide shallow bight instead of the usual notch in the middle, no side lobes, and a shallow median furrow; the anterolateral edge with three low, blunt teeth, the hindmost of which is hardly distinguishable; the chelipeds, large, unequal, covered with granules of some size, which are largest on the upper part of the outside of the hand, no spines on the arm or wrist, the fingers flattened, not gaping, sharply pointed at the tips, in the large hand the fingers set, on their opposed edges, with a row each of conical teeth, in the small hand these edges blade-like, making up a remarkable pair of shears, which are no doubt adapted to some peculiarity in the habits; and the walking legs rather slender, each bearing on its last joint a set of three slender, brown end-claws, of which two are somewhat smaller than the third."

Length: 3 mm. Breadth: 4 mm. Colour in spirit: pale brown, the walking legs white, the back covered with small dark-brown spots, the fingers white.

One female specimen taken on *Leptoria tenuis* in Minikoi lagoon.

Subgenus *Platyozius*, n.

A specimen dredged in Suvadiva cannot be referred to any known species, and is also difficult to place in a genus. It differs from *Pseudozius*, as hitherto defined, in more than one point, but none of these is of importance enough to warrant the setting up of a new genus, and it is therefore taken here as the type of a new subgenus *Platyozius*. Other groups of species akin to *Pseudozius* will probably have to be reduced to this rank before long.

*Platyozius* differs from *Pseudozius* s. str. in the following points: (1) Relatively greater fronto-orbital breadth. (2) Absence of small outer lobes from the front. (3) Equality of the chelipeds. (4) Slenderness of the legs. (5) A flatter and shallower body. (6) Less marked endostome ridges.

5. *Pseudozius* (*Platyozius*) *laevis*, n. sp. (Fig. 45).

Diagnosis: "A *Platyozius* with the carapace smooth, hairless, without regions; the front broad, bent slightly downward, almost straight, with a broad shallow bight in the middle and

<sup>1</sup> See above, footnote to p. 239.



notches separating it from the orbits, but no outer lobes; the anterolateral edges short, with two big blunt triangular teeth behind the orbital angle, and a small notch, rather than a projecting tooth, at the junction with the posterolateral edge; the hinder edge slightly hollowed; the chelipeds equal, smooth, without spines but with a blunt tooth at the inner angle of the

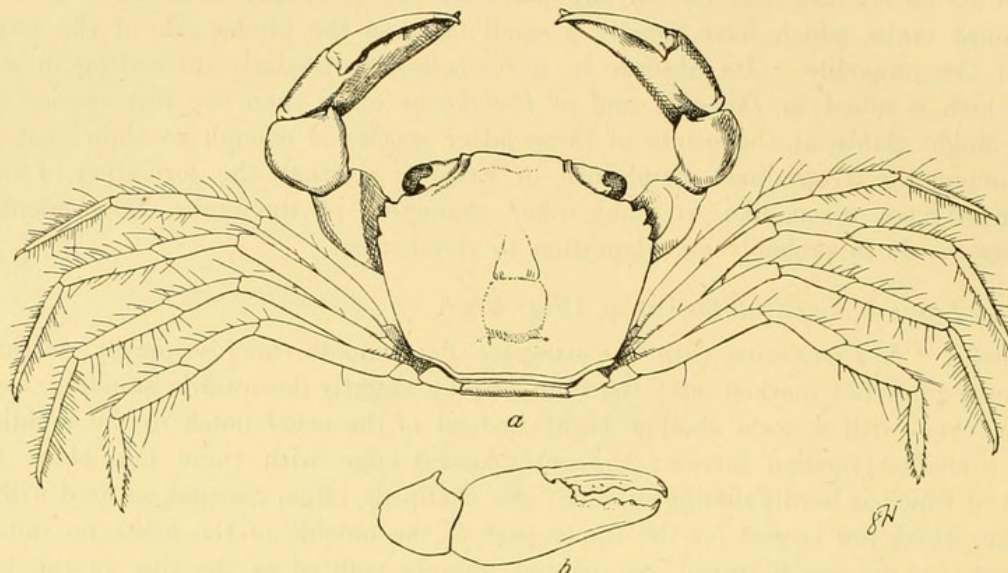


FIG. 45. *Pseudozius laevis*; a. whole animal, b. outside of hand.

wrist, the fingers compressed, grooved, not gaping, each with a row of triangular teeth interlocking with those of the other; and the walking legs long, slender, sparsely hairy, and without spines, except on the dactylopodite of the last leg, which is rather broad, while those of the other walking legs are very long and narrow."

Length: 5 mm. Breadth: 6 mm. Colour in spirit: white.

One male specimen dredged in 20 fathoms in Suvadiva Atoll.

#### Genus *Pilumnus*, Leach, 1815.

As a general rule the species of crabs are not local in distribution, but are spread over wide areas and are probably correlated with habitative<sup>1</sup> rather than geographical differences in environment. There are, of course, exceptions to this rule, as for instance the land and freshwater crabs of the genera *Sesarma* and *Potamon*. *Pilumnus* is another of these exceptions, as may be seen at once on looking down a list of the known species, when it will be evident that many of them have been only recorded from one locality. This impression is strengthened on reading the remarks of various authors in recording a species from a new locality. In many cases the identification is doubtful, or the description does not tally with that of the original specimens. The present collection affords an excellent example of this, not one of the 11 species being represented by specimens which exactly obey former diagnoses. Under the circumstances I shall describe as new species the forms which do not agree closely with specific descriptions already published, and rank as subspecies<sup>2</sup> those which in-

<sup>1</sup> For the meaning of this word, see p. 195 of Part II. of this publication.

<sup>2</sup> See footnote to p. 195 of Part II. of this publication.



fringe such descriptions in small points only. The phenomenon of local variation in *Pilumnus* deserves, and would repay, careful investigation, especially with regard to the existence of intermediates, their number relative to those of the described forms, and their distribution, whether they be found in intermediate localities or no. In short, information is needed as to whether the subspecies of *Pilumnus* be "discontinuous," like true varieties, or no.

The members of the genus live under stones, in coral blocks, etc.

6. *Pilumnus vespertilio* (Fabr.) 1793. Alcock, III.<sup>1</sup> p. 192.

The fur of the Maldive specimens is not dark, as in the type, but of a golden-yellow colour, like that of Alcock's Karachi and Tavoy race. At the same time the usual smooth patch is to be found near the base of the finger of the large hand. Perhaps these characters are distinctive of local races or subspecies of *P. vespertilio*.

The species, which is sluggish in its habits, lives under stones, etc., and was taken on the reef at Hulule, Male Atoll, and in Funadu Velu, Miladumadulu.

7. *Pilumnus andersoni* de Man, 1887. subsp.<sup>2</sup> See Alcock, III. p. 194.

The Maldive specimens differ from the race defined by Alcock in the following points: (1) There are no granules on the carapace, which is everywhere smooth and finely pitted. (2) The spines on the fore edge of the meropodites of the walking legs are vestigial, and there is no spine at the end of the joint. (3) The arrangement of the spines on the fore edge of the arm does not agree with that described by de Man. Alcock does not mention these spines, but, as he cites de Man's paper, it is presumable that all his specimens presented the same arrangement as the type. In the Maldive example there is a row of strong, blunt teeth, growing smaller from without inwards. In de Man's specimens there were two, large, arched, sharp spines at the outer end, with a small spine at the base of the distal of the two. The more proximal was larger than the distal one, and behind it were four or five acute granules.

Dredged in 5—39 fathoms in Minikoi, South Nilandu, and Haddumati Atolls.

8. *Pilumnus hirsutus* Stimps, 1858. subsp. See Alcock, III. p. 197.

The Maldive specimens differ from those on which Alcock's description was founded in the following points: (1) A small subhepatic tooth is present. (2) The gaps on the orbital edge are fairly distinct.

According to Haswell (*Cat. Austral. Crust.* p. 69), the meropodites of the walking legs of this species should bear three or four spines. Alcock does not mention these spines, and they are wanting in the Maldive specimens, in which the fore edge of the meropodite is roughened by a row of low, blunt teeth. Alcock is doubtful about the identity of the species he is describing as *P. hirsutus*, and it seems likely that the three forms<sup>3</sup> are distinct.

A single specimen from South Nilandu, which bears a *Sacculina*, differs from the others in the following points: (1) The antennal flagella are long and hairy. (2) The large hand is rather less "full." (3) The body is rather flatter. (4) The legs are a little longer.

<sup>1</sup> *Journ. As. Soc. Beng.* LXVII. ii. pp. 67—233 (1898). For the principle on which references are given in this paper see Vol. I. Part II. p. 192 of the present publication.

<sup>2</sup> See footnote to p. 195 of Part II. of this publication.

<sup>3</sup> I am using the word "form" in its broadest sense to

include species, subspecies, and varieties. In this sense it is a useful counterpart of "group," used to include all divisions of the animal kingdom from genera upwards. For definition of "variety" and "subspecies" see the article on Varieties in Part II. of this publication.



It is impossible to say whether any or all of these features be due to the presence of the parasite.

The figure of a specimen referred to this species in the *P.Z.S.* for 1900 [pl. XLII., fig. 9] was drawn with the hair on the body and in consequence the side-teeth and frontal notch have not been shown by the artist.

Dredged in 22—45 fathoms in Haddumati, Felidu, Addu, Mulaku, North Male, South Nilandu, Suvadiva, and Kolumadulu Atolls.

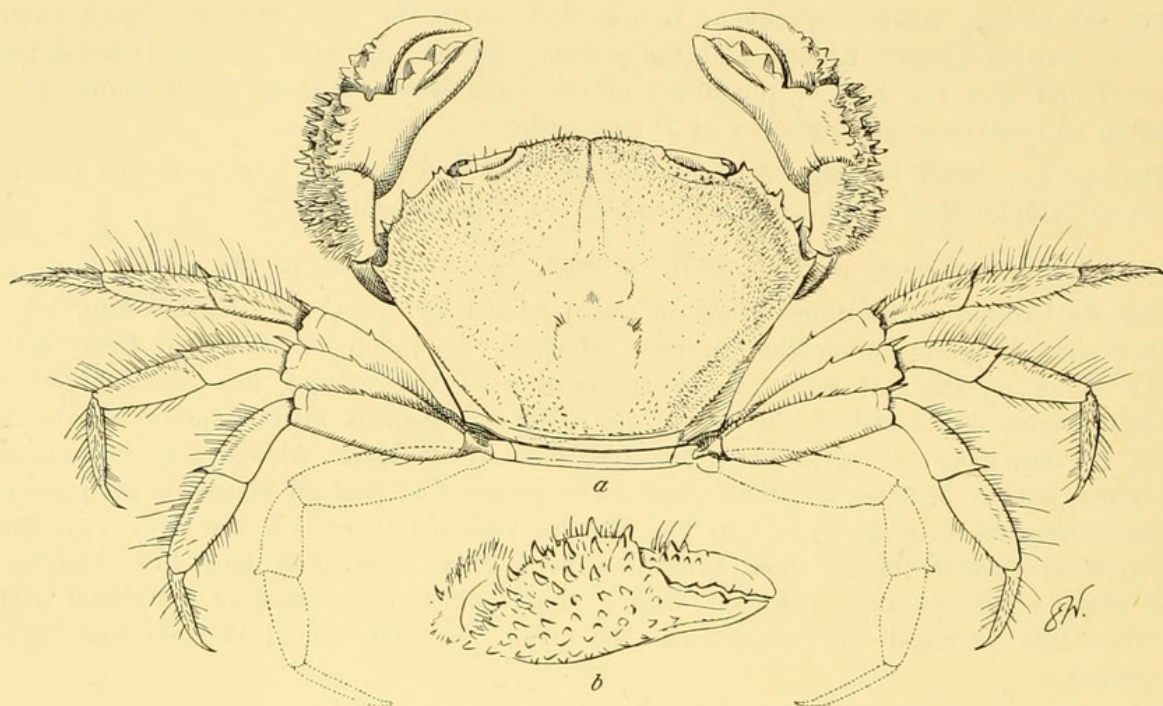


FIG. 46. *Pilumnus rotundus*; a. whole animal, b. outside of hand.

