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# MATERIALS

FOR A

## CARCINOLOGICAL FAUNA OF INDIA.

No. 6.

### THE BRACHYURA CATOMETOPA

OR

### GRAPSOIDEA.

BY

A. ALCOCK, M.B., C.M.Z.S.,  
SUPERINTENDENT OF THE INDIAN MUSEUM.

158

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5



XVI.—Materials for a Carcinological Fauna of India. No. 6. *The Brachyura Catometopa, or Grapsoidea.*—By A. ALCOCK, M.B.,  
C.M.Z.S., Superintendent of the Indian Museum.

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In treating the Catometopes I have in the main followed the scheme of Milne Edwards (*Annales des Sciences Naturelles* for 1852 and 1853) as modified by Dana, and I may introduce this paper with a statement of the points at which it deviates from the former of those classical works.

In the first place, following Dana and most subsequent authors, I have evicted the *Telphusidæ*. With them must also go *Gecarcinucus*, which is an undoubted Telphusoid, although it is persistently ranked with the *Geocarcinidæ*.

Again I have followed the lead of Dana in his treatment of the *Gonoplacæa* of Milne Edwards, the genera of which are distributed among the *Ocypodidæ* and the Sesarmine *Grapsidæ*, while *Gonoplax* itself is relegated to the *Carcinoplacidæ*.

This step necessitates a considerable enlargement of Milne Edwards' group of *Carcinoplacinæ*, and a reconstruction of his *Ocypodinæ*, and in carrying this out I have in the main followed Dana's admirable system.

The isolation of *Myctiris* as an independent family, which was first suggested by Dana, is here accented, but at the same time I fully agree with Milne Edwards estimate of this singular form as a "satellite" of the *Ocypodoids*.

In grouping the genera of the *Grapsidæ* I have departed very little from the arrangement of Milne Edwards, who recognized—though his successors have ignored it—the independence of the *Varuna* group.

I have adopted Dana's family of *Geocarcinidæ*, but with some hesitation, for Milne Edwards' estimation of the group as a subfamily of *Grapsidæ* has much to recommend it.

I gladly follow Milne Edwards in recognizing the *Hymenosoma* group as a *tribu principale* not distantly related to the *Ocypodes* and quite distinct from and independent of the *Pinnoteræ* group.

As regards additions to the *Catometopa* as known to and recognized by Milne Edwards, I may mention the *Rhizopinæ* (Stimpson, Miers), the *Hexapodinæ*, the *Palicidæ* (which include *Cymopolia* formerly classed with the *Dorippidæ*), and the new family *Ptenoplacidæ*.

From the system of Dana I would dissent only in separating the *Hymenosoma*-group from the *Pinnoteridæ*; in enlarging the *Scopimerinæ* (= *Dotinæ*) at the expense of the *Ocypodidæ*; in splitting the *Grapsinæ* into two equal groups,—one round *Grapsus*, the other round *Varuna*; and in removing *Gecarcinucus* from the *Geocarcinidæ*.

The scheme of classification proposed by Miers seems to me to, too often, disregard natural relations without facilitating the recognition of species by way of compensation.

The most conspicuous instance is the family *Pinnoteridæ*, in which we find *Pinnoteræ* and its kindred included with such undoubted *Ocypodoids* as *Dotilla* and *Scopimera*, with *Mictyris*, with *Hymenosoma* and its allies, and finally with *Hexapus* whose affinities are quite clearly with the *Rhizopinæ*.

Again by the exclusion of *Scopimera* and *Dotilla* and by the inclusion of the *Gonoplacidæ*, Miers family of *Ocypodidæ* becomes unnatural and incomplete.

I follow Miers in treating the *Rhizopinæ* as a subfamily of *Carcinoplacidæ*.

Ortmann obviates some difficulties by separating *Gonoplax* and *Ommatocarcinus* from the *Carcinoplacidæ* as a distinct family, and by altogether removing the *Hymenosomidæ* from the *Catometopes*. By the latter step his *Pinnoteridæ* gain in natural value, as they further do by the restoration of *Scopimera* and *Dotilla* to their place among the

Ocypodoids; so that both his *Pinnotheridæ* and *Ocypodidæ* are far more natural families than those of Miers. I am doubtful, however, whether Ortmann has assigned its full rank to *Mictyris*, or their proper place to the *Hexapodinæ*.

The Catometope crabs of the Indian fauna number about 140, of which 136 are noticed in the present paper. Of these, 31 are new to science, and include 2 species of *Libystes*, 1 of *Psopheticus*, 2 of *Litochira*, 1 of *Notonyx*, 1 of *Ceratoplax*, 1 of *Typhlocarcinus*, 2 of *Pinnotheres*, 3 of *Dotilla*, 2 of *Scopimera*, 1 of *Glistostoma*, 1 of *Tylodiplax*, 1 of *Elamena*, 2 of *Hymenicus*, 2 of *Ptychognathus*, 1 of *Pyxidognathus*, 3 of *Sesarma*, 2 of *Palicus* (*Cymopolia*), and 1 of each of the following new genera, *Typhlocarcinodes* (Rhizopinæ), *Lambdophallus* (Hexapodinæ), and *Chasmocarcinops* (Asthenognathinæ).

The new species are, for the most part, either little crabs that are liable to be overlooked, or inhabitants of depths which, though moderate, are inaccessible to ordinary collectors.

As heretofore, most of the new species come from the copious collections of the "Investigator" and will be duly figured in the *Illustrations of the Zoology of the R.I.M.S. Investigator*.

#### Tribe CATOMETOPA.

*Quadrilatera*, Latreille (pt.), Fam. Nat. du Règne Anim. p. 269.

*Catometopes*, Milne Edwards (pt.), Hist. Nat. Crust. II. p. 1.

*Cancris* (pt.), *Ocypodes*, *Grapsi*, *Pinnotheridea*, De Haan, Faun. Japon. Crust.

*Ocypodidæ*, Milne Edwards (pt.), Ann. Sci. Nat., Zool., (3) XVIII. 1852, pp. 123, 140.

*Grapsoidæ*, Dana, U. S. Expl. Exp. Crust. pt. I. pp. 67, 306.

*Catometopa*, Miers, Challenger Brachyura, p. 216.

*Catometopa*, Ortmann, Zool. Jahrb., Syst. VII. 1893-94, pp. 411, 683, plus

*Majoidea Hymenosomidæ*, p. 31: and in Bronn's Thier Reich, V. ii. *Arthropoda*, pp. 1165, 1168, 1175.

The carapace is variable, but commonly and typically it is transverse, more or less quadrate, with large branchial and small and indistinct hepatic regions and a broad front. The front also is variable in form, but typically it is much deflexed.

The orbits, typically, occupy the whole or the greater part of the anterior border of the carapace on either side of the front. The typical fold of the antennules is transverse; but it may be oblique, or nearly vertical, and in a few cases there are no distinct fossæ at all into which these appendages can fold.

The epistome, typically, is extremely short, but occasionally it is

of considerable length. The buccal orifice is typically, but by no means always, square cut.

The palp of the external maxillipeds usually articulates either at the summit, or at or near the external angle, of the merus; but often, as in almost the whole family *Gonoplacidae*, it articulates distinctly at the antero-internal angle.

*The genital ducts of the male usually perforate the sternum opposite the last pair of legs: if, as happens in the family Gonoplacidae, they perforate the bases of the last pair of legs, they pass forwards to their destination in a groove in the sternum.*

The abdomen of the male is very often narrow at its base and so does not cover all the space between the last pair of legs.

The branchiæ are often fewer than 9—from 8 to 6—on either side: their efferent channels open on either side of the palate.

The *Catometopa* may be divided into 9 families. One of these, the *Gonoplacidae*, so closely approaches the Cyclometope family *Xanthidae* that such Xanthoid forms as *Geryon* and *Camptoplax* have by some authors been included in it, while, on the other hand, some of its constituent genera, such as *Gonoplax* and *Carcinoplax*, have been ranged among the Cyclometopes.

Three other families, namely, the *Grapsidae*, the *Geocarcinidae*, and the *Ocypodidae*, include the typical Catometopes, upon which our general conception of the group is founded.

The remaining five families are more or less aberrant, they are the *Pinnoteridae*, the *Mictyridae*, the *Hymenosomidae*, the *Palicidae*, and the *Ptenoplacidae*.

Of these aberrant families, the *Pinnoteridae* are probably most nearly related to the *Gonoplacidae*, the *Mictyridae* to the *Ocypodidae*, and the *Palicidae* to the *Grapsidae*.

The true position of the *Hymenosomidae* appears to me to be still doubtful. Many authors place them near the *Pinnoteridae* and *Mictyridae*, and I think that their most natural place is alongside the *Mictyridae*. Ortmann alone boldly removes them from the Catometope grade altogether and unites them with the Oxyrhynchs, which I think is a decided mistake.

There remains the family *Ptenoplacidae*, which includes the single species *Ptenoplax notopus*. This, though it has a superficial resemblance to *Macrophthalmus*, is remote from that genus in many important characters, and, though it has no look of *Hexapus*, yet shows an attraction to *Hexapus* and *Lambdophallus* that can hardly be accidental.

The 9 families may be characterized as follows, their compass in relation to the schemes of other authors will be noted in the sequel:—

Family GONOPLACIDÆ. Marine Catometopes closely resembling Cyclometopes. The palp of the external maxillipeds articulates at or near the antero-internal angle of the merus, never at the antero-external angle or at the middle of the anterior border: the exognath of the external maxillipeds is of normal size and is not concealed. The interantennular septum is a thin plate. The division of the orbit into two fossæ is not accented.

Family GRAPSIDÆ. Littoral (rock-haunting), or pelagic (drift-weed and timber-haunting), or estuarine and paludine, or fluviatile, or rarely terrene Catometopes. The palp of the external maxillipeds articulates either at the antero-external angle, or at the summit, or at the middle of the anterior border of the merus: the exognath is either abnormally slender or abnormally broad. The interantennular septum is very broad. The division of the orbit into two fossæ is accented. [Front of great breadth: carapace usually quadrilateral, with the lateral borders either straight or very slightly arched, and the orbits at or very near the antero-lateral angles: the buccal cavern is square and there is generally a gap, which is often large and rhomboidal, between the external maxillipeds]. Male openings sternal.

Family GEOCARCINIDÆ. Terrene Catometopes (Land-crabs). The palp of the external maxillipeds articulates either at the antero-external angle or at the middle of the anterior border of the merus (but is sometimes, though never in any Indian species, completely hidden behind the merus): the exognath is slender and inconspicuous (sometimes more or less concealed) and sometimes carries no flagellum. The interantennular septum is very broad and the antennular fossæ are narrow. The front is of moderate breadth and always strongly deflexed: the carapace is more or less transversely oval, *the antero-lateral borders being strongly arched and the fronto-orbital border being very much less than the greatest breadth of the carapace*. In all the Indian forms there is a wide rhomboidal gap between the external maxillipeds. Male openings sternal.

Family OCYPODIDÆ. Amphibious littoral and estuarine crabs, burrowing, and commonly gregarious. The palp of the external maxillipeds is coarse, and articulates at or near the antero-external angle of the merus: the exognath is generally slender and often more or less concealed. The interantennular septum is generally broad, but in one

subfamily (*Macrophthalminæ*) is a thin plate. The front is usually of no great breadth, and is often a narrow lobe more or less deflexed. The orbits occupy the whole anterior border of the carapace outside the front, and their outer wall (between the far ends of the upper and lower borders) is often defective. The buccal cavern is usually large and a little narrower in front than behind, the external maxillipeds are foliaceous and usually completely close it, but if they do not they never leave between them a wide rhomboidal space exposing the mandibles. The abdomen of the male is narrow. Male openings sternal.

Family PINNOTERIDÆ. Small crabs, usually living as commensals in the mantle-cavity of Bivalve Mollusks or Ascidiæ, in the cloaca of Holothurians, in worm-tubes, or in coral-stocks, and hence often exhibiting degeneration of some of the organs of special sense. The external maxillipeds vary: the merus, though often very large, is never quadrilateral, and never carries the palp distinctly at the antero-internal angle: the ischium is often small, and is sometimes absent or indistinguishably fused with the merus, in which case the merus lies with its long axis directed obliquely or almost transversely inwards: the exognath is small and more or less concealed. The interantennular septum, when distinguishable, is a thin plate. [The front is narrow, the eyes and orbits very small, the cornæ sometimes obsolescent: the antennules and antennæ are usually very small and cramped. The buccal cavern is short and of great breadth, being commonly semi-circular in outline. The male abdomen is very narrow]. Male openings sternal.

Family MICTYRIDÆ. Amphibious Catometopes resembling the *Ocypodidæ* in habits. The buccal cavern is of enormous size and is completely closed by the enormous foliaceous convex external maxillipeds, whose coarse palp articulates with the antero-external angle of the merus, and whose short slender exognath is entirely concealed and carries no flagellum. The interantennular septum is narrow. The orbits are represented by a small post-ocular spine, the eyes being quite unconcealed. [Carapace elongate-globose: front a narrow declivous lobe: the rudimentary antennular flagella fold nearly vertically, and are a good deal concealed by the front: the abdomen of the male resembles that of the female and covers the greater part of the sternum. No membranous spaces (*tympana*) on the meropodites of the legs or on the sternum]. Male openings sternal.



Family HYMENOSOMIDÆ. Small marine and estuarine Catometopes having a curious superficial resemblance to some of the Oxyrhynch crabs of the Inachine subfamily, a resemblance heightened by the fact that the epistome is sometimes nearly as long as broad. The palp of the external maxillipeds articulates near the antero-external angle of the merus, but as the antero-internal angle of the merus is sometimes truncated the true relations of the palp are often not quite clear: the exognath is slender and partly or entirely concealed. There are no orbits and the eyes are exposed and little retractile. [Carapace thin, flat, triangular or subcircular, not very well calcified, usually produced to form a horizontal rostrum. Antennular fossæ shallow and ill defined. Antennal peduncle slender. Buccal cavern square, the ischium of the external maxillipeds well developed]. Male openings sternal.

Family PALICIDÆ. Small Catometopes having a sort of *Dorippe* appearance. The Indian members of the family are found among coral- and shell-shingle, at a moderate depth, and have a kind of protective resemblance to an eroded flake of coral rock. The external maxillipeds close the buccal cavern ventrally but not anteriorly: their merus is a very small joint articulating with the retreating antero-external angle of the ischium, and carrying the palp at the middle of the oblique-lying anterior (or inner) border, their exognath is not concealed and is rather broad. The interantennular septum is a thin plate. The orbit has 2 or 3 deep gaps in the upper border. Front of moderate breadth, little or not at all deflexed: antennal flagella of good length: epistome absent: abdomen of male narrow. Compared with the other 3 pairs, the 4th (last) pair of legs, which are dorsally situated, are rudimentary in all the Indian species. Male openings sternal: female openings placed far forward on the sternal segment corresponding with the first pair of ambulatory legs (2nd peræopods).

Family PTENOPLACIDÆ. Represented by an aberrant Catometope found only in Indian Seas at a depth of 100 to 250 fathoms. The external maxillipeds are slender and subpediform, not nearly covering the buccal cavity: their palp articulates with the summit of the slender merus: their exognath is of normal size and form, and is not concealed. The interantennular septum is a thin rudimentary plate. The orbits are very incomplete below. The front is a narrow, little deflexed lobe. No distinct antennular fossæ. Antennal flagella of good length. No epistome. Abdomen of male narrow. Compared with the other 3 pairs, the last (fourth) pair of legs are rudimentary, being also placed close together dorsally: the last segment of the sternum is also rudimentary.

The male openings are in the bases of the last pair of legs but the ducts run forward in a sternal groove.

Most of these families can be further split into subfamilies, as is shown in the following scheme :—

Family GONOPLACIDÆ, Dana.

*Gonoplaciens*, Milne Edwards (pt.), Hist. Nat. Crust. II. 56.

*Gonoplacés Cancéroïdes* plus *Carcinoplacines*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, pp. 162, 164.

*Gonoplacidæ*, Dana, U. S. Expl. Exp. Crust. pt. I. pp. 308, 310.

*Carcinoplacines* plus *Gonoplacines* plus *Hæmapodines*, Miers, Challenger Brachyura, pp. 222, 237, 275.

*Carcinoplacini*, Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 633.

*Carcinoplacidæ* plus *Gonoplacidæ* plus *Hæmapodines*, Ortmann in Bronn's Thier Reich, tom. cit. pp. 1175, 1176, 1177.

This family may be divided into the 5 following subfamilies :—

Subfamily I. PSEUDORHOMBILINÆ (*Carcinoplacines* Miers, *Carcinoplacidæ* Ortmann). Carapace Xanthoid, the regions seldom well defined: front usually of good breadth and square cut, often little deflexed: eyes and orbits of normal size and form, the eyes well pigmented and the eyestalks normally movable except in certain deep-sea genera: the antennules fold transversely: antennal flagella of fair length. Epistome well defined: buccal cavern square-cut and usually completely closed by the external maxillipeds, which have a subquadrate merus. The base of the male abdomen covers the whole space between the last pair of legs. Male openings not sternal.

Subfamily II. GONOPLACINÆ (*Gonoplacines* Miers, *Gonoplacidæ* Ortmann). The anterior border of the subquadrate carapace is entirely occupied by the square-cut front and orbits, the front being either narrow or of fair breadth, and the orbits being long narrow trenches for the elongate eyestalks. In other respects similar to the *Pseudorhombilines*.

Subfamily III. PRIONOPLACINÆ (not represented in India). Differs from *Pseudorhombilines* only in the form of the male abdomen, which is not broad enough at base to cover all the space between the last pair of legs.

Subfamily IV. RHIZOPINE (*Rhizopinæ* Miers, Ortmann). With the exception of one species (*Notonyx nitidus*) the eyestalks are fixed, and very often the "cornea" is minute or obsolete: the lower border of the orbit has a tendency to run downwards towards the epistome. The carapace usually has its antero-lateral corners cut away and rounded off: the front may be square-cut and broad, but is more often narrow and more or less distinctly bilobed and deflexed. The antennules may be of fair size and transversely folded, but more often, owing to the narrowness of the front, they are cramped, and fold obliquely: sometimes they cannot be folded in their fossæ at all. Antennal flagella usually short. The epistome may either be well defined and prominent, or ill defined and sunken. The buccal cavern may be squarish, but it often is decreased in breadth anteriorly: the external maxillipeds have a square merus and may completely close the buccal cavern, or there may be a gap between them. The male abdomen does not nearly cover the space between the last pair of ambulatory legs. Male openings sternal.

Subfamily V. HEXAPODINÆ (*Pinnoteridæ-Hexapodinæ* Miers, Ortmann). Only three pairs of legs besides the chelipeds, the last segment of the sternum also aborted. Carapace much broader than long with the antero-lateral corners cut away and rounded off. Front narrow: eyes, orbits and antennæ small: the antennules fold transversely. Epistome well defined: buccal cavern with the sides a little anteriorly-convergent, or not, nearly closed by the external maxillipeds, whose merus is either quadrate or has the antero-external angle rounded off. The male abdomen does not nearly fill the space between the last pair of ambulatory legs. Male openings sternal.

#### Family PINNOTERIDÆ, Edw.

*Pinnoteridæ*, De Haan (part), Faun. Japon., Crust., pp. 5, 34.

*Pinnothériens*, Milne Edwards (part), Hist. Nat. Crust. II. 28.

*Pinnotherinæ*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 138, and XX. 1853, p. 216: Dana, U. S. Expl. Exp., Crust. pt. I. pp. 378, 379: Miers, Challenger Brachyura, p. 274: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 691; and in Bronn's Thier Reich, tom. cit. p. 1177.

I propose, with some diffidence, as I have not examined enough of the forms included, to divide this family into 4 subfamilies:—

Subfamily I. PINNOTERINÆ. Ischium of the external maxillipeds either rudimentary, or indistinguishably fused with the merus to form a single piece which is usually oblique, sometimes transverse. Usually the carapace is not transverse and the palp of the external maxillipeds not so large as the merus-ischium.

Subfamily II. PINNOTHERELINÆ. Ischium of the external maxillipeds distinct and independent, but smaller than the merus, the latter joint little oblique. Usually the carapace is broadly transverse, and often the palp of the external maxillipeds is the largest part of these appendages.

Subfamily III. XENOPHTHALMINÆ. Ischium of the external maxillipeds distinct, as large as or larger than the merus, the latter joint little oblique, the palp of ordinary size. *The orbits are narrow chinks situated dorsally with their long axis at right angles to the anterior border of the carapace.*

Subfamily IV. ASTHENOGNATHINÆ (*Asthenognathidæ* Stimpson). External maxillipeds weak and slender, not nearly meeting across the buccal cavern, the ischium distinct and larger than the merus, the palp of ordinary size. Eyes in the normal position.

#### Family GRAPSIDÆ, Dana.

*Grapsoidiens*, Milne Edwards, Hist. Nat. Crust. II. 68.

*Grapsinæ*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. p. 136 and XX. p. 163.

*Grapsidæ*, Dana, U. S. Expl. Exp., Crust. p. 329; Miers, Challenger Brachyura, p. 252; Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 699, and in Bronn's Thier Reich, tom. cit. p. 1177.

This family can be divided into four well characterized subfamilies as follows:—

Subfamily I. GRAPSINÆ (*Grapsacea*, Edw., *Grapsinæ* in part, Dana, Kingsley, Miers, Ortmann). Front strongly deflexed: the lower border of the orbit runs downwards towards the buccal cavern: antennal flagellum very short: the external maxillipeds leave a wide rhomboidal gap between them, they are not traversed by any oblique hairy crest, their palp articulates at the antero-external angle of the merus, and their exognath is very slender and is exposed throughout. The male abdomen fills all the space between the last pair of ambulatory legs.

Subfamily II. VARUNINÆ (*Varunacea* and *Cyclograpsacea* part, Milne Edwards; *Grapsinæ* in part, Dana, Kingsley, Miers, Ortmann). Front moderately or little deflexed, sometimes sublaminar: the sub-orbital crest, which supplements the defective lower border of the orbit, is rather distant from the orbit and usually runs nearly in a line with the anterior border of the epistome: antennal flagellum usually of good length: the external maxillipeds do not often gape widely, though usually there is something of a gap, they are not traversed by any oblique hairy crest, their palp articulates with the middle of the

anterior border of the merus, and their exognath is generally broad and is exposed throughout. The male abdomen, though not narrow, rarely covers all the space between the last pair of ambulatory legs.

Subfamily III. SESARMINÆ. (*Sesarmacea* and *Cyclograpsacea* part, Milne Edwards; *Sesarminæ*, Dana, Kingsley, Miers, Ortmann). Front strongly deflexed: the lower border of the orbit commonly runs downwards towards the angle of the buccal cavern: the external maxillipeds leave a wide rhomboidal gap between them, an oblique hairy crest traverses them from a point near the antero-external angle of the ischium to a point near the antero-internal angle of the merus, their palp articulates either at the summit or near the antero-external angle of the merus, and their exognath is slender and either partly or almost entirely concealed. The male abdomen either fills or does not quite fill all the space between the last pair of ambulatory legs. Antennal flagella variable.

Subfamily IV. PLAGUSINÆ. (*Plagusiacea*, Milne Edwards; *Plagusinæ*, Dana, Kingsley, Miers, Ortmann). The front is cut into lobes or teeth by the antennular fossæ, which are visible in a dorsal view as deep clefts: the lower border of the orbit curves down into line with the prominent anterior border of the buccal cavern: the external maxillipeds do not completely close the buccal cavern but they do not leave a wide rhomboidal gap, they are not traversed by any oblique hairy crest, their palp articulates near the antero-external angle of the merus, and their slender exposed exognath has no flagellum. The antennal flagella are short. The male abdomen fills all the space between the last pair of legs.

#### Family GEOCARCINIDÆ, Dana.

*Gecarciniens*, Milne Edwards, Hist. Nat. Crust. II. 16.

*Gecarcinacea*, Milne Edwards (pt.), Ann. Sci. Nat., Zool., (3) XX. 1853, p. 200.

*Gecarcinidæ*, Dana (pt.), U. S. Expl. Exp. Crust. pt. I. p. 374.

*Gecarcinidæ*, Miers, Challenger Brachyura, p. 216.

*Gecarcinidæ*, Ortmann (pt.), Zool. Jahrb. Syst. VII. 1893-94, pp. 699, 732, and in Bronn's Thier Reich, tom. cit. p. 1178.

I think it inadvisable to subdivide this small group, which Milne Edwards, with more justice, regarded as itself only a subfamily of the *Grapsidæ*.

*Gecarcinucus* is a *Telphusoid* and should not be referred here. *Epigrapsus* and *Grapsodes*, if they are distinct from one another, belong here rather than to the *Grapsidæ*.

## Family PALICIDÆ (vel CYMOPOLIDÆ).

This little and aberrant family is probably best treated as an appendage to the *Grapsidæ*.

## Family OCYPODIDÆ, Ortmann (pt.).

*Ocypodians*, Milne Edwards, Hist. Nat. Crust. II. p. 39.

*Ocypodinæ*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 140, plus *Gonoplacés Vigils* (pt.), p. 155.

*Macrophthalmidæ*, Dana, U. S. Expl. Exp. Crust. pt. I. pp. 308, 312.

*Ocypodinæ*, Miers (pt.), Challenger Brachyura, p. 236, and *Myctirinæ* (pt.), p. 275.

*Ocypodidæ*, Ortmann (pt.), Zool. Jahrb., Syst., VII. 1893-94, pp. 700, 741; and in Bronn's Thier Reich, tom. cit., p. 1179.

In the treatment of this family nothing can be added to the scheme of Dana, where they are divided into 3 sub-families as follows:—

Subfamily I. OCYPODINÆ (*Ocypodiacés Ordinaires* Edw., *Ocypodinæ* Dana (pt.), Miers (pt.), Ortmann). Carapace deep, subquadrilateral, the regions seldom well defined: front narrow deflexed, commonly a mere lobe between the long eyestalks: antennular flagellum small, folding obliquely or almost vertically, the interantennular septum broad: the external maxillipeds completely close the buccal cavern, their exognath is inconspicuous but is not, or not entirely, concealed, and may either have, or be destitute of, a flagellum: chelipeds remarkably unequal either in both sexes or in the male only. *There is an orifice or recess, the edge of which is thickly fringed with hair, between the bases of the 2nd and 3rd pairs of true legs.*

Subfamily II. SCOPIMERINÆ (*Ocypodiacés Globulaires* Edw., *Dotinæ* Dana, *Myctirinæ* (pt.) Miers, Ortmann). Carapace very deep, cuboidal or globose: front narrow deflexed, commonly a mere lobe: antennular flagellum rudimentary, folding nearly vertically and hidden beneath the front, interantennular septum broad: buccal cavity large, sometimes enormous, completely closed by the external maxillipeds which are commonly very prominent and have small linear concealed exognaths with or without a flagellum: chelipeds equal or subequal in both sexes. *Orbits shallow. Curious membranous spaces known as "tympana" exist on the meropodites of the legs and often of the chelipeds also; and sometimes on some of the segments of the sternum. No hairy recesses between the bases of the 2nd and 3rd pairs of true legs.*

Subfamily III. MACROPHTHALMINÆ. (*Gonoplacés Vigils* pt. Edw., *Macrophthalminæ* Dana, Miers, Ortmann). Carapace usually quadrilateral, broader than long (sometimes more than twice as broad as long),

flattish and not very deep, the regions usually well defined: front variable, but never very broad: antennules with a well developed flagellum that folds transversely, interantennular septum very narrow: eyestalks usually elongate: the external maxillipeds do not always meet across the buccal cavern, though the gap between them is never very wide, their exognath is not, or not entirely, concealed and has a flagellum: chelipeds usually subequal. No special recess between the bases of any of the legs.

#### Family MICTYRIDÆ, Dana.

*Pinnothériens*, Milne Edwards (pt.), Hist. Nat. Crust. II. 39.

*Myctiroidea*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 154.

*Mictyridæ*, Dana, U. S. Expl. Exp., Crust. pt. I, pp. 309, 389.

*Pinnotheridæ-Myctirinæ*, Miers (pt.), Challenger Brachyura, p. 275; Ortmann (pt.) in Bronn's Thier Reich, tom. cit., p. 1179.

*Ocypodidæ-Myctirinæ*, Ortmann (pt.), Zool. Jahrb., Syst. VII. 1893-94, pp. 742, 747.

There can be little question that Milne Edwards was right in reckoning *Mictyris* as a "satellite" of the *Ocypodidæ*, or that Dana's plan of separating them as a distinct family is fully justified. The affinities which several authors find between *Mictyris* and the *Pinnotheridæ* are by no means easy to recognize.

#### Family HYMENOSOMIDÆ, Ortmann.

*Pinnothériens*, Milne Edwards (pt.), Hist. Nat. Crust. II. 39.

*Hymenosominæ*, Milne Edwards, Ann. Sci. Nat., Zool. (3) XX. 1853, p. 221.

*Pinnotheridæ-Hymenicinæ*, Dana, U. S. Expl. Exp., Crust. pt. I. pp. 379, 384.

*Pinnotheridæ-Hymenosominæ*, Miers, Challenger Brachyura, p. 275.

*Majoidea-Hymenosomidæ*, Ortmann, in Bronn's Thier Reich, tom. cit., p. 1168.

Three types seem to be distinguishable in this family: in one (e.g. *Hymenosoma*) there is no epistome and the external maxillipeds almost encroach on the bases of the antennules, which appendages are not concealed by the front; in the second (e.g. *Halicarcinus*) there is an epistome of considerable length, but the antennules are still unconcealed by the front; in the third (e.g. *Hymenicus*) there is a long epistome and the antennules are quite concealed by the front.