9. *Pilumnus rotundus*, n. sp. (Fig. 46).

Diagnosis: "A *Pilumnus* with the carapace very convex, subglobular, covered with short hairs, the regions faintly marked; the lobes of the front only moderately prominent, with faintly granular edge; the lower rim of the orbit denticulate, the upper rim granular, with two distinct but shallow notches; the anterolateral edge bearing four spiniform teeth, of which the first is the orbital angle, the teeth being short and set wide apart and having smaller teeth at their bases; the chelipeds rather unequal, covered outside with stout thorns, which are arranged in somewhat irregular rows and are largest on the upper side, the fingers bent at an angle with the hand, the moveable finger bearing a strong ridge above; and the walking legs moderately long, covered with long hairs, and with a thorn on the upper edge of the meropodite and one at the end of both the meropodite and the carpopodite."

Length: 8 mm. Breadth: 12 mm. Colour in spirit: yellowish-white, with white fingers.

Dredged in 35 fathoms in Kolumadulu Atoll.

10. *Pilumnus dorsipes* Stimps, 1858. Alcock, III. p. 197.

The specimens agree very closely with Alcock's definition, but I am quite unable to detect



any granulation of the carapace, which, when laid bare, is absolutely smooth, save for the stumps of the hairs. The larger hand is very stout and the fingers short.

The species was taken in South Nilandu, Haddumati, North Male, Mulaku, Suvadiva, Felidu, Kolumadulu, and Fadifolu Atolls, in 12—70 fathoms of water.

11. *Pilumnus maldivensis*, n. sp. (Fig. 47).

Diagnosis: "A *Pilumnus* with the carapace convex both fore and aft and from side to side, smooth, pubescent and hairy, the regions faintly marked; the middle lobes of the front prominent, the outer lobes very small; the lower rim of the orbit finely toothed, the upper rim smooth, with traces of two notches; the antero-lateral edge short, with three spiniform teeth and a spine on the orbital angle; the chelipeds unequal, granular and hairy outside, a small bare patch at the base of the fingers and along the lower edge of the greater hand, fingers moderately long, smooth; and the walking legs of moderate length and stoutness, hairy and pubescent, and without thorns on the meropodites."

Length: 4 mm. Breadth: 5 mm. (Largest specimen.) Colour in spirit: yellowish-white, fingers white.

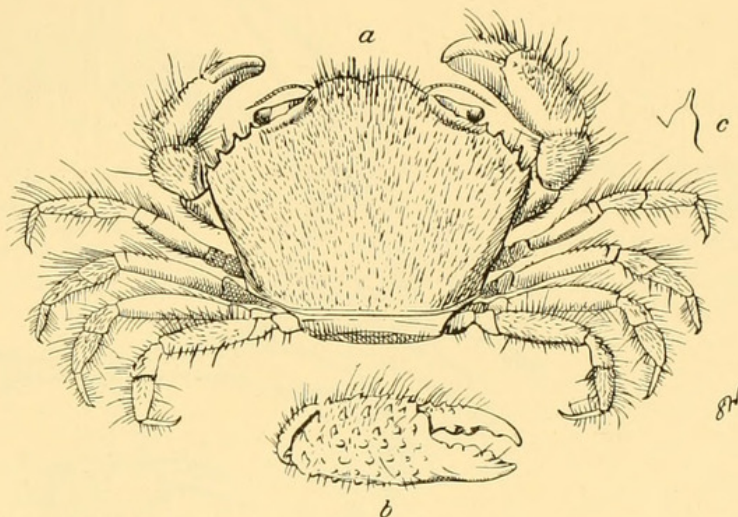


FIG. 47. *Pilumnus maldivensis*; a. whole animal, b. outside of hand, c. one of the teeth of the anterolateral edge.

This species seems to be akin to *P. caerulescens* A. M.-Edw. 1873, which is included in Major Alcock's list of Indian Crabs, but the colour and the spiniform orbital angle serve to distinguish it. It was dredged in Suvadiva, North Male, Miladumadulu, and South Nilandu Atolls, in 25—43 fathoms.

12. *Pilumnus rotumanus* Borradaile, 1900. ? subsp.

*Pilumnus rotumanus* Borradaile, *Proc. Zool. Soc.* 1900, p. 581, pl. XLI. fig. 6 (1900).

A single female of this crab was taken on the shore at Hulule, Male Atoll. It differs from the type specimen in two points: (1) The moveable finger, which in *P. rotumanus* has a slightly uneven cutting-edge, has in the Maldivian example a row of well-marked teeth. (2) The carapace of the Maldivian specimen is narrower relatively to its breadth.

Both specimens are females, but it is possible that these differences may be due to age, since the Rotuman individual is much larger than that from Hulule (length 15 mm. as against 8 mm.). Or, again, a series from each locality might show that the features in question are not characteristic.

13. *Pilumnus elegans* de Man, 1887. subsp.

See *Pilumnus elegans* de Man, *Arch. Naturges.* 53 I. p. 310, pl. XII. fig. 3 (1887).

The specimens agree with de Man's description in all points but the two following:

G.



(1) The fore edge of the meropodites of all the walking legs bears three spines besides that at the end of the joint. In de Man's race there is only one, and that is wanting from the last leg. (2) The red colour mentioned by de Man is wholly wanting, though of course this may be due to the state of preservation.

Taken in South Nilandu Atoll, in 19—25 fathoms.

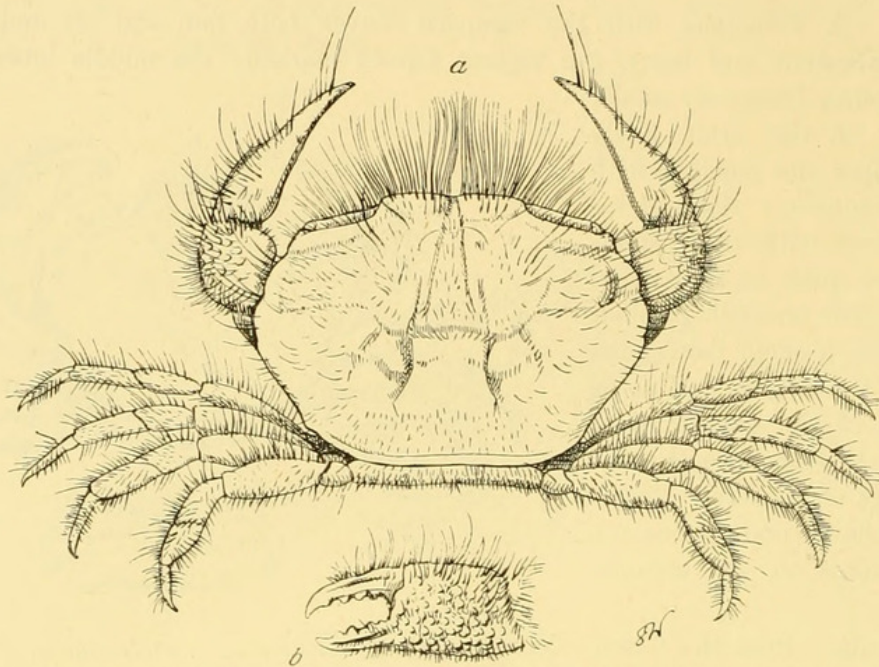


FIG. 48. *Pilumnus alcocki*; a. whole animal, b. outside of hand.

14. *Pilumnus alcocki*, n. sp. (Fig. 48).

Diagnosis: "A *Pilumnus* with the carapace of moderate breadth only, covered rather sparsely with long hairs but without pubescence, the regions well marked; the front almost straight, slightly arched, not deeply notched in the middle, bearing a fringe of very long hairs; the anterolateral edge raised into three low mounds, the hindmost of which is very inconspicuous; the outer orbital notch shallow, the inner wanting, the lower orbital rim granular, the orbital angle not at all prominent; the chelipeds subequal, granular and covered with long hairs, the fingers gaping, somewhat furrowed and toothed; and the walking legs short, stout, hairy and pubescent, and without thorns on the meropodites."

Length: 4.8 mm. Breadth: 6.2 mm. Colour in spirit: white.

Dredged in 20 fathoms in Suvadiva Atoll.

I have called this species after Major A. Alcock, F.R.S., to whose excellent work on the Indian Crabs it has so often been necessary to refer in the present paper.

Genus *Actumnus* Dana, 1851.

15. *Actumnus globosus* (Dana), 1852.

*Pilumnus globosus*, Dana, *U.S. Expl. Exped. Crust.* i. p. 236, pl. XII. fig. 10 (1852).

By the shape of its body this species seems to belong to *Actumnus*, rather than to



*Pilumnus*, though, in any case, with *A. obesus* Dana, 1852, and *A. elegans* de Man, 1887, it holds an intermediate position.

Taken on the reef at Minikoi.

16. *Actumnus setifer* (de Haan), 1835. Alcock, III. p. 202.

The carapace is very sparsely granular in the larger specimens.

Dredged in 23—30 fathoms in Mahlos and South Nilandu Atolls.

17. *Actumnus tomentosus* Dana, 1852. Alcock, III. p. 202.

Dredged in 25 fathoms in South Nilandu Atoll.

#### Genus *Melia* Latr., 1825.

I have followed Ortmann in placing this genus provisionally in the Menippinae chiefly because the orbital gap forbids its being included in the Trapeziinae, to which its body-shape, coral haunting habits, and coloration seem at first to show a relationship. For the rest, the shape of the body may be reached without much difficulty from that of *Pilumnus*, and none

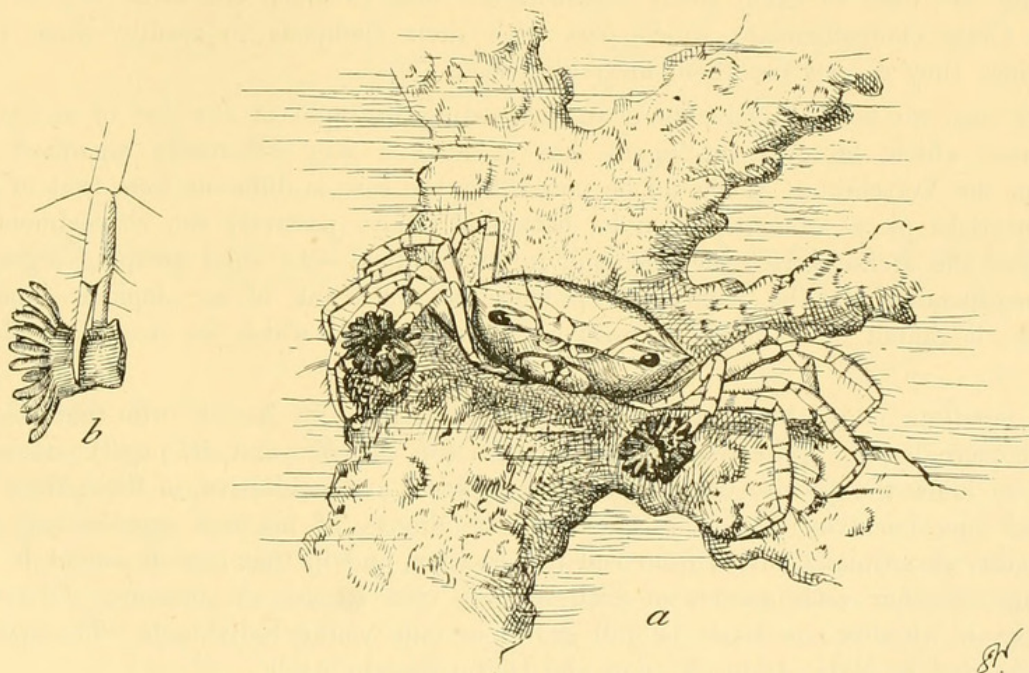


FIG. 49. *Melia tessellata*, bearing in its claws two sea anemones. The colour of this crab in life is very beautiful. Its translucent legs are ringed, as in the figure, with dark purple, and lines of the same colour mark out the body into polygonal fields which are coloured pale pink or brown and lemon yellow. The anemones when alive are olive-green, and the coral pink or green. The whole figure is considerably enlarged, and *b*, which shows the "hand" holding an anemone, is very much so.

of the other characters offers any great obstacle to our classifying it with the present sub-family. It has obviously undergone considerable modifications in structure in connection with its peculiar and interesting habits.



18. *Melia tessellata* (Latr.) (Fig. 49.)*Melia tessellata*, Borradaile, *Proc. Zool. Soc.* 1900, p. 580.

This crab, which lives, like *Trapezia*, among the living branches of coral stocks, holding on by its long slender legs, has for some time<sup>1</sup> been known to be in the habit of carrying in each chela a small sea anemone. The object of this habit is not known, but it is certainly a voluntary act on the part of the crab, for the actinian is not attached, but held between the fingers of the *Melia*, and, if it be taken away, will be again seized. Usually there is an anemone in each hand, but sometimes one or both hands are empty. The actinians, which are grasped firmly round the middle below the tentacles, may be useful, by means of their stinging-cells, either for defence or to "fish" for food with, or perhaps for both purposes. The chelipeds are slender and feeble—ill-suited for defence, but at the same time mobile and well adapted to wield the anemones they carry, and, if the crab be threatened, it will stretch out its arms towards the aggressor, as though it would ward him off with the disagreeable obstacles it thus presents to his attack. Certainly the fingers cannot be used to take food unless the anemone be first dropped, but, on the other hand, the tentacles of the latter are directed outwards, away from the mouth of the crab. The third maxillipeds are mobile, with the proximal joints rather slender and the last three stout, and are fringed with long hairs. Possibly they are used to catch small organisms for food in much the same way as those of the China Crabs (Porcellanidae), which part with their chelipeds so readily when they are attacked, since they do not use them for taking food.

In any case we seem to have here an interesting example of the use of an implement by an animal which, however intelligent, has at least a very differently organised nervous system from the Vertebrata. It should be noted that the case is different from that of a spider crab, which sticks pieces of seaweed on its back and enjoys passively the concealment gotten thereby. For the *Melia* carries the anemone in its cheliped—the chief grasping organ of the animal, corresponding to the hand of a primate or the trunk of an elephant—and, whatever its use, it cannot be a means of passive concealment, to which its size is wholly inadequate<sup>2</sup>.

*Melia tessellata* is not recorded from the Indian region by Alcock, who finds the genus represented there by two quite distinct new species (*M. caestifer* and *M. pugil*). It would be interesting to know the precise distribution, geographical and habitative, of these three species. The "hairs" mentioned by Alcock as found on the fingers of his new species may possibly be the remains of actinians, rotten from bad preservation, and in that case it would be needful to determine whether each species of crab has its own species of anemone. Of course we must also know whether the latter be full grown or only young individuals. The species was taken on the reef in Male, Addu, Minikoi and Goifurfehendu Atoll.

Subfamily **Xanthinae.**Genus *Cymo* de Haan, 1833.

The members of this genus live under stones, in coral blocks, etc.

<sup>1</sup> The fact was noted in 1880 by Richter (Möbius' *Meeres-fauna Mauritius*), but since then its interest, and indeed its very existence, have been generally overlooked.

<sup>2</sup> The ant *Oecophylla smaragdina* uses its own larvae (which have glands for making a cocoon) as spinning imple-

ments to fasten together the edges of the leaves which form its home, holding them, the while, in its jaws. There is also said to be a wasp which uses a stone to beat down the earth over its burrow.



19. *Cymo andreossyi* (And.) 1826, var. *melanodactylus* (de Haan) 1833. Alcock, III. p. 174.

Taken on the shore in Minikoi and Goifurfehendu Atolls, and dredged from 12 fathoms in Fadifolu Atoll.

20. *Cymo quadrilobatus*, Miers, 1884. Alcock, III. p. 175. This species is probably identical with *C. tuberculatus* Ortmann (*Zool. Jahrb.* VII. Syst., p. 443).

Taken on the shore in Male, Goifurfehendu and Fadifolu Atolls.

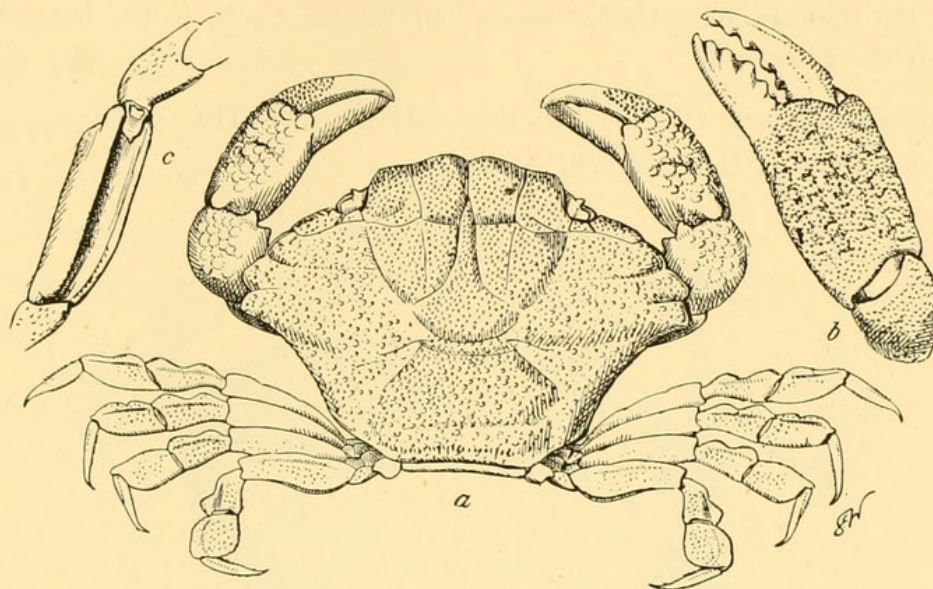


FIG. 50. *Xantho frontalis*; a. whole animal, b. outside of hand, c. underside of meropodite of walking leg, to show the groove into which the last three joints can be folded.

Genus *Xantho* Leach, 1815.

21. *Xantho frontalis*, n. sp. (Fig. 50).

Diagnosis: "A *Xantho* with the whole body finely and evenly granulated, the regions marked out by fine sharp lines; the front prominent, its outline like that of a cupid's bow; the anterolateral edge divided into four lobes, of which the first two are low and rounded and the last two prominent and conical; the chelipeds subequal, their outer surface rough and uneven, the hands with four indistinct longitudinal ridges, the fingers furrowed and bearing interlocking teeth, the upper side of the hand with an irregular-rounded lobe, the inside of the wrist with a conical tooth; and the walking legs short, with long end-joints, two knobs on the upper side of the carpopodite, and a hollow under the meropodite into which the outer joints can be folded."

Length: 5 mm. Breadth: 8 mm. Colour in spirit: white with pale-brown fingers.

Genus *Xanthias* Rathbun, 1897.

22. *Xanthias lamarcki* (H. M. Edw.), 1834. Alcock, III. p. 157.

Taken on the shore in Male, Goifurfehendu, Miladumadulu, Fadifolu, S. Mahlos, and Minikoi Atolls.



23. *Xanthias notatus* (Dana), 1852. Alcock, III. p. 158.

Taken on the reef and in the lagoon at Minikoi.

Genus *Leptodius*, A. M.-Edw., 1863.

The numbers of this genus may be taken under stones and in coral stocks.

24. *Leptodius nudipes* (Dana), 1852. Alcock, III. p. 121.

Taken on the shore in Male, Goifurfehendu and Minikoi Atolls; in the latter locality from a coral mass on the outer reef.

25. *Leptodius sanguineus* (H. M.-Edw.), 1834. Alcock, III. p. 119.

Taken on the shore in Goifurfehendu Atoll.

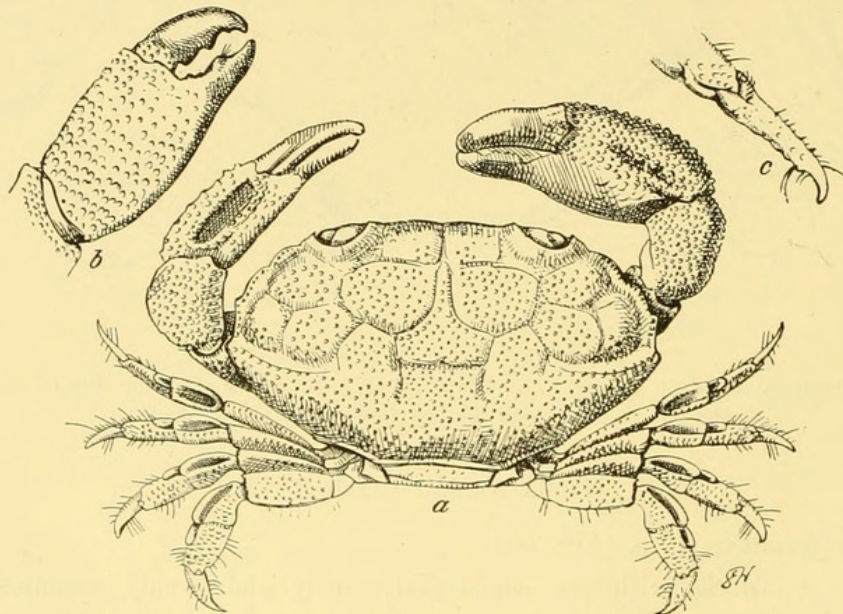


FIG. 51. *Leptodius cristatus*; a. whole animal, b. outside of hand, c. end of walking leg.

26. *Leptodius* (*Xanthodius*) *cristatus*, n. sp. (Fig. 51).

Diagnosis: "A *Xanthodius* with the carapace flat behind, falling steeply in front, somewhat sparsely granular all over, the granules being smaller and closer set in the hinder part, and naked, the forepart of the carapace divided up by wide, smooth grooves; the front bent strongly downwards, with an almost straight, thickened, granular edge and a rather shallow notch in the middle; the notches in the orbital rim indistinct; four low side-teeth with thickened, granular edges; the hind edge of the carapace slightly hollowed; a feeble ridge on the endostome reaching the fore edge of the mouth; the basal joint of the antenna short; the chelipeds unequal, granular all over except on the facet against the body, the hands with a crest and a smooth furrow above, the fingers deeply hoofed at the tip, a little granular at the base, furrowed on the smaller hand only, with a few blunt teeth on the larger hand; and the walking legs finely granular, their last two joints hairy; the carpopodite and propodite with a crest and a broad smooth groove above."



Length: 5 mm. Breadth: 7 mm. Colour in spirit: mottled purple and orange-brown, fingers dark-brown with paler tips.

Four female specimens were found under stones on the inner part of the reef-flat at Minikoi.

Genus *Lioxantho* Alc., 1898.

27. *Lioxantho asperatus* Alc., 1898. Alcock, III. p. 92.

The specimens agree exactly with Alcock's definition, except in not having hair on the dactylopodites.

Taken on the shore at Hulule, Male Atoll.

28. *Lioxantho tumidus*, Alc., 1898. Alcock, III. p. 91.

Taken on the shore in Male and Goifurfehendu Atolls.

29. *Lioxantho punctatus* (H. M. Edw.), 1834. Alcock, III. p. 91.

Taken on the shore at Hulule, Male Atoll.

Genus *Liomera* Dana, 1851.

30. *Liomera cinctimana* (White), 1847. Alcock, III. p. 88.

Taken on the shore at Goidu, Goifurfehendu Atoll.