#### Family PTENOPLACIDÆ.

This family has no very close connexions with any of the others although it is an undoubted Catometope.

The following is a list of all the Catometope genera known to me arranged according to the foregoing scheme. As in previous papers, the genera known to me by autopsy are marked with an asterisk, and all the Indian genera are printed in roman type.

Family GONOPLACIDÆ, Dana.

Subfamily I. PSEUDORHOMBILINÆ, nov.

? *Brachygrapsus*, J. S. Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 203.

*Bathyplox*, A. Milne Edwards, Bull. Mus. Comp. Zool., VIII, 1880-81, p. 16: Miers, Challenger Brachyura, p. 230.

? *Camptandrium*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 106.

\* *Carcinoplax* (= *Curtonotus*).

\* *Catoptrus* (= *Goniocaphyra*).

? *Cryptoceloma*, Miers, Zool. H. M. S. Alert, p. 227.

\* *Eucrate*.

*Freyvillea*, A. Milne Edwards, Bull. Mus. Comp. Zool. VIII, 1880-81, p. 15.

*Heteroplax*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 94.

\* *Libystes*.

\* *Litochira*.

\* *Pilumnoplax*.

\* ? *Platypilumnus*.

\* *Pseudorhombila*.

\* *Psopheticus*.

Subfamily II. PRIONOPLACINÆ, nov.

*Eucratoplax*, A. Milne Edwards, Bull. Mus. Comp. Zool. VIII, 1880-81, p. 17.

*Eucratopsis*, Smith, Amer. Journ. Sci. XLVIII, 1869, p. 391, and Trans. Connect. Acad. II. 1871-73, p. 35.

*Euryplax*, Stimpson, Ann. Lyc. Nat. Hist., New York, VII, 1862, p. 60.

*Glyptoplax*, Smith, Trans. Connect. Acad. II, 1871-73, p. 164.

*Oedioplax*, Mary J. Rathbun, P. U. S. Nat. Mus. XVI, 1893, p. 241.

*Panoplax*, Stimpson, Bull. Mus. Comp. Zool. II, 1870-71, p. 151.

*Prionoplax*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII, 1852, p. 163.

*Speocarcinus*, Stimpson, Ann. Lyc. Nat. Hist., York, VII, 1862, p. 58.



## Subfamily III. GONOPLACINÆ, Miers.

\* *Gonoplax*, Leach, Trans. Linn. Soc. XI, 1815, p. 323; Miers, Challenger Brachyura, p. 245.

*Ommatocarcinus*, White, in Voy. H. M. S. Rattlesnake, II, p. 393; Miers, Challenger Brachyura, p. 246.

## Subfamily IV. RHIZOPINÆ, Stimpson, Miers.

\* *Camatopsis*.

\* *Ceratoplax*.

? *Chasmocarcinus*, Mary J. Rathbun, Bull. Nat. Hist. Iowa, 1898, p. 284.

\* *Hepthopelta*.

\* *Notonyx*.

*Rhizopa*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 95.

\* *Scolopidia* (= *Hypophthalmus*).

\* *Typhlocarcinus*.

\* *Typhlocarcinodes*.

\* *Xenoplithalmodes*.

## Subfamily V. HEXAPODINÆ, Miers.

*Amorphopus*, Bell, Journ. Linn. Soc., Zool., III, 1859, p. 27.

\* *Hexapus*, De Haan, Faun. Japon. Crust., p. 35.

\* *Lambdophallus*.

*Thaumastoplax*, Miers, Ann. Mag. Nat. Hist. (5) VIII, 1881, p. 261.

## Family PINNOTERIDÆ, Edw.

## ? Subfamily I. PINNOTERINÆ, nov.

*Cryptophrys*, Mary J. Rathbun, P. U. S. Nat. Mus. XVI, 1893, p. 250.

*Dissodactylus*, S. I. Smith, Trans. Connect. Acad. II, 1871-73, p. 172.

*Durckheimia*, de Man, Zool. Jahrb., Syst., 1889, p. 442.

*Fabia*, Dana, Proc. Ac. Nat. Sci. Philad. 1851, p. 253, and U. S. Expl. Exp., Crust. pt. I. p. 382.

? *Holothuriophilus*, Nauck, Zeits. Wiss. Zool. XXXIV, 1880, pp. 24, 66.

*Ostracoteres*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX, 1853, p. 219.

? *Parapinnixa*, Holmes, Proc. Calif. Acad. IV, 1893-94, pp. 565, 587.

*Pinnaxodes*, Heller, Novara Crust., p. 67.

\* *Pinnoterres*.

? *Scleroplax*, Mary J. Rathbun, P. U. S. Nat. Mus. XVI, 1893, p. 250.

\* *Xanthasia*.

? Subfamily II. PINNOTHERELINÆ, nov.

? *Malacosoma*, de Man, Notes Leyden Mus. I, 1879, p. 67.

*Opiathopus*, Mary J. Rathbun, P. U. S. Nat. Mus. XVI, 1893, p. 251.

*Pinnixa*, White, Ann. Mag. Nat. Hist. XVIII. 1846, p. 177  
(= *Tubicola*, Lockington, Proc. Calif. Acad. VII. 1876, p. 55).

*Pinnotherelia*, Milne Edwards and Lucas, in Voy. Amér. Mérid., Crust. p. 24 (1843).

*Pseudopinnixa*, Ortmann (*nec* Holmes), Zool. Jahrb., Syst. VII, 1894, p. 694.

\* *Tetrias*.

? *Tritodynamia*, Ortmann, Zool. Jahrb., Syst. VII, 1194, p. 692.

? Subfamily III. XENOPHTHALMINÆ, nov.

\* *Xenopthalmus*.

? Subfamily IV. ASTHENOGNATHINÆ, Stimpson.

*Asthenognathus*, Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 107.

\* *Chasmocarcinops*.

Family OCYPODIDÆ, Ortmann, emend.

Subfamily I. OCYPODINÆ, Dana.

*Acanthoplax*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII, 1852, p. 151.

\* *Gelasimus*.

\* *Heloccius*, Dana, Amer. Journ. Sci., (2) XII, 1851, p. 286, and U. S. Expl. Exp., Crust. pt. I. p. 319.

\* *Ocyropa*.

Subfamily II. MACROPHTHALMINÆ, Dana.

\* *Clistostoma*.

*Chænostoma*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 97.

*Euplax*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII, 1852, p. 160; Miers, Challenger Brachyura, p. 251.

*Hemiplax*, Heller, *Novara Crust.* p. 40: Miers, *Challenger Brachyura*, p. 250.

\**Macrophthalmus*.

*Paraclistostoma*, de Man, *Zool. Jahrb., Syst.*, VIII, 1895, p. 580.

\**Tylodiplax*.

### Subfamily III. SCOPIMERINÆ.

\**Dotilla* (= *Doto*, De Haan).

*Ilyoplax*, Stimpson, *Proc. Ac. Nat. Sci. Philad.* 1858, p. 98.

\**Scopimera*.

\**Tympanomerus* (= *Dioxippe*, de Man).

### Family MICTYRIDÆ, Dana.

\**Mictyris*.

### Family HYMENOSOMIDÆ, Ortmann.

\**Flamene*.

?? *Elamenopsis*, A. Milne Edwards, *Nouv. Archiv. du Mus.* IX, 1873, p. 324.

\**Halicarcinus*, White, *Ann. Mag. Nat. Hist.* XVIII, 1846, p. 178: Miers, *Challenger Brachyura*, p. 280 (= *Liriopea*, Gay, *Hist. Fis. Chile.* pt. III. *Zool.* p. 158.

\**Hymenicus*.

\**Hymenosoma*, Leach, Milne Edwards, *Hist. Nat. Crust.* II, 35: Miers, *Challenger Brachyura*, p. 279.

*Rhynchoplax*, Stimpson, *Proc. Ac. Nat. Sci. Philad.* 1858, p. 109.

\**Trigonoplax*.

### Family GRAPSIDÆ, Dana.

#### Subfamily I. GRAPSINÆ, Dana (pt.).

\*??? *Epigrapsus*.

\**Geograpsus*.

\**Goniopsis*, De Haan, *Faun. Japon. Crust.*, p. 33 (pt.): Miers, *Challenger Brachyura*, p. 266.

\**Grapsus*.

\**Leptograpsus*, Milne Edwards, *Ann. Sci. Nat., Zool.*, (3) XX, 1853, p. 171: Miers, *Challenger Brachyura*, p. 257 (sub-genus of *Grapsus*).

\**Metopograpsus*.

*Orthograpsus*, Kingsley, *Proc. Ac. Nat. Sci. Philad.* 1880, p. 194 (sub-genus of *Grapsus*).

**\*Pachygrapsus.**

*Perigrapsus*, Heller, Verh. zool.-bot. Ges. Wien, XII, 1862, p. 522, and Novara Crust. p. 48.

## Subfamily II. VARUNINÆ, nov.

? *Acmæopleura*, Stimpson, Proc. Ac. Nat. Sci. Philad., 1858, p. 105.

\**Brachynotus*, De Haan, Faun. Japon., Crust., p. 34, 1835: Miers, Challenger Brachyura, p. 264 (= *Heterograpsus*, Lucas, Expl. Sci. Algerie, Anim. Artic. I, p. 18, 1849: = *Hemigrapsus*, Dana, Amer. Journ. Sci. (2) XII, 1851, p. 288, and U. S. Expl. Exp., Crust., pt. I. p. 348).

\**Cyrtograpsus*, Dana, Amer. Journ. Sci. (2) XII, 1851, p. 288, and U. S. Expl. Exp., Crust., pt. I, p. 351.

\**Eriochir*, De Haan, Faun. Japon. Crust. p. 32.

*Euchirograpsus*, A. Milne Edwards, Bull. Mus. Comp. Zool., VIII, 1880-81, p. 18: and Milne Edwards and Bouvier "Hirondelle" (Monaco) Crust., Brachyures et Anomures, p. 46.

*Glyptograpsus*, S. I. Smith, Trans. Connect. Acad. II, 1871-73, p. 153.

\**Planes*, Leach, Malac. Pod. Brit., Expl. of pl. xxvii, figs. 1-3, 1815 (= *Nautilograpsus*, Milne Edwards, Hist. Nat. Crust. II, 89, 1837.)

*Platychirograpsus*, de Man, Zool. Anz. 1896, p. 292, and Mitteil. Nat. Mus. Hamburg, XIII, 1896, p. 95.

*Platygrapsus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 104: Miers, Challenger Brachyura, p. 263 (= *Platynotus*, De Haan, Faun. Japon., Crust., p. 34).

\**Pseudograpsus*, Milne Edwards, Hist. Nat. Crust. II, 81: Miers, Challenger Brachyura, p. 261 (= *Pachystomum*, Nauck, Zeits. Wiss. Zool. XXXIV, 1880, p. 67).

\**Ptychognathus* (= *Gnathograpsus*, A. M. Edw. = *Cœlochirus*, Nauck).

\**Pyxidognathus*.

*Utica*, White, P. Z. S. 1847, p. 85, and Ann. Mag. Nat. Hist., XX, 1847, p. 206.

\**Varuna* (= *Trichopus*, De Haan).

## Subfamily III. SESARMINÆ, Dana.

\**Aratus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX, 1853, p. 187.

\**Chasmagnathus*, De Haan, Faun. Japon., Crust., p. 27 (= *Paragrapsus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX, 1853, p. 195).

\**Clistocœloma*.

\**Cyclograpsus*, Milne Edwards, Hist. Nat. Crust., II, 77, 1837  
(= *Gnathochasmus*, MacLeay, in Smith's Ill. Ann. S. Afr. p. 65, 1838).

\**Helice*, De Haan, Faun. Japon., Crust., p. 28: Miers, Challenger Brachyura, p. 268.

\**Metaplax* (= *Rhaconotus*, Gerst.).

\**Metasesarma*.

*Metopaulias*, Mary J. Rathbun, P. U. S. Nat. Mus. XIX, 1897, p. 144.

\**Sarmatium* (= *Metagrapsus*, Edw.).

\**Sesarma* (= *Holometopus*, Edw.).

#### Subfamily IV. PLAGUSINÆ, Dana.

\**Liolophus* (= *Acanthopus*, De Haan).

\**Plagusia*.

#### Family GEOCARCINIDÆ, Dana.

\**Cardiosoma* (= *Discoplax*, A. M. Edw.).

\**Epigrapsus*.

\**Gecarcinus*, Leach, Trans. Linn. Soc. XI, 1815, p. 322: Miers, Challenger Brachyura, p. 217.

\**Pelocarcinus* (= *Gecarcoidea*, Edw., = *Hylæocarcinus*, W.-M., = *Limnocarcinus*, de Man).

*Uca*, Latr., Encycl. Méthod. X, p. 685: Milne Edwards, Hist. Nat. Crust. II, 21.

#### Family PALICIDÆ, Rathbun (name only).

\**Palicus* (= *Cymopolia*).

\**Grossotonotus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX, 1873, p. 282, and Journ. Mus. Godeffroy, I, 1873, p. 258.

#### Family PTENOPLACIDÆ, Alcock.

\**Ptenoplax*.

#### Family I. GONOPLACIDÆ, Dana.

##### Subfamily i. PSEUDORHOMBILINÆ, Alcock.

##### Key to the Indian Genera.

I. Front with the edge cut straight and square, never curved, often prominent:—

1. The fronto-orbital border, though extensive, is much less than the greatest breadth of the carapace, so that the antero-lateral borders of the carapace have

- a distinctly Cancroid arch: the carapace is usually much broader than long:—
- i. Dactyli of last pair of legs styliform ..... PSEUDORHOMBILA.
  - ii. Dactyli of last pair of legs compressed and ciliated:—
    - a. Antero-external angle of merus of external maxillipeds not particularly produced:—
      - a. Carapace transversely quadrilateral, its antero-lateral borders with few teeth ..... CARCINOPLAX.
      - β. Carapace transversely elliptical, its antero-lateral borders with 5 or 6 teeth ..... CATOPTRUS.
    - b. Antero-external angle of merus of external maxillipeds strongly produced outwards: last pair of legs sometimes paddle-like..... LIBYSTES.
2. The fronto-orbital border is not so very much less than the greatest breadth of the carapace in extent, so that the antero-lateral borders of the carapace are either slightly arched or nearly straight: the carapace is broader than long but is not conspicuously transverse:—
- i. The antennal flagellum stands loosely in orbital hiatus:—
    - a. Carapace deepish, rather markedly transverse: the meri of the legs with a spine or spines on the anterior border ... PSOPHETICUS.
    - b. Carapace shallow, depressed, and flat, little broader than long:—
      - a. Legs spiny ..... PLATYPILUMNUS.
      - β. Legs unarmed..... PILUMNOPLAX.
  - ii. A process of the basal antenna-joint completely fills up and closes the orbital hiatus, entirely excluding the antennal flagellum ..... EUCRATE.
- II. Front with the edge slightly but distinctly curved, never cut straight and square; carapace and appendages in all the Indian species tomentose and hairy ..... LITOCHIRA.

## EUCRATE, De Haan.

*Eucrate*, De Haan, Faun. Japon. Crust. p. 36: de Man, Journ. Linn. Soc., Zool., 1887-88, p. 88: Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 685.

*Heteroplax*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858 (1859) p. 94.

Carapace deepish, subquadrilateral, a little broader than long, smooth and with little or no distinction of regions, convex fore and aft, very slightly so from side to side.

The extent of the fronto-orbital border is not much less than the greatest breadth of the carapace, the antero-lateral borders therefore, which are toothed, are short and but slightly arched. Front square-cut and straight, well delimited from the well-defined supra-orbital angles, usually notched or grooved in the middle line, about a third the breadth of the carapace.

Upper border of orbit with two distinct sutures. The orbital hiatus is compactly filled and closed by a process of the basal antenna-joint, so that the antennal flagellum, which is of good length, lies entirely outside the hiatus. The antennules fold transversely.

Buccal cavern square, completely closed by the external maxillipeds, the flagellum of which articulates with the inner angle of the merus. Efferent branchial channels of palate well defined.

Chelipeds subequal, much more massive and shorter, or not much longer, than the legs.

Legs slender, unarmed; the propodite and dactylus of the last pair are compressed and are usually, but not always, somewhat broadened.

In both sexes all seven abdominal segments are distinct, and in the male the third segment covers the whole width of the sternum between the bases of the last pair of legs.

*Distribution* : Indo-Pacific (Indian, Australian and Japanese).

Following de Man and Ortman, I restrict the genus *Eucrate* to those species in which the orbital hiatus is completely stopped-up by a process of the basal antenna-joint.

*Key to the Indian species of the genus Eucrate.*

- I. Antero-lateral borders of the carapace cut into four teeth (including the outer orbital angle) all of which are distinct: dactylus of last pair of legs distinctly palmulate: front grooved or notched in the middle line:—
  - 1. Carapace nearly smooth..... *E. crenata.*
  - 2. Carapace with some short transverse ridges in its antero-lateral part..... *E. crenata* var. *affinis.*
- II. Antero-lateral borders cut into four teeth (including the orbital angle) of which the 2nd and 4th are hardly distinguishable: front with the median notch almost obsolete: dactylus of last pair of legs palmulate ..... *E. crenata* var. *dentata.*
- III. Antero-lateral borders cut into three teeth (including the orbital angle): dactylus of last pair of legs almost styliform ..... *E. sexdentata.*

1. *Eucrate crenata*, De Haan.

*Cancer (Eucrate) crenatus*, De Haan, Faun. Japon. Crust. p. 51, pl. xv. fig. 1.

*Eucrate crenata*, Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 663.

? *Pilumnoplax sulcatifrons*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858 (1859), p. 93: Tozzetti, 'Magenta' Crust. p. 102, pl. vii. fig. 2.

Carapace smooth, its length about five-sixths of its breadth. Front not quite a third the breadth of the carapace, notched and grooved in the middle line. Major diameter of orbit about half the width of the front.

Antero-lateral borders of carapace cut into 4 bluntish teeth, the middle two of which are the largest: a short ridge runs on to the dorsum of the carapace from the last tooth.

Chelipeds less than twice the length of the carapace, not much longer than the legs, especially in the female: one or two teeth at the far end of the upper border of the arm, and one at the inner angle of the wrist: hand rather short and squat, the fingers, which are stout, are a little longer than the palm: there is a characteristic patch of fur at the far end of the upper surface of the wrist.

Legs smooth, the last 3 joints more or less ciliated: in the 4th (last) pair the propodite and dactylus are broader and more compressed than in the other legs.

In the Indian Museum are 3 specimens from the Andamans and 1 from Madras (besides 3 from Hongkong).

The carapace of the largest specimen is 10 millim. long and 12 millim. broad.

2. *Eucrate crenata* var. *affinis*, Haswell.

*Eucrate affinis*, Haswell, P. L. S., N. S. Wales, VI. 1861-62, p. 547 and Cat. Austral. Crust. p. 86: de Man, Journ. Linn. Soc., Zool. XXII. 1867-68, p. 69, pl. v. fig. 5.

? *Pseudorhombila sulcatifrons*, var. *australiensis*, Miers, Zool. H. M. S. Alert, p. 242, pl. xxiv. fig. c.

Differs from typical *E. crenata*, specimens of the same sex and of approximately the same size compared, only in the following characters:—

(1) the carapace is more sculptured, for besides the short transverse ridge on the dorsum of the carapace that runs from the last tooth of either antero-lateral border, there are similar ridges running (a) from the 2nd tooth of either antero-lateral border, parallel with the orbit, and (b) parallel with the front, near the anterior limit of the gastric region; there is also a beaded ridge running parallel with either postero-lateral border:



(2) the patch of fur on the wrist may be smaller :

A single specimen from Mergui (Anderson collection) has the carapace 12 millim. long and 15 millim. broad.

In a large series of specimens these distinctions would probably fail.

### 3. *Eucrate crenata* var. *dentata*.

? *Heteroplax dentatus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, (1859), p. 94 : A. O. Walker, Journ. Linn. Soc. Zool. XX. 1886-1890, p. 110.

Differs from the typical *E. crenata*, only in the following particulars :—

(1) the front is entire, the median notch being inconspicuous or absent :

(2) the outer orbital angle and the third tooth of the antero-lateral border are large and acute, while the 2nd and 4th teeth are quite inconspicuous.

In the Indian Museum are two small specimens, one from Palk Strait (the other from Hongkong).

### 4. *Eucrate sexdentata*, Haswell.

*Eucrate sexdentata*, Haswell, P. L. S., N. S. Wales, VI. 1881-82, p. 548, and Cat. Austral. Crust. p. 86.

? *Pseudorhombila vestita* var. *sexdentata*, Miers, Zool. 'Alert,' p. 240, pl. xxiv. fig. B, and Challenger Brachyura, p. 229.

Differs from *E. crenata* in the following particulars :—

(1) the only ridges on the carapace are two exceeding faint ones running parallel with the postero-lateral borders :

(2) the antero-lateral borders are cut into 3 teeth, of which the last is spine-like :

(3) the median emargination of the front is much less distinct :

(4) the chelipeds are about  $1\frac{3}{4}$  times the length of the carapace and are decidedly shorter than the legs: there is only one distinct tooth near the far end of the upper border of the arm: the tooth at the inner angle of the wrist is very large and acute :

(5) the propodite and dactylus of the last pair of legs are not broader than those of the other legs.

In the Indian Museum is a single male from the Gulf of Martaban, 20 fms. The carapace is 11.5 millim. long and 13.5 millim. broad.

### CARCINOPLAX, Edw.

*Carcinoplax*, Milne Edwards, Hist. Nat. Crust. II. 60; and Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 164: Ortmann, Zool. Jahrb., Syst., &c., VII. 1893-94, p. 685. *Curtonotus*, De Haan, Faun. Japon. Crust., p. 20 (*nom. presc.*).

The chief differences between this genus and *Eucrate* are that (1)

the carapace is very much broader, and its antero-lateral borders are much more arched, the fronto-orbital border being relatively much less extensive; (2) the supra-orbital angles are almost merged in the front, and the median notch of the front is almost obsolete; and (3) the orbital hiatus is not stopped up by any process of the basal antenna-joint.

Carapace deepish, subquadrilateral, usually much broader than long, smooth and with little or no distinction of regions, convex fore and aft, very slightly so from side to side.

The extent of the fronto-orbital border is much less than two-thirds the greatest breadth of the carapace, and the antero-lateral borders, which are toothed, are well arched. Front square-cut and straight, faintly notched or longitudinally grooved in the middle line, not very distinctly demarcated from the supra-orbital angles, from a third to a fourth, or less, the width of the carapace.

The upper border of the orbit is sinuous and may, or may not, be marked by a single faint suture line. The basal antenna joint is short and the antennal flagellum stands loosely in the open orbital hiatus. The antennules fold transversely.

Buccal cavern, palate, and external maxillipeds as in *Eucrate*.

Chelipeds subequal, much more massive and sometimes, in the adult, much longer than the legs.

Legs slender, unarmed; in the last pair the propodite and dactylus are compressed and decidedly broadened for swimming.

In both sexes all seven abdominal segments are distinct, and in the male the third segment covers the whole width of the sternum between the bases of the last pair of legs.

*Distribution*: Indo-Pacific (Indian, Japanese, Californian).

I exclude from the genus *Carcinoplax* those species, e.g., *setosa* and *integra*, which have the edge of the front turned down and arched: these it seems to me are better associated with *Litochira*.

*Key to the Indian species of the genus Carcinoplax.*

- I. The long diameter of the orbit is nearly three-fourths the width of the inter-orbital space: a spine or tooth at the outer angle of the wrist. Chelipeds in the adult male very much longer than the legs ... .. *C. longimanus.*
- II. The long diameter of the orbit is about half the width of the inter-orbital space: no spine or tooth at the outer angle of the wrist. Chelipeds rather shorter than the legs ... .. *C. longipes.*

5. *Carcinoplax longimanus*, De Haan.

*Cancer (Curtonotus) longimanus*, De Haan, Faun. Japon. Crust. p. 50, pl. vi. fig. 1.

*Carcinoplax longimanus*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 164; Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 688.

Carapace, length a little more than two-thirds its breadth, its surface (like that of the chelipeds) finely frosted: in the young the hepatic are obscurely delimited from the branchial and gastric regions and are very slightly tumescent.

Front proper about two-ninths the greatest breadth of the carapace, very faintly notched in the middle line, its free edge longitudinally grooved.

Orbits shallow, their major diameter more than two-thirds the width of the front: borders of orbit finely beaded, the upper border sinuous but entire.

Antero-lateral borders of carapace not much more than half the length of the postero-lateral, well arched, armed with 3 teeth or tubercles (including the outer orbital angle) which become much worn away in adults.

Chelipeds subequal, massive, varying in length with increase in age—from 2 or  $2\frac{1}{2}$  times the length of the carapace in females and young males to 4 times and more the length of the carapace in old males, the palm being the principal joint in which the lengthening takes place. There is a spine or tooth in the distal half of the upper surface of the arm, and one at either angle (inner and outer) of the wrist: a blunt crest, ending in a blunt tooth, traverses the inner surface of the palm.

The legs are long: the 3rd pair, which are slightly the longest, are a little more than twice the length of the carapace. The last two joints—as also the anterior border of the carpus—of all the legs are plumose.

In the Indian Museum are 2 specimens from the Gulf of Martaban and the Andaman Sea 53 and 60 fathoms, (besides a large male from Japan).

In spirit the colour is a light reddish ochre, the fingers uncoloured.

6. *Carcinoplax longipes* (Wood-Mason).

*Nectopanope longipes*, Wood-Mason, Ann. Mag. Nat. Hist., March, 1891, p. 262: Alcock and Anderson, Ill. Zool. Investigator, Crust. pl. xiv. fig. 7.

*Carcinoplax longipes*, Alcock, Investigator Deep-Sea Brachyura, p. 71.

Carapace, length more than three-quarters its breadth, the regions barely indicated.

Front proper about a third the greatest breadth of the carapace, remarkably prominent, as faintly as possible notched in the middle line.

Orbits shallow, their upper border sinuous but entire, their major diameter about half the width of the front. Eyes small.

Antero-lateral borders of carapace not two-thirds the length of the postero-lateral, moderately arched, armed with two pro-curved spine-like teeth, and with a small blunt denticle just behind the ill-defined orbital angle.

Chelipeds twice the length of the carapace; the arm has a denticle beyond the middle of the upper border, and there is a strong spine—with sometimes a secondary spinule at its base—at the inner angle only of the wrist.

The legs are long and have the dactylus well plumed and the 2 preceding joints more scantily hairy; the third pair, which are slightly the longest, are nearly  $2\frac{1}{2}$  times the length of the carapace: though the terminal joints of the fourth (last) pair are compressed they are not so subfoliaceous as those of *C. longimanus*.

In the Indian Museum are 20 specimens from the Andamans 220 to 290 fathoms and off Travancore, 430 fathoms.

In the largest specimen the carapace is 14 millim. long and 17 millim. broad.

In spirit the colour is white with a faint pink tinge, the fingers blackish-brown.

#### 7. PSEUDORHOMBILA, Edw.

*Pseudorhombila*, Milne Edwards, Hist. Nat. Crust. II. 59, and Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 164.

The only particulars in which *Pseudorhombila* differs from *Carcinoplax* are that the regions of the carapace are better defined, that the square-cut front is more distinctly bilobed, that the supra-orbital border has two distinct sutures, and that the dactyli of the last pair of legs are styliform.

The only specimen in the Indian Museum that is perhaps referable to this genus is too small and too much damaged for description: it is from the Andamans.

#### LIBYSTES, A. M. Edw.

*Libyestes*, A. Milne Edwards, Ann. Soc. Entom. France, (4) VII. 1867, p. 285, and Nouv. Archiv. du Mus. IV. 1863, p. 84.

This genus unites *Carcinoplax* with *Catoptrus*. It chiefly differs

from *Carcinoplax* in having (1) a much shorter and broader carapace, (2) a much shorter and broader buccal cavern, with external maxillipeds that have the antero-external angle of the merus remarkably produced outwards, and (3) the 3rd to 5th abdominal terga of the male fused together. From *Catoptrus* it chiefly differs (1) in having the carapace more subquadrilateral than elliptical, and (2) in the curious *Amphitrite*-like form of the external maxillipeds.

Carapace deepish, subquadrilateral or subelliptical, vastly broader than long, with little or no distinction of regions, convex fore and aft, slightly so from side to side.

The extent of the fronto-orbital border is vastly less than the greatest breadth of the carapace, so that the antero-lateral borders, which may be toothed or entire, have a Cancroid-like curve. Front square-cut and quite straight, not well separated from the supra-orbital angles, slightly notched in the middle line, a third or less the greatest breadth of the carapace.

Orbits shallow, their upper border entire. The basal antenna-joint is short, and the antennal flagellum stands loosely in the orbital hiatus. The antennules fold transversely.

Buccal cavern square-cut, much broader than long; the efferent branchial canals of the palate very well defined. The merus of the external maxillipeds is short and broad and has the external angle much produced, as in many species of *Neptunus*.

Chelipeds subequal, much more massive and longer than the legs; the hands however, which are somewhat tumid, are unequal in the adult.

Legs slender, unarmed: in the Indian species the last pair are almost as paddle-like as those of the typical swimming-crabs of the Portunid family.

In the male the abdomen covers the whole width of the sternum between the last pair of legs, and the 3rd-5th abdominal terga are fused together.

The sternal canals of the male are more perfect than in any other Gonaplacoid known to me.