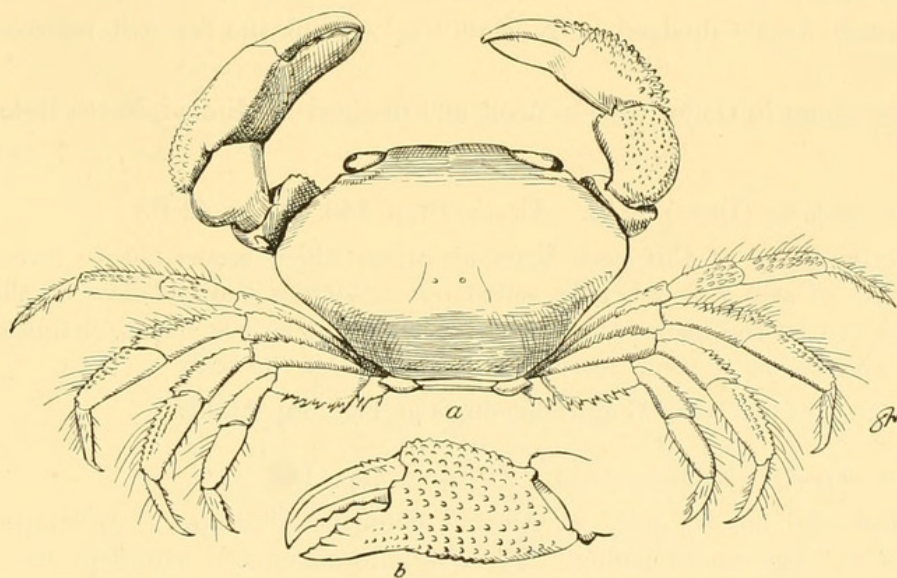


FIG. 52. *Liomera spinipes*; a. whole animal, b. outside of hand.

31. *Liomera spinipes*, n. sp. (Fig. 52).

Diagnosis: "A *Liomera* with the carapace smooth and polished, without a trace of regions, rather more than half as long as broad; the front divided into two well-marked rounded lobes of simple outline; the anterolateral edge sharp, almost crest-like in its hinder half, with traces of the last two lobes only, not marked off by a tubercle from the posterolateral edge; the orbital rim without notches; the antennal flagellum rather longer than the breadth of the orbit; the fore edge



of the third maxilliped almost straight; the chelipeds stout; the arm short and broad, with a large tooth near the end of the upper edge and the lower edge roughened; the outside of the wrist roughened in parts; the outside of the hand covered with small, sharp thorns, and some of the same thorns on the base of the moveable finger; the fingers compressed, toothed on their opposite edges, and furrowed outside; and the walking legs having the upper edge of the meropodites much compressed and finely toothed, but not crested; the lower edge of the last meropodite with long thorns, those of the other meropodites with much smaller thorns, and the carpopodites and propodites of all the legs rather sparsely hairy, with broad upper sides covered with prickles."

Length: 5 mm. Breadth: 8 mm. Colour in spirit: white.

Dredged in 30 fathoms in Mulaku Atoll.

Genus *Actaea* de Haan, 1833.

32. *Actaea tomentosa* (H. M.-Edw.), 1834. Alcock, III. p. 140.

Taken on the reef in Male, Goifurfehendu, Addu, and Minikoi Atolls.

33. *Actaea affinis* (Dana), 1852.

*Actaea affinis*, Borradaile, *Proc. Zool. Soc.*, 1900, p. 583.

Taken on the reef in Male, Goifurfehendu, Fadifolu, and Minikoi Atolls.

34. *Actaea rufopunctata* (H. M.-Edw.), 1834. Alcock, III. p. 142.

One very small female dredged in N. Male was without the fine felt between the lobules of the back.

Taken on the shore in Goifurfehendu Atoll, and dredged in Minikoi, North Male, and Miladumadulu Atolls.

35. *Actaea speciosa* (Dana), 1852. Alcock, III. p. 143. (Fig. 42 C.)

The first walking leg of this crab bears an organ which seems not to have been noticed hitherto. A brush of stiff yellow bristles surrounds and hides the end-claw on the last joint of the limb. What can be the use of this structure it is hard to see, but so definite and constant an organ must correspond to some feature in the habits of the crab.

Taken on the reef in Male, Goifurfehendu, and Fadifolu Atolls.

36. *Actaea ruppelli* (Krauss), 1843. Alcock, III. p. 144.

The specimens are not so hairy as Alcock's definition indicates. A. Milne-Edwards says that the species is "légèrement poilue." Probably the amount of hair depends greatly on the state of preservation of the specimens, in this as in other Xanthids.

Taken on the reef in Goifurfehendu Atoll.

37. *Actaea lata*, n. sp. (Fig. 53).

Diagnosis: "An *Actaea* with the carapace broad (length : breadth = about 7 : 10) and strongly lobulated all over, though the lobules are not very convex, the grooves between the lobules smooth and lined with fine dark pile, the lobules covered with pearly granules, which are smaller on the hinder lobules than on those before them, long golden-brown hairs and



shorter black bristles arising among the granules, the front bent strongly downwards, not much arched or very strongly notched in the middle line; the anterolateral edge with four low lobes, the first being confluent with the orbital angle; the orbit with two notches in its upper rim and one in the lower; the under side of the body furred, and grooves running from between the lobes of the edge over the finely granular pterygostome; the posterolateral edge not marked by a row of granules; the chelipeds subequal, the wrist and hand lobulated above, the hands swollen, rounded and covered with granules outside and inside, the fingers short, much arched, not compressed or hollowed at the tip, with a few blunt teeth on the opposed edges and some granules at the base of the moveable one, which is furrowed, though not to the tip; and the walking legs covered with granules, hairs and bristles like those of the carapace and with a furrow on the hinder side of the carpopodite."

Length: 7 mm. Breadth: 10 mm. Colour in spirit: white with red spots; the fingers black with white tips, the black spreading over a great part of the inner and outer sides of the palm.

The species is allied to *A. hirsutissima* (Rüppell), 1830, and *A. kraussi* Keller, 1861, but may be distinguished from both by the shape of the hands.

Dredged in 15 fathoms in Fadifolu Atoll.

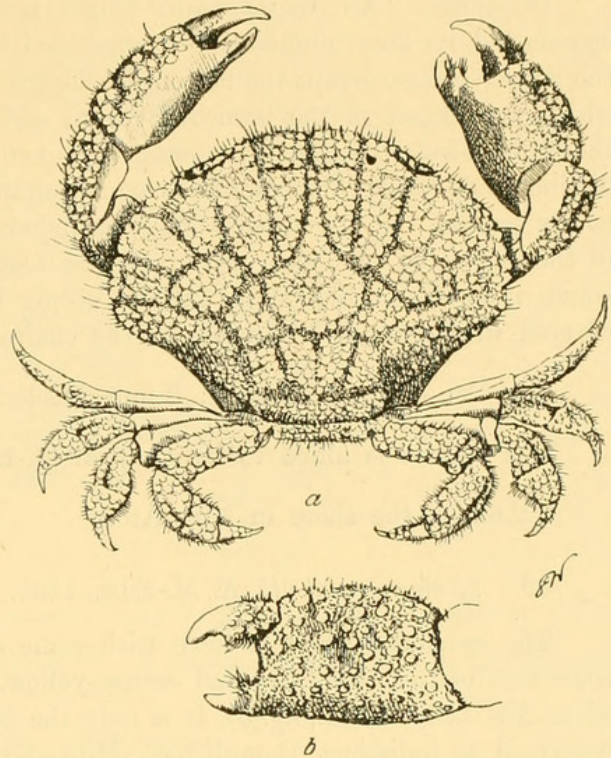


FIG. 53. *Actaea lata*; a. whole animal, b. outside of hand.

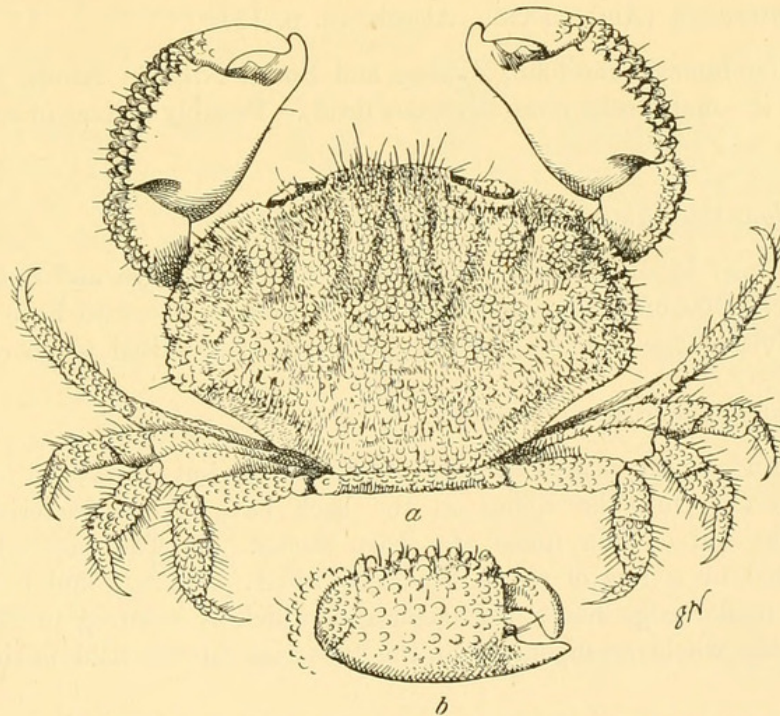


FIG. 54. *Actaea variolosa*; a. whole animal, b. outside of hand. The animal is drawn rather broader than it actually is.



38. *Actaea variolosa*, n. sp. (Fig. 54).

Diagnosis: "An *Actaea* whose length is about three-quarters of its breadth; the carapace egg-shaped, its areas numerous but separated by shallow grooves on the fore-part, wanting behind, the whole surface, except the bottom of the grooves in the fore-part, covered with rounded granules, which are largest in the branchial region and are interspersed with stout, golden-brown bristles; the front bent strongly downwards, prominent, fairly deeply notched in the middle; four indistinct side-lobes; the chelipeds equal, granular; the hands rather large, somewhat swollen, nearly square; the fingers very short, rounded, smooth save for a few small granules on the base of the moveable one, each with but one tooth, which is very blunt and lies quite at the base where it is almost hidden by tufts of strong hairs; and the outer surface of all the walking legs covered with granules like those of the cheliped but with no dimples."

Length: 6 mm. Breadth: 8 mm. Colour in spirit: white, bases of fingers black.

The species is allied to *A. obesa* A. M.-Edw., 1865, but differs in the shape of the hands.

Taken on the shore in Male Atoll.

39. ? *Actaea pulchella* A. M.-Edw., 1865. Alcock, III. p. 140.

The specimen which I have with some doubt assigned to this species has a very distinct coloration of mottled white and orange-yellow. As in Milne-Edwards's figure (*Nouv. Arch. Mus. Hist. Nat.* I., Pl. XVII., fig. 5), it is only the first of the side lobes of the carapace that can be described as indistinct, though both Milne-Edwards and Alcock apply this term to all of them. If Milne-Edwards's figure be not correctly drawn, then my specimen represents another, and probably a new species.

Dredged in 25 fathoms in North Male Atoll.

40. *Actaea granulata* (And.), 1825. Alcock, III. p. 151.

Dredged in Haddumati, Fadifolu, Mahlos, and South Nilandu Atolls, in 19—50 fathoms. In two cases taken in coral stocks (one alive, one dead). Possibly it lives in such positions, rather than under stones.

41. *Actaea flosculata* Alc., 1898. Alcock, III. p. 151.

Taken on the reef in Miladumadulu and dredged in Suvadiva and South Nilandu Atolls, in 19—38 fathoms. One of the South Nilandu specimens is noted to have come from a block of *Pocillopora*. Neither this nor the species akin to it seem suited to an exposed life.

42. *Actaea spinosissima* n. sp. (Fig. 55).

Diagnosis: "An *Actaea* nearly akin to *A. flosculata*, but with the following differences from that species: (1) Only the spines on the back have the characteristic petaloid shape. Those at the sides and on the limbs are sharp thorns. (2) The posterolateral edge of the back is not marked by a row of small beads, as in *A. flosculata* and in *A. perspinosa* (see below). (3) The hinder edge has a thickened rim, which is wanting in the above-mentioned two species, and the whole arrangement of the tubercles on the field behind the post-gastric



furrow is different, as will be seen by comparing the figures. (4) The peculiar tubercles on

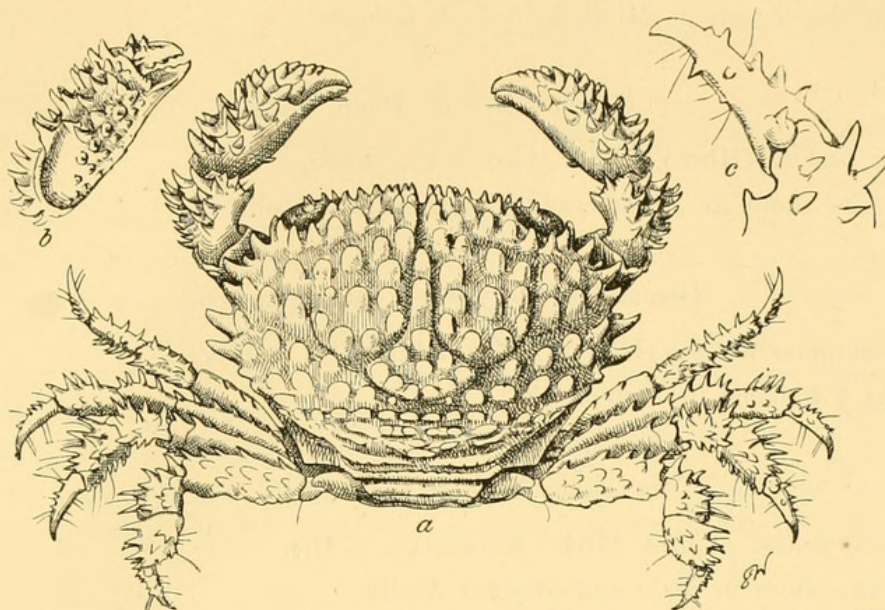


FIG. 55. *Actaea spinosissima*; a. whole animal, b. outside of hand, c. end of walking leg enlarged.

the outside of the hand of *A. flosculata* are replaced in *A. spinosissima* by sharp thorns, and the teeth on the apposed edges of the fingers are less stout."

Length: 4 mm. Breadth: 5.2 mm. Colour in spirit: white.

Dredged in Mahlos Atoll, in 23 fathoms.

43. *Actaea perspinosa*, n. sp. (Fig. 56).

Diagnosis: "An *Actaea* nearly akin to *A. flosculata*, but differing from it in that, in place of the characteristic petaloid spines of the latter species, it is covered with stout, sharp thorns of an entirely different shape."

From *A. spinosissima* it differs in the points indicated above, and from *A. acantha* A.-M. Edw., 1861, and *A. hystrix* Miers, 1886, in the greater size and smaller number of the spines.

Length: 4 mm. Breadth: 5.5 mm. Colour in spirit: pure white.

Dredged in Miladumadulu Atoll in 25 fathoms.

44. *Actaea fossulata* (Girard), 1859. Alcock, III. p. 148. (Fig. 41 A.)

The bridge across the hollow on the carpopodites of the walking legs is not always to be found. Taken on the reef at Hulule, Male Atoll, and in Funadu Velu, Miladumadulu.

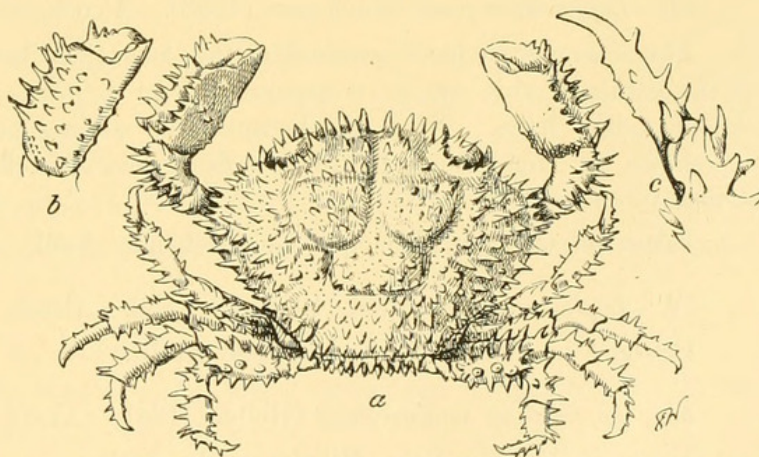


FIG. 56. *Actaea perspinosa*; a. whole animal, b. outside of hand, c. end of walking leg enlarged.



45. *Actaea cavipes* (Dana), 1852. Alcock, III. p. 147.  
Dredged in the lagoon at Minikoi, in 7—9 fathoms.

Genus *Daira* de Haan, 1833.

46. *Daira perlata* (Hbst.), 1790. Alcock, III. p. 155.  
Taken on the shore in Minikoi and Goifurfehendu Atolls.

Genus *Lophozozymus* A. M.-Edw., 1863.

47. *Lophozozymus dodone* (Hbst.), 1801. Alcock, III. p. 108.  
Dredged in 4 fathoms in Male Atoll.

Genus *Zozimus* Leach, 1818.

48. *Zozimus aeneus* (Linn.), 1764. Alcock, III. p. 164.  
Taken on the shore in Male and Minikoi Atolls.

Genus *Lophactaea* A. M.-Edw., 1862.

49. *Lophactaea anaglypta* (Heller), 1861. Alcock, III. p. 102.  
Taken on the reef at Hulule, Male Atoll.
50. *Lophactaea cristata* A. M.-Edw., 1865. Alcock, III. p. 100.  
Taken in Funadu Velu, Miladumadulu Atoll.

51. *Lophactaea fissa* Henderson (1893). Alcock, III. p. 103.

Alcock seems to have overlooked the fact that, besides the wide gaps in the side edge of the carapace, this species is separated from *L. granulosa* by the presence of a thick coating of long yellow hairs. No doubt because this coating hides the granules of the carapace it is not shown in Henderson's figure (*Tr. Linn. Soc. Zool.* 2. v., pl. XXXV. fig. 8), though he describes it.

Taken on the reef at Goidu, Goifurfehendu Atoll.

52. *Lophactaea granulosa* (Rüppell), 1830. Alcock, III. p. 101.  
Dredged in Felidu and South Male Atolls.

53. *Lophactaea semigranosa* (Heller), 1861. Alcock, III. p. 101.  
Taken in Funadu Velu, Miladumadulu Atoll.

Genus *Atergatis* de Haan, 1833.

54. *Atergatis floridus* (Rumph). Alcock, III. p. 98.  
Taken on the reef at Hulule, Male Atoll, under stones.



Subfamily **Carpilinae.**Genus *Phymodius* A. M.-Edw., 1863.55. *Phymodius ungulatus* (H. M.-Edw.), 1834.*Phymodius ungulatus*, Ortmann, *Zool. Jahrb. Syst.* VII. p. 464 (1893); Alcock, III. p. 162 (1898).*Phymodius monticulosus*, Alcock, III. p. 163 (1898).

I am quite unable to distinguish between these species, or to assign my specimens to either of them rather than to the other. All the characters vary, as it seems independently, and the descriptions given by several authors do not always agree. Until examination of a long series of full-grown males have shown whether there exist varieties corresponding to the above two names, and if so exactly in what points they differ, I prefer to follow Ortmann in joining the species absolutely, without keeping varietal names.

These crabs, which were taken on the reef in Hulule and Goifurfehendu Atolls and in lagoons in 3—7 fathoms in Minikoi and Miladumadulu Atolls, live in coral stocks and under stones.

56. *Phymodius sculptus* (A. M.-Edw.), 1873. Alcock, III. p. 164.

Taken on the reef in Male and Goifurfehendu Atolls.

Genus *Chlorodius* H. M.-Edw., 1834.

The members of this genus are often found in coral stocks.

57. *Chlorodius laevis* Dana, 1852. Alcock, III. p. 161.

In one specimen the teeth on the inner side of the fingers are wanting in the small chela and obsolescent in the large. The colour of many specimens is yellow, rather than white.

Taken on the reef in Goidu and Fadifolu Atolls, and dredged in South Nilandu and Mahlos Atolls in 22—25 fathoms.

58. *Chlorodius barbatus* Borradaile, 1900. (Fig. 41 D.)*Chlorodius barbatus*, Borradaile, *Proc. Zool. Soc.* 1900, p. 587, pl. XLI. fig. 4 (1900).

Taken on the reef, and in lagoons down to 9 fathoms, in Minikoi, Goifurfehendu, and Miladumadulu Atolls.

59. *Chlorodius niger* (Forsk.), 1775. Alcock, III. p. 160.

Taken in Male, Fadifolu, Goifurfehendu, Felidu, North Male, and Minikoi Atolls on the reef and in lagoons down to 25 fathoms.

Genus *Euxanthus* Dana, 1851.60. *Euxanthus exsculptus* (Hbst.), 1790; var. *rugosus* Miers 1884. (Fig. 41 C.)*Euxanthus melissa*, Alcock, III. p. 110.

Since Miers speaks of a specimen of some size, it is likely that this is at least a variety,



and not merely a young form. I am inclined to think that it will prove to be a distinct species. The specimen before me measures 14 mm. in length and 21 in breadth. The brown colour of the fingers does not spread over the palm. Taken on the reef at Hulule, Male Atoll.

Genus *Carpilodes* Dana, 1851.

61. *Carpilodes stimpsoni*, A. M.-Edw., 1865. Alcock, III. p. 82.

Taken on the reef at Goidu, Goifurfehendu Atoll.

62. ? *Carpilodes pediger* Alc., 1898. Alcock, III. p. 83.

Two small male specimens in the collection may either be the young of this species or belong to *C. ruber*. The colour is that of *C. pediger*. They were dredged in Miladumadulu and Fadifolu Atolls in 20 and 23 fathoms respectively.

63. *Carpilodes ruber* A. M.-Edw., 1865.

*Carpilodes ruber*, A. Milne-Edwards, *Norw. Arch. Mus.* p. 228, pl. XI. fig. 4 (1865).

Dredged in 25 fathoms in South Nilandu Atoll.

64. *Carpilodes vaillantianus* (A. M.-Edw.), 1862. Alcock, III. p. 85.

Taken on the reef in Male and Goifurfehendu Atolls, in Funadu Velu, Miladumadulu, and in Minikoi lagoon. In the latter locality a specimen was found among the leaflets of the *Halimeda*-weed, where its bright red colour could not be in the least protective.

65. *Carpilodes monticulosus* A. M.-Edw., 1873. Alcock, III. p. 86.

This species, which lives under stones, was taken on the reef at Male, Goifurfehendu, and Minikoi Atolls.

66. *Carpilodes pallidus* Borradaile, 1900.

*Carpilodes pallidus*, Borradaile, *Proc. Zool. Soc.* 1900, p. 586, pl. XL. fig. 1.

This species is allied to *C. monticulosus* and to *C. cariosus*. It differs from the former in that: (1) There is no narrow transverse ridge behind the mesogastric lobule. (2) The furrows of the carapace are not so deep. (3) The colouring is quite different.

From *C. cariosus* it differs in that: (1) The lobules are not pitted, and the carapace has therefore not a worm-eaten appearance. (2) There is no transverse ridge behind the mesogastric lobule, and the branchial lobules are not broken up into smaller ones. (3) The furrows between the lobules are rather shallow. (4) Counting the groove which marks off the mesogastric lobule and that which runs within the hinder edge, there are altogether three grooves behind the lobule in question, but the middle of the three is shallow, and may consist of two separate dimples, hardly connected across the middle line. (5) The notch between the first two lobules of the edge may be rather indistinct. (6) The pink colour of the legs does not tend to orange (as in most of my specimens of *C. cariosus*), and even in the most brightly coloured specimens there is no trace of colour on the carapace.