*Key to the Indian species of Libystes.*

- 1. Antero-lateral borders of the carapace serrated almost exactly like those of *Catoptrus nitidus* ... .. *L. Edwardsi.*
- 2. Antero-lateral borders of the carapace entire ... .. *L. Alphonssi.*

*Distribution:* Indo-Pacific (Madagascar to Sandwich Is.).

8. *Libystes Edwardsi*, n. sp.

Carapace, length about four-sevenths of the breadth, finely pitted under lens, somewhat granular near the antero-lateral borders: an angular eminence near either posterior angle and a slight concavity of the postero-lateral part of the lateral epibranchial regions give the carapace a somewhat quadrilateral cast.

Front a good deal less than a third the breadth of the carapace, perfectly straight, faintly notched in the middle line. Eyes small.

Antero-lateral borders of the carapace with 5 or 6 granular denticles followed by a sharp procurved spine.

The chelipeds have the hands unequal in the adult. They are more than three times the length of the carapace and are smooth and unarmed. The fingers are slender and hooked at tip, especially in the smaller hand: they are a good deal longer than the palm in the smaller hand, and about as long as the palm in the larger hand. On the immobile finger of the smaller hand there are several irregular enlarged teeth. [In the young, as in *Catoptrus*, the hands are nearly equal, and the fingers of both hands are equally long and slender].

The legs are slender and the longest pair are not much more than twice the length of the carapace. The last 3 joints of the last pair form typical swimming paddles.

An apparently adult specimen from the Persian Gulf and 3 young from the Andamans are in the Indian Museum.

The carapace of the large specimen is 8 millim. long and 14 millim. broad.

9. *Libystes Alphonsi*, n. sp.

Differs from *L. Edwardsi* in the following particulars:—

(1) the carapace, though of the same proportions, is more quadrilateral and more convex fore and aft, and the eminences at the posterior angles are wanting:

(2) the antero-lateral borders of the carapace are smooth and entire:

(3) the front is more deflexed and more distinctly divided in the middle line:

(4) the chelipeds (in the young) are about  $2\frac{1}{2}$  times the length of the carapace and are nearly equal and similar: the fingers are hardly as long as the palm:

(5) The last 3 joints of the last pair of legs are much broadened and compressed, but are not such unmistakeable paddles as those of *L. Edwardsi*.

In the Indian Museum is a single specimen from the Andamans : its carapace is 4 millim. long and 7 millim. broad.

This species differs but little, except in the sub-quadrilateral shape of the thorax, from the *Libystes nitidus* described and figured by M. A. Milne-Edwards.

#### CATOPTRUS, A. M. Edw.

*Catoptrus*, A. Milne Edwards, Ann. Sci. Nat. Zool. (5) XIII. 1870, p. 82 : Ortman, Zool. Jahrb., Syst. VII. 1893-94, p. 685.

*Goniocaphyra*, de Man, Archiv für Naturges. LIII. 1887, i. p. 339.

Carapace transversely elongate-elliptical, without distinction of regions, moderately convex in both directions.

The extent of the fronto-orbital border is vastly less than the greatest breadth of the carapace, the antero-lateral borders, which are serrated, are therefore well curved. Front straight, slightly notched in the middle line, not distinctly separated from the supra-orbital angles, less than a third the greatest breadth of the carapace.

Orbits shallow, their upper border entire. The antennal flagellum, which is of good length, stands in the orbital hiatus. The antennules fold transversely.

Buccal cavern, palate, and external maxillipeds as in *Eucrate*.

Chelipeds much as in *Libystes*. Legs as in *Libystes*, except that the last pair, though they have the dactylus compressed and ciliated, are never paddle-like.

Abdomen as in *Libystes*.

*Distribution* : Indo-Pacific (Mauritius to Samoa).

*Catoptrus* really differs from *Libystes* only in the form of the merus of the external maxillipeds and of the last pair of legs, which are not paddle-like as they are in one species of *Libystes*.

#### 10. *Catoptrus nitidus*, A. M. Edw.

*Catoptrus nitidus*, A. Milne Edwards, Ann. Sci. Nat., Zool., (5) XIII. 1870, p. 82 : de Man, Notes Leyden Mus. XII. 1890, p. 67 : Ortman, Zool. Jahrb., Syst., VII. 1893-94, p. 687.

*Goniocaphyra truncatifrons*, de Man, Archiv für Nat. LIII. 1887, p. 339, pl. xiv. fig. 1, and Notes Leyden Mus. XII. 1890, p. 67,

*Goniocaphyra* sp., Zehntner, Rev. Suisse Zool. II. 1894, p. 163, pl. viii. fig. 12, 12a.

Carapace, length less than two-thirds its breadth, perfectly smooth and shining except for some fine granulation near the antero-lateral borders.

Front about a third the greatest breadth of the carapace, faintly notched and grooved in the middle line.

Antero-lateral borders cut into five teeth followed by a procurved spine.

Merus of external maxillipeds having the external angle very slightly produced.

Chelipeds unequal, much longer and more massive than the legs, the larger one about three times the length of the carapace: they are smooth and unarmed, except that the anterior border of the arm is finely serrulate and that one of the serratics at either the near or far end (rarely at both) is enlarged to form a spine. In the smaller cheliped the fingers are slender hooked and finely toothed, and are rather longer than the slightly swollen palm: in the larger cheliped they are stouter and more coarsely toothed and are shorter than the swollen palm.

Legs slender, the longest pair are hardly more than twice the length of the carapace; the dactylus of all, though compressed, is slender.

In the Indian Museum are 16 specimens from off Ceylon 34 fathoms (besides 3 from Mauritius and 2 from Samoa).

In the largest specimen (from Mauritius) the carapace is 9.5 millim. long and 14.5 millim. broad. The Indian specimens, though they include egg-laden females, are much smaller.

#### PSOPHETICUS, Wood-Mason.

*Psopheticus*, Wood-Mason, Admin. Rep. Marine Survey of India, 1890-91, p. 20 (name only): Alcock, Investigator Deep-Sea Brachyura, p. 72.

*Psopheticus* in several respects connects *Carcinoplax* and *Pseudorhombila* with *Eucrate*, and hence serves to emphasize the opinion of Miers as to the closeness of the ties that connect the three latter genera.

As in *Pseudorhombila* and *Carcinoplax*, the carapace is much broader than long and the orbital hiatus is open. As in *Pseudorhombila*, the dactylus of the last pair of legs is styliform. As in *Eucrate*, the fronto-orbital border occupies almost all the breadth of the carapace.

Carapace deepish, quadrilateral or subquadrilateral, a good deal broader than long, with the regions hardly defined, moderately convex fore and aft, flat from side to side.

Fronto-orbital border little, if at all, less than the greatest breadth of the carapace; the antero-lateral borders of the carapace therefore— which are short—are either very slightly arched or are in the same



straight line with the postero-lateral borders. Front square, entirely straight, prominent, entire, not well delimited from the supra-orbital angles, equal to the third the breadth of the carapace, or a little less.

Upper border of orbit very sinuous and with a single faint shoulder suture line. The antennal flagellum, which is of good length, stands loosely in the orbital hiatus. The antennules fold transversely.

Mouth and external maxillipeds as in *Euerate*.

Chelipeds much stouter than the legs. The legs end in a slender styliform dactylus, and have one or many spines on the anterior border of the merus.

In both sexes the abdomen consists of seven separate segments, and in the male the third segment covers the whole width of the sternum between the last pair of legs.

Distribution: Andaman Sea.

#### Key to the (Indian) species of *Psopheticus*.

- I. Carapace quite quadrilateral, the fronto-orbital border being equal to the greatest breadth of the carapace: meropodites of legs with numerous spines ... *P. stridulans*.
- II. Carapace subquadrilateral, the fronto-orbital border being about three-fourths its greatest breadth; meropodites of legs with a single spine ... *P. insignis*.

#### 11. *Psopheticus stridulans*, Wood-Mason.

*Psopheticus stridulans*, Wood-Mason, Illustrations of the Zoology of the Investigator, Crustacea, pl. v, fig. 1. (1892); Alcock, Ann. Mag. Nat. Hist., May 1894, p. 402; and Investigator Deep-Sea Brachynra, p. 73.

Carapace quite quadrilateral, three-fourths as long as broad, smooth and polished, crossed transversely in its posterior half by a broad groove which is continued obliquely across the pterygostomian regions to the angles of the mouth.

Owing to the large size of the eye and orbit, the extent of the fronto-orbital border is equal to the greatest breadth of the carapace.

A thin sharp prominent tooth at the outer orbital angle, and an obliquely-prominent spine at the junction of the antero-lateral and postero-lateral borders.

The subocular and subhepatic regions are inflated, and together form a granular eminence against which a strong spine on the upper border of the arm can be brought to play, producing a sound. Hence the names *Psopheticus* and *stridulans*.

The major diameter of the reniform eye is between a sixth and a seventh the breadth of the carapace; though the orbit does not conceal the eye its edges are well and cleanly cut.

The chelipeds in the adult male are a little more, in the adult female a little less, than twice the length of the carapace, but are slightly shorter than the legs: they are smooth and polished, as also are the legs. The arm has a strong upstanding claw-like tooth near the middle of its upper border, one or two spinules near the far end of the outer border, and a spinule near the far end of the inner border: the wrist has both the inner and the outer angles spiniform.

The third pair of legs, which are slightly the longest of the four, are rather more than two-and-a-half times the length of the carapace. In all, the anterior edge of the meropodites is armed with spines and the same edge of the carpopodites with spinules—these being least numerous and least distinct in the case of the first pair.

Colours in glycerine: chelipeds and legs rather dusky red; carapace dusky red behind the transverse groove—which forms a very sharply-defined red band—livid red, or almost violet, in front of it; eyestalks almost purple, eyes purplish-black. Eggs in life magenta.

The carapace of the largest male is 15 millim. long and 20 millim. broad.

Only known, so far, from the Andaman Sea: 2 males and a female from 173 fms., 2 males and a female (Types of the species and genus) from 188–220 fms., 7 females (3 with eggs) from 185 fms., a male and 4 females from 370–419 fms.

#### 12. *Psopheticus insignis*, n. sp.

Carapace subquadrilateral, the antero-lateral borders being slightly arched, about three-fourths as long as broad, smooth, crossed transversely by two very low and indistinct ridges—one (convex forwards) between the lateral epibranchial spines, the other at the level of the post-cardiac region. The extent of the fronto-orbital border is about three-fourths the greatest breadth of the carapace.

There is a bluntish tooth at the outer orbital angle, and an obliquely prominent spine at the junction of the antero-lateral and postero-lateral borders, the edge of the carapace between the two being granular.

Eye small, subglobular, its diameter being hardly a tenth the greatest breadth of the carapace.

Chelipeds more than  $2\frac{1}{2}$  times as long as the carapace and decidedly longer than the legs: they are unarmed except for a small tooth or spinule at the outer angle of the wrist.

The meropodites of the legs have the anterior border sharply granular, and in the case of the last three pair of legs there is a spine near the far end of this border. The longest pair of legs are hardly  $2\frac{1}{3}$  times as long as the carapace.

Two specimens, from the Gulf of Martaban, 60 and 67 fms.

The carapace of the largest is 13 millim. long and 19 millim. broad.

Colours in glycerine, reddish: in the middle of the carapace is a large deep-red shield with a milk-white edge and centre.

This species closely connects *Psopheticus* with *Carcinoplax*.

#### PILUMNOPLAX, Stimpson restr.

*Pilumnoplax*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858 (1859) p. 93: Miers, Challenger Brachyura, p. 225: Alcock, Investigator Deep Sea Brachyura, p. 74.

Carapace depressed, flat, a little broader than long, the regions very faintly indicated. Fronto-orbital border two-thirds, or more, the greatest breadth of the carapace: the antero-lateral borders, which are toothed, are slightly arched or oblique. Front square-cut, straight, rather prominent, more or less confluent with the supra-orbital angles, often notched or grooved in the middle line.

Supra-orbital border often with two fissures. The antennal flagellum, which is of good length, stands in the orbital hiatus. The antennules fold transversely, or nearly so.

Mouth and mouth-parts as in *Eucrate*.

Chelipeds either subequal or unequal, much more massive than the legs. Legs slender, their dactyli compressed.

The abdomen in both sexes is seven-jointed: in the male the 3rd segment covers the whole width of the sternum between the last pair of legs.

*Distribution*: Tropical and S. Atlantic (deep sea), Arabian Sea (deep), Japan, Fiji.

The species of *Pilumnoplax* are characterized by the flat, depressed carapace, which is also comparatively narrow and, owing to the prominence of the perfectly straight front, is subhexagonal in shape.

#### 13. *Pilumnoplax americana*, Rathbun.

*Pilumnoplax americanus*, Mary J. Rathbun, Bull. Lab. Nat. Hist. Iowa, 1898, p. 283, pl. vii. figs. 1, 2.

*Pilumnoplax Sinclairi*, Alcock, Investigator Deep Sea Brachyura, p. 74, pl. iii. fig. 1.

Carapace subquadrilateral, much depressed, a little more than three-quarters as broad as long, very finely frosted, perfectly bare, the regions fairly indicated.

Front horizontal, slightly prominent, square cut, grooved but not distinctly notched in the middle, more than a third the greatest breadth

of the carapace; its free edge is turned vertically downwards and rather deeply grooved from side to side.

The antero-lateral borders are not much more than half the length of the postero-lateral: they are thin and sharp, and are cut into three teeth, of which the first is broad and bicuspid and the other two are acute. On the postero-lateral borders, just behind the junction with the antero-lateral, is a denticle.

The eyes are small but well-formed, and are freely movable. The orbits conceal the retracted eyes to dorsal view: their upper margin is fissured near the middle, and the lower margin is slightly excavated just below the outer angle: the inner angle of the lower margin is not prominent, though dentiform.

The chelipeds in both sexes are very unequal, the larger one being not quite twice as long as the carapace; their surface, under the lens, is finely frosted: the inner angle of the wrist is strongly pronounced and is capped by a pair of acute teeth.

Legs moderately stout, unarmed, smooth, almost hairless: the third pair, which are somewhat the longest, are about two-and-a-half-times the length of the carapace. The dactyli are compressed-styliform.

Colours in spirit french-grey, fingers much darker grey.

A single female specimen, from off the Travancore coast 430 fms., has the carapace 13 millim. long and 16 millim. broad.

This species is closely related to *Pilumnoplax heterochir* (Studer) Miers, but is distinguished from it by the entire and more prominent front, by the absence of transverse markings on the carapace, by the longer legs, and by the smoothness of the chelipeds and legs.

From *Pilumnoplax abyssicola* Miers, which it also closely resembles, it is distinguished by the smooth carapace (to the naked eye), by the turned-down milled edge of the front, by the spinule on the postero-lateral border, by the fissured upper-margin of the orbit, and by the double spine at the inner angle of the wrist.

*Distribution*: Off Atlantic coasts of North America (Florida and Georgia) 440 and 70 to about 200 fms. Off Travancore coast 430 fms.

A single specimen from the latter locality is in the Indian Museum collection.

#### [PLATYPILUMNUS, Wood-Mason.]

*Platypilumnus*, Wood-Mason MS., Alcock, Ann. Mag. Nat. Hist., May, 1894, p. 401: Journ. Asiatic Soc. Bengal, Vol. LXVII. pt. 2, 1898, p. 232: Investigator Deep Sea Brachyura, p. 62.

This genus, like so many of the preceding, has strong affinities with

the *Xanthidae*: it may prove to belong to that family, where I have already, with reserve, placed it.

I may here, however, state that it closely resembles *Pilumnoplax*, having a flat, depressed, slightly transverse carapace. It differs from *Pilumnoplax* in the following particulars:—

(1) the front is more prominent, so that the carapace is more decidedly hexagonal:

(2) the fronto-orbital border is sharply serrated and the chelipeds and legs are profusely spiny:

(3) the external maxillipeds do not completely close the buccal cavern, but leave a wide gap between their anterior margin and the edge of the epistome:

(4) the dactyli of the legs are styliform.

*Distribution*: Andaman Sea.]

[*Platypilumnus gracilipes*, Wood-Mason.

*Platypilumnus gracilipes*, Wood-Mason MS., Alcock, Ann. Mag. Nat. Hist., May, 1894, p. 401: Ill. Zool. Investigator, Crust., pl. xiv. fig. 6: J.A.S.B. Vol. LXVII, pt. 2, 1898, p. 232: Investigator Deep Sea Brachyura, p. 63.

A description of the female (which is the only sex known) has been already given in this *Journal* (*loc. cit.*)].

LITochira, Kinahan.

*Litochira*, Kinahan, Journ. Roy. Soc. Dublin, I. 1858, p. 121: Miers, Challenger Brachyura, p. 231.

? *Brachygrapsus*, Kingsley, Proc. Ac. Nat. Sci. Philad. 1880 (1881) p. 203.

Carapace and appendages in all the Indian species thickly tomentose and hairy.

Carapace deepish, either subquadrilateral and a good deal broader than long, or almost square, smooth, with little or no distinction of regions, flat, but declivous anteriorly. Fronto-orbital border not much less than, if not equal to, the greatest breadth of the carapace: antero-lateral borders short and if arched at all, very slightly so, and usually, but not always, with 2 or 3 teeth or spines.

Front not well delimited from the supra-orbital angles, its free edge deflexed and somewhat arched, never square-cut and laminar; more or less distinctly bilobed.

Upper border of orbit entire. The antennal flagellum, which is of good length, stands in the orbital hiatus. The antennules fold transversely, or nearly so.

Mouth and external maxillipeds as in *Eucrate*, &c.

Chelipeds subequal, more massive and usually shorter than the legs. The legs, including the dactyli, are compressed.

The abdomen of the male occupies the whole width of the sternum between the last pair of legs : in both sexes it consists of 7 segments.

I restrict the genus *Litochira* to those species which have the edge of the front turned down and distinctly arched as is shown in Kinahan's figure. These species fall into two groups, in one of which the carapace is a good deal broader than long, as in Kinahan's type, while in the other it is nearly square. Perhaps these two groups should be separated, though I do not recommend this course.

*Distribution* : S. Atlantic and Indo-Pacific (Cape to Australia).

*Key to the Indian species of Litochira.*

- I. Length of carapace about two-thirds the greatest breadth of the carapace and equal to the extent of the fronto-orbital border ; the antero-lateral borders distinctly arched :—
  1. Antero-lateral borders of the carapace with three truncated teeth, exclusive of the orbital angle .. *L. angustifrons.*
  2. Antero-lateral borders with two distinct, though blunt, teeth ..... *L. setosa.*
  3. Antero-lateral borders with hardly any trace of lobulation—almost entire ..... *L. integra.*
- II. Carapace more nearly square, the fronto-orbital border almost equal to its greatest breadth, so that the antero-lateral borders are almost in the same straight line with the postero-lateral borders or a very little curved :—
  1. Antero-lateral borders with two spines and one at the orbital angle : legs unarmed ..... *L. Beaumontii.*
  2. Antero-lateral borders with two spines : no spine at the orbital angle : meropodites of the legs with some spines ..... *L. quadrispinosa.*

14. *Litochira integra* (Miers).

*Carcinoplax integra*, Miers, Zool. H. M. S. Alert, p. 543, pl. xlviii. fig. C : de Man, Journ. Linn. Soc., Zool., XXII, 1887-88, p. 93.

Length of the carapace about two-thirds its breadth and equal to the extent of the fronto-orbital border.

Antero-lateral borders arched, without spines, though when completely denuded they are granular and show faint but quite distinguishable traces of division into two lobules besides the orbital angle.

Chelipeds less than twice the length of the carapace and shorter than the legs, unarmed except for an indistinct blunt tooth near the

far end of the upper border of the arm : inner angle of wrist dentiform.  
Legs unarmed.

A single female from Mergui: its carapace is 6 millim. long and 9 millim. broad.

15. *Litochira setosa* (A. M. Edw.).

*Carcinoplax setosa*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 267, pl. xii. fig. 2: de Man, Archiv f. Naturges. LIII. 1887, i. p. 349, and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 93.

The only essential difference between this species and the preceding is that the carapace here is a little more depressed and that the antero-lateral borders are cut into 2 blunt teeth besides the blunt orbital angle. The size is about the same.

In the Indian Museum are 16 specimens, from the Andamans and Mergui.

16. *Litochira angustifrons*, n. sp.

Carapace, length a little more than two-thirds the breadth. Fronto-orbital border nearly five-ninths the breadth of the carapace in extent. Antero-lateral borders arched, cut into 4 teeth (including the outer orbital angle) the edges and dorsal surface of which are granular: the first 3 teeth are sharply truncated, the fourth is subacute.

Chelipeds, in the adult male, nearly twice the length of the carapace and hardly shorter than the legs; in the female much less than twice the length of the carapace and markedly shorter than the legs. There is a lobule near the far end of the upper border of the arm, and the inner angle of the wrist is subacute.

Two specimens, from Bombay and Karachi. The carapace of the larger is 13 millim. long and 18 millim. broad.

This species appears to be closely related to *Pilumnoplax ciliatus* Stimpson.

17. *Litochira Beaumontii*, n. sp.

Carapace, length more than two-thirds the greatest breadth, nearly square. The extent of the fronto-orbital border is hardly less than the breadth of the carapace. The antero-lateral borders are hardly arched and are armed with 3 sharp spinules—including one at the outer orbital angle.

The chelipeds are much shorter than the legs and, like them, are unarmed, except that the inner angle of the wrist is dentiform. The longest (penultimate) pair of legs are more than  $2\frac{1}{2}$  times as long as the carapace.

In the Indian Museum are 4 specimens, from the Andamans and from off Ceylon 34 fms. The carapace of the type specimen is 5 millim. long and 7 millim. broad.

Colour in spirit, uniform yellow.

18. *Litochira quadrispinosa*, Zehntner.

*Litochira quadrispinosa*, Zehntner, Rev. Suisse de Zool. II. 1894, p. 171, pl. viii. figs. 11, 11b.

Differs from *L. Beaumontii* in the following particulars only:—

- (1) the carapace is still more nearly square:
- (2) there are 2 spines on the antero-lateral borders but none at the outer orbital angles:
- (3) the inner border of the ischium and arm of the chelipeds is serrated, and the meropodites of the legs are armed with spines.
- (4) the colouration is yellow, with a large purplish-brown horse-shoe behind the front, and with sinuous markings of the same colour on the lateral subfrontal and suborbital regions of the carapace: the greater part of the antennal flagella is of the same purplish-brown colour.

In the Indian Museum is a single specimen from the Andamans: the carapace is 4 millim. long and 5 millim. broad.

Subfamily ii. GONOPLACINÆ.

19. GONOPLAX, Leach.

*Gonoplax*, Leach, Trans. Linn. Soc. XI. 1815, pp. 309, 323, and Malac. Bod. Brit.: Desmarest, Consid. Gen. Crust. p. 124, and Dict. Sci. Nat. XXVIII. p. 243: De Haan, Faun. Japon. Crust., p. 19: Milne Edwards, Hist. Nat. Crust. II. 60, and Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 162: Dana, U. S. Expl. Exp. Crust. pt. I. p. 310: Bell, Brit. Stalk-eyed Crust. p. 129: Heller, Crust. Sudl. Europ. p. 102: Miers, Challenger Brachyura, p. 245.

*Rhombilia*, Lamarck (part), Hist. Nat. Anim. sans Vert. (2) V. p. 466: Latreille, Encyc. Méthod. X. p. 292.

Carapace subquadilateral, with the antero-lateral angles acute and the lateral borders posteriorly convergent, a good deal broader than long, moderately convex, the regions but faintly indented.

The front and orbits occupy the whole anterior border of the carapace: the front is square cut, laminar, and obliquely deflexed, and takes up between a third and a fourth of the anterior border of the carapace, the rest being taken up by the trench-like orbits.

Eyestalks long and slender: the antennules fold quite transversely beneath the front: the antennæ have a short basal joint and a slender flagellum of good length, standing in the orbital hiatus.



The buccal cavern is square and is well separated from the prominent epistome: the efferent branchial channels are not well defined. The external maxillipeds completely close the buccal cavern: their merus is square and carries the flagellum at the antero-internal angle.

Chelipeds in both sexes much more massive, and in the male very much longer, than the legs, which are long and slender.

The abdomen in both sexes consists of 7 separate segments: in the male the 3rd segment nearly but not quite covers the sternum between the last pair of legs.

*Distribution*: North-Eastern Atlantic coasts, Mediterranean basin; Persian Gulf; East Indian Archipelago.

In the Indian Museum there is a young female, lately received by myself from the Persian Gulf, of a species of *Gonoplax*. Apart from the shortness of the chelipeds it differs from *G. angulata*, of which we have several good specimens from Europe, only in wanting the terminal spine to the upper border of the meropodites of the legs.

Subfamilies iii. & iv. RHIZOPINÆ & HEXAPODINÆ.

*Key to the Indian Genera.*

A. Four pairs of legs, besides the chelipeds (*Rhizopinæ*):—

I. The antennular flagella can be completely retracted within the antennular fossæ:—

1. The epistome is of good length fore and aft, it is not in any way confused with the palate but is commonly prominent and almost vertical:—

i. Eyes well formed, rarely deficient in pigment:—

a. Eyes in all respects perfect: front straight, entire, from two-fifths to half the greatest breadth of the carapace: merus of the external maxillipeds nearly square.....

NOTONYX.

b. Eyes either quite perfect or deficient in pigment: front slightly curved and notched in the middle, about a third the greatest breadth of the carapace: antero-external angle of the merus of the external maxillipeds much produced...

CERATOPLAX.

ii. Eyes obsolete or nearly so:—

a. Carapace much broader than long, the postero-lateral borders parallel ...

TYPHLOCARCINUS.

b. Carapace a little broader than long, the postero-lateral borders anteriorly-convergent .....

XENOPHTHALMODES.

2. The epistome is short, sunken, and not boldly separated from the palate :—
- i. Eyes minute, orbits concealed beneath the anterior border of the carapace : merus of external maxillipeds with a sharp antero-external angle ... .. SCALOPIDIA.
  - ii. Eyes obsolete or nearly so, orbits visible from above : antero-external angle of merus of external maxillipeds rounded off ... .. TYPHLOCARCINODES.
- II. The basal joint of the antennules completely fills its fossa, into which the flagellum cannot therefore be retracted :—
1. Eyes small, but perfect : outer border of merus of external maxillipeds almost straight ... .. HEPHTHOPELTA.
  2. Eyes reduced to a speck of pigment : outer border of merus of external maxillipeds with a strongly convex bulge outwards ... .. CAMATOPSIS.
- B. Only three pairs of legs besides the chelipeds, the last pair of other crabs not being represented even by a rudiment. The *vasa efferentia* of the male open on the 4th sternal segment (*Hexapodinae*) ... .. LAMBDOPHALLUS.

## Subfamily iii. RHIZOPINÆ, Stimps.

NOTONYX, A. M. Edw.

*Notonyx*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 268 : Miers, Challenger Brachyura, p. 235.

Carapace deepish, subquadrilateral with the antero-lateral angles rounded off, broader than long, perfectly nude smooth and polished, without any indication of regions, convex fore and aft and anteriorly declivous.

Fronto-orbital border a good deal more than three-fourths the greatest breadth of the carapace : antero-lateral borders short, entire, curved. Front straight, sublaminar, from two-fifths to half the breadth of the carapace.

Eyes small but well developed, the eyestalks movable, obpiriform : orbits in the usual marginal position. The antennules fold transversely in well formed pits. Basal antenna-joint short ; the flagellum, which is of fair length, stands in the orbital hiatus.

Epistome well formed, nearly vertical : buccal cavern a little wider in front than behind. A slight hiatus between the external maxillipeds, the merus of which appendages is square and carries the flagellum at the antero-internal angle.

Chelipeds subequal, or a little unequal, smooth and polished, much

more massive and but little shorter than the legs: palm short and rather deep, with the lower border sharply carinate.

Legs smooth, unarmed, with a very few scattered lank hairs: dactyli styliiform.

The abdomen in both sexes consists of 7 separate segments and does not nearly conceal the sternum between the last pair of legs.

*Distribution*: Indo-Pacific, from Fiji to the Persian Gulf.

*Key to the Indian species of Notonyx.*

- I. Carapace, length about three-fourths the breadth: merus of external maxillipeds about as long as the ischium ... *N. nitidus.*
- II. Carapace, length about five-sixths the breadth: merus of external maxillipeds much shorter than the ischium ... *N. vitreus.*

20. *Notonyx nitidus*, A. M. Edw.

*Notonyx nitidus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX, 1873, p. 209, pl. xii. fig. 3: Miers, Challenger Brachyura, p. 236.

Carapace, length a little more than three-fourths the greatest breadth. Front between a third and two-fifths the breadth of the carapace. Orbits elongate. Merus of the external maxillipeds as long as the ischium.

A small denticle near the far end of the upper border of the arm: inner angle of wrist pronounced, but not acute.

Legs with some scattered hairs along the edges, the 3rd pair, which are slightly the longest, are about  $2\frac{1}{2}$  times the length of the carapace and nearly half again as long as the chelipeds.

In the Indian Museum is a single specimen from the Persian Gulf: its carapace is 8.5 millim. long and 11 millim. broad.

21. *Notonyx vitreus*, n. sp.

Carapace, length about five-sixths the greatest breadth, rather tumid. Front nearly half the breadth of the carapace. Merus of the external maxillipeds shorter than the ischium.

No denticle on the arm: inner angle of wrist blunt. Legs with hardly any hairs, otherwise resembling those of *N. nitidus*.