Taken on the reef at Hulule, Male Atoll.



67. *Carpilodes cariosus* Alc., 1898. Alcock, III. p. 86.

The colour in most of my specimens is not pink but orange-yellow<sup>1</sup>. One small male from Miladumadulu, however, exactly agrees with Alcock's description of the colouring, and at the same time differs from the yellow-marked specimens in having less extensive patches of colour on the back, and in that the lobules of its carapace are somewhat more compact and less irregular in shape. It is possible that this is the true *C. cariosus*, while the other specimens belong either to a distinct species or to a variety.

Dredged in Miladumadulu, Suvadiva, Mahlos, Fadifolu, Male, and South Nilandu Atolls, in 20—40 fathoms.

Genus *Carpilius* Desm., 1825.

68. *Carpilius maculatus* (Linn.), 1764. Alcock, III. p. 79.

This species was seen both at Minikoi and in the Maldives. It may be found wedged into holes on the reef, just above low water-mark, exposed to the full force of the surf.

69. *Carpilius convexus* (Forsk.), 1775. Alcock, III. p. 80 (Fig. 41 B, 42 A).

Taken in Fadifolu, Male, Minikoi and North Male Atolls on the reef and in lagoons down to 35 fathoms.

Subfamily **Etisinae**.

Genus *Chlorodopsis* A. M.-Edw., 1873.

70. *Chlorodopsis spinipes* (Heller), 1861. Alcock, III. p. 169.

Taken on the reef in Male and Minikoi Atolls.

71. *Chlorodopsis woodmasoni* Alc., 1898. Alcock, III. p. 171.

Taken on the reef in Male, Fadifolu and Goifurfehendu Atolls, and dredged in 6 fathoms in Male Atoll.

72. *Chlorodopsis frontalis* (Dana), 1852.

? *Etisodes frontalis*, Dana. *U.S. Expl. Expt. Crust.* I. p. 187, pl. IX. fig. 3 (1852).

[Not *Etisodes frontalis*, Borradaile, *Proc. Zool. Soc.* 1900, p. 588 (1900) = *Leptodius sanguineus* H. M.-Edw., 1834, juv.]

The collection contains specimens of a crab which resembles Dana's species in all but the following points: (1) The forepart of the carapace derives its roughness, not from minute granules, but from minute dimples. (2) The carapace is a little broader than in Dana's figure. (3) The chelipeds are not entirely "unarmed," for the wrist bears two blunt teeth on the inside.

The front and the upper edges of the legs of the last four pairs are finely toothed. The fore edge of the meropodite of the third maxilliped is but slightly hollowed. The length of the carapace is very little more than  $\frac{3}{4}$  of the breadth.

I have placed this species in the genus *Chlorodopsis* because the fronto-orbital breadth is a little more than half the greatest breadth, and because of the outline of the fore edge of the meropodite of the third maxilliped. The front is not broad enough to justify its being

<sup>1</sup> *C. vaillantianus* also often tends to orange rather than crimson, when preserved in spirit.



placed in the subgenus *Cyclodius*, being less than half the breadth of the carapace. In any case the species seems to be a transitional one.

The specimens mentioned under the name of this species in the *P. Z. S.* for 1900 were small individuals of *Leptodius sanguineus*.

Taken on the reef on Male Atoll and dredged in 25 fathoms in South Nilandu Atoll.

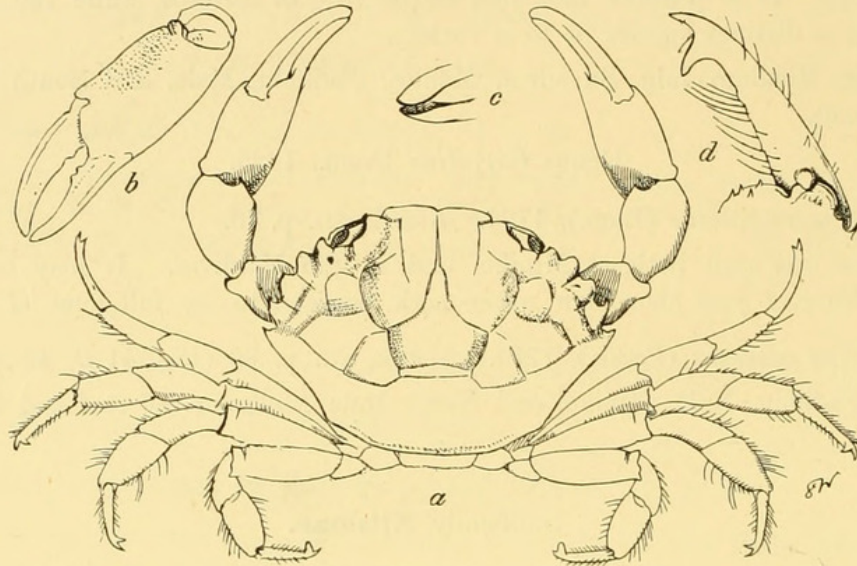


FIG. 57. *Chlorodopsis espinosus*; a. whole animal, b. outside of hand, c. ends of fingers to show hoof-like tips, d. end of walking leg enlarged.

73. *Chlorodopsis espinosus*, n. sp. (Fig. 57).

Diagnosis: "A *Chlorodopsis* whose length is just under  $\frac{3}{4}$  of the breadth, the carapace hairless, of even surface but minutely granular, areolated as in *C. frontalis* (Dana); the front slightly arched, slightly notched in the middle, with thickened edge; the anterolateral edge with five sharp teeth (including the orbital angle), of which the two hindmost are thorn-like; the hinder edge slightly arched; the orbital gap very narrow, so that the prolongation of the basal joint of the antenna is hard to see; the fore edge of the meropodite of the third maxilliped only slightly concave, with a small projection at its inner end; the chelipeds equal, without tubercles or thorns except one sharp thorn at the inner angle of the wrist, the hand narrow, with a faint groove above and a groove down each finger, the fingers as long as the upper edge of the palm, gaping, with a few sharpish teeth and hoof-like ends; and the walking legs hairy, with spines on the end-joints, and a double end-claw."

Length: 8 mm. Breadth: 12 mm. (Largest specimen.) Colour in spirit: white; the fingers brown with white tips.

This species differs from most *Chlorodopsis* in the absence of spines from the back and chelipeds.

Taken in Funadu Velu, Miladumadulu Atoll.

74. ? *Chlorodopsis* (*Cyclodius*) *ornata* Dana, 1852. Alcock, III. p. 171.

I have assigned several small specimens to this species, but am uncertain whether they are not really the young of *Phymodius unguulatus*. They agree with Alcock's definition, except



in that the basal joint of the antenna does not fill the orbital gap, though the flagellum is not placed at its apex, a small process extending inwards towards the orbit as shown in Dana's figure (*U. S. Expl. Expd. Crust. Atlas*, Pl. XII. figs. 11 c, 11 d).

Taken on the reef in Male, Goifurfehendu and South Mahlos Atolls.

Genus *Etisodes* Dana, 1851.

75. *Etisodes anaglyptus* (H. M.-Edw.), 1834. Alcock, III. p. 133.

Taken on the reef in Goifurfehendu Atoll and dredged in 3—9 fathoms in Minikoi lagoon.

76. *Etisodes electra* (Hbst.), 1801. Alcock, III. p. 133.

In young specimens the lobes of the front are shorter, and not so equal as in old individuals, the middle lobes being distinctly broader than the outer. I doubt the specific distinctness of this form from *E. anaglypta*.

Taken on reefs and in lagoons in Male, Goifurfehendu, Miladumadulu, Fadifolu and Minikoi Atolls.

Genus *Etisus* H. M.-Edw., 1834.

77. *Etisus laevimanus* Randall, 1839. Alcock, III. p. 131.

Alcock quotes only figures 1 a—b on Dana's plate X., seeming thus to exclude figs. 1 f—h, which Dana labels as young females of the same species. My specimen, a female, exactly resembles these latter figures.

Taken on the reef at Hulule, Male Atoll.

#### Subfamily **Eriphiinae.**

Genus *Domecia* Eyd. and Soul., 1841.

78. *Domecia hispida* Eyd. and Soul., 1841 var.? (Fig. 41 e.) See Alcock, III. p. 230.

My specimens agree with the figures and descriptions of *D. hispida*, but have no hairs on the carapace.

This is a true coral crab, like *Trapezia* and *Melia*, and lives among the branches of living corals. It was taken on the reef at Goidu, Goifurfehendu Atoll, and seen also in Minikoi.

Genus *Eriphia* Latr., 1817.

79. *Eriphia laevimana* Latr., 1817. Alcock, III. p. 214.

This species, which was taken at Minikoi, lives in holes in the rocks and is rather active in its movements.

80. *Eriphia scabricula* Dana, 1852. Alcock, III. p. 216.

Taken on the reef in Minikoi and Addu Atolls. Lives under stones and in coral stocks.

#### Subfamily **Trapeziinae.**

This group of little, square-bodied crabs, with a broad front and a smooth, usually polished, cuticle (Figs. 41 f, 56), is very characteristic of the Indopacific region, to which its members



are restricted, and within which they are everywhere abundant on coral reefs. They find shelter on various sessile animals, especially branched corals, from which they are usually not to be dislodged except by breaking up the stock, and it is very remarkable that they are found only on living corals, and in these only on those branches which are still alive. Yet they do not eat or in any way damage their host, contenting themselves with deriving protection from its stinging-cells<sup>1</sup>. In correspondence with this habitat, their legs are rather slender, and have end-joints which can be moved through a considerable arc, so as to form with the next joint a kind of hook, serviceable for grappling the branches of the host. These end-joints (Figs. 42 B, 58 c) are remarkable and interesting structures when the habitat of the crabs is borne in mind. Besides the peculiar flange working on the joint before, which has been described above on p. 242, and is probably an adaptation to clambering, there are several other modifications, which seem intended to give the animals a better foothold on the rugged and yet slimy surface of the coral. Thus the joint is covered with hairs, and among these are a number of stout, moveable prickles. The claw at the end of the joint is bent sharply forming a hook, and is smooth and pointed in *Quadrella*, while in *Trapezia* it is broad and shovel-like, and bears above two rows of structures resembling the prickles but rounded at the end. It is likely that the smoothness of the bodies of these crabs is due to the same cause as that of other semiparasitic Decapods, such as the mussel-prawns and crabs (*Pontonia* and *Pinnotheres*), and that this cause is the need of inconveniencing as little as possible the animals which give them shelter. *Trapezia* and *Tetralia* especially affect corals, but *Quadrella* has been taken on Alcyonarians of various kinds, and even among pearl-mussels<sup>2</sup>.

The Trapeziinae are exceptional among Xanthids on account of their tendency to form varieties, and present the feature, unusual in crabs, of definite colour forms. It is possible that some of these forms may be physiological phenomena of the same kind as the colour-phases of prawns<sup>3</sup>, but others are associated with structural features, and cannot well be of this nature. It is also important to note that, in *Trapezia*, they bear no relation to the colour of the coral. For the present it were well that none of them were overlooked, and I have therefore revived, in two cases, colour names which had been dropped, without, however, intending any implication as to the nature of the phenomena.

The synonymy of this group is extremely intricate, and the authority followed here is Ortmann, in his late revision [*Zool. Jahrb. Syst.* x. ii. p. 201 (1897)].

#### Genus *Trapezia* Latr., 1825.

81. *Trapezia ferruginea* Latr., 1825 (Fig. 41 F, 42 B).

i. Var. *typica* Ortm., 1897, Alcock, III. p. 220.

On reefs and in lagoons down to 35 fathoms in Goifurfehendu, Male, Fadifolu, Addu, Minikoi, South Nilandu, Suvadiva, and South Male Atolls.

ii. Var. *dentata* (Mackay), 1838. Ortmann, *loc. cit.* p. 204.

On reefs at Male, Goifurfehendu and Fadifolu Atolls and in Suvadiva lagoon in 25 fathoms.

<sup>1</sup> I am much obliged both to Mr Stanley Gardiner and to Mr Forster Cooper for information confirming these statements. From first to last a very large number of coral stocks were broken up by the members of the expedition, and in none of these were *Trapezias* found anywhere but

among the living branches, nor was there any evidence of damage to the coral caused by them.

<sup>2</sup> Smith, *Proc. Boston Soc. Nat. Hist.* XII. p. 288 (1869).

<sup>3</sup> Gamble and Keeble, *Q. J. M. S.* XLIII. Pt. 4.



- iii. Var. *guttata* Rüppell, 1830. Alcock, III. p. 221.

On the reef in Goifurfehendu and in the lagoons of Mahlos, Suvadiva and North Male Atolls down to 25 fathoms.

- iv. Var. *maculata* (Mackay), 1838. Alcock, III. p. 221.

On the reefs in Goifurfehendu, Male, Fadifolu and Minikoi Atolls, and in the lagoons at Suvadiva and South Nilandu down to 25 fathoms.

82. *Trapezia cymodoce* (Hbst.), 1801. Alcock, III. p. 219.

The name *T. coerulea* was given by Heller in 1861 to specimens of this species in which the blue tinge, found to a greater or less extent in many individuals, was very conspicuous. The intermediate cases, however, between pure brown examples and those in which blue predominates, are so numerous, and form such a complete series, that it is impossible to keep *coerulea* even as a varietal name.

On reefs and in lagoons down to 35 fathoms in Male, Minikoi, Goifurfehendu, Fadifolu, South Nilandu, Suvadiva and Felidu Atolls.

83. *Trapezia digitalis* Latr., 1825. Ortmann, *loc. cit.*

- i. Var. *typica* = *T. digitalis*, Alcock, III. p. 222.

Dark-brown specimens.

Taken on the reef at Goidu, Goifurfehendu Atoll.

- ii. Var. *formosa* Smith, 1869. (*Proc. Bost. Soc. N. H.* XII. p. 286.)

This variety differs so sharply from the dark-brown true *digitalis* that it seems to deserve a separate varietal name. In structure the variety is like *digitalis*, but it somewhat resembles *T. ferruginea* in the shape of the front. This feature, however, varies considerably in *digitalis*. The earliest name for the orange-coloured form is *formosa* Smith. *T. corallina* Gerstaecker, 1856, is a coral-red crab.

84. *Trapezia rufopunctata* (Hbst.), 1790. Alcock, III. p. 222.

Taken on the reef in Male and Fadifolu Atolls, and in 19 fathoms in South Nilandu lagoon.

#### Genus *Tetralia* Dana, 1851.

85. *Tetralia glaberrima* (Hbst.), 1790. Alcock, III. p. 223.

The black colouring on the front of this species varies in breadth from an almost imperceptible line, through bands of greater breadth, to a suffusion of the whole carapace and limbs with dark coloration, and no purpose would be served by keeping Dana's name *nigrifrons*. But the colouring of the legs will, I think, be found to fall into definite varieties. The walking legs, in short, may be either: (1) Uniformly yellow. (2) Uniformly dark brown. (3) Yellow banded with dark brown across the middle of each joint. (4) Yellow with a sharp black spot at the end of the meropodites and propodites. (5) Yellow with narrow brown longitudinal stripes.

An examination of a long series of specimens would probably give interesting results.

Taken on reefs and in lagoons down to 35 fathoms in Goifurfehendu, Fadifolu, Male, Felidu, and Minikoi Atolls.



Genus *Quadrella* Dana, 1851.

86. *Quadrella coronata* Dana, 1852. Var. *granulosa* n. See Alcock, III. p. 266.

All the specimens of *Quadrella coronata* in the collection belong to a new variety, which differs from the type in the following features: (1) The carapace is distinctly broader than long. (2) The chelipeds are only about  $2\frac{1}{2}$  times as long as the carapace. (3) The chelipeds are frosted over with tiny granules set in short rows athwart the limb. On the underside of the hand the granules are less regular in arrangement, and, projecting in profile, give the inner (lower) edge of the hand an irregular, fine denticulation. (4) The colour in spirit is a uniform pale flesh-colour, purplish in places.

By the first three of these features the new variety is allied to var. *maculosa* Alc., but it differs from that variety in the following points: (1) The fore edge of the arm is not serrate, but bears about ten long thorns. (2) The coloration in spirit is different.

The following key shows the principal characters which separate the known varieties of *Q. coronata*:

I. Carapace as long as broad. Chelipeds polished. Colour in spirit uniform milk-white. [Fore edge of arm spined. Chelipeds  $2\frac{3}{4}$  times the length of the carapace.]

Var. A, *type* Dana, 1851.

II. Carapace broader than long. Chelipeds more or less frosted over with granules. More or less colour on the body.

A. Fore edge of arm spined. Colour in spirit uniform pale flesh-colour. [Chelipeds  $2\frac{1}{2}$  times the length of the carapace.]

Var. B, *granulosa* n.

B. Fore edge of arm serrate or finely denticulate. Colour arranged in a pattern.

i. Fore edge of arm serrate. Chelipeds  $2\frac{1}{2}$  times the length of the carapace. Colour in a network of fine lines.

Var. C, *reticulata* Alc., 1898.

ii. Fore edge of arm finely denticulate. Chelipeds  $2\frac{3}{4}$  times the length of the carapace(?). Colour in tiny purple dots.

Var. D, *maculata* Alc., 1898.

Var. *granulosa* was taken on a Gorgonacean dredged in 39 fathoms in Suvadiva Atoll and on a red Alcyonarian dredged in 25 fathoms in the same Atoll, and was dredged in 23 fathoms in Mahlos Atoll.

87. *Quadrella bispinosa*, n. sp. (Fig. 58.)

Diagnosis: "A *Quadrella* which is near akin to *Q. coronata* but differs from it in the following points: (1) The carapace is distinctly broader than long. (2) There is a spine on the anterolateral edge of the carapace, rather farther from the spine at the outer angle of



the orbit than from that which marks the junction of the antero- and postero-lateral edges, and rather smaller than the latter spine. (3) The upper, inner angle of the orbit is not spiniform, but is somewhat raised. The minute teeth which edge both the upper and lower rims of the orbit are, on this angle, increased in size and set farther apart, so that one or two of them can just be seen with the naked eye. (4) The chelipeds are frosted over with tiny granules as in some varieties of *Q. coronata*. The granules are somewhat larger underneath the hand. (5) The arm is rather shorter than in *Q. coronata*. (6) There are few thorns on the end-joints of the legs, but these joints are very hairy. (7) The colour in spirit is a rich orange-brown, paler on the walking legs and fingers.

A female with eggs was dredged in 25 fathoms in Addu Atoll.

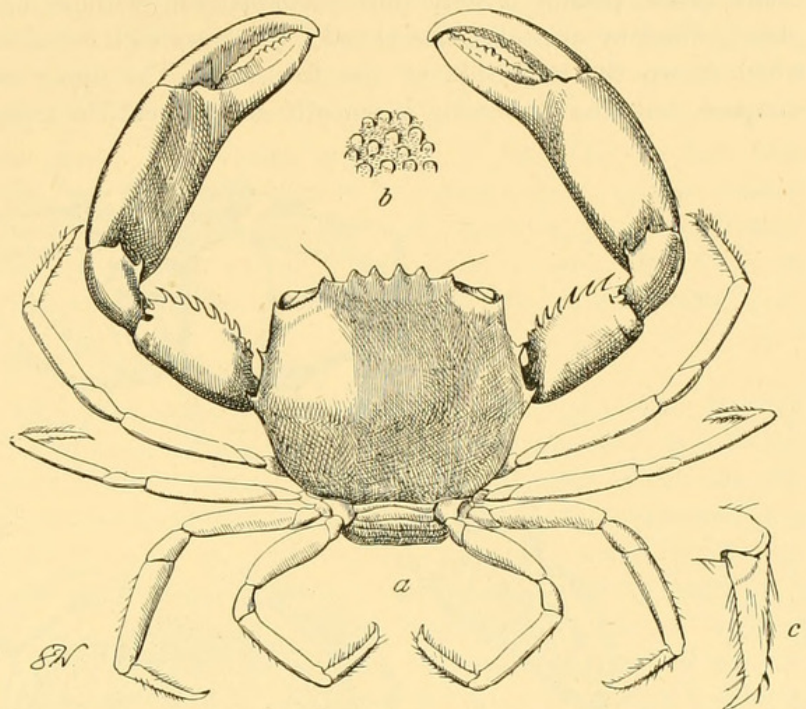


FIG. 58. *Quadrella bispinosa*; a. whole animal, b. part of outside of hand enlarged to show the scales, c. end of walking leg enlarged.

#### Subfamily Oziinae.

It is somewhat remarkable that the collection contains no example of this subfamily, whose genera (*Ozius*, *Epixanthus*, *Euruppellia* and *Baptozius*) contain several very common species which have been recorded from surrounding localities such as India, Ceylon, the Red Sea, and the Seychelles. Both Alcock (*loc. cit.*) and Ortmann (*Zool. Jahrb. Syst.* VII.) occasionally report species from the Maldives or Laccadives, but neither of them mentions a member of the Oziinae from those islands.

#### Genera incertae sedis.

#### Genus *Caecopilumnus*, n.

Among the decapods taken on the reef at Naifaru in Fadifolu Atoll is a small, *Pilumnus*-like crab whose orbital region has undergone a remarkable transformation, so that the animal appears to be absolutely blind. In a few words, this transformation consists in the orbits becoming very small, almost on the underside of the carapace, and completely filled by the eyestalks, while the small cornea lies on the underside of the stalk and is hidden in the orbit, so that the outline of the body is quite unbroken over the area where the open orbit should lie.

I propose to establish for this crab a new genus, under the name of *Caecopilumnus*, with the following characters: (1) *Carapace* roughly square, convex both fore and aft and from



side to side, hairy, and granular. (2) *Front* narrow, triangular with rounded apex, hollowed and grooved above. Front-orbital breadth small. (3) *Anterolateral edge* irregularly set with small spines, passing evenly into posterolateral, without orbital angle. (4) *Orbits* small, completely filled by eyestalks, not closed. (5) *Eyes* with relatively large end-joint but small cornea, which is on the underside at the free end. The upper side is granular and hairy like the carapace, but the underside is smooth and its cuticle transparent. (6) *Antennae* with rather