In the Indian Museum is a single specimen from the Andaman Sea, 53 fathoms: its carapace is 5 millim. long and 6 millim. broad.

CERATOPLAX, Stimpson.

*Ceratoplax*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 96: Miers, Challenger Brachyura, p. 233.

Carapace deep, subquadrilateral with the antero-lateral angles rounded off, a good deal broader than long, the regions very indistinctly

and incompletely indicated, strongly convex fore and aft and anteriorly declivous.

Fronto-orbital border about two-thirds the greatest breadth of the carapace: antero-lateral borders sharp, entire, curved: postero-lateral borders parallel.

Front about a third the greatest breadth of the carapace, its free edge slightly arched, notched in the middle line.

The orbits are in the usual position and the eyestalks are immovably fixed in them, but the eyes are fairly well formed, though they may be deficient in pigment. The antennules fold transversely in proper pits. The basal antenna-joint is short: the flagellum, which is of good length, stands in the orbital hiatus.

Epistome well formed and prominent: buccal cavern quadrilateral, slightly increasing in breadth from behind forwards, almost completely closed by the external maxillipeds, the merus of which has the antero-external angle much produced and carries the flagellum at the antero-internal angle.

Chelipeds subequal, more massive but decidedly shorter than the legs; the palm short, deep, and compressed.

Legs slender, unarmed, the 3rd pair the longest: dactyli styliform.

The abdomen in both sexes consists of 7 separate segments and does not nearly occupy the space between the last pair of legs.

*Distribution*: Indo-Pacific from the Bay of Bengal to Ecuador.

#### Key to the Indian species of *Ceratoplax*.

- I. Surface of carapace nude, eyes well pigmented: outer surface of palm polished and nearly smooth ... .. *C. ciliata*.
- II. Surface of carapace tomentose, eyes deficient in pigment: rows of vesiculous granules on the outer surface of the palm ... .. *C. hispida*.

#### 22. *Ceratoplax ciliata*, Stimpson.

*Ceratoplax ciliatus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 96: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 110.

*Ceratoplax ciliata*, Miers, Challenger Brachyura, p. 234, pl. xix. fig. 3: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 229.

Carapace, chelipeds and legs rather scantily fringed with hairs, but with a nude surface.

Carapace, length a little more than three-fourths the greatest breadth, sparsely punctate, the regions not distinguishable. Front about a third the greatest breadth of the carapace, its free edge slightly arched and notched in the middle line. Eyes well pigmented. Chelipeds decidedly shorter than the legs: inner angle of wrist sharp, but

not produced: outer surface of palm smooth and polished, except for a few depressed granules inferiorly. Third pair of legs not twice the length of the carapace.

In the Indian Museum is a single specimen from the Andaman Sea, 53 fms.

23. *Ceratoplax hispida*, n. sp.

Carapace, chelipeds and legs with a tomentose surface, and fringed with longer silky hairs.

Carapace, length a little less than three-fourths the breadth, when denuded its regions (and three gastric subregions) are just distinguishable, and its surface is pitted and its lateral margins granular. Front a little more than a third the greatest breadth of the carapace, its free edge decidedly arched and notched in the middle line. Eyes very deficient in pigment. Chelipeds (in the female—male unknown) much shorter than the legs: inner angle of wrist sharply dentiform; outer surface of palm with numerous rows of vesiculous granules. Third pair of legs two-and-a-half times the length of the carapace.

In the Indian Museum is a single specimen from Palk Straits: its carapace is 9 millim. long and 13 millim. broad.

TYPHLOCARCINUS, Stimpson.

*Typhlocarcinus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 95.

Carapace as in *Ceratoplax*. Fronto-orbital border about half the greatest breadth of the carapace. Front less than a fourth the breadth of the carapace, more or less distinctly bilobed. Antero-lateral borders well curved, often emarginate in places: postero-lateral borders parallel.

Orbits in the usual position, completely filled by the immovable eye-stalks: eyes obsolete, or nearly so. The antennules fold nearly transversely, in proper pits. Basal antenna-joint short; the flagellum, which is short, stands in the orbital hiatus.

Epistome well formed and prominent: buccal cavern completely, or almost completely, closed by the external maxillipeds, the flagellum of which articulates with the antero-internal angle of the merus; the outer angle of the merus not produced.

Chelipeds subequal or unequal, much more massive than the legs from which they do not much differ in length: palm short deep and compressed, with sharp upper and lower borders.

Legs slender, unarmed, the 3rd pair slightly the longest: dactyli styliform.

The abdomen in both sexes consists of 7 separate segments and does not nearly occupy all the sternum between the last pair of legs.

*Distribution*: Indo-Pacific, from the Persian Gulf to Hongkong.

From *Rhizopa*, of which we possess specimens from Hongkong, this genus differs only in having the eyes obsolete and the external maxillipeds more closely opposed to each other. It may well be doubted whether these differences are of generic value.

*Key to the Indian species of Typhlocarcinus.*

- I. Antero-lateral borders with 2 or 3 emarginations:—
1. Buccal cavern decreasing in size from behind forwards: antero-external angle of merus of external maxillipeds obsolete and rounded off ... .. *T. nudus.*
  2. Buccal cavern quite square: antero-external angle of merus of external maxillipeds sharp ... .. *T. villosus.*
- II. Antero-lateral borders of carapace entire: buccal cavern quite square ... .. *T. rubidus.*

24. *Typhlocarcinus nudus*, Stimpson.

*Typhlocarcinus nudus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 96.

Carapace much transverse, its length only about five-eighths its greatest breadth, its surface smooth and bare, the regions hardly distinguishable. The posterior part of the antero-lateral border has two or three obscure notches.

The front, which is about a fifth the greatest breadth of the carapace, is grooved in the middle line—almost bilobed. Orbits broadly oval, almost subcircular.

Buccal cavern considerably decreasing in breadth from behind forwards: merus of the external maxillipeds with the antero-external angle obsolete and rounded off; the exognath very narrow.

Chelipeds and legs smooth, with only a few scant hairs on the margin. Chelipeds, in the male about twice the length of the carapace, a little longer than any of the legs: inner angle of wrist sharp, but not produced: palms unequal, smooth and polished, the upper border smooth and crest-like, the lower border with a distinct moulding.

In the Indian Museum are 25 specimens, from Karachi and the Mekran coast, Madras coast and Sandheads, and the Andamans.

In this species a tiny speck of pigment denotes an eye.

25. *Typhlocarcinus villosus*, Stimpson.

*Typhlocarcinus villosus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 96. Miers, P. Z. S., 1879, pp. 20, 40; Walker, Journ. Linn. Soc. Zool. XX. 1890, p. 110, pl. ix. figs. 6-8; Ortmann, Zool. Jahrb. Syst. VII. 1893-04, p. 689.

Carapace and appendages everywhere covered with velvet. Carapace

about three-fourths as long as broad, its greatest breadth across the middle: when dentated it is granular in places and the regions are hardly distinguishable. Three blunt granular teeth on the lateral borders, two of which are antero-lateral, the third being postero-lateral.

Front between a fourth and a fifth the breadth of the carapace, bilobed: orbits pyriform.

Buccal cavern quite square: antero-external angle of merus of external maxillipeds well marked but not produced, the exognath normal.

Chelipeds about twice as long as the carapace, and nearly the same length as the 3rd (longest) pair of legs, their outer surface, especially that of the palm, is granular: inner angle of the wrist produced, dentiform. The legs are fringed with coarsish hairs.

In the Indian Museum, besides a specimen from Hongkong, are 6 from various parts of the coast of the Bay of Bengal.

The carapace of the best specimen is 6 millim. long and 8 millim. broad.

In this species also there is a tiny speck of pigment for an eye.

#### 26. *Typhlocarcinus rubidus*, n. sp.

Carapace perfectly smooth and nude, except for a few hairs on the anterior and antero-lateral margins, its length a little over three-fifths its breadth, the regions hardly distinguishable, though the epibranchial regions have a decided dorsal bulge.

The antero-lateral borders, which, like the postero-lateral are blunt and granular, are quite entire.

Front about a fifth the breadth of the carapace, bilobed, the median groove very deep. Orbits pyriform. Buccal cavern and external maxillipeds as in *T. villosus*.

Chelipeds and legs rather hairy, but there is always a large smooth bare space on the outer surface of the wrist and palm. Chelipeds about as long as the longest legs, less than twice the length of the carapace: inner angle of wrist produced, dentiform: below and above the bare patch on the wrist and hand the surface, when dentated, is granular.

The colour is a rich ruddy brown.

In the Indian Museum are 18 specimens from the Bay of Bengal, 20 to 65 fms.

The largest specimen has the carapace nearly 7 millim. long and 10 millim. broad, but there are egg-laden females smaller than this.

There is no pigment speck to represent an eye in this species.

#### XENOPHTHALMODES, Richters.

*Xenopthalmodes*, Richters, in Müllins Meeresf. Maurit. p. 155, 1880.

Carapace rudely semicircular in outline, the posterior border being

the longest, and the postero-lateral borders being anteriorly-convergent to form a common curve with the well-arched anterior and antero-lateral borders: it is but little broader than long, is convex fore and aft and strongly declivous anteriorly, and shows the regions indistinctly and incompletely.

Fronto-orbital border less than half, front less than a fifth, the greatest breadth of the carapace, the front being prominent and bilobed.

Orbits in the usual position, completely filled by the immovable eye-stalks: eyes obsolete. The antennules are small, and fold obliquely rather than transversely in proper pits. Basal antenna-joint short: the flagellum, which also is short, stands in the orbital hiatus.

Epistome and mouth parts, as also the abdomen, as in *Typhlocarcinus*.

Chelipeds a little unequal, much more massive and rather longer than the legs, of which the 3rd pair is slightly the longest. Palm short deep and compressed, with sharp edges.

Legs slender, unarmed: dactyli styliform.

*Distribution*: Indian Ocean, from Mauritius and the Red Sea to the Andamans.

This genus differs from *Typhlocarcinus* in having the carapace more elongate and more semicircular in outline, the front more prominent and narrower, and the antennules more cramped in consequence.

#### 27. *Xenophthalmodes moebii*, Richters.

*Xenophthalmodes moebii*, Richters, in Möbius, Meeresf. Maurit. p. 155, pl. xvi. fig. 29 and pl. xvii. figs. 1-5 1880: Miers, P. Z. S. 1884, pp. 10, 12: de Man, Notes Leyden Mus. XII. 1890, p. 68, pl. iii. fig. 5.

The carapace has rather a lop-sided look and is practically smooth, except for two rather deep semilunar impressions that incompletely separate the gastro-cardiac from the epibranchial regions: its surface is bare, but its free edges, like the edges of the chelipeds and legs, are thickly fringed with longish silky hairs: its length is about five-sixths the greatest breadth, which is quite posterior. Front very decidedly bilobed. Orbits oval. Buccal cavern very slightly decreasing in breadth anteriorly: the merus of the external maxillipeds has the antero-external angle rounded off.

Chelipeds in the male a little longer than the legs, and with the hands decidedly unequal: the inner angle of the wrist is acuminate: the upper edge of the palm is sharp and crest-like, the lower edge has a low granular crest or moulding, the surface of the palm is smooth and polished. The larger cheliped, measured along its convexities, is about twice the length of the carapace.



In the Indian Museum are 13 specimens, from the Persian Gulf, Malabar coast, Coromandel coast, Gulf of Martaban, and the Andamans. The carapace of the largest specimen is 10 millim. long and 12 millim. broad.

In one very young specimen the eye is represented by a tiny speck of pigment, as shown in de Man's figure, but in large specimens there is no trace of this speck.

SCALOPIDIA, Stimpson.

*Scalopidia*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 95: Miers, Challenger *Braehynra* p. 223.

*Hypophthalmus*, Richters, Abh. Senck. Nat. Ges. Frankfurt, XII. 1861, p. 429.

Carapace of but moderate depth, moderately convex fore and aft and but moderately declivous anteriorly: it is a good deal broader than long and inclines somewhat to a semicircular outline, the greatest breadth being quite posterior, the postero-lateral borders being anteriorly convergent, and the antero-lateral borders being nicely curved: the regions are distinctly mapped out by fine grooves.

Fronto-orbital border about two-fifths, front about a fourth the greatest breadth of the carapace: front rather obscurely bilobed, antero-lateral borders acute.

Eyes minute, eyestalks fixed in small orbits which lie entirely beneath the anterior border of the carapace. The antennules fold transversely in shallow and rather inadequate pits. Basal antenna-joint short; the flagellum, which is of moderate length, stands quite clear of the orbital hiatus.

Epistome sunken, not well demarcated from the edge of the buccal cavern: the latter is squarish and broader in front than behind. There is a considerable gap between the external maxillipeds, the merus of which is square and has a sharp antero-external angle and carries the flagellum at the antero-internal angle.

Chelipeds a little unequal, much shorter and not much more massive (except as regards the larger palm) than the third pair of legs: palm short and compressed, with sharp edges.

The legs have the merus broadened, especially in the case of the 2nd and 3rd pair: the 3rd pair is considerably the longest.

The abdomen consists of 7 separate segments, and does not nearly occupy all the sternum between the last pair of legs.

*Distribution*: Indo-Pacific, from Madagascar to China.

28. *Scalopidia spinosipes*, Stimpson.

*Scalopidia spinosipes*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 95: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 379.

Carapace and appendages downy. Carapace, length about two-

thirds the greatest breadth, its surface closely punctate: all the regions are quite plainly defined by grooves, which also subdivide the gastric into three subregions, and the epibrauchial into two—an anterior and a posterior; and the cardiac region has a distinct bulge. The sharp-ent antero-lateral borders are, like the anterior border, very finely serrated, and are marked off from the blunt postero-lateral borders by a minute spine.

The larger cheliped is barely half again as long as the carapace: both chelipeds have the lower edge of the arm finely serrated, have a spinule near the far end of the upper border of the arm and one at the outer angle of the wrist, and have the inner angle of the wrist strongly dentiform.

The legs have their edges, except in the case of the dactyli, closely and evenly spinulate, but there is a tendency for the spines to fail on the posterior edge of the carpus and propodite. The 3rd pair, which are considerably the longest, are much more than  $2\frac{1}{2}$  times the length of the carapace. The legs increase remarkably in length from the 1st to the 3rd, and the 4th are about the same length as the first. The dactyli are sharp, strong, styliform and ciliated: those of the last pair are curved, those of the other pairs are straight.

Henderson records this species from the Gulf of Martaban: the only specimens in the Indian Museum are from Hongkong.

#### 29. TYPHLOCARCINODES, n. gen.

Apparently one of the links between *Typhlocarcinus* and its allies on the one hand and *Scalopidia* on the other.

Carapace moderately deep, shaped much as in *Typhlocarcinus*, but slightly more elongate, the free edges hairy. Fronto-orbital border about three-fifths, front about a third, the greatest breadth of the carapace: front prominent, its free edge convex and entire.

Orbits in the normal position, narrow, button-hole shaped; eye-stalks tapering; immovable; eyes obsolete or nearly so. *Antennules cramped, folding very obliquely—nearly longitudinally*—in proper pits. Antennal peduncle small and cramped, the flagellum standing in the orbital hiatus.

*Epistome sunken, linear*: buccal cavern square, its anterior angles, like the antero-external angles of the merus of the external maxillipeds, rounded off: the external maxillipeds completely close the buccal cavern and have the flagellum articulated to the antero-internal angle of the merus.

The abdomen does not nearly occupy all the space between the last pair of legs.

The above diagnosis is framed on a broken specimen, without chelipeds or legs, in the Indian Museum. In the form of the front and shape of the carapace this specimen has a strong resemblance to the *Typhlocarcinus integrifrons* described and figured by Miers in Ann. Mag. Nat. Hist. (5) VIII. 1881, p. 260, pl. xiv. fig. 1. Miers himself was doubtful about referring his species to *Typhlocarcinus*.

Our specimen is too much damaged to furnish a useful specific diagnosis.

#### HEPHTHOPELTA, Alcock.

*Hepthopelta*, Alcock, Investigator Deep Sea Brachyura, p. 76.

Carapace very deep, inflated, rudely semicircular, about as long as broad, convex fore and aft and vertically deflexed anteriorly, all its borders entire and all, except the posterior, tumid, the cardiac and branchial regions well delimited.

Front considerably less than a third the greatest breadth of the carapace, bilobed, vertically deflexed; the whole extent of the fronto-orbital border is more than half the greatest breadth of the carapace.

Orbits small, shallow, excavated in the vertically-deflexed anterior border of the carapace, not concealing the eyes. Though the eyes are small and their stalks immovably fixed, they are *well formed, well defined and well pigmented*.

*The antennulary fossæ are completely filled by the basal antennulary joint, to the exclusion of the flagella.*

The basal antenna-joint is small, slender, and does not nearly reach the front; the flagellum, which arises in the orbital hiatus, is hardly longer than the orbit.

The epistome is of considerable width fore and aft and, though sunken, is well defined from the palate. The buccal cavern is square, though very slightly narrower in front than behind; the excurrent branchial canals are well defined. The external maxillipeds, which completely cover the buccal cavern, have the merus shorter and slightly narrower than the ischium and somewhat oval in shape, and the palp jointed to the antero-internal angle of the merus and of good size.

The legs are all long and slender and end in a slender dactylus: the third pair are slightly the longest.

The chelipeds are lost in the single specimen obtained, which is a female.

#### 30. *Hepthopelta lugubris*, Alcock.

*Hepthopelta lugubris*, Alcock, Investigator Deep Sea Brachyura, p. 77. pl. iv, fig. 2.

Carapace as long as broad, roughly semicircular or semiglobose, of thin texture, its surface very finely frosted and somewhat pubescent.

The fronto-orbital region is vertically deflexed and almost invisible in a dorsal view.

Epibranchial and cardiac regions tumid, circumscribed by deepish grooves.

Legs subcylindrical, with a finely frosted and pubescent surface: the third pair, which are slightly the longest, are about  $2\frac{3}{4}$  times the length of the carapace: the posterior (lower) border of the merus of the first two pairs is spinulose.

Colours in spirit, light yellow, eyes black.

A single female, without chelipeds, from the Andaman Sea, 490 fms. The carapace is 8 millim. long, and the same in breadth.

#### CAMATOPSIS, Alcock.

*Camatopsis*, Alcock, Investigator Deep Sea Brachyura, p. 75.

Carapace deep, rudely sub-semicircular, hardly broader than long, strongly convex fore and aft and declivous anteriorly: its antero-lateral borders short sharp and entire, its postero-lateral borders long sharpish and slightly convergent anteriorly: its only markings are two longitudinal grooves hardly visible on the undenuded carapace, that mark off the epibranchial regions.

Front considerably less than a fourth the greatest breadth of the carapace, obscurely bilobed; the whole fronto-orbital border is about half the greatest breadth of the carapace.

Orbits large, deep, and normally cut in the anterior border of the carapace: eyestalks large, tumid, conical, almost immovably fixed in the orbits: eyes reduced to a speck of pigment placed on the under surface of the tip of their stalks.

Antennulary fossæ small, and filled entirely by the basal antennulary joint, to the complete exclusion of the large flagellum.

The small basal antenna-joint is wedged in between and beneath the eyestalk and antennule, the second joint hardly reaches to the front, the flagellum is large and considerably longer than the orbit.

The epistome is of considerable width fore and aft, especially at its middle, and though sunken, is well separated from the palate. The buccal cavern is square, though rather broader in front than behind, and is almost entirely covered by the external maxillipeds. These have the merus as long as, and markedly broader than the ischium, owing to the strongly convex bulge of the outer border of the merus: the palp, which is of good size, is jointed to the antero-internal angle of the merus.

The chelipeds are moderately massive and in the male the hands are unequal. The arm is short and trigonal, the wrist rather long narrow and crooked.

Legs sufficiently long and stout, the penultimate pair being the longest; their dactyli are sharply trigonal and elegantly plumose: the last pair have the dactylus slightly curved and compressed.

The abdomen of the male, which is four-jointed, does not nearly fill the space between the last pair of legs.

Between the 4th and 5th segments of the sternum, in the male, is intercalated a long narrow plate that covers the external genital ducts.

### 31. *Camatopsis rubida*, Alcock and Anderson.

*Camatopsis rubida*, Alcock and Anderson, Ann. Mag. Nat. Hist. Jan. 1899, p. 13: Alcock, Investigator Deep Sea Brachyura, p. 76, pl. iv. fig. 3.

Carapace very finely granular when denuded of the short velvet that covers it and all parts of the body and appendages. The narrow front and the antero-lateral borders form a semicircular curve: the postero-lateral borders are anteriorly convergent, the greatest breadth of the carapace being between the bases of the penultimate pair of legs. The tumid anterior (true inner) borders of the eyestalks bulge beyond the orbital concavities of the anterior border of the carapace.

The efferent branchial canals cause an angular bulging or carination of the pterygostomian regions.

The chelipeds are unequal in the male (female unknown), the longer one being about  $1\frac{3}{4}$  times the length of the carapace. They are unarmed. In the larger hand the fingers meet only at tip and are finely toothed in the distal half only, being rather deeply notched in the basal half, while on the inner surface of the movable finger is a curious truncated spine. In the smaller hand the fingers meet throughout their extent and only the immovable finger is distinctly toothed, one or two of its teeth being enlarged.

The first and last pair of legs are about  $1\frac{2}{3}$  times, the second and third pair are about twice, the length of the carapace. In the last pair of legs the terminal joints are more strongly ciliated, and the dactylus is slightly curved and compressed as for swimming.

Colours in spirit rich chocolate brown. Animal entirely covered with velvet.

Three males from the Andaman Sea, 194 fathoms. The carapace of the largest is 9 millim. long and 10 millim. broad.

### Subfamily iv. HEXAPODINÆ, Miers.

#### LAMBDOPHALLUS, nov. gen.

Near *Hexapus*, De Haan, from which it chiefly differs in the form of the anterior pair of male sexual appendages, which are rigidly bent

into the form of an **L**, the horizontal limb of which is lodged in a special trench in the first segment of the sternum.

Carapace much broader than long, broadest behind. Front narrow, nearly vertically deflexed. Orbits small, circular, widely communicating with the antennular fossæ. The antennules fold transversely. Antennæ small, standing in the orbital hiatus.

Epistome well-defined. Buccal cavern with the sides slightly convergent anteriorly. The external maxillipeds have coarse palps, which, when folded, fill the rather broad space that exists between the ischiopodites: the merus is subquadrilateral, with the antero-external angle rounded off, and the palp articulates with its antero-internal angle: the exognath is not concealed.

Chelipeds unequal in the male, shorter but more massive than the legs.

*Only three pairs of legs, the fourth pair entirely absent.*

Sternum extremely broad. Abdomen of the male very narrow. The efferent ducts of the male sex open on the 4th sternal segment inside the fossa into which the abdomen fits.

### 32. *Lambdophallus searpes*, n. sp.

Resembles *Hexapus searpus*, De Haan, with a specimen of which I have compared it, but differs in numerous important characters.

Carapace subquadrilateral with the anterior angles broadly rounded off, much broader than long, convex fore and aft and anteriorly deflexed, nearly flat from side to side, the gastric and cardiac regions well defined, the surface uniformly finely granular under a lens.

Front nearly vertically deflexed, its edge square-cut but grooved or notched in the middle line, its breadth about a fifth the greatest breadth of the carapace.

Orbits freely communicating with the antennular fossæ: eyestalks immovable and very short, eyes small but well pigmented.

Antennules large, folding transversely; the inter-antennular septum narrow if complete.

Epistome lozenge-shaped, well defined: the sides of the buccal cavern converge slightly from behind forwards: the ischiopodites of the external maxillipeds are rather narrow and leave between them a widish gap, which, however, is filled by the flagella.

There is a deep crescentic groove across the pterygostomial region, just in front of the bases of the chelipeds, and there are several close-set oblique scorings near the antero-lateral angles of the buccal cavern.

Chelipeds in the male unequal, more massive than the legs, the larger one not  $1\frac{1}{2}$  times the length of the carapace: under the lens their

outer surface is very finely and uniformly granular: the fingers are short, especially in the larger hand, and meet only at tip, and at the base of the dactylus of the larger hand is a molariform tooth.

Legs tomentose: only 3 pairs are present, the 4th pair not being represented even by a rudiment. The first pair, which are not much longer than the chelipeds, are the shortest and slenderest: the next two pairs, which are about equal in size, are not quite twice the length of the carapace.

Sternum very broad, finely and uniformly granular: in the male, in the first sternal segment, on either side of the last abdominal tergum, is a long narrow oblique trench, in which the ends of the modified abdominal appendages are lodged.

Male abdomen very narrow, not a fifth the breadth of the sternum at its base. The first tergum is short fore and aft, the second is linear and has a somewhat trilobed form, the 3rd 4th and 5th are fused to form a sort of hexagonal plate with the distal end narrowed, the 6th and 7th are separate.

The anterior of the two pairs of male abdominal appendages are most curiously modified: they are very long and stiff and are L shaped, and the proximal limb of the L lies beneath and parallel with the abdomen, while the distal limb of the L emerges at right angles to the abdominal tergum, and, instead of being free, lies in the special sternal canal before mentioned.

In the Indian Museum are 2 specimens, from the Bay of Bengal, 65 fathoms. The carapace is 4.5 millim. long and 7 millim. broad.

Family II. PINNOTERIDÆ, Edw.

Key to the Indian genera of Pinnoteridæ.

- I. Carapace ill-calcified: the ischium of the external maxillipeds is indistinguishably fused with the much enlarged merus:—
  - 1. Edges of the carapace swollen and ill-defined: dactylus of the external maxillipeds small and often abnormally placed, but present ..... PINNOTERES.
  - 2. The edge of the carapace, in all but its short fronto-orbital portion, forms a thin upturned crest: dactylus of the external maxillipeds wanting, or represented by a tiny pencil of hairs ..... XANTHOSIA.
- II. Carapace well calcified: the ischium of the external maxillipeds is distinct and independent:—
  - 1. Ischium of the external maxillipeds much smaller than the merus: dactylus of the external maxillipeds very large, spatulate. Orbits and eyes normal, the orbits circular ..... TETRIAS.

2. Ischium of the external maxillipeds as well developed as the merus, the dactylus not enlarged. The orbits are narrow slits situated dorsally with their long axis almost at right angles with the anterior border of the carapace, and the eyes are minute or obsolescent ..... XENOPHTHALMUS.
3. Ischium of the external maxillipeds very much larger than the merus, the appendages as a whole being slender and not nearly closing the buccal cavern. The orbits are in the usual marginal position..... CHASMOCARCINOPS.

## Subfamily XENOPHTHALMINÆ, nov.

## XENOPHTHALMUS, White.

*Xenopthalmus*, White, Ann. Mag. Nat. Hist. XVIII. 1846, p. 177; Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 220; Burger, Zool. Jahrb., Syst. VIII. 1894-95, p. 386.

Carapace broader than long and broadest behind, arched antero-laterally, the regions faintly indicated. Front narrow, strongly deflexed.

The orbits are small, oblique or nearly longitudinal, button-hole like slits, placed dorsally almost at right angles to the frontal border, and the eyestalks are immovably embedded in them. The eyes are, at most, minute specks of pigment. The antennules and antennæ are extremely small, the antennules folding nearly vertically beneath the front.

Epistome not defined. Buccal cavern almost semicircular, completely closed by the external maxillipeds. The external maxillipeds have the ischium and merus equally well developed (the ischium being nearly square and the merus about a quadrant of a circle) and the palp articulated at the antero-external angle of the merus. Exognath small and concealed.

Chelipeds in the male "with the hands somewhat elongated and thickened," in the female short and very slender.

Legs fairly stout, the third pair the longest.

The abdomen in both sexes consists of seven separate segments.

Key to the Indian species of *Xenopthalmus*.

- I. The legs are ciliated and the third (longest) pair are not twice the length of the carapace ..... *X. pinnoteroides*.
- II. The legs are ciliated towards the tip only, and the third (longest) pair are more than twice the length of the carapace ..... *X. obscurus*.

33. *Xenopthalmus pinnoteroides*, White.

*Xenopthalmus pinnoteroides*, White, Ann. Mag. Nat. Hist. XVIII. 1846, p. 178, pl. ii. fig. 2, and Samarang Crust. p. 68, pl. xii. fig. 3; Milne Edwards, Ann. Sci.



Nat., Zool., (3) XX. 1853, p. 221: Stimpson, Proc. Ac. Nat. Sci, Philad. 1858, p. 107: Sluiter, Tijds. Nederl. Ind. XL. 1881, p. 162: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 394.

This species is included in the Indian Fauna on the authority of Professor J. R. Henderson. It seems to be characterized by having the ischium and merus of the external maxillipeds deeply grooved, longitudinally, near the outer margin; the legs stout and hairy, the third pair barely twice as long as the carapace; and the three terminal joints of the first pair of legs broadened so that their edges are almost carinate: the lateral borders of the carapace are granular or finely denticulate.

34. *Xenophthalmus obscurus*, Henderson.

*Xenophthalmus obscurus*, J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 394, pl. xxxvi. figs. 18, 19.

Carapace glabrous and shiny, but its surface is somewhat creased: the median regions are separated from the branchial regions by grooves or depressions, and each branchial region is traversed obliquely in its posterior part by a low ridge.

The rounded-off antero-lateral corners of the carapace are traversed by three low fine ridges, nearly parallel with one another: one of these defines the pterygostomial region, the next appears to be the true antero-lateral border, while the most dorsal one runs from the angle of the orbit to the junction of the antero-lateral and postero-lateral borders.

Front narrow, nearly vertically deflexed, longitudinally grooved in the middle line, its free edge square-cut but faintly sinuous. The eyes are just visible as minute linear specks, placed posteriorly.

No epistome. The ischium and merus of the external maxillipeds are not deeply grooved near the outer border.

Chelipeds in the female shorter and much slenderer than the first and last pair of legs.

The 3rd pair of legs are the longest, being about  $2\frac{1}{4}$  times the length of the carapace: the second pair, though a little shorter than the 3rd, are equally stout. The first and last pairs are about equal to one another in size (in the female) being hardly longer than the carapace, and slenderer than the other legs. The terminal joints of all the legs are hairy: the posterior borders of the meropodites of the first three pairs are spiny, the anterior border being very finely serrulate.

In the Indian Museum are two females, one, with eggs, from off the Ganjam coast, 20 fathoms, the other from the Andamans. The carapace in the larger female is 6 millim. long and 8 millim. in greatest breadth.

## Subfamily ASTHENOGNATHINÆ, Stimps.

## CHASMOCARCINOPS, n. gen.

Carapace deep, convex fore and aft and declivous anteriorly: its greatest breadth is quite posterior, so that the postero-lateral borders, which are blunt, are anteriorly-convergent, though slightly so: the antero-lateral borders are sharp and form an elegant curve with the anterior border: the regions are nearly as well defined as they are in *Scolopidia*: its length is hardly less than its breadth.

The fronto-orbital border is considerably more than a third, but the front (which is bilobed) is only about a sixth, the greatest breadth of the carapace.

The orbits, which are in the usual marginal position, are small, and the *eyestalks*, which are immovable, are *shrunk within them*: the eyes are minute.

The antennular flagella are large and cannot be retracted into the antennular pits, which are filled entirely by the basal joint.

The antennal flagella are long—considerably more than a third the length of the carapace—and stand in the orbital hiatus.

Epistome sunken and not altogether well demarcated from the palate. The buccal cavern has its antero-external angles rounded off, and is not nearly closed by the external maxillipeds: these have the *merus* much shorter and narrower than the *ischium*, oval and somewhat oblique, and the flagellum appears to articulate with the summit of the *merus*.

The chelipeds are about as long as the legs and are very unequal in the male.

The third pair of legs are slightly the longest. As in *Scolopidia* the dactylus of the last pair of legs is recurved.

The abdomen in both sexes is narrow, not nearly occupying all the space between the last pair of legs, and in the male consists of 5 pieces, the 3rd–5th segments being fused. In the male also, as in *Camatopsis*, there is, on either side, a narrow plate intercalated between the 4th and 5th segments of the sternum and covering the external genital ducts.

This genus more clearly than any other connects the *Rhizopinæ* and the *Pinnotheridæ* together.

35. *Chasmocarcinops gelasimoides*, n. sp.

Carapace nearly as long as broad, its surface abundantly sprinkled with vesiculous granules, its free margins rather sparsely ciliated: all the regions are distinguishable, and the cardiac and posterior lobe of the gastric regions are defined by deep impressions: the antero-lateral

borders are sharply defined and granular. Front very distinctly bilobed, prominent.

Chelipeds in the male very unequal, the larger one being twice as long as the carapace, its chief bulk being contributed by the hand, which, with its large swollen polished palm and long crooked fingers meeting only at tip, recalls that of *Gelasimus*. The smaller cheliped (like the female chelipeds) is not much shorter than the larger one and, like it, has the articulation of the wrist confined to a rather prominent postero-inferior lobe of the hand, and the fingers longer than the palm: the chief difference is that the palm is not enlarged and swollen and that the fingers meet throughout almost all their extent. In both chelipeds the surfaces of all the segments are smooth, and there are sharpish granules along the borders of the arm and at the not very pronounced inner angle of the comparatively slender wrist.

The legs, like the fingers of the smaller cheliped, are fringed, but not very thickly, with hair. The 3rd pair are very slightly the longest, being twice the length of the carapace. The edges of the meropodites are furnished with sharp granules and spinules, these being abundant in the case of the first 3 pairs and rather few on the 4th pair. In the first 3 pairs also the carpopodites are of good length and subcylindrical, and the dactyli straight and almost styliform; but in the 4th pair the two terminal joints are compressed, the carpopodite being shortened and the dactylus recurved.

A male and a female from off Madras, 12 fathoms. The carapace of the male is 11 millim. long and 12 millim. broad.

#### Subfamily PINNOTHERELINÆ.

##### TETRIAS, Rathbun.

*Tetrias*, Rathbun, Proc. U. S. Nat. Mus. XXI. 1898, p. 607.

Carapace strongly calcified, broader than long, deep, subquadrangular, dorsally flattish, anteriorly declivous, the regions faintly indicated.

Front between a third and a fourth the greatest breadth of the carapace, its edge only deflexed, not directly united to the epistome. Orbits circular, small: eyestalks short, eyes small. The antennules fold a little obliquely from the transverse. Antennæ small, the flagellum in the orbital hiatus.

Epistome well defined: buccal cavern broadish, quadrilateral. External maxillipeds large, their palp about as large as their merus and ischium combined: ischium distinct, small; merus very large, carpus large and triangular and articulating at the antero-external

angle of the merus, propodite large and articulating with the end of the carpus, dactylus large and spathulate and articulating with the inner angle of the propodite: exognath small and a good deal concealed.

Chelipeds equal, short: the chelipeds in the male equal, and much stouter than the legs.

First 3 pairs of legs coarse, not differing much from each other or from the chelipeds in length, though the second pair are slightly the longest. The fourth (last) pair are very much smaller than the others.

The abdomen of the male is narrow and consists of 7 separate segments.

*Tetrias* differs very little from *Pinnixa* of which it might, perhaps, be regarded as a subgenus.

*Distribution*: Indo-Pacific, Andamans to California.

36. *Tetrias Fischeri*, (A. M. E.).

or *Pinnixa (Tetrias) Fischeri* (A. M. E.).

*Pinnotheres Fischeri*, A. Milne Edwards, Ann. Soc. Entomol. France, VII. 1867, p. 287.

*Pinnixa Fischeri*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 319, pl. xviii. fig. 3: de Man, Archiv fur Naturges. LIII. 1887, i. p. 385, pl. xvii. fig. 2.

Carapace and appendages everywhere covered by a close adherent coat of short hair. The regions of the carapace are fairly well indicated and its dorsal surface is closely and finely granular, except in the middle where also the hair is somewhat deficient. Deflexed edge of the front broadly triangular. Eyes well pigmented. The inner edge of the carpus and the inner and distal edges of the large spathulate dactylus of the external maxillipeds are fringed with a close row of hairs of extraordinary length.

Chelipeds in the male much more massive than the legs, and about  $1\frac{1}{2}$  times the length of the carapace: their movements are somewhat restricted. There are some spinules at the inner angle of the wrist, and numerous rows of granules—the lowermost row rather acute—on the outer surface of the palm: the fingers, which are shorter than the palm, are stumpy but sharp-pointed.

The first 3 pairs of legs are coarse and are all about  $1\frac{1}{2}$  times the length of the carapace, though the second pair are very slightly the longest. The 4th pair are very short—not two thirds the length of the carapace—and are much slenderer than the others. All the legs have a shaggy posterior border, and all end in small hooked dactyli. The posterior border of the meropodite of the last pair is armed with small coarse spines.

The abdomen of the male is narrow and consists of 7 segments: the first two segments are very short, the 3rd 4th and 5th gradually increase in length and slightly decrease in breadth, the 6th is a little shorter than the 5th, and the 7th is long and spatulate and encroaches on the buccal cavern.

In the Indian Museum is a single male specimen, from coral, from the Andamans: its carapace is a little over 5 millim. long and 7 millim. broad.

#### Subfamily PINNOTERINÆ.

##### \*PINNOTERES, Latreille.

*Pinnotheres*, Latreille, Hist. Nat. Crust. et Ins. VI. p. 78, and Gen. Crust. et Ins., p. 34: Lamarck, Hist. Nat. An. Sans. Vert. (2nd edit. Vol. V. p. 410): Bosc, Hist. Nat. Crust. I. p. 239: Leach, Malac. Pod. Britt.: Desmarest, Consid. Gen. Crust. p. 116: De Haan, Faun. Japon. Crust., p. 34: Milne Edwards, Hist. Nat. Crust. II. 30, and Ann. Sci. Nat., Zool., (3) XX. 1853, p. 216: Dana, U. S. Expl. Exp. Crust. pt. I. p. 378: Bell, British Stalk-eyed Crust. p. 119: Miers, Challenger Brachyura, p. 275: Ortmann, Zool. Jahrb., Syst., VII. 1894, p. 698: Bürger, Zool. Jahrb. Syst., VIII. 1894-95, p. 362: Adensamer, Ann. Nat. Hofmus., Wien, 1897, p. 105.

Carapace often ill calcified, generally convex with ill-defined edges, in shape transversely oval, or circular, or subquadrangular or sub-hexagonal with rounded angles, the surface generally smooth, the regions seldom defined.

Front narrow, generally deflexed in the female if not in the male. Orbits small, circular, eyestalks short, eyes small. Antennules folding obliquely in small pits. Antennæ small, the minute flagellum standing in the inner angle of the orbit.

Epistome well defined. The buccal cavern is of a curious crescentic shape, being arched and very broad from side to side, but very narrow fore and aft. The external maxillipeds completely close the buccal cavern: they consist chiefly of the merus, which is fused with the ischium to form a single large obliquely-directed joint carrying the flagellum at its inner end: the flagellum is small though its propodite may be spatulate, and the dactylus is often inserted on the inner or flexor border of the propodite: the exognath is for the most part concealed.

The chelipeds and legs are short, the chelipeds being equal and generally, even in the female, stouter than the legs.

The abdomen in the male is narrow, in the female it is generally larger than the sternum: it consists of 7 separate segments.

\* *Pinnoteres*, the correct transliteration of the Greek word, was used by Rumph in 1705, so that no apology is necessary for reverting to it.

The Pinnoteræ live as parasites or messmates, generally within the mantles of Lamellibranch Mollusks.

*Key to the Indian species of Pinnoteræ.*

- I. The dactylus of the external maxillipeds is articulated far back on the inner or flexor edge of the propodite: the eyes in the female are not entirely visible in an ordinary dorsal view:—
  1. The dactyli of all the legs are about equal:—
    - i. Carapace somewhat octagonal in outline, with deepish tomentose pits separating the branchial from the median regions: first three pairs of legs nearly equal in length: dactyli of all the legs of fair length..... *P. Edwardsi.*
    - ii. Carapace circular, perfectly smooth: second pair of legs decidedly the longest: dactyli of all the legs very short..... *P. mactricola.*
  2. Dactylus of the 3rd pair of legs longer than any of the others ..... *P. purpureus.*
  3. Dactylus of the 4th pair of legs longer than any of the others ..... *P. parvulus.*
- II. The dactylus of the external maxillipeds is articulated to the tip of the propodite: the eyes in the female are entirely dorsal ..... *P. abyssicola.*

37. *Pinnoteræ Edwardsi*, de Man.

*Pinnoteræ Edwardsi*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 103, pl. vi. figs. 6-9 (1889).

The description applies to the female.

The length of the carapace is nearly equal to the greatest breadth. Carapace octagonal in shape, with the angles rounded: its dorsal surface little convex, with tomentose depressions of some size and depth separating the median from the branchial regions. The deflexed part of the front is very distinctly triangular. Eyes very small, but deeply pigmented.

Dactylus of external maxillipeds slender and inconspicuous; placed far back on the inner edge of the spatulate propodite.

Chelipeds and legs more or less downy, especially on their under surface. Chelipeds nearly as long as the carapace, a little longer and much stouter than the legs, unarmed: dactylus as long as the upper border of the palm.

Legs rather coarse: the first 3 pairs are about equal in length, the 4th pair is a little shorter.

Carapace 15 millim. long and 16 millim. broad.

From an *Ostræa* from Mergui.

38. *Pinnotheres purpureus*, n. sp.

Closely related to *P. palaensis*, Bürger.

The description applies to the female.

Carapace and appendages smooth, polished, nude. Carapace transversely oval, strongly convex, the regions not well defined. Deflexed part of front broadly and indistinctly triangular. Eyes very small, but well pigmented.

Dactylus of external maxillipeds slender and inconspicuous, placed far back on the inner (flexor) edge of the propodite.

Chelipeds and legs slender, the chelipeds being little stouter than the legs and about the same length as the first pair of legs. The movable finger is not much more than half the length of the upper border of the palm.

The third pair of legs are the largest of all, their meropodites and carpopodites being longer than those of the first two pairs and nearly twice as long as those of the 4th pair. The dactyli of the 3rd and 4th pairs are several times the length of those of the first two pairs, and the dactylus of the 3rd pair exceeds that of the 4th pair. Though the 4th pair have a long dactylus their total length is not greater than that of either of the first two pairs.

Colour either hyaline with numerous minute specks of bluish-black pigment, or the specks may be sufficiently numerous to make the whole animal nearly black.

From an *Ostræa* from the Andaman Islands.

Carapace 7 millim. long and 9 millim. broad.

39. *Pinnotheres parvulus*, Stimpson, de Man.

*Pinnotheres parvulus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1853, p. 106; de Man, Journa. Linn. Soc., Zool., XXII. 1887-88, p. 105, and Archiv für Nat. LIII. 1887, i. p. 383; Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 699; Bürger, Zool. Jahrb., Syst., VIII. 1894-95, pp. 363, 376, pl. ix. fig. 16 and x. fig. 17.

A single damaged female appears to differ from *P. purpureus* only in the following particulars:—

(1) though the 4th pair of legs are shorter than the 3rd, they are decidedly longer than the 2nd, and still more decidedly longer than the 1st.

(2) the dactylus of the 4th pair of legs is the longest of all.

40. *Pinnotheres mactricola*, n. sp.

Closely related to *P. cardii*, Bürger.

The description applies to the female.

Carapace perfectly circular smooth and polished, convex. Edge of front nearly straight. Eyes minute, well pigmented.

Dactylus of external maxillipeds slender and inconspicuous, arising far back on the inner (flexor) edge of the propodite.

Chelipeds decidedly stouter than the legs and about as long as the first pair of legs: their inner border is scantily fringed with hair: their dactylus is nearly two-thirds the length of the palm.

Legs slender, fringed with hairs: the second pair are decidedly the longest—a little longer than the carapace: the fourth pair are decidedly the shortest: the first and third pairs are about equal in length: in all four pairs the dactyli are equally short.

From *Macra violacea*, from the mouth of the R. Hooghly.

Diameter of carapace not quite 6 millim.

In the male the front is a little prominent and the chelipeds are very much stouter.

#### 41. *Pinnoteres abyssicola*, Alcock and Anderson.

*Pinnoteres abyssicola*, Alcock and Anderson, Ann. Mag. Nat. Hist. (7) III. 1899, p. 14: Alcock, Investigator Deep Sea Brachyura, p. 81.

The description applies to the female.

Carapace subcircular, smooth, convex. Front rather prominent, little deflexed, broadly triangular. Eyes of good size but deficient in pigment, entirely dorsal.

The palp of the external maxillipeds is minute and is much concealed by hairs that fringe the prominent internal angle of the merus: the dactylus is borne at the tip of the propodite.

Chelipeds much stouter than the legs, nude except for a fringe of hairs on the lower border of the immobile finger: they are about as long as the carapace, and the dactylus is not much shorter than the upper border of the palm.

Legs slender, nude: the 2nd and 3rd pairs are slightly longer than the 1st and 4th, being nearly  $1\frac{1}{2}$  times the length of the carapace: the dactyli also of the 2nd and 3rd pairs are a little longer than those of the 1st and 4th.

From *Lima indica*, from 430 fathoms off the Travancore coast.

Diameter of carapace 8 millim.

#### XANTHASIA, White.

*Xanthasia*, White, Ann. Mag. Nat. Hist. XVIII. 1846, p. 176: Dana, U.S. Expl. Exp., Crust., pt. I. p. 383: Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1853, p. 221: Bürger, Zool. Jahrb., Syst., VIII. 1894-95, p. 386.

Resembles *Pinnoteres* in structure and habit, but differs in the following particulars:—

The edge of the carapace is well defined and, in all but its fronto-



orbital portion, forms an upturned crest, so that the dorsal surface of the carapace is depressed and saucer-like. Other crests are found on the dorsal surface of the carapace and, in the centre, a large mushroom-like tubercle.

Though it is on an inferior plane, the narrow front is prominent and not deflexed.

The buccal cavern and mouth-parts have the same curious form, except that (owing to the encroachment of the epistome in the middle line) the anterior edge of the buccal cavern is bilobed or bow-shaped rather than semicircular, and the dactylus of the external maxillipeds is wanting or is represented by a few hairs.

*Distribution* : Indo-Pacific, from the east coast of Africa to Fiji.

#### 42. *Xanthasia murigera*, White.

*Xanthasia murigera*, White, Ann. Mag. Nat. Hist. XVIII. 1846, p. 177, pl. ii. fig. 3: Dana, U. S. Expl. Exp., Crust. pt. I. p. 384, pl. xxiv. figs. 6 a-b: Milne Edwards, Ann. Sc. Nat., Zool., (3) XX. 1853, p. 221: A Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 321: Haswell, Cat. Austral. Crust. p. 113: Miers, Zool. H. M. S. Alert, pp. 518, 546: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 106: Bürger, Zool. Jahrb., Syst. VIII. 1894-95, p. 386, pl. x. fig. 33: Adensamer, Ann. KK. Nat. Hofmus. Wien, XII. 1897, p. 109: Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 264.

The edge of the carapace is formed, in all but its short fronto-orbital portion, by a thin sharp upturned overhanging crest, which ends in a curl on the anterior part of either branchial region.

A large mushroom tubercle, having a rough or reticulate surface and a more or less reniform outline, occupies the middle of the dorsal surface of the carapace, and between this and the front is a pair of parallel longitudinal crests.

The front is somewhat prominent and is dorsally grooved or obscurely bilobed, and on each side of it, beyond the small orbits, is a small wing-like projection.

Chelipeds not, or hardly, stouter than the legs: the dactylus in the male is about two-thirds, in the female not much more than half the length of the palm.

Legs rather coarse: the first three pairs, which are about equal to one another and to the chelipeds in length, are about as long as the carapace, the fourth pair are a little shorter: the dactyli in all are about equally short.

In the female the broad abdomen is traversed longitudinally by a sort of coarse interrupted carina.

In the Indian Museum are 5 specimens from the Andamans and Mergui. The carapace of the largest female is 11.5 millim. long and 15.5 millim. broad.

The *Xanthasia* sp., or *Xanthasia Whitei*, from Mergui, referred to by de Man in Journ. Linn. Soc., Zool., XXII. 1887-88, p. 106, pl. vii. fig. 1 is represented in the collection by a single small male and is characterized by having the upraised edge of the carapace blunt and rounded, instead of thin and acute, and the median tubercle of the carapace ill defined instead of sharply circumscribed: the posterior margin of the carapace, also, is more prominent and is not quite continuous with the lateral margins. The legs also are somewhat longer.

Family OCYPODIDÆ, Ortmann, emend.

Key to the Indian genera of Ocypodidæ.

- I. A hairy-edged pouch leading into the branchial cavity, between the bases of the 2nd and 3rd pair of true legs [*Ocypodinæ*]:—
  - 1. Antennular flagella rudimentary, completely hidden beneath the front: antennæ small, almost rudimentary: eyes very large, occupying the greater part of the ventral surface of the eyestalks: chelipeds very unequal in both sexes ..... OCYPODA.
  - 2. Antennular flagella small, not hidden beneath the front: antennæ of good size: eyes small, terminal on the long slender eyestalks: in the male only, one cheliped is enormously enlarged the other being very small ..... GELASIMUS.
- II. No pouch or opening between the bases of any of the legs:—
  - 1. The antennules fold obliquely or nearly vertically: curious membranous spaces, or "tympana," are present on the meropodites of the legs (*Scopimarinæ*):—
    - i. Tympana very well defined: external maxillipeds very large and with a strong almost hemispherical bulge forwards:—
      - a. Merus of external maxillipeds larger than the ischium: the distal end of the 4th abdominal segment of the male is fringed with bristles and overlaps the 5th segment ..... DOTILLA.
      - b. Ischium of external maxillipeds larger than the merus: the 4th abdominal segment of the male is normal, but the 5th is constricted in part or all of its extent and gives the abdomen a wasp-like appearance ..... SCOPIMERA.

- ii. Tympana ill defined: external maxillipeds of moderate size, the merus larger than the ischium: the chelipeds of the female, though not so stout as those of the male, are stouter than the legs ..... **TYPANOMERUS.**
- 2. The antennules fold obliquely or quite transversely: no "tympana" are present on any of the joints of the legs (*Macrophthalminae*):—
  - i. Merus of the external maxillipeds smaller than the ischium, the flagellum coarse and articulating at the antero-external angle of the merus: front deflexed: eyestalks often very long ..... **MACROPTHALMUS.**
  - ii. Merus of the external maxillipeds as large as or larger than the ischium, at least the two terminal joints of the flagellum are slender: eyestalks not particularly long:—
    - a. Front declivous: carapace slightly convex: the flagellum of the external maxillipeds articulates at the antero-external angle of the merus: (the chelipeds of the female, as in all *Macrophthalminae*, are shorter and slenderer than the legs) ..... **CLISTOSTOMA.**
    - b. Front square-cut, not in the least deflexed; carapace quite flat dorsally: the flagellum of the external maxillipeds articulates near, but not at, the antero-external angle of the merus: eyes not terminal on the eyestalks ..... **TYLODIPLAX.**

Subfamily OCYPODINÆ, Dana.

OCYPODA, Fabr.

*Ocyпода*, Fabricius, Ent. Syst. Suppl. p. 347: Desmarest, Consid. Gen. Crust. p. 119, and Dict. Sci. Nat. XXVIII. p. 239: De Haan, Faun. Japon. Crust. p. 29: Milne Edwards, Hist. Nat. Crust. II. 41, and Ann. Sci. Nat., Zool., (3) XVIII. 1852 p. 141: Dana, U. S. Expl. Exp. Crust. pt. I. p. 324: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 179: Miers, Ann. Mag. Nat. Hist. (5) X. 1882, p. 376, and Challenger *Brachyura*, p. 237: Ortmann, Zool. Jahrb., Syst., X. 1897-98, p. 359 (*Revision der Gattung Ocyпода*).

Carapace deep, square or subquadrilateral, broader (but not much broader) than long, moderately convex, strongly declivous anteriorly, its dorsal surface closely granular with the regions indistinctly and incompletely defined. Front a narrow deflexed lobe, from a seventh to an eighth the greatest breadth of the carapace.

Orbits very capacious, occupying the whole face of the carapace between the front and the antero-lateral angles on either side, usually not very deep: their floor is divided into two fossæ, one for the basal portions of the eyestalk, the other for the eye. The basal joint of the eyestalk is visible throughout: the eye chiefly occupies the ventral surface of the eyestalk, and is often, but not always, tipped by a horn or style formed by a prolongation of the latter.

The basal antennular joint is visible, but the rudimentary antennular flagellum is quite hidden beneath the front. The antennæ, which lie in the orbital hiatus, are, though properly formed in all their parts, little more than rudiments.

The epistome, though short, is quite distinct, and is sculptured. The buccal cavern (in its widest part) is as broad as long, but diminishes in size a little, anteriorly: it is completely closed by the external maxillipeds, which are somewhat narrow and elongate and end in a coarse flagellum that articulates with the antero-external angle of the merus.

Chelipeds shorter than the legs and, in both sexes, remarkably unequal, the larger one being much more massive than the legs. The palm is short and high—especially in the larger cheliped—and is almost always compressed—especially so in the smaller cheliped: the fingers are stout, usually compressed, and strongly toothed. In most cases there is, on the inner surface of the larger palm, near the fingers, a stridulating organ, which can be scraped against the inner surface of the ischium.

Legs stout, the fourth pair much shorter and somewhat less massive than the first three pair, which are of about equal length: between the basal joints of the 2nd and 3rd pair is an orifice, thickly protected by hairs, leading towards the branchial cavity. The branchial cavity is very capacious, and its lining membrane is thick spongy and vascular.

The abdomen of the male is narrow: in both sexes it consists of seven separate segments.

*Distribution:* Tropical and subtropical coasts, from the American Atlantic, through the Mediterranean and Red Seas, to the American Pacific.

The Ocypodes live together in large companies, and most of them are in the habit of digging long and tortuous burrows in the moist sand near high-water mark, into which they retire with great rapidity when alarmed. As a rule they do not go far from their burrows, but if they do happen to wander and are cut off, they run to sea with marvellous speed. Though the burrows can be but temporary structures, each individual crab, in all the species that I have observed, keeps rigidly to its own. The efficacy of the stridulating-organ as a musical instrument is beyond

dispute, and I have published my own observations on that of *O. macrocera* in the Administration Report of the Marine Survey of India for the year 1891-92 (reprinted in the *Annals and Magazine of Natural History* for 1892). Dr. A. R. Anderson has published a note on the sound produced by *O. ceratophthalma* in this *Journal* for the year 1894.

My own opinion is that these crabs use the stridulating-organ when in their burrows—which undoubtedly are private property—to warn intending intruders of the herd that the burrow is occupied, and thus to prevent the burrow becoming crowded to suffocation-point. This, of course, need not be its exclusive use.

*Key to the Indian species of Ocypoda.*

- I. No stridulating ridge on the inner surface of [the palm: eyestalks not prolonged beyond the eyes in the form of a style ..... *O. cordimana.*
- II. A stridulating ridge on the inner surface of the palm: eyestalks (except sometimes in the young) prolonged beyond the eyes to form a horn or style:—
  - 1. Length of the stridulating organ much more than half the greatest breadth of the palm: antero-lateral angles of the carapace well pronounced:—
    - i. Fingers of both chelipeds pointed:—
      - a. Stridulating ridge narrow, consisting entirely of small tubercles: no brushes of hairs on the propodites of any of the legs ..... *O. platytarsis.*
      - b. The stridulating ridge consists of tubercles gradually passing into striæ: the anterior surface of the propodites of the first two pairs of legs thickly furnished with hairs ... *O. ceratophthalma.*
    - ii. Fingers of the smaller cheliped expanded at tip: the stridulating ridge consists entirely of striæ... *O. macrocera.*
  - 2. Length of the stridulating organ much less than half the greatest breadth of the palm: antero-lateral angles of the carapace rounded off ..... *O. rotundata.*

The synonymy of the species of *Ocypoda* has been discussed, at length, by Ortmann (*Zool. Jahrb., Syst.*, X. 1897-98, p. 359), who has had access to a great deal more material than I have. It would be inadvisable, therefore, for me, working on a collection made almost entirely in India, to attempt any independent criticism of the older work; so that, in dealing with the Indian species, I shall generally restrict my citations to the papers of Ortmann and the other authors (Kingsley and Miers) who have made a revision of the genus.

43. *Ocypoda ceratophthalma* (Pallas), Ortm.

*Cancer ceratophthalmus*, Pallas, *Spicilegia Zool.* IX. p. 88, pl. v. figs. 7, 8.

*Cancer cursor*, Herbst, *Krabben*, I. ii. 74, pl. i. figs. 8, 9.

*Ocypoda ceratophthalma*, Fabricius, *Ent. Syst. Suppl.* p. 347: Milne Edwards, *Hist. Nat. Crust.* II. 48, and Cuvier *Règne An. Crust.* pl. 17: Kingsley, *Proc. Ac.*

Nat. Sci. Philad. 1880, p. 179: Miers, Ann. Mag. Nat. Hist. (5) X. 1882, pp. 378, 379: C. W. S. Aurivillius, Zur. Biol. Amphib. Decap., p. 17 (Mitg. K. Ges. Wiss. Upsala, 1893).

ORTMANN, ZOOL. JAHRB., SYST. X. 1897-98, pp. 360, 364 (*ubi synonym.*).

Carapace square, its greatest breadth, which is about a tenth more than its greatest length, is at the acuminate antero-lateral angles, which coincide with the outer orbital angles and are right angles, or nearly so.

The borders of the carapace, with the exception of the posterior border, are elegantly beaded or serrulate, and the lateral borders in their anterior third are straight and parallel, or nearly so.

The cardiac region can be distinguished, and the anterior ends of the cervical groove are present on either side of the gastric region.

Upper border of orbit sinuous and a little oblique, so that the outer angle of the orbit is considerably behind the front: the lower border has an obscure notch near its middle, but there is *no gap at its outer angle*. The eyestalk is prolonged beyond the eye into a blunt-pointed style of variable length.

The lateral borders of the buccal cavern, though their general direction is slightly convergent anteriorly, have a distinct outward curve. The merus and ischium of the external maxillipeds have their exposed surface circumscribed by a raised row of granules, which is deficient only at the basal attachment of the ischium.

Chelipeds and legs scabrous, the asperities having in many places a tendency to a rugiform or squamiform arrangement, and almost forming serrations on the borders of some of the joints, and becoming spines or teeth on the lower borders of the arms and hands and at both angles of the wrist—especially at the inner angle where there is always at least one distinct spine.

The stridulating organ of the larger palm is of good length (much more than half the greatest breadth of the palm) and is some little distance from the immobile finger, a thick strip of hair intervening: in its upper half it consists of tubercles gradually passing to striæ, in its lower half it consists of a comb of fine regular and very close-set striæ. It plays against a polished ridge that runs across the upper part of the inner surface of the ischium.

The palms and fingers of both hands—but notably of the smaller hand—are compressed, and the fingers of both hands are *pointed*.

The first three pairs of legs have the merus broadened: they do not differ greatly in length, and the 2nd pair, which are slightly the longest, are about two-and-a-half times the greatest length of the carapace. The fourth (last) pair are a good deal shortened—reaching only a little

more than half-way along the propodite of the 3rd pair—and have a much narrower merus. In all the legs the dactylus is stout and fluted like a bayonet and has more or less of its anterior surface hairy: though somewhat laterally-compressed at base and gradually broadening and becoming dorso-ventrally-compressed towards the tip, it may fairly be called styliform. The propodites of the first two pairs of legs have conspicuous brushes of hairs along their anterior surface.

In the Indian Museum are 84 specimens from all parts of the coasts of the mainland and islands of India. Large specimens have the carapace 40 millim. long and about 45 millim. in greatest breadth.

*Distribution*: Indo-Pacific, from the east coast of Africa to the Sandwich Islands.

In young specimens the surface of the appendages is smoother and the eyestalks are not prolonged beyond the eyes, which are of large size. In half-grown specimens the terminal style of the eyes is still short.

#### 44. *Ocypoda macrocera*, Edw.

*Ocypoda macrocera*, Milne Edwards, Hist. Nat. Crust. II. 49: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 181: Miers, Ann. Mag. Nat. Hist. (5) X. 1882, pp. 378, 381: ORTMANN, Zool. Jahrb., Syst., X. 1897-98, pp. 360, 368.

Closely related to *O. ceratophthalma*, from which it is distinguished by the following characters:—

- (1) the carapace is rather broader and the orbits are a little more oblique:
- (2) the raised marginal row of granules on the external maxillipeds is less pronounced:
- (3) the fingers of the smaller cheliped are lamellar up to the tips, which are broad and blunt, not pointed:
- (4) the stridulating ridge is less hairy and consists entirely of striæ.
- (5) it is a smaller species, large specimens having the carapace 31 millim. long and 37 millim. broad.

In the Indian Museum are 78 specimens from the coasts of the Bay of Bengal: there are none from the west coast or from any of the islands, and the species appears to be confined to the Bay.

The colour, in life, is bright red. This species lives in large warrens in the sands of almost all parts of the east coast of the peninsula. One of its most active enemies is the Brahminy kite (*Haliastur indus*). One almost certain use of the stridulating-organ is to give warning to intending trespassers, of its own species, that a burrow is already occupied by its rightful owner.

45. *Ocypoda platytarsis*, Edw.

*Ocypoda platytarsis*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1882, p. 141; Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 180; Miers, Ann. Mag. Nat. Hist. (5) X. 1882, pp. 378, 383; ORTMANN, Zool. Jahrb., Syst., X. 1897-98, pp. 360, 368 (*sibi synon.*).

This species may be distinguished from *O. ceratophthalma*, which it closely resembles, by the following characters:—

(1) the carapace is very distinctly broader, its length being about four-fifths of its breadth, and the orbits are hardly at all oblique:

(2) the surface of the ischium of the external maxillipeds is often quite smooth:

(3) the stridulating ridge is not, or hardly at all, hairy and consists entirely of granules or small mamillated tubercles; and though the upper edge of the inner surface of the ischium of the larger cheliped is raised and rough, there is no special process against which the stridulating-ridge of the palm can be scraped:

(4) the dactyli of the legs, though fluted as in the other species, are distinctly compressed dorso-ventrally and broadened:

(5) there are no brushes of hairs along the anterior surface of the propodites of any of the legs.

It is a somewhat larger species, the carapace in full-sized adults being 40 millim. long and 54 millim. broad.

In the Indian Museum there are 42 specimens from both coasts of the peninsula and from Ceylon.

46. *Ocypoda rotundata*, Miers.

*Ocypoda rotundata*, Miers, Ann. Mag. Nat. Hist. (5) X. 1882, pp. 378, 382; Ortmann, Zool. Jahrb., Syst., X. 1897-98, pp. 360, 364.

This species differs from *O. ceratophthalma* in the following important particulars:—

The carapace is less distinctly quadrilateral, owing to the fact that the antero-lateral borders are arched, instead of forming an angle with the upper border of the orbit. These borders sometimes form an unbroken curve with the upper border of the orbit, but sometimes the junction between the two is marked by a notch. The length of the carapace is about five-sixths its greatest breadth, which, owing to the curvature of the antero-lateral borders, is some distance behind the orbits.

There is a notch in the middle of the lower border of the orbit, and a gap at the outer angle, between the upper and lower borders.

The deflexed tip of the front is swollen.

The spines or serrations at the inner angle of the wrist are more numerous, and at the outer angle are better marked.



The length of the stridulating organ is much less than half the greatest height of the palm: the organ consists of about a dozen distant ridges much concealed in hair, and each ridge is sharply serrated.

The scraper on the ischium is placed near the upper angle of the inner face of that joint and consists of an elongate-elliptical longitudinally-grooved cicatrix-like surface, with a patch of hair above it and a much larger patch below it.

The fingers of the smaller cheliped are almost as much dilated at tip as those of *O. macrocera*.

The dactyli of the legs are dorso-ventrally compressed as in *O. platytarsis*.

There is a thick brush of hairs along the anterior surface of the propodite of the first pair of legs only.

The meropodites of the first three pairs of legs are not so broad as in the three preceding species.

In the Indian Museum are 29 specimens from the coasts of Cutch, Sind, and Baluchistan.

This is the largest Indian Ocypode, the carapace of the adult being 52 millim. long and 62 millim. broad.

#### 47. *Ocypoda cordimana*, Desm.

*Ocypoda cordimana*, Desmarest, Consid. Gen. Crust. p. 121: Milne Edwards, Hist. Nat. Crust. II. 45: Kingsley, Proc. Ac. Nat. Sci. Philad., 1880, p. 185: de Man, Notes Leyden Mus., III. 1881, p. 248: Miers, Ann. Mag. Nat. Hist. (5) X. 1882, pp. 379, 387: ORTMANN, ZOOL. JAHRB., SYST., X. 1897-98, pp. 359, 362 (*ubi synonym.*).

Carapace deep, quadrilateral, strongly convex fore and aft, its length about seven-eighths its greatest breadth, which is some little distance behind the orbits, owing to the gentle curve of the antero-lateral borders: its antero-lateral angles coincide with the outer orbital angles, and point acutely forwards.

Orbits deep; their upper border sinuous, but not in the least oblique; there is usually a notch near the middle of their lower border, and always a deep gap at the outer angle. No terminal style to the eyes.

The lateral borders of the buccal cavern are anteriorly convergent and have no outward curve. The marginal row of granules on the outer surface of the ischium of the external maxillipeds is indistinct or absent.

Though the chelipeds and legs are rough and the roughness is in places squamiform, there is no serration of their edges, except in the case of the lower borders of the arms, the inner edge of the wrists, and the lower border of the hands. The palm of the larger hand, though deep, is not particularly compressed, and it has no stridulating ridge.

The propodites and dactyli of the legs are rather short and stout, the dactyli being fluted and more or less hairy: the edges of the propodites of the first 2 pairs of legs are hairy. The third pair of legs, which are slightly longer than the first 2 pairs, are less than twice the length of the carapace.

In the Indian Museum are 59 specimens, from the Laccadives, the Madras coast, Ceylon, Mergui, Tavoy, the Andamans and Nicobars.

The carapace of the largest specimen is 35 millim. long and 40 millim. broad.

#### GELASIMUS, Latr.

*Gelasimus*, Latreille, Dict. des Sciences Nat. XVIII. p. 286 (1820): Desmarest, Consid. Gen. Crust. p. 122, and Dict. Sci. Nat. XXVIII. p. 241: De Haan, Faun. Japon. Crust. p. 25: Milne Edwards, Hist. Nat. Crust. II. 49, and Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 144: Dana, U. S. Expl. Exp. Crust. pt. I, pp. 312, 315: Hess, Archiv f. Naturges. XXXI. 1865, p. 145: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 271: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 135, 136: Miers, Challenger Brachyura, p. 241: de Man, Notes Leyden Mus. XIII. 1891, pp. 20-23: Ortmann, Zool. Jahrb., Syst. VII. 1893-94, pp. 749-753.

"*Uca*," Leach, Trans. Linn. Soc. XI. 1815, pp. 309, 323: M. J. Rathbun, Proc. Biol. Soc. Washington, XI. 1897, p. 154: Ortmann, Zool. Jahrb., Syst., 1897-98, p. 346 (cf. notes by Desmarest and Milne Edwards, *ll. cc. supra*).

In obedience to certain interpretations of the rule of priority, which sacrifice everything to a legal precision that defeats the object of classification, some modern authors propose to apply the name *Uca*, which was originally given to and has for nearly seventy-five years been authoritatively used for a land-crab of the Gecarcinoid family, to the species of the Ocypodoid family which have for the same long period been known to everybody by the name *Gelasimus*.

One of the objects of my poor work being to avoid confusion, I cannot consent to this proposal: and if the rules of nomenclature do not permit me to retain a name that has been deliberately chosen, and used without any ambiguity, by such illustrious predecessors as Latreille, Milne Edwards, and Dana, then I think that the rules should be modified.

The introduction of a rule sanctioning the retention of any name that has been accepted and defined by a monographer of repute, and that has thereafter been in common use for fifty years, would probably satisfy those to whom the written authority of the law is a consideration of first importance.

Carapace deep, subquadrilateral but with the antero-lateral angles produced and acute and the lateral borders more or less convergent posteriorly, occasionally subhexagonal, a good deal broader than long, the regions never very strongly defined. The front is a narrow declivous lobe, the breadth of which, between the eyestalks, is from one-sixteenth to one-sixth the greatest breadth of the carapace.

The orbits are narrowish trenches occupying the whole anterior extent of the carapace between the narrow front and the antero-lateral

angles, and are more or less sinuous and oblique: the eyestalks are very long and are formed as in *Ocypoda*, but are much slenderer: the eyes, though chiefly ventral in aspect, are always terminal.

The small antennular flagella, which are not hidden under the front, fold obliquely. The antennæ, which stand free at the inner angle of the orbits, have well developed flagella.

Epistome, though short, quite distinct. The lateral borders of the buccal cavern are convex outwards, sometimes so much so as to give the cavern a subcircular outline. The external maxillipeds have a long ischium and a short and somewhat oblique merus with the coarse flagellum jointed to its antero-external angle: they close the buccal cavern except for a chink anteriorly.

The chelipeds differ greatly in the sexes. In the female they are equal, are shorter and slenderer than the legs, and have broad-tipped spoon-shaped fingers. In the male one of the chelipeds resembles those of the female, but the other is of relatively gigantic proportions, the hand alone being often as big and heavy as all the rest of the animal.

The legs are stout and end in very sharp dactyli, and the meropodites of at least the 2nd and 3rd pairs are foliaceous: these two pairs are a little longer than the other two, being about twice the length of the carapace.

As in *Ocypoda*, the branchial cavity is capacious, and its lining membrane thickened and vascular, with a fleshy lobe, shaped like a gill-plume, projecting into the space between the tips of the last two gill-plumes: also, between the basal joints of the 2nd and 3rd pairs of legs, there is an orifice, thickly protected by hairs, leading towards the branchial cavity.

The abdomen of the male is narrow: in both sexes of all the Indian species it consists of seven separate segments.

*Distribution*: all the warmer regions of the globe, from the Atlantic coasts of America eastwards (including the Mediterranean basin) to the Pacific coasts of America again.

The species of *Gelasimus* are, like the *Ocypodes*, gregarious, and live in warrens in the mud-flats of tropical and subtropical estuaries. Their intelligence, like that of the *Ocypodes*, is of a high order.

In one species, at any rate (*Gelasimus annulipes*), the males, which are greatly in excess of the females, use the big and beautifully-coloured cheliped, not only for fighting with each other, but also for "calling" the females. I have described my own observations on these points in the *Administration Report of the Marine Survey of India for 1891-92*—reprinted, as an extract, in the *Annals and Magazines of Natural History* for 1892.

The fact that the males greatly outnumber, and therefore are more

commonly captured than, the females, is sufficient justification for the common practice of using the larger cheliped of the male for the discrimination of the species. It must, however, be remembered that—at least in all the Indian species—this organ changes greatly with advancing age.

I must also confess here that the synonymy of species has defied me.

*Key to the Indian species of Gelasimus.*

- I. The breadth of the front, measured exactly between the bases of the eyestalks, is between a fifth and a sixth the greatest breadth of the carapace :—
  1. Two oblique granular ridges on the inner surface of the palm of the large cheliped of the male, one continuous with the dentary edge of the immobile finger, the other running to the lower edge of the same finger :—
    - i. Carapace subquadrilateral, the true lateral borders being moderately convergent posteriorly : an enlarged tooth near the tip of the immobile finger of the large cheliped of the male gives the tip of this finger a notched-truncate appearance *G. annulipes.*
    - ii. Carapace subquadrilateral, the true lateral borders nearly parallel : the tip of the immobile finger of the large cheliped of the male is oblique-truncate but not notched ..... *G. lacteus.*
    - iii. Carapace distinctly hexagonal, owing to the great obliquity of the orbits and the strong convergence posteriorly of the true lateral borders : tip of the immobile finger of the large cheliped of the male not truncate or notched ..... *G. triangularis.*
  2. The oblique crest running to the lower edge of the immobile finger of the large cheliped of the male is either absent or is represented by a slight and smooth tumescence ..... *G. inversus.*
- II. The breadth of the front, measured as above, is very much less than a sixth the greatest breadth of the carapace :—
  1. No row of granules running inside of and parallel with the lower border of the orbit :—
    - i. The inner border of the arm of the larger cheliped of the male ends in a sharp tooth or spine, independent of the terminal lobe-like constriction of the arm :—
      - a. Front, measured as above, about a tenth the greatest breadth of the carapace : in the large cheliped of the male the wrist is

smooth, the palm full with the granular ridges on the inner surface indistinct, and the fingers are not specially compressed...

*G. tetragonum.*

b. Front, measured as above, not a fifteenth the greatest breadth of the carapace: in the large male cheliped the upper surface of the wrist is granular and the fingers are remarkably compressed and blade-like:—

a. In the large male cheliped the crests on the inner surface of the palm are moderately prominent, the dactylus is quite blade-like and the cutting-edge of the immobile finger is not much scalloped .....

*G. Marionis.*

β. The crests on the inner surface of the palm are extremely prominent, the cutting edge of the dactylus is not quite straight and that of the immobile finger is scalloped into two large triangular lobes .....

*G. Marionis, var. nitidus.*

ii. The arm of the large male cheliped ends in a constricted lobe, but there is no sharp upstanding tooth inside it on the inner border:—

a. Front, measured as above, about a twelfth the greatest breadth of the carapace; the fingers of the large male cheliped have tips that suggest tongs, owing to the presence of an enlarged tooth near the tip: the meropodites of the last pair of legs are nearly as foliaceous as those of the preceding pair .....

*G. acutus.*

b. Front, measured as above, not a fifteenth the greatest breadth of the carapace: the fingers of the large male cheliped end in simple hooked tips: the meropodites of the last pair of legs are not much broadened .....

*G. Dussumieri.*

2. On the lower wall of the orbit, inside of and parallel with the middle third of the lower border of that cavity, is a raised row of granules .....

*G. Urvillei.*

48. *Gelasimus annulipes*, Latr., Edw.

? *Cancer vocans minor*, Herbst, Krabben, I. ii. 81, pl. i. fig. 10.

*Gelasimus annulipes*, Milne Edwards, Hist. Nat. Crust. II. 55, pl. xviii. fig. 10-13; and Ann. Sci. Nat., Zool. (3) XVIII. 1852, p. 149, pl. iv. fig. 15: Dana, U. S. Expl. Exp., Crust., pt. I. p. 317: Heller, Novara Crust. p. 38: Hügendorf, in v. d. Decken's Reis. Ost-Afr. III. i. p. 85, and MB. Ak. Berl. 1878, p. 803: Hoffmann, in Pollen and van Dam, Faun. Madagasc., Crust. p. 18: Kossmann, Reise roth.

Meer., Crust., p. 53 : Miers, Phil. Trans. Roy. Soc. Vol. 168, 1879, p. 488, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 310, and Zool. H. M. S. Alert, pp. 518, 541, and Challenger Brachyura, p. 244 : Richters, in Möbius Meeresf. Maurit., p. 155 : Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 148, pl. x. fig. 22 : de Man, Notes Leyden Mus. II. 1880, p. 69, and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 118 pl. viii. fig. 5-7, and Archiv f. Naturges. LIII. 1887, i. p. 353, and Notes Leyden Mus. XIII. 1891, pp. 23, 39, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 307, and Zool. Jahrb., Syst., VIII. 1894-95, p. 577 : Lenz & Richters, Abh. Senck. Nat. Ges. Frankf., XII. 1881, p. 423 : F. Muller, Verh. Ges. Basel. VIII. 1886, p. 475 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 388 : Ortmann, Zool. Jahrb. Syst. VII. 1893-94, pp. 752, 758, and Jena. Denk. VIII. 1894, p. 57 : Zehntner, Rev. Suisse de Zool. II. 1894, p. 178.

*Gelasimus Carionis*, Edv. (nec Desm.), Hist. Nat. Crust. II. 53.

*Gelasimus porcellanus*, White, P. Z. S. 1847, p. 85, and in Adams and White, Samarang Crust., p. 50 : Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 151 : Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 155.

*Gelasimus perplexus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 150, pl. iv. fig. 18 : A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 274.

? *Gelasimus pulchellus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, pp. 99, 100.

*Uca annulipes*, Ortmann, Zool. Jahrb. Syst. X. 1897-98, pp. 351 and 354 : Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 274 : Doflein, SB. Ak. Münch. XXIX. 1899, p. 193.

Length of the carapace about three-fifths of the greatest breadth at the acute claw-like antero-lateral angles. The posterior border of the dorsum of the carapace—*i.e.*, the border corresponding with the last segment of the sternum—is a good deal over half the greatest breadth of the carapace, so that the lateral borders of the dorsum of the carapace, which are distinctly defined in almost two-thirds of their extent by a fine raised line, are only moderately convergent. The post-gastric and cardiac regions are the only ones that are defined, and they but faintly.

Front, measured between the bases of the eyestalks, from a fifth to a sixth the greatest breadth of the carapace.

Orbits sinuous and considerably oblique ; their upper border defined by a fine raised line which is very distinctly double in a good part of its extent ; their lower border very elegantly and regularly serrated—the teeth increasing in size from within outwards. In the female only there is a short row of granules inside of and parallel with the lower border of the orbit.

In the large cheliped of the adult male the greatest length of the hand (including fingers) is at least three times the length of the carapace : the outer surface of the somewhat rounded arm and of the wrist and hand is smooth to the naked eye, with a few small granules on the inner border of the wrist : the lower border of the palm is obscurely marginate : and on the inner surface of the palm are two salient granular crests, one of these is deeply grooved and nearly vertical and becomes continuous with the dentary edge of the immobile finger, the other,

which is the more prominent, is oblique and runs to the lower border of the same finger. In the adult male the fingers of the large hand are about twice the length of the upper border of the palm: they are not very broad, and owing to the hook-like curve of the dactylus there is a wide space between them when the tips are apposed: the immobile finger is but slightly curved, and is generally shorter than the dactylus, and owing to the presence of an enlarged tooth near the tip, the tip has a characteristic notched-truncate appearance.

The meropodite in the last pair of legs is not at all foliaceous.

The carapace in the adult male is about 11 millim. long and 19 millim. broad.

In the Indian Museum are 300 specimens from all parts of the coast from Karachi on the west to Mergui on the east.

This species is not, as Miers queries, the same as Stimpson's *G. splendidus*, of which we have numerous specimens from Hongkong.

#### 49. *Gelasimus lacteus* (De Haan).

*Ocypode* (*Gelasimus*) *lactea*, De Haan, Faun. Japon., Crust., p. 54, pl. xv. fig. 5.

*Gelasimus lacteus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, pl. iv. fig. 16: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 100: Miers, P. Z. S. 1879, pp. 20, 36: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 149, pl. x. fig. 28: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 234: de Man, Notes Leydén Mus. XIII. 1891, p. 22: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, pp. 752, 759.

*Uca lactea*, Ortmann, Zool. Jahrb., Syst., X. 1897-98, pp. 351, 355.

Easily distinguished from *G. annulipes*, which is its nearest relative, by the following characters:—

(1) the carapace is much more nearly quadrangular, the posterior border of its dorsum being between three-fifths and two-thirds of its greatest breadth, and its true lateral borders being parallel, while the lateral borders of its dorsum are nearly so:

(2) in the larger cheliped of the male the outer end of the upper border of the arm, and the inner border of the wrist, are distinctly denticulated; the dactylus is not so strongly hooked, and the end of the immobile finger though obliquely truncate has an acuminate tip—never a notched-truncate tip:

(3) the colour, in spirit specimens, has a sort of livid bloom never seen in *G. annulipes*.

In the Indian Museum are 47 specimens from Karachi and 3 from the Andamans.

[*Gelasimus inversus*, Hoffmann.

*Gelasimus inversus*, Hoffmann, in Pollen and van Dam, Faun. Madagasc. Crust. p. 19, pl. iv. figs. 23-26 (1874): Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 155

de Man, Notes Leyden Mus. XIII. 1891, pp. 21, 44, pl. iv. fig. 12: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 751, and Jena. Denk. VIII. 1894, p. 59.

*Gelasimus chlorophthalmus*, Hilgendorf (nec Edw.), MB. Ak. Berl. 1878, p. 803 (apud de Man).

*Gelasimus Smithii*, Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 144, pl. 9, fig. 14 (apud Ortmann).

*Uca inversa*, Ortmann, Zool. Jahrb., Syst., X. 1897-98, p. 351.

There are in the Indian Museum specimens of this species from Madagascar and the Red Sea, and some from Karachi which differ from the type in the form of the dactylus of the large male cheliped, and are here separated as a variety.]

50. *Gelasimus inversus*, var. *sindensis*, nov.

This variety differs from typical *G. inversus* from Madagascar only in having the tip of the dactylus of the large male cheliped simple (instead of furnished with a second tooth that gives it a notched appearance) and the palm of the hand smoother externally.

The species resembles *G. annulipes*, from which it differs in the following characters:—

(1) the lateral borders of the dorsum of the carapace are defined by a fine line which is raised and distinct in the anterior third only, and is a little more oblique:

(2) the lower border of the orbit is much more sinuous, and is either entire or is quite imperceptibly denticulated at its outer angle:

(3) in the large cheliped of the male the arm is trigonal with sharp edges, the upper edge rising into a distinct lobe or crest and the distal end of the inner edge forming a crest or blunt tooth; the inner edge of the wrist is distinctly denticulated, and the upper border of the palm has several longitudinal rows of granules; of the granular ridges on the inner surface of the palm the lower one that in *G. annulipes* runs to the lower edge of the immobile finger is absent or, at most, is represented by a smooth and slight swelling; finally the immobile finger, though as in *G. annulipes* nearly straight and shorter than the dactylus, has a simple not a notch-like tip.

In the Indian Museum are 30 specimens from Karachi. The carapace of the largest specimen is 10 millim. long and 18 millim. broad.

51. *Gelasimus triangularis*, A. M. Edw.

*Gelasimus triangularis*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 275: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 150: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 113, pl. viii. figs. 8-11, and Notes Leyden Mus. XIII. 1891, p. 22, and in Weber's Zool. Ergebn. Niederl. Ost. Ind. II. 1892, p. 307: and Zool. Jahrb., Syst., VIII. 1894-95, p. 577: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 388.



*Gelasimus perplexus*, Heller (nec Edw.), Novara Crust. p. 28, pl. v. fig. 4.

?? *Gelasimus minor*, Owen, Zool. H. M. S. "Blissom," Crust., p. 79, pl. xxiv, figs. 2, 2a (1839): Milne Edwards, Ann. Sci. Nat., Zool., XVIII. 1852, p. 151: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 150.

*Uca triangularis*, Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 274.

Length of the carapace about four-sevenths of the greatest breadth, which is at the spine-like antero-lateral angles.

Carapace strongly convex, almost hexagonal, the regions not indicated. The posterior border of the dorsum of the carapace is less than half the greatest breadth, hence not only the lateral borders of the dorsum of the carapace, but also the true lateral borders, are strongly convergent posteriorly, the former being defined by a fine raised line in more than two-thirds of their extent.

Front, as in *G. annulipes*, from a fifth to a sixth the greatest breadth of the carapace.

Orbits sinuous, much oblique: the upper border defined by a fine microscopically-beaded line, which is double in great part; the lower microscopically beaded, serrulate at its outer end.

In the large cheliped of the adult male the hand is about  $2\frac{1}{2}$  times as long as the carapace; the outer surface of the arm, wrist, and hand are smooth to the naked eye; all the borders of the arm are sharply defined and finely serrulate, the inner border of the wrist is finely serrulate, and the upper and lower borders of the palm are marginate and granulate, especially the upper border; and the two oblique granular crests on the inner surface of the arm are in strong relief.

In the large hand the dactylus, in the adult, is from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times the length of the upper border of the palm; its tip is simply hooked and overhangs the simple upcurved tip of the immobile finger.

The meropodite of the last pair of legs is not nearly so broad as that of the two preceding pairs.

In the Indian Museum are 70 specimens, all but one being from various parts of the Bay of Bengal littoral. The carapace of a large specimen is 10 millim. long and about 18 millim. broad.

The figures of *G. minor*, Owen, agree very well with this species, and if the two names should prove to refer to the same species this name has the precedence.

## 52. *Gelasimus tetragonum* (Herbst).\*

*Cancer marinus, minor, vociferans*, Seba, Thesaurus, III. p. 48, pl. xix. fig. 15.

*Cancer tetragonon*, Herbst, Krabben, I. ii. 257, pl. xx. fig. 110, and III. i. 31.

*Gelasimus tetragonum*, Rüppell, 24 Krab. roth. Meer., p. 25, pl. v. fig. 5; Milne

\* I assume that Herbst used *tetragonon* as a noun substantive in apposition to *Cancer*: it may therefore continue in apposition to *Gelasimus* used as a substantive.

Edwards. Hist. Nat. Crust. II. 52, and Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 147, pl. iii. fig. 9: Guérin, Voy. Coquille, II. Zool., Crust. p. 10, pl. i. figs. 2, 3: A. Milne Edwards, in Maillard's Pile Réunion, Ann. F., p. 6, and Nouv. Archiv. du Mus. IX. 1873, p. 273: Heller, Novara Crust., p. 37: Hilgendorf, in v. d. Decken's Reisen Ost-Afr. Crust. p. 84: Hoffmann, in Pollen and Van Dam, Faun. Madag. Crust. p. 16: Kossmann, Reis. roth. Meer. Crust. p. 52: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 143, pl. ix. fig. 11: de Man, Archiv f. Naturges. LIII. 1887, i. p. 353, and Notes Leyden Mus. XIII. 1891, pp. 20, 24, pl. ii. fig. 6: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, pp. 750, 754: Whitelegge, Mem. Austral. Mus. III. 1897, p. 138.

*Gelasimus Duperreyi*, Guérin, Dana U. S. Expl. Exp. Crust. pt. i. p. 317.

*Uca tetragona*, Ortmann, Zool. Jahrb., Syst. X. 1897-98, p. 348: Doflein SB. Ak. Münch. XXIX. 1899, p. 193.

Length of the carapace about two-thirds of its greatest breadth at the acute antero-lateral angles. Carapace somewhat pentagonal, markedly convex fore and aft, the regions all recognizable but not strongly defined: though the posterior border of its dorsum is only half its greatest breadth, the true lateral borders are but slightly convergent posteriorly. In the adult male the fine raised line that bounds the dorsal plane on each side is distinct as such only in the neighbourhood of the antero-lateral angles, but in the female it runs much further backwards.

The breadth of the front, measured between the bases of the eyestalks, is about a tenth the greatest breadth of the carapace.

Orbits much oblique, both borders sinuous, the lower border elegantly denticulated throughout.

In the large cheliped of the adult male the upper border of the arm is fairly prominent and the inner border ends in a sharp tooth, quite independent of the constricted-off terminal lobule; the wrist is quite smooth to the naked eye, and has the inner angle sharp but not spiniform; and the hand is about  $2\frac{1}{2}$  times the greatest length of the carapace.

In the hand of this cheliped the palm is, to the naked eye, frosted with very fine granules, some of which in the neighbourhood of a scar near the base of the immobile finger are visible to the naked eye; its upper border is not, and its lower border is but obscurely, defined; and the two oblique crests on its inner surface are mere swellings, often quite faint, and never strongly salient. The fingers are neither broad nor particularly thin: the dactylus, which is about  $1\frac{2}{3}$  times the length of the upper border of the palm, tapers and is somewhat hooked at tip; the immobile finger commonly has two teeth a little enlarged, the second one being near the tip and sometimes giving the tip a somewhat notched (but not truncated) appearance.

The merns of the last pair of legs is not at all foliaceous.

In the Indian Museum are 29 specimens from the Andamans: the carapace of a large one is 17 millim. long and 26 millim. broad.

The "Challenger" specimens referred by Miers to this species have a broad front and are identical with specimens from Hongkong that I take to be *G. splendidus*.

53. *Gelasimus Marionis*, Desm.

*Gelasimus Marionis*, Desmarest, Consid. Gen. Crust., p. 124, pl. xiii. fig. 1, and Dict. Sci. Nat. XXVIII. 1823, p. 243: Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 145, pl. iii. fig. 5 (nec Hist. Nat. Crust. II. 53): de Man, Notes Leyden Mus. II. 1880, p. 67: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 308: Kingsley, Proc. Ac. Nat. Sci. Philad. XXXII. 1880, p. 141, pl. ix. fig. 8.

*Gelasimus cultrimanus*, White, P. Z. S. 1847, p. 205, Ann. Mag. Nat. Hist. XX. 1847, p. 205, and Samarang Crust. p. 49 (apud Miers loc. cit. supra).

*Gelasimus cultrimanus* var. *Marionis*, Ortmann, Zool. Jahrb. Syst. VII. 1893-94, pp. 750, 754.

Length of the carapace about two-thirds of the greatest breadth, which is at the claw-like antero-lateral angles.

Carapace little convex, all its regions very well defined, the posterior border of its dorsum in the adult male is half its greatest breadth and the true lateral borders are moderately convergent posteriorly: the fine raised line that in some other species defines the greater part of the dorsal plane is here, in the adult male, confined to the neighbourhood of the antero-lateral angles.

The breadth of the front between the bases of the eyestalks is not a fifteenth the greatest breadth of the carapace.

Orbits not very oblique nor very sinuous; the lower border, which is nearly straight, is elegantly crenulate throughout.

In the large cheliped of the adult male the upper border of the arm is prominent and the inner border ends in a sharp tooth, independent of the terminal constricted-off lobule; the upper surface of the wrist is granular, and the inner border of the wrist has a denticle or spinule at its angle; and the hand (fingers included) is about three times the length of the carapace.

This large hand has a curious twist: its palm is compressed and has the upper and lower margins well defined, the outer surface covered with large granules, and the two granular crests on its inner surface fairly prominent: its fingers are broad thin and laminar; the dactylus, which may be four times as long as the upper border of the palm, is shaped like a knife-blade; and in the immobile finger, which has a groove or line of pits along its outer surface, the dentary edge has a simple S-shaped curve.

The merus of the last pair of legs is not at all foliaceous.

In the Indian Museum are 9 specimens from the Andamans. The carapace of a large specimen is 18.5 millim. long and 26.5 millim. broad.

54. *Gelasimus Marionis* var. *nitidus*, Dana.

*Gelasimus vocans*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 145, pl. iii. fig. 4 (*nec* Hist. Nat. Crust. II. 54): Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 99: Heller, Novara Crust. p. 37: Hilgendorf, in v. d. Decken's Reis. Ost-Afr., p. 83: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 272: Hoffmann, in Pollen and Van Dam's Faun. Madagasc. Crust. p. 16: Miers, Phil. Trans. Roy. Soc. Vol. 168, 1879, p. 488, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 308, and Challenger Brachyura, p. 242: Richters, in Mobius, Meeresf. Maurit. p. 155: de Man, Notes Leyden Mus. II. 1880, p. 67, and XIII. 1891, p. 23, pl. ii. fig. 5, and Archiv f. Naturges. LIII. 1887, i. p. 352, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 305, and Zool. Jahrb. Syst. VIII. 1894-95, p. 572: Haswell, Cat. Austral. Crust. p. 92.

*Gelasimus nitidus*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 316, pl. xix. figs. 5a-d: Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 147: Thallwitz, Abh. Mus. Dresden, 1890-91, p. 42.

*Gelasimus cultrimanus*, Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 140, pl. ix. fig. 7: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, pp. 750-753, and Jena. Denk. VIII. 1894, p. 56.

*Uca cultrimana*, Ortmann, Zool. Jahrb., Syst. X. 1897-98, p. 343.

Differs from *G. Marionis* only in the form of the large hand of the adult male: this member, in var. *nitidus*,

(1) is not much over  $2\frac{1}{2}$  times the length of the carapace, its dactylus being but little more than twice the length of the upper border of the palm:

(2) it has the two oblique granular ridges on the inner surface of the palm remarkably salient:

(3) it has the dentary edge of the immobile finger thrown into a characteristic W-shaped curve owing to the strong projection of two large triangular lobes, and

(4) it has the dactylus somewhat hooked at tip.

In the Indian Museum are 103 specimens, chiefly from the Andamans and Nicobars, but also from the Coromandel and Malabar coasts. The length of the carapace in large specimens is 14 millim., the breadth 21 millim.

55. *Gelasimus acutus*, Stimpson, de Man.

*Gelasimus acutus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 99: Tozzetti, Magenta Crust. p. 107: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 144: de Man, Journ. Linn. Soc., Zool. XXII. 1887-88, p. 113, pl. vii. figs. 8-9, pl. viii. figs. 1-4, and Notes Leyden Mus. XIII. 1891, p. 21, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 306, and Zool. Jahrb. Syst. VIII. 1894-95, p. 573: Ortmann, Zool. Jahrb., Syst. 1893-94, p. 750.

*Uca acuta*, Doflein, SB. Ak. Münch. XXIX. 1899, p. 193.

Length of the carapace about three-fifths the greatest breadth, which is at the acute wing-like antero-lateral angles,

Carapace strongly convex fore and aft, the regions moderately well defined: its lateral borders are strongly convergent, and still more so are the lateral borders of the dorsal plane, which are defined in more than two-thirds of their extent by a fine raised line: the posterior border of the dorsal plane is contained from  $2\frac{1}{2}$  to  $2\frac{3}{4}$  times in the greatest breadth.

Front, measured between the eye-stalks, about a twelfth the greatest breadth of the carapace, its moulded and bevelled edges do not together take up half its breadth.

Orbits moderately oblique, both upper and lower borders much sinuous; the lower border finely, the upper border still more finely and more distantly crenulate.

In the large cheliped of the adult male all three borders of the arm are well defined, the inner and the lower borders being crenulated, but the inner border having no tooth independent of the terminal constricted-off lobule; the upper surface of the wrist and the outer surface of the palm are closely covered with vesiculous granules; and the hand (fingers included) may be  $3\frac{1}{2}$  times the length of the carapace.

In this large hand the upper and lower borders of the palm are well defined, and of the two oblique granular crests on the inner surface of the palm the upper one that runs to the dentary edge of the immobile finger is short and indistinct: the fingers are not particularly broad or thin, and however the teeth may be disposed, there is always one near the end of each finger that is enlarged so as to give the ends of the fingers, when apposed, a sort of tongs-like or forceps-like grip: the dactylus is from 2 to nearly  $2\frac{3}{4}$  times the length of the upper border of the palm.

The merus of the last pair of legs is distinctly foliaceous.

In the Indian Museum are 92 specimens chiefly from the Sunderbunds and Mergui, but also from Karachi and the Andamans. In a large specimen the carapace is 14 millim. long and 25 broad.

56. *Gelasimus Dussumieri*, Edw.

*Gelasimus Dussumieri*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 148, pl. iv. fig. 12: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71, and IX. 1873, p. 274: Hoffmann in Pollen and van Dam's Faun. Madag. Crust. p. 17, pl. iii. figs. 19-22: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 145, pl. x. fig. 16: de Man, Notes Leyden Mus. II. 1880, p. 68, and XIII. 1891, pp. 20, 26, and Journ. Linn. Soc. Zool. XXII. 1887-88, p. 108, pl. vii. figs. 2-7, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 306, and Zool. Jahrb., Syst., VIII. 1894-95, p. 576: Lenz and Richters, Abh. Senck. Nat. Ges. Frankf. XII. 1881, p. 423: Haswell, Cat. Austral. Crust. p. 93: Miers, Zool. H. M. S. Alert, pp. 518, 541: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, pp. 759, 755.

*Gelasimus longidigitum*, Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 144, pl. ix. figs. 10, 13 (side Ortmann l. c. *infra*).

*Uca Dussumieri*, Ortmann, Zool. Jahrb., Syst., X. 1897-98, p. 348: Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 273: Doflein, SB. Ak. Münch. XXIX. 1899, p. 193.

Closely related to *G. acutus*, from which it can be distinguished by the following characters when fully adult males are compared:—

(1) the regions of the carapace are much more strongly defined, and the raised lines that bound the dorsal plane of the carapace on each side are more curved, less rapidly convergent, and less distinct in their posterior part, which gives the carapace a much less posteriorly-contracted look; and the orbits are less oblique:

(2) the front, measured between the bases of the eyestalks, is about a fifteenth the greatest breadth of the carapace, and its moulded and bevelled edges together take up more than two-thirds of its breadth:

(3) in the large cheliped the arm is longer and more slender, both the oblique granular ridges on the inner surface of the palm are very strongly defined, and the fingers may be fully 3 times the length of the upper border of the palm:

(4) these large fingers are broader and thinner, their tips are somewhat hooked and have no enlarged tooth near them, but near the middle of the immobile finger there is a enlarged tooth or triangular lobe:

(5) the merus of the last pair of legs, though it is compressed and somewhat broadened, is not a short foliaceous joint.

In the Indian Museum are 52 specimens, from Mergui, Andamans and Nicobars, and Bimlipatam.

#### 57. *Gelasimus Urvillei*, Edw.

*Gelasimus Urvillei*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 148, pl. iii. fig. 10: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 145, pl. ix. fig. 15: de Man, Notes Leyden Mus. XIII. 1891, pp. 21, 34: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 750.

*Gelasimus Dussumieri*, Hilgendorf (*nec* Edw.), in v. d. Decken's Reis. Ost-Afr. Crust. p. 84, pl. iv. fig. 1.

This species closely resembles *G. acutus* and *G. Dussumieri*, but is distinguished from both by the presence of a raised row of granules behind and parallel with the middle third of the lower border of the orbit—*i.e.*, just inside the orbital cavity.

As in *G. acutus*, the fine raised lines that define the dorsal plane of the carapace laterally are distinct throughout and rapidly convergent, which gives the carapace a look of breadth in front and of unusual narrowness behind; and, as in *G. acutus*, the meropodites of the last

pair of legs are, even in the male, decidedly shortened and falcate joints.

On the other hand the front is, as in *G. Dussumieri*, extremely narrow, and its bevelled and moulded edges take up most of its breadth between the eye-stalks. The regions of the carapace, also, are as strongly defined as they are in *G. Dussumieri*.

The large hand of the male resembles that of *G. Dussumieri* in having both the oblique granular ridges on the inner surface of the palm strongly salient, and in having very long fingers with simple hooked tips: the fingers however are not so broad and thin, and the lobe near the middle of the dentary edge of the immobile finger may be present or not.

In the Indian Museum are 10 specimens, from Karachi, Madras, and the Nicobars.

The carapace of the largest specimen is 20 millim. long and 36 millim. broad.

#### Subfamily SCOPIMERINÆ.

##### *DOTILLA*, De Haan, Stimpson.

*Dotilla*, De Haan, Faun. Japon. Crust. p. 24 (1835) *nom. præoc.*: Milne Edwards, Hist. Nat. Crust. II. 38, and Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 152.

*Dotilla*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 98.

Cephalothorax so deep as to be subcubical, as long as broad or a little broader than long. Anteriorly the sidewalls of the carapace have a curious gyrous-sulcate sculpture resembling brain-convolutions: often also a similar kind of sculpture is found on the dorsum of the carapace and on the meropodites of the external maxillipeds.

Front a narrow deflexed lobe much as in *Ocyropa*. The orbits, which occupy all the rest of the anterior border of the carapace, are more or less oblique and shallow—in one species so shallow as to be almost obsolete. Eystalks rather long and slender, with the eyes at the end.

Antennules, like those of *Ocyropa*, having the basal joint of good size, and the flagellum small and hidden by the front. The antennæ stand at the inner angle of the lower orbital border and have a rather short flagellum.

The epistome would be linear but for a large median triangular lobe that projects between the external maxillipeds.

Buccal cavern enormous, suboval or subcircular in outline: the external maxillipeds, which completely cover it and are also very large, have a strong almost hemispherical bulge; their merus is much larger

than the ischium and carries the flagellum at the antero-external angle: the exognath is extremely slender and inconspicuous.

Chelipeds equal, stouter than the legs: fingers usually slender and a little deflexed, usually without conspicuous teeth.

Legs not much differing in length, which is moderate: their meri (as also those of the chelipeds) have on the upper surface a curious membranous area or "tympanum." Similar "tympana" may also be present on some of the segments of the sternum.

The abdomen in the male consists of 7 separate segments, and though narrow is nowhere linear or compressed: the distal end of the fourth segment is thickly fringed with bristles, and overlaps and partly conceals the fifth tergum. In the female, according to De Haan, the abdomen consists of 5 separate segments.

*Distribution:* Tropical shores and mud-flats, from East Africa and the Red Sea eastwards to Japan. Found in the same situations as *Gelasimus* and *Ocypoda*.

*Key to the Indian species of Dotilla.*

- I. Carapace broader than long: chelipeds not much longer than the carapace, and not much differing from the legs in point of length: no "tympana" on the sternum:—
  1. Meropodites of legs not dilated: fingers of chelæ slender, without any conspicuous teeth:—
    - i. Whole surface of merus of external maxillipeds gyrous-sulcate: fingers not longer than palm..... *D. affinis.*
    - ii. Only the outer-half of the merus of the external maxillipeds is gyrous-sulcate:—
      - a. Fingers slightly longer than the palm..... *D. Blanfordi.*
      - b. Fingers more than twice as long as the palm..... *D. intermedia.*
  2. Meropodites of the legs dilated:—
    - i. Fingers of chelæ without any conspicuous tooth: dactyli of the legs, even of the last pair, shorter than the propodites..... *D. brevitarsis.*
    - ii. A large tooth on each finger of the chelæ, arranged so that when the tips of the fingers are closed these large teeth meet, and an hour-glass-shaped space is left between the closed fingers: dactyli of the legs longer than the propodites..... *D. clepsydrodactylus.*
- II. Carapace at least as long as broad: chelipeds 3 or 4 times as long as the carapace, and much longer than the legs: "tympana" present on the sternum..... *D. myctiroides.*



58. *Dotilla affinis*, n. sp.

Differs from *D. sulcata*, with specimens of which, from the Red Sea, I have compared it, only in the following characters:—

(1) there is no spine on the under surface of the arm, (2) the fingers are not so long as the palm, (3) there is a small tympanum on the dorsal surface of the merus of the last pair of legs, whereas in *D. sulcata* only the tympanum on the ventral surface is present.

The carapace behind the gastric and inside the branchial regions, forms a smooth semicircular facet, but all its anterior and lateral regions have a curiously convoluted sculpture, the convexities of the convolutions being finely granular.

The grooves that define these convolutions form, when viewed as a whole, a sort of five-rayed star, the anterior ray (which runs up between the eyes on to the front) being the shortest, the antero-lateral rays (which run towards the outer angles of the orbit) being a little longer, and the postero-lateral rays (which really are triple) being the longest of all.

The pterygostomian regions and neighbouring part of the side-walls of the carapace, and the meropodites of the external maxillipeds have the same curious convoluted sculpture. The orbits are shallow but are perfectly defined.

The merus of the external maxillipeds is more than twice the size of the ischium.

Chelipeds (measured round their curve) not twice the length of the carapace: no spine on any of their segments: fingers not so long as the palm.

Legs slightly longer than the chelipeds, their meropodites not at all broadened but all having a "tympanum": except in the case of the last pair of legs—in which the dactylus is remarkably long—the dactyli are rather shorter than the propodites.

No tympana on the sternum.

In the Indian Museum are 4 specimens from Aden and the Baluchistan coast. The carapace of the largest is 5.3 millim. long and 7.3 millim. broad.

59. *Dotilla intermedia*, de Man.

*Dotilla intermedia*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 135, pl. ix, figs. 4-6 (1888).

Carapace sculptured in much the same way as in *D. affinis*, only the grooves are not so deep and distinct, and there is an additional groove running parallel with the posterior margin.

The merus of the external maxillipeds is not twice as large as the ischium, and the sculpturing consists of a single loop parallel with the outer border of the merus, the inner half of that joint being quite smooth.

Fingers more than twice as long as the palm. In the last pair of legs the dactylus is about twice as long as the propodite: in all the other legs the dactyli are very little longer than the propodites.

In other respects this species agrees with *D. affinis*.

In the Indian Museum are 15 specimens from Mergui. The carapace is 4 millim. long and a little over 4 millim. broad.

#### 60. *Dotilla Blanfordi*, n. sp.

The whole of the dorsal surface of the carapace is areolated and grooved (the areolæ being finely granular and the grooves smooth) as follows:—

A very distinct groove runs parallel with either lateral border, and a scarcely less distinct one runs parallel with the posterior border, and in the space bounded by these grooves a six-rayed star of grooves of nearly equal length can be made out. This "star" is formed by a groove running fore and aft down the middle of the carapace and having, on either side of it, a semicircular chord joining the outer angle of the orbit with a point near the postero-lateral angle of the carapace. The intersection of these grooves cuts the post-gastric sub-region into 4 symmetrical tubercles.

The whole side-wall of the carapace is finely granular, and the sub-hepatic and pterygostomial regions have the characteristic convoluted sculpture. The orbits are shallow but are perfect.

The external maxillipeds are finely granular: the merus is twice as big as the ischium, and its sculpture consists of a single loop parallel with the outer border and a single groove parallel with the inner border.

Chelipeds as in *D. affinis*, except that the fingers are a little longer than the palm.

Legs as in *D. affinis*, the meropodites being slender and all having a "tympanum," but in the last pair the dactylus is about twice as long as the propodite, and in the other pairs the dactyli are very slightly longer than the propodites. No sternal tympana.

In the Indian Museum are 4 specimens from the coast of Sind and Baluchistan. The carapace of the type is a little over 5 millim. long and not quite 7 millim. broad. Collected by Mr. W. T. Blanford, F.R.S.

61. *Dotilla slespydrodactylus*, n. sp.

Near *D. Wichmanni*, de Man.

The sculpture of the dorsum of the carapace is like that of *D. Blanfordi*, only the grooves are much deeper cut and the groove between the post-gastric region and the postero-lateral angle of the carapace is double: the sculpture of the sidewall of the carapace is like that of *D. Blanfordi*.

In the external maxillipeds the merus is not twice as big as the ischium, and its sculpture consists of a single simple convolution parallel with the outer border, the inner half of its surface being quite smooth—as is *D. intermedia*.

The orbits are shallow but are quite perfect.

The chelipeds, measured all round their curve, are not twice the length of the carapace and have no spine on the arm. The fingers are much longer than the palm: *in the adult male they are extremely slender, and each has a large tooth arranged so that when the tips of the fingers are closely apposed these two teeth meet and leave an hour-glass-shaped space between the closed fingers.*

Legs a little longer than the chelipeds; their meropodites are slightly but distinctly dilated and all have a *tympanum*: their dactyli are all longer than their propodites, and in the last pair the dactylus is very long, slender, straight, and fluted. No sternal tympana.

Colours, speckled like the sand in which they live.

In the Indian Museum are eight specimens from False Point on the sea face of the Mahanaddi Delta. The carapace of the largest is 5 millim. long and 6 millim. broad.

62. *Dotilla brevitarsis*, de Man.

*Dotilla brevitarsis*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 130, pl. ix. figs. 1-3 (1888).

The whole carapace is grooved and areolated (but the sculpture is not very deep) as follows:—

A strong groove runs fore and aft down the middle of the carapace, another runs parallel with the posterior border, and on each side another takes a sinuous course along each lateral border: other short and rather indefinite grooves join the median and lateral grooves.

The subhepatic and pterygostomial regions have the usual convoluted sculpture. Orbits shallow, but distinct.

The merus of the external maxillipeds is much larger than the ischium: its whole surface is sculptured, the sculpture taking the form of a W-shaped convolution.

Chelipeds short, without any spine on the arm: palm short, high, and compressed, with sharp edges, traversed by a fine raised line near and parallel with the lower border: fingers thin and compressed, about as long as the palm, the upper edge of the dactylus—like that of the palm—fringed with hair.

Legs a little longer than the chelipeds, the meropodites—especially of the first 3 pairs—*much broadened and compressed*, all having a tympanum. *The dactyli, even of the last pair of legs, are shorter than the propodites.*

No tympana on the sternum.

In the Indian Museum are fragments of 3 specimens from Mergui: de Man states that the breadth of the cephalothorax of the largest specimen is nearly 10 millim.

### 63. *Dotilla myctiroides*, Edw.

*Doto myctiroides*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, pl. iv. fig. 24.

*Dotilla myctiroides*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 98: A. O. Walker, Journ. Linn. Soc. Zool. XX. p. 111: Aurivillius, Zur Biologie amphibischer Dekapoden, p. 5, pl. i. figs. 1-13, pl. iii. fig. 13, (Mitg. Ges. Wiss. Upsala, 1893).

*Scopimera myctiroides*, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 390.

Carapace about as long as, or slightly longer than, broad, little sculptured dorsally, though its antero-lateral parts are studded with vesiculous granules. Front grooved: a groove runs parallel with either lateral border, and a faint groove crosses either postero-lateral angle. The side-walls anteriorly have the usual "brain-couvolution" sculpture.

Orbits very oblique and very shallow, almost obsolete.

The merus of the external maxillipeds is nearly twice as big as the ischium and is finely granular; a single faint groove, most distinct anteriorly, runs parallel with its outer border.

Chelipeds between three and four times the length of the carapace, all the joints long, slender, and unarmed: fingers longer than the palm, without any conspicuous teeth.

Legs long, but much shorter than the chelipeds: the meropodites strongly dilated, and with a large "tympanum": the dactylus of the last pair is longer than the propodite, but in the other three pairs it is a little shorter than the propodite.

On either side of each of the last four thoracic sterna is a large tympanum.

In the Indian Museum are 19 specimens from the Andamans and 11 from the Coromandel coast. The carapace is 10 millim. long.

## SCOPIMERA, De Haan.

*Scopimera*, De Haan, Faun. Japon. Crust., p. 24 (1835): Milne Edwards, Ann. Sci. Nat., (3) XVIII. 1852, p. 153.

*Scopimera* has the same deep "cubical" carapace and the same general facies as *Dotilla*, but differs in the following characters:—

The carapace is much broader than long and has none of the curious sculpture, resembling brain convolutions, that is found, at any rate on the sidewalls, in *Dotilla*: the external maxillipeds are unsculptured and their merus, though large, is smaller than their ischium: the abdomen of the male has a curious wasp-like form owing to the length and narrowness of its fifth segment, which segment may even become elongate-linear by constriction; it has no bristles either on the 4th tergum or elsewhere: in the female the abdomen consists of 7 separate segments.

*Distribution*: Indo-Pacific shores, from Karachi to Japan.

*Key to the Indian species of Scopimera.*

- I. Chelipeds and legs with a reticulate or subsquamiform granulation, the chelipeds in the male about twice the length of the carapace: most of the tympana on the legs are traversed by a longitudinal ridge: fifth abdominal tergum of male long and narrow, but not linear..... *S. investigatoris.*
- II. Chelipeds and legs finely and uniformly granular, the chelipeds in the male nearer 3 times than twice the length of the carapace: the tympana not subdivided by a ridge: the fifth abdominal tergum of the male is long and linear..... *S. crabricauda.*

According to F. Müller, *S. globosa*, De Haan, is found in Indian waters. The form of the abdomen in this species is similar to that of *S. investigatoris*, but the carapace is smooth, and the tympana of the legs are different.

64. *Scopimera investigatoris*, n. sp.

Carapace much broader than long, decidedly pentagonal, without distinction of regions, smooth except anteriorly and laterally where there are numerous irregularly-scattered granules: the sidewalls and pterygostomial regions finely granular.

Orbits broad as in *Ocypoda*, shallow, the upper border very oblique, the lower border finely denticulated and very prominent as in *Gelasimus*.

External maxillipeds with some obsolescent granulation. Chelipeds and legs finely granular in a somewhat reticulate or subsquamiform way.

Chelipeds about twice as long as the carapace: tympanum on the inner surface of the arm large, that on the outer surface of the arm small: fingers about as long as the palm, without any enlarged teeth.

First 3 pairs of legs about the same length as the chelipeds, the 4th pair shorter: the merus of all much dilated and with large well-defined tympana, all of which, except only the one on the dorsal surface of the last pair, are longitudinally subdivided by a fine ridge: the dactylus in the first 3 pairs is about the same length as the propodite, but in the last pair is considerably longer.

In the male abdomen the first 2 segments are horizontal-linear, the 3rd and 4th, though distinct, form a "butterfly" plate, the 5th is long and narrow and longitudinally grooved and gradually expands to meet the 6th, which is long and broad, while the 7th is transversely oval.

In the female the abdomen is of the usual shape, but in its broadest part is little more than half the breadth of the sternum.

In the Indian Museum are 11 specimens, from Diamond Island off C. Negrais in Burma. The carapace of the largest male is 4.5 millim. long and 7 millim. broad.

65. *Scopimera crabricauda*, n. sp.

Carapace subpentagonal, the regions indistinctly indicated, the surface of the mid-dorsal region is symmetrically puckered or vesicular; the sidewalls and pterygostomial regions granular.

Orbits moderately broad and deep, the upper border oblique, the lower border prominent and finely denticulate.

External maxillipeds smooth: chelipeds and legs "frosted" under the lens.

In the male the chelipeds are more than  $2\frac{1}{2}$  times the length of the carapace and are longer and much stouter than the legs: there is a large tympanum on the inner surface of the arm, and a very small one on the outer surface: the dactylus is a little shorter than the palm and has one large tooth. In the female the chelipeds are shorter and not much stouter than the legs: the fingers are shorter than the palm, and the dactylus has no large tooth.

The meropodites of the legs are much dilated: all have tympana but these are not subdivided by any ridge: in the first 3 pairs of legs the dactyli are a little longer, in the fourth pair considerably longer, than the propodites.

In the male abdomen the first 2 segments are linear-horizontal and concealed, the 3rd and 4th form a triangular plate deeply grooved down

the middle line, the 5th is long linear and grooved, the 6th and 7th, though separate, together form a racket-head.

In the female the abdomen is of normal shape.

In the Indian Museum are a male and female from Karachi. The carapace of the male is 6.5 millim. long and barely 10 millim. broad.

*TYMPANOMERUS*, de Man, Rathbun.

*Diorippe*, de Man, Journ. Linn. Soc., Zool., XXII, 1887-88, p. 187 (1898) (nom. *privoc.*

*Tympanomerus*, Rathbun, Proc. Biol. Soc., Washington, XI, 1897, p. 164.

Carapace deep, quadrilateral, broader than long, the regions not defined. Front narrow, deflexed: the orbits are trenches occupying the whole anterior border of the carapace between the front and the antero-lateral angles.

Eyes, antennulæ, antennæ and epistome as in *Dotilla*. Buccal cavern large, a little narrowed and rounded anteriorly: the external maxillipeds completely close the buccal cavern, the anterior outer corner of the ischium is marked off as a distinct facet as in *Dotilla* and *Scopimera*, the merus is much larger than the ischium, the palp arises near the antero-external angle of the merus, and the exognath is small and linear.

Chelipeds in both sexes stouter, and in the male longer, than the legs: fingers a little deflexed.

Legs rather compressed, the two middle pairs a little longer than the first and last pair: there are ill-defined tympana on the meropodites.

The abdomen in both sexes consists of separate segments, and in the male is narrow.

*Distribution*: Japanese and Andaman Seas.

The name *Tympanomerus* is a most unfortunate one, since the "tympana," compared with those of *Dotilla* and *Scopimera*, are ill-defined and inconspicuous.

66. *Tympanomerus orientalis* (de Man).

*Diorippe orientalis*, de Man, Journ. Linn. Soc. Zool. XXII, 1887-88, p. 138, pl. ix, figs. 8-10.

Carapace square-cut, the length about four-fifths of the greatest breadth, dorsally nearly flat with the lateral borders well defined especially anteriorly, the surface a little lumpy in places: a perfectly straight fine transverse ridge runs close to and parallel with the posterior border.

Front grooved dorsally, hardly a fourth the breadth of the carapace. The outer angle of the lower border of the orbit forms a

prominent tooth. The merus of the external maxillipeds is grooved along the outer border.

Chelipeds in the male nearly three times the length of the carapace: wrist elongate, somewhat cuboid, with a strong laterally-compressed lobe or tooth at its inner angle: palm rather high, both borders marginate and a second fine ridge runs close to and parallel with the lower border: fingers a little shorter than the palm, finely denticulate.

In the female the chelipeds are not twice the length of the carapace, the wrist is not elongate, though the tooth at its inner angle is present, and the fingers are a little longer than the palm.

The meropodites of the legs are slightly dilated, the dactyli are shorter than the propodites, and the carpopodites and propodites of the first two pairs are densely tomentose.

The fifth abdominal tergum of the male, though not particularly elongate, is a little constricted at base.

In the Indian Museum are 6 specimens from Mergui. The carapace of the largest is 4 millim. long and 5 millim. broad.

#### Subfamily MACROPHALMINÆ, Dana.

##### CLISTOSTOMA, De Haan restr.

*Cleistostoma* (= *dilata* nec *pusilla*) De Haan, Faun. Japon. Crust. p. 26: Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 160.

Carapace of no great depth, broader than long, its sides slightly arched, its regions ill-defined.

Front of moderate breadth, more than a fourth the greatest breadth of the carapace, declivous: orbits well defined, of good depth, occupying all the rest of the anterior border of the carapace: eyestalks stout, eyes terminal. The antennules fold obliquely: the antennæ are small and stand in the inner orbital hiatus.

Epistome well defined, very short fore and aft, with a prominent lobe or tooth in the middle line projecting between the external maxillipeds.

Buccal cavern squarish, but with the sides a little arched, completely closed by the external maxillipeds. These are large, and have the inner angle of the ischium strongly produced, the merus as large as or larger than the ischium, and the palp articulating at the antero-external angle of the merus: the carpus is ovate, but the two terminal joints are very short and slender: the exognath is in great part concealed.

Chelipeds in the female shorter and slenderer than any of the legs, in form exactly like those of the female of *Gelasimus*.



Of the legs the first two pairs are the shortest and slenderest, while the middle two pairs are much the largest and have very broad meropodites. There are no "tympana."

The abdomen of the female consists of 7 separate segments, and is very broad.

67. *Olistostoma dotilliforme*, n. sp.

Carapace rather depressed, slightly convex, smooth, with the regions ill-defined; its lateral borders are slightly arched and are finely serrated anteriorly behind the acute, almost dentiform, antero-lateral angles. Front between a third and a fourth the greatest breadth of the carapace, concave in the middle line. Upper border of the orbit sinuous, lower border prominent and finely serrated.

Merus of the external maxillipeds larger than the ischium, sculptured (somewhat as in the *Dotillæ*) with a sort of Y-shaped sulcus starting from the antero-external angle. The pterygostomial regions also are sculptured with branching or convoluted grooves much as in the *Dotillæ*.

The second and third pair of legs, which are much longer than the other two pair, are a little over  $1\frac{1}{2}$  times the length of the carapace and have an almost foliaceous meropodite with the anterior border finely serrulate and the posterior border elegantly spinate: the anterior border of the carpus and propodite of the second and third pair of legs is tomentose.

A single egg-laden female is in the Indian Museum: it was found at Karachi, and its carapace is 7 millim. long and 9 millim. broad.

TYLODIPLAX, de Man.

*Tylodiplax*, de Man, Zool. Jahrb., Syst. VIII. 1894-95, p. 598 (1895).

Carapace deepish, quite flat dorsally, broader than long and broader behind than in front, the lateral borders being posteriorly divergent and having a distinctly convex curve, the regions more or less defined.

Front between a third and a fourth the greatest breadth of the carapace, not deflexed, grooved longitudinally. The orbits occupy the rest of the anterior border of the carapace, but as the extent of this border is a good deal less than the greatest breadth of the carapace, and as the front is broad, the orbits have not the same elongate form as they have in most species of *Macrophthalmus*, though otherwise similar. Antennules and antennæ as in *Macrophthalmus*. Eyes small, not terminal on the eyestalks,

The epistome would be linear, were it not for a septum-like fold or lobe that projects strongly between the meropodites of the external maxillipeds: owing to this fold the anterior edge of the buccal cavern has a bilobed appearance. The external maxillipeds completely close the buccal cavern: their merus is at least as long as and decidedly broader than their ischium: the flagellum, which is slender, is articulated near, but not at, the antero-external angle of the merus: the exognath is not much concealed, though not completely exposed.

The chelipeds in the adult male are unknown: in the young male they are equal and are shorter and slenderer than the legs, except perhaps the very small 4th pair.

The legs have somewhat the same relations as in *Macrophthalmus*—i.e., the first and last pairs are much the shorter and the two middle pairs are much the longer and stouter.

The abdomen in the female is unknown: in the male it is narrow, and consists of 5 separate joints, the 3rd 4th and 5th segments being fused, but without obliteration of sutures.

It seems to me of very doubtful utility to separate this form from *Paraclistostoma*, de Man, or either of them from *Clistostoma*, De Haan (as restricted by de Man).

#### 68. *Tylodiplax indica*, n. sp.

Two young males from Karachi are in the Indian Museum: their chelipeds are still of the female *Macrophthalmus* type, so that it is impossible to give a complete diagnosis of the species.

Carapace more or less hairy, finely punctate, its length less than two-thirds its greatest breadth which, owing to the strong divergence, from before backwards, of the lateral borders, is posterior; its antero-lateral angle is an obtuse angle. The gastric region is defined by a perfectly circular line.

Front square-cut, laminar, but not projecting beyond the inner angles of the orbits, from which it is separated by a groove: the front is concave in the middle line.

The pigment of the eyes is small in amount, and is placed some distance behind the end of the eyestalks.

The merus of the external maxillipeds is longer and much broader than the ischium, and has its antero-external angle considerably dilated, and its surface somewhat granular.

The chelipeds of the immature male, and the legs, are hairy, much as in *Macrophthalmus depressus*, the hairs on the posterior border of the merus of the 2nd pair of legs and on the dorsal surface of carpus and propodite of the 2nd and 3rd pair of legs being particularly

thickset. The length of the longest (second) pair of legs is  $2\frac{1}{2}$  times that of the carapace, that of the last pair of legs is very little more than that of the carapace.

Two young males from Karachi: the carapace 6.5 millim. long and 11 millim. broad.

#### MACROPTHALMUS, Latreille.

*Macrophthalmus*, Latreille, in Cuvier Règne An. (ed. 2) Vol. IV. p. 44 (1829): De Haan, Faun. Japon. Crust. p. 26: Milne Edwards, Hist. Nat. Crust. II. 63, and Ann. Sci. Nat., Zool. (3) XVIII. 1852, p. 155: Dana, U. S. Expl. Exp., Crust. pt. I. p. 312: Miers, Challenger Brachyura, p. 248.

Carapace depressed, quadrilateral, broader than (sometimes more than twice as broad as) long: the regions are well defined, the cervical and branchial grooves being characteristically conspicuous both on the dorsum of the carapace, and on the lateral border where they cut out two prominent teeth or lobes.

Front deflexed, narrow, often a narrow lobe as in *Gelasimus*: its free edge never approaches the epistome. The orbits are narrow trenches occupying the whole anterior border of the carapace between the front and the antero-lateral angles: eyestalks usually very long and slender, as in *Gelasimus*. The antennular flagella, which are rather small, fold transversely beneath, but are not concealed by, the front. The antennæ stand at the inner angle of the orbit: the basal joint is short, and the flagellum is of good length.

Epistome very short fore and aft, almost linear, but well delimited from the palate. Buccal cavern somewhat arched anteriorly. The external maxillipeds have a broad foliaceous ischium and merus (the latter about half the length of the former) and a coarse flagellum articulating with the antero-external angle of the merus: though the ischium and merus may not quite meet across the middle of the buccal cavern, the narrow interval that may exist between them is largely filled by the flagella, so that the underlying parts are concealed.

The chelipeds differ greatly in the sexes: in the female they are equal, and are shorter and slenderer than any of the legs except, perhaps, the short and weak last pair: in the *adult* male they are equal or subequal, and are longer and stouter than any of the legs except, perhaps, the particularly large and stout penultimate pair: in both sexes the fingers are curiously deflexed and bent or curved inwards distally.

Of the legs, the first and last pairs are usually singularly short and slender compared with the second and third pairs: the third pair are the longest and stoutest, being nearly or quite as large as the chelipeds,

and the fourth (last) pair much the shortest and weakest of all. The dactylus in all is broad, stout, and laterally compressed.

The abdomen in both sexes consists of 7 separate segments, and in the male is narrower at base than the breadth of the sternum.

*Key to the Indian species of Macrophthalmus.*

- I. Carapace much broader than long, its sides are distinctly convergent posteriorly and the antero-lateral angles are acute and spiniform: front narrow:—
  1. The eyestalks project nearly half their length beyond the antero-lateral angles of the carapace..... *M. Verreauxi.*
  2. The eyestalks project slightly beyond the antero-lateral angles of the carapace: the true first tooth of the lateral border of the carapace belongs to the upper border of the orbit, and the antero-lateral angle of the carapace is formed by the true second tooth..... *M. sulcatus.*
  3. The eyestalks do not project beyond the antero-lateral angles of the carapace:—
    - i. Some of the borders of some of the leg joints are denticulate or spiny..... *M. pectinipes.*
    - ii. Legs smooth, except for a small subterminal denticle on the anterior border of the meropodites ..... *M. convexus.*
- II. Carapace broader than long, its sides are parallel:—
  1. The tooth at the antero-lateral angle of the carapace is truncate and square-cut: front about an eighth the greatest breadth of the carapace: inner surface of the palm of the male smooth..... *M. depressus.*
  2. Front about a fourth the greatest breadth of the carapace: inner surface of the palm of the male armed with a spine..... *M. erato.*
- III. Carapace broader than long, its sides divergent posteriorly: two nearly parallel, obliquely longitudinal, finely beaded lines on the posterior part of each epibranchial region ..... *M. tomentosus.*

Besides the fore-named, the four following species, of which I have not seen specimens, are said to occur in Indian Seas:—

(1) *M. simplicipes*, Guérin, Mag. de Zool. II. 1838, pl. xxiv. fig. 1: it appears to differ from *M. pectinipes* in having no spines or denticles on the leg-joints.

(2) *M. carinimanus*, Milne Edwards, Hist. Nat. Crust. II. 65, and Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 156: it appears to differ from *M. convexus* only in having a spine on the inner surface of the palm of the male cheliped.

(3) *M. pacificus*, Dana, U. S. Expl. Exp., Crust. pt. I. p. 314, pl. xix. fig. 4: it appears to differ from *M. erato* only in not having a spine on the inner surface of the palm of the male cheliped.

*M. bicarinatus*, Heller, Novara Crust. p. 36, pl. iv. fig. 2, which I am unable from the descriptions to distinguish from *M. pacificus*.

69. *Macrophthalmus Verreauxi*, Edw.

*Macrophthalmus Verreauxi*, Milne Edwards, Ann. Sci. Nat., Zool., (3) IX. 1848, p. 358, and XVIII. 1852, p. 155, pl. iv. fig. 25; Hess, Archiv f. Nat. XXXI. 1865, i. pp. 142, 171; de Man, Notes Leyden Mus. II. 1880, p. 184; Haswell, Cat. Austral. Crust. p. 89.

Carapace finely granular on the branchial regions, its length about two-thirds its greatest breadth, its sides slightly convergent posteriorly and cut anteriorly into 3 teeth, the first of which is the antero-lateral angle.

Front only very moderately deflexed, its least breadth (between the eyestalks) is about a fifth the greatest breadth of the carapace, very obscurely bilobed.

Orbits oblique, sinuous, their borders microscopically beaded. *The eyestalks project nearly half their length beyond the antero-lateral angles of the carapace.*

The external maxillipeds, when the flagella are folded, completely occlude the buccal cavern: the suture between the merus and ischium is oblique.

The legs are darkly variegated or incompletely banded, and are unarmed except for a subterminal spine on the anterior border of the meropodites of the first 3 pairs.

The chelipeds in the young male are not as long as, though more massive than, the 2nd and 3rd pairs of legs.

In the Indian Museum are 4 specimens, more or less damaged, from the Andamans and Mergui ("Investigator" collection). The largest male (which wants the chelipeds) has a carapace 9 millim. long and 14 millim. broad.

70. *Macrophthalmus pectinipes*, Guérin.

*Macrophthalmus pectinipes*, Guérin, Voy. Favorite, p. 167, pl. 49 (1839), and Mag. de Zool. II. 1839, Crust. (Cl. VII.) pl. xxiii (1838); Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 158; Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 369; Ortmann, Zool. Jahrb., Syst., X. 1897-98, p. 340.

Carapace studded with large conspicuous pearly granules, its length in the adult male is about six-elevenths of its greatest breadth at the level of the second tooth of the lateral border: the lateral borders are slightly but distinctly convergent posteriorly where they are beaded or denticulate, anteriorly they are cut into three acute teeth the last of which is minute, the first being the outer orbital angle.

The front, measured at its narrowest part between the eyestalks, is barely a sixteenth the greatest breadth of the carapace: its free edge is distinctly bilobed. Orbits sinuous, a little oblique; their upper border

elegantly denticulate, the lower border unevenly crenulate. Eyestalks slender and curved: the eye does not reach to the end of the orbital trench.

When their flagella are folded the external maxillipeds completely occlude the buccal cavern: the suture between the ischium and merns is hardly at all oblique.

In the adult male the chelipeds are from  $2\frac{1}{2}$  to 3 times the length of the carapace and longer than any of the legs except the 3rd (penultimate) pair: except the hand, their joints are not more massive than those of the 2nd and 3rd pair of legs. The arm is trigonal, its inner border being prominent and rising into a crest, on the most convex part of which is a short horny plate, called by de Man the "musical ridge": this border of the arm, as also the inner border and angle of the wrist and the extreme proximal end of the upper border of the palm, is serrated. The palm is nearly as long as the arm and is perfectly smooth and unsculptured, it has a tuft of hair at its extreme distal end, continuous with a thick fringe of hair along the upper border of the dactylus: the dactylus is about two-thirds the greatest length of the palm and has a molariform tooth at its basal end, but there is no such tooth on the immobile finger: the fingers meet only at the distal inbent end.

In the female and young male the chelipeds are short and slender, a good deal fringed with hair, but unsculptured, and the fingers are longer than the palm.

In both sexes the legs are alike, the 2nd and 3rd pairs being remarkably long and strong and the 1st and 4th (last) pairs being short and comparatively slender. The 3rd pair, which are the longest of all, are from  $2\frac{1}{2}$  to nearly 3 times the length of the carapace, the 4th pair are only about  $1\frac{1}{2}$  times the length of the carapace. In all but the last pair the meropodites carpopodites and propodites are scabrous, the anterior border of all these joints and the distal end of the posterior border of the meropodites being serrated: in the third pair only the posterior border of the propodite is very strongly serrated.

In the Indian Museum are 7 specimens from Karachi and one from Orissa. In a large male specimen the carapace is 35 millim. long and 62 millim. broad.

The great changes that occur in the chelipeds during the growth of the male indicate that caution is necessary in basing specific distinctions on the form of these organs in this genus.

#### 71. *Macrophthalmus convevus*, Stimpson.

*Macrophthalmus convevus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1856, p. 97: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 307: Haswell, Cat. Austral. Crust. p. 89:

de Man, Archiv f. Naturges. LIII. 1867, i. p. 334, pl. xv. fig. 4: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 745 and X. 1897-98, pp. 342, 344.

*Macrophthalmus inermis*, A. Milne Edwards, Ann. Soc. Ent. France, (4) VII. 1867, p. 286, and Nouv. Archiv. du Mus. IX. 1873, p. 277, pl. xii. fig. 5 (*apud* de Man).

Carapace smooth, becoming finely granular near the lateral margins, its length in the male is half, in the female decidedly more than half, its greatest breadth: on either branchial region, behind the branchial groove, are two granular eminences, one behind the other: 3 teeth arranged as in *M. pectinipes* at the anterior end of the posteriorly-convergent lateral borders, the first (outer orbital angle) being the most prominent and much the largest, the third minute.

Front, in its narrowest part between the eyestalks, about one-eleventh the greatest breadth of the carapace, its free edge obscurely bilobed. Orbits considerably oblique, the upper border microscopically beaded, the lower border finely and elegantly serrate. The eyestalks are slender and curved, and the eyes reach to the end of the orbital trench.

The suture between the ischium and merus of the external maxillipeds is decidedly oblique, and there is a distinct gap between these appendages even when their flagellum is folded.

The chelipeds have the same general proportions as in *M. pectinipes*: all the borders of the arm are granular or denticulate, but there is no "musical ridge" on the inner border: a bunch of spinules at the inner angle of the wrist: both borders of the palm, but particularly the lower border, are finely granular, and a fine raised granular line runs along the outer surface of the palm parallel with the lower border: the inner surface of the palm, like that of the fingers, is hairy, but quite smooth and unarmed beneath the hair: there is a small molariform tooth at the base of the dactylus, and a larger one having a forward slant on the immobile finger.

The legs have the same general proportions as in *M. pectinipes*, but they are quite smooth and unarmed, except for a small subterminal spine on the anterior border of the meropodites of the 2nd and 3rd pair.

In the Indian Museum are 5 specimens from the Andamans. The carapace of the largest specimen is 10.5 millim. long and 21.5 millim. broad.

## 72. *Macrophthalmus sulcatus*, Edw.

*Macrophthalmus sulcatus*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 156: Ortmann, Zool. Jahrb. Syst. X. 1897-98, pp. 344, 345 (*nec synon.*).

Carapace free of granules in the female, studded with minute granules in the male, its length in the male only about three-eighths, in the female nearly half, its greatest breadth. On the branchial region,

behind the branchial groove, are, in both sexes, three granular eminences, one behind the other, the last being on the posterior border. The lateral borders are convergent: their true *first* tooth, which in other species is at once the antero-lateral angle of the carapace and the outer angle of the orbit, appears in this species to belong to the *upper border* of the orbit, so that the antero-lateral angle of the carapace is formed by the much larger *second* tooth which also is the *apparent* outer orbital angle.

The least breadth of the front, between the eyestalks, is about an eighth the greatest breadth of the carapace: its free edge is very obscurely bilobed.

Orbits sinuous and oblique: the upper border microscopically beaded and furnished near its outer end with a sharp recurved tooth, which is really the outer orbital angle, though the apparent angle is the much larger tooth of the lateral border of the carapace: the lower orbital border is finely denticulated in its inner two-thirds, but is broken and indistinct beyond this. Eyestalks long, slender, curved: the eyes reach not only beyond the true limits of the orbit, but also beyond the antero-lateral angle of the carapace.

The external maxillipeds do not quite meet across the buccal cavern: the suture between the ischium and merus is decidedly oblique.

The legs and chelipeds have the same general proportions as in *M. pectinipes*, but the legs are unarmed.

In the male chelipeds the anterior border of the arm is hairy and strongly denticulated, but there is no "musical ridge:" the inner angle of the wrist and the proximal part of the upper border of the palm are also denticulated. On the outer surface of the palm there is a crest running close to, and parallel with, the lower border; and on the inner surface of the palm, near the middle line, is a longitudinal row of denticles the first one of which is considerably enlarged: the surface above this ridge, as also the inner surface of the fingers, is densely hairy. The dactylus is not nearly two-thirds the length of the palm: the immobile finger, but not the dactylus, has a strong molariform tooth at its basal end.

In the female the chelipeds are short and weak as usual, and the hand is quite smooth and has the borders—but specially the lower border—thin and sharp.

In the Indian Museum are a male and a female from the Andamans: the carapace of the male is 9 millim. long and 24 millim. broad.

### 73. *Macrophthalmus depressus*, Rüpp.

*Macrophthalmus depressus*, Rüppell, 24 Krabben Roth. Meer. p. 19, pl. iv. fig. 6, pl. vi. fig. 13: Milne Edwards, Hist. Nat. Crust. II. 66, and Ann. Sci. Nat. Zool. (3)



XVIII. 1852, p. 159: Heller, SB. Ak. Wien, XLIII. 1861, i. p. 362: de Man, Notes Leyden Mus. III. 1881, p. 255, and Archiv f. Naturges. LIII. 1887, i. pl. xv. fig. 3, and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 124, and Zool. Jahrb., Syst. VIII. 1894-95, p. 578: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 389: Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 745 (?) and X. 1897-98, pp. 341, 342.

*Macrophthalmus affinis*, Guérin, Mag. de Zool. II. 1838, pl. xxiv. fig. 2: Milne Edwards, Ann. Sci. Nat. (3) XVIII. 1852, p. 158: Haswell, Cat. Austral. Crust. p. 88 (*apud* Ortmann).

Carapace studded with minute granules not always plainly visible to the naked eye, its length in the male about two-thirds of its breadth. The lateral borders are parallel and the antero-lateral angle is rather a square-cut lobe than a tooth. On the epibranchial regions, behind the branchial groove, are two nearly parallel obliquely-longitudinal finely-granular lines, the inner of which is faint.

Front, at its narrowest part, about an eighth the breadth of the carapace, longitudinally grooved, but its free edge is straight and not bilobed.

Orbits little sinuous and little oblique, their upper border microscopically, their lower border finely and evenly denticulate. Eyestalks slender, hardly curved, the eyes reach almost to the end of the orbital trenches.

When the flagella are folded there is not much space between the external maxillipeds: the suture between the ischium and merus of these appendages is hardly oblique.

In the male the chelipeds and legs have much the same general proportions as in *M. pectinipes*, but they are unarmed, except for a small subterminal denticle on the anterior border of the meropodites of the first three pairs of legs: on the other hand the inner surface of the joints of the chelipeds, and the upper surface of the leg-joints (especially of the meropodites) are densely hairy. The dactylus is more than two-thirds the length of the palm, which is smooth and unsculptured: there is a molariform tooth near the basal end of the dactylus, and a similar, but less distinct and more oblique, tooth on the immobile finger.

In the Indian Museum are 2 males from Mergui, besides several specimens from Aden. The carapace of the largest specimen is 14 millim. long and 22 millim. broad.

#### 74. *Macrophthalmus erato*, de Man.

*Macrophthalmus erato*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 125, pl. viii. figs. 12-14, and Zool. Jahrb. Syst., VIII. 1894-95, p. 579.

Carapace quadrilateral, not granular to the naked eye, its length about two-thirds of its breadth, the cervical groove plain, but the

branchial groove faint: the second tooth of the lateral border is a little more prominent than the first. *Front* about two-ninths the breadth of the carapace, square cut, longitudinally grooved, but not bilobed. Orbits slightly sinuous, hardly oblique: eyestalks little curved, stoutish, not quite reaching end of orbit. In the male the lower border of the orbit is peculiar: it is finely denticulate at its internal extremity and has a small lobule at its outer angle, and in between these it has the form of a prominent deflexed somewhat triangular lobe. In the female the lower border of the orbit is finely crenulate throughout. The external maxillipeds do not quite meet across the buccal cavern, and the suture between their ischium and merus is a little oblique.

All three borders of the arm are serrated, and the inner angle of the wrist and upper border of the arm are very finely denticulated. There is a strong "musical crest" obliquely parallel with the inner border of the arm and in the middle third of that border. Palm longer than the arm, its inner surface is hairy and carries a spine near the carpal end about midway between the upper and lower borders. The fingers are considerably less than two-thirds the length of the palm: there is a molariform tooth at the base of the dactylus and a larger slanting one on the immobile finger.

The upper surface of the legs, especially in the case of the third pair, is hairy.

In the Indian Museum are 4 specimens from Mergui and Akyab: the carapace of the largest specimen is 10 millim. long and 14 millim. broad.

#### 75. *Macrophthalmus tomentosus*, Eyd. and Soul.

*Macrophthalmus tomentosus*, Eydoux and Souleyet, Zool. Voy. Bonite, I. p. 243, pl. iii. fig. 8, (1841): Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 159: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 279: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 122.

Carapace studded with very fine granules: its length is about two-thirds its greatest breadth, which is behind the middle of the lateral border, the lateral borders being decidedly divergent posteriorly. On either epibranchial region, behind the branchial groove, are two finely beaded obliquely-longitudinal lines. The first two teeth of the lateral borders are square-cut.

*Front*, in its narrowest part, about one-eleventh the greatest breadth of the carapace; though longitudinally grooved it is not bilobed.

Orbits hardly sinuous, not oblique; their upper border microscopically beaded, their lower border finely crenulate. The eyestalks are hardly curved, and the eyes do not reach to the end of the orbits.

The chelipeds and legs have the same general proportions as in *M. pectinipes*, but are shorter. Chelipeds unarmed and unsculptured, except for some spinules along the inner angle of the wrist and some denticles along the proximal part of the upper border of the palm: in the distal half of the inner border of the arm is a short upstanding horny "musical crest": the borders of the arm and the inner border of the fingers are hairy. The dactylus has a small molariform tooth near the base, and the immobile finger has a much larger one.

The legs are unarmed, except for a small subterminal denticle on the anterior border of the meropodites of the first 3 pairs: the upper surfaces of their joints are more or less hairy.

In the Indian Museum is a single specimen from Mergui: its carapace is 23 millim. long and 34 millim. broad.

### Family MICTYRIDÆ, Dana.

#### MICTYRIS, Latreille.

*Mictyris*, Latreille, Gen. Crust. et Ins. p. 40 (1806), and in Cuvier Règne Animal, III. p. 21: Desmarest, Consid. Gen. Crust. p. 115, and Dict. Sci. Nat. XXVIII. 1823, p. 235: De Haan, Faun. Japon. Crust. p. 24: Milne Edwards, Hist. Nat. Crust. II. 36, and in Cuvier Règne An., Crust. p. 67, and Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 154: Miers, Challenger Brachyura, p. 278.

Carapace elongate globose, oval but truncated posteriorly by the short and perfectly straight posterior border, the cervical and cardio-branchial grooves well developed and making the regions very distinct and convex, the posterior border fringed with bristles, as is also the apposed very prominent edge of the first abdominal tergum.

The afferent branchial orifice is a singular valvular recess, formed dorsally by a semicircular notch in the margin of the carapace, and ventrally by a curious cup-shaped dilatation of the base of the epipodite of the external maxillipeds.

Front a narrow deflexed lobe as in *Ocypoda*. Orbits represented by a small post-ocular spine, the eyes, which are borne on shortish stalks, being quite unconcealed.

Antennules as in *Ocypoda*, the basal joint being large and exposed, while the flagellum is rudimentary and concealed beneath the front. Antennæ small but well formed, standing in the usual position.

Epistome short lozenge-shaped. Buccal cavity enormous, somewhat oval in outline. External maxillipeds very large and foliaceous, with a hemispherical bulge causing them to face as much laterally as ventrally: their greater part is formed by the ischium, the inner margin of which is hairy, especially at base: the merus is very much smaller

than the ischium and carries the coarse hairy flagellum at its antero-external angle: the exognath is small, slender, and very inconspicuous.

Chelipeds moderately long and rather slender, stouter and a little shorter than the legs; their freest motion is in a vertical plane: the wrist is a rather elongate trigonal oboconical joint.

Legs somewhat compressed: the first pair are the longest and the others decrease slightly in length in posterior succession.

The abdomen in both sexes is of a broad truncate-oval shape, the segments from the 2nd to the 6th gradually increasing in length but the 7th being narrow: in both sexes the abdomen is fringed with hairs.

*Distribution*: Indo-Pacific from China and Australia to the Andamans.

In habits the species of *Mictyris* resemble the *Ocypodes*, *Gelasimi* and *Dotillæ*.

#### 76. *Mictyris longicarpus*, Latreille.

*Mictyris longicarpus*, Latreille, Gen. Crust. et Ins. p. 41 (1806): Desmarest, Consid. Gen. Crust. p. 115, pl. xi. fig. 2, and Dict. Sci. Nat. XXVIII. p. 236: Guérin, Icon. Règne An. Crust. pl. iv. fig. 4: Milne Edwards, Hist. Nat. Crust. II. 37, and in Cuvier Règne An. Crust. pl. xviii. fig. 2, and Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 154: Dana, U. S. Expl. Exp. Crust. pt. I. p. 389: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 99: Hess, Archiv f. Nat. XXXI. 1865, p. 142: Heller, Novara Crust. p. 40: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 276: Tozzetti, Magenta Crust. p. 185, pl. xi. figs. 5, 5a-c: Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 22, pl. i. figs 5-7 (gastroic teeth): Haswell, Cat. Austral. Crust. p. 116: Miers, Zool. H. M. S. Alert, pp. 184, 248, and Challenger Brachyura, p. 278: de Man, Archiv f. Naturges. LIII. 1887, i. p. 358, and Notes Leyden Mus. XII. 1890, p. 83: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 390: Aurivillius, Zur Biol. Amphib. Dekap. p. 38, pl. iii. figs. 10-11 (Mitg. K. Ges. Wiss. Upsala, 1893): Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 748, and in Semon's Forschungsgr. Crust. p. 58 (Jena. Denks. VIII): Stead, Zoologist, (4) II. 1898, p. 307: Nobili, Ann. Mus. Genov. (2) XX. 1890, p. 272.

Carapace smooth, the regions moderately convex and dividing the dorsal surface into four lobes: edge of front broadly triangular: *linea anomurica* very distinct.

Chelipeds a little over  $1\frac{1}{2}$  times the length of the carapace: a strong spine at the inner angle of the ischium (sometimes absent in the female): usually some spinules along the distal part of the lower border of the arm: wrist with the upper border of the outer surface marginate, and with a tooth near the middle of the distal border of the inner surface: palm much shorter than the wrist and not much more than half the length of the fingers; the upper and lower borders of its outer surface are marginate, and the middle of its outer surface is traversed by two divergent ridges which are continued along the

fingers : fingers slender and tapering, in the male there is an enlarged tooth near the base of the dactylus.

The legs, like the chelipeds, are rough under the lens : the edges of their propodites and dactyli are finely plumed : none of their joints are dilated : the first pair, which are slightly the longest, are about  $1\frac{3}{4}$  times the length of the carapace.

In the Indian Museum are 5 specimens from the Andamans and 2 from the Nicobars.

### Family HYMENOSOMIDÆ, Ortm.

#### Key to the Indian Genera or Sub-genera.

- I. Front conspicuously tridentate : the external maxillipeds do not quite meet across the buccal cavern and their exognath is not hidden in its proximal portion : chelipeds much more massive than the legs ... .. HYMENICUS.
- II. Front broadly triangular, or truncated : the external maxillipeds completely close the buccal cavern and their exognath is completely hidden :—
  1. The interantennular septum is a prominent plate : chelipeds in the male much more massive than the legs ... .. ELAMENA.
  2. The interantennular septum is a mere ridge ; chelipeds in both sexes slender, not stouter than the legs ... .. TRIGONOPLAX.

#### ELAMENA, Edw.

*Elamena*, Milne Edwards, Hist. Nat. Crust. II. 33, and Ann. Sci. Nat., Zool., (3) XX. 1853, p. 223 : Dana U. S. Expl. Exp. Crust. pt. I. p. 379 : A Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 321.

Carapace flat dorsally, thin and almost lamellar, triangular or sub-circular, its edges are usually turned up to form a thin circumscribing ridge and are without any teeth. Front broadly triangular, or sometimes truncated. There are no orbits and the eyes, though they may be hidden beneath the front, are exposed and non-retractile : a small post-ocular tooth may be present or not. The antennules fold beneath the front and are not visible from above when folded