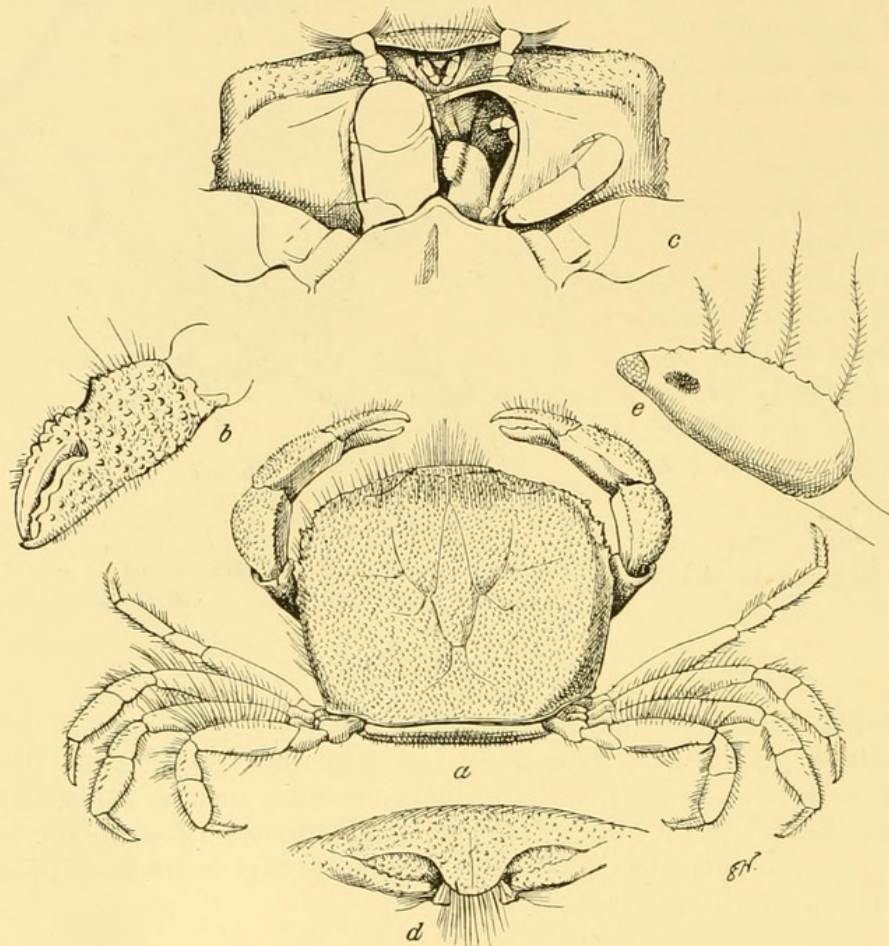


FIG. 59. *Caecopilumnus hirsutus*; a. whole animal, b. outside of hand, c. view of underside with roof of mouth laid bare, d. front view to show orbits closed by eyestalks, e. underside of eye enlarged, showing small cornea and mass of pigment within stalk. The hairs have been taken off the right side of the body.

broad basal joints, which do not completely fill the orbital gap. (7) *Third maxillipeds* with broad, squarish ischiopodite and meropodite, the latter having its fore edge rounded, and narrow exopodite. The carpopodite is attached distally to the meropodite. (8) *Endostome ridges* present and distinct, but not reaching the fore edge of the mouth. (9) *Chelipeds* equal, granular, with pointed fingers. (10) *Walking legs* stout and of moderate length.

The single specimen being a female, it is impossible to describe the characters of the male.

As to the habits, nothing is known, save that the crab was taken on the reef. There is nothing in its appearance to suggest a parasitic existence except the reduction of its eyes. Probably the peculiar conformation of the orbits is due to some circumstance which makes it



necessary to guard against the entrance of foreign bodies or enemies. Whether the eyestalks can be raised, upon occasion, so that the small eyes are exposed, it is impossible to say, but in the spirit specimen they are certainly so firmly fixed that they cannot be moved without breaking the carapace. The specimen is not well enough preserved to allow of statements being made as to the retina, but a small mass of pigment can be seen through the transparent underside of the eyestalk, at some distance from the cornea.

The systematic position of the genus is doubtful, especially in view of the fact that the male is not known. If it belong to the Xanthidae, it is perhaps more closely related to the Menippinae than to any other subfamily, but it may quite possibly be a Catometope allied to the Rhizopinae, and especially to the species which Miers referred doubtfully to *Typhlocarcinus* under the name *T. integrifrons* [*Ann. Mag. N. H.* (5), VIII. p. 260 (1881)].

1. *Caecopilumnus hirsutus*, n. sp. (Fig. 59).

Diagnosis: "A *Caecopilumnus* with the carapace moderately convex from side to side, strongly so fore and aft, granular and pubescent all over, the front strongly bent downwards, its sides sloping inwards to a groove in the middle, fringed with long hairs, which are also found all over the orbital region and eyestalks and along the sides of the carapace; the orbit very small, without orbital tooth or spine or notches in the rim; the anterolateral edge passing with an even sweep into the posterolateral behind, and in front fading away at a point behind and above the outer angle of the orbit, which thus comes to lie to a great extent on the underside of the body; the granules of the carapace enlarged along the anterolateral edge into small spines, arranged in four irregular sets; the hinder edge hollowed; the regions rather faintly marked; the eyestalks large relative to the orbits, which they entirely fill, fitting close against the thin, non-prominent rims, and thus complete the outline of the carapace, simulating the carapace in their granulation and hairs; cornea small and hidden on the underside of the eyestalk; chelipeds equal, granular, pubescent and hairy, these features extending to the fingers, the fingers compressed and grooved, with interlocking teeth on their apposed edges, and sharp, crossing tips; and walking legs of moderate length, very stout, especially the second and third, which have very long propodites, covered with long hairs but without spines."

Length: 8 mm. Breadth: 9 mm. Colour in spirit: white.

Genus *Maldivia*.

A white Gorgonacean, dredged in eight fathoms of water, in North Male, bore a minute but very interesting symbiotic crab, whose peculiarities justify the setting up of a new genus for it. The following are the characters of this genus: (1) *Carapace* hexagonal, swollen, a little longer than broad, hairless, roughened with granulations which pass into spines at the sides, and with indications of the regions. (2) *Front* broad, triangular, widely grooved, bent strongly downwards. (3) *Anterolateral edge* toothed, about equal to posterolateral. *Hind edge* wavy. (4) *Orbits* large, very slanting, not fully closed. (5) *Abdomen* of male seven-jointed. (6) *Endostome ridges* present, but not very strong. (7) *Eyes* large. (8) *Antennae* with slender basal joints which do not touch the front, and long flagella. (9) *Merus of third maxilliped* about as long as broad, without a notch in the fore edge, which is straight. (10) *Chelipeds* stout, *Pilumnus*-like, fingers not hollowed at the tip. (11) *Walking legs* moderately stout.

The genus resembles *Pilumnus* in the shape of the hands and the endostomial ridges.



The form of the carapace, the presence of endostomial ridges and the symbiotic habits recall *Quadrella*. The front and the spinate region at the side of the granulated carapace, and again the endostomial ridges, show a certain resemblance to *Caecopilumnus* described above, though the eyes and orbits are very different. The form of the antennae points to its true position being among the Menippinae, perhaps in the neighbourhood of *Pilumnus*.

2. *Maldivia symbiotica*, n. sp.  
(Fig. 60).

Diagnosis: "A *Maldivia* whose carapace is roughened with small tubercles, which in places, as on the anterolateral edge, pass into spines; the latter edge with four lobes, including the orbital lobe, each lobe bearing several spines, of which one is larger than the rest, while the lobes decrease in size from behind forwards; the chelipeds equal, bearing on the outside spines set in rows, a row along the upper edge being specially long, the fingers shorter than the hand; the walking legs moderately stout, bearing some long hairs."

Length: 1.5 mm. Breadth: 1.6 mm. Colour in spirit: white.

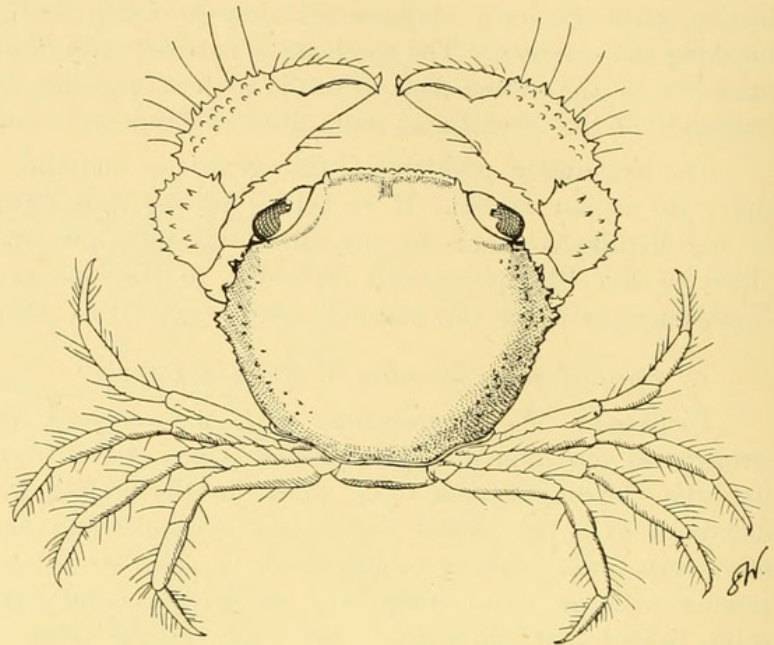


FIG. 60. *Maldivia symbiotica*, found on a gorgonian, whole animal greatly enlarged.

Family **Atelecyclidae**.

Subfamily **Thiinae**.

Genus *Kraussia* Dana, 1852.

1. *Kraussia rugulosa* (Krauss), 1843.

*Kraussia rugulosa*, Dana, *U.S. Expl. Exped. Crust.* p. 302, pl. 19, fig. 1 (1852).

Taken on the reef in Male, Goifurfehendu and Minikoi Atolls.

2. *Kraussia integra* (de Haan), 1837. Alcock, iv. p. 97.

A small specimen from Mahlos Atoll shows characters which recall *K. nitida* Stimps., 1858, in that the frontal lobes are subdivided, though not so deeply as in Stimpson's species, and the carapace is somewhat narrower than in adult specimens of *K. integra*. The teeth on the dactylopodites of the legs are small.

Taken on the reef in Male and dredged in 24 fathoms in Mahlos Atoll.



Family **Hapalocarcinidae.**

This interesting little family of symbiotic crabs, of which, in one case, only the females are known, is, as Calman has shown [*Tr. Linn. Soc. Zool.* (2), VIII. p. 43 (1900)], quite *incertae sedis*, and is taken here for convenience alone, and not on account of any relationship to the Xanthidae. It is discussed at length in Calman's paper. For some remarks on the importance of these crabs as affording by their holes a foothold for destructive boring organisms in the coral blocks, see a paper by Mr Stanley Gardiner in this part of the present publication.

Genus *Hapalocarcinus* Stimps., 1857.

1. *Hapalocarcinus marsupialis* Stimps., 1857. Calman, *loc. cit.*

Galls containing specimens of this crab were found on *Pocillopora* in the lagoon at Minikoi and on the reef at Hulule, Male Atoll.

Genus *Cryptochirus* Heller, 1861.

2. *Cryptochirus coralliodytes* Heller, 1861.

*Cryptochirus coralliodytes*, Heller, *S. B. Ak. Wiss. Wien*, XLIII. i. p. 366, pl. II. figs. 33—39 (1861); Semper, *Animal Life*, London, 1881, pp. 217, 221—223; Calman, *loc. cit.* p. 47.

Mr Stanley Gardiner has kindly given me the following note on this species: "A block of *Leptoria tenuis* which had a large number of round holes on the surface, up to 4 mm. across, was broken up. The holes, when traced in, were nearly all found to be occupied by a symbiotic crab [*Cryptochirus*]. In two holes, however, were crabs of the ordinary form [*Pseudozius*, see above, p. 241]. The holes varied in depth from 1—30 mm., the coral itself being in the latter position 48 mm. thick. Normally the animal would appear to live close to the surface—some slightly projected, with the carapace as a kind of shield closing the hole. When the block becomes more or less dry, they retreat into the bottom of the holes. I found some deserted holes, perhaps due to an accident in breaking the coral, but the crabs certainly could not wander, on account of the small size of the entrances of the holes. It is obvious that the crab must have taken up its abode on the coral, which afterwards enclosed it. [This refers to the inner hole, not to the funnel round it.] These commensals are extremely common in *Leptoria* from the lagoon at Minikoi, but are never found in specimens from the outer reef. They are rare on other corals, occasionally occurring in massive astraeids from the lagoon at Minikoi, but not apparently in branching corals, fungoids, or perforate corals."





Borradaile, L. A. 1902. "Marine crustaceans. III. The Xanthidae and some other crabs." *The fauna and geography of the Maldive and Laccadive archipelagoes : being the account of the work carried on and of the collections made by an expedition during the years 1899 and 1900* 1, 237–271.

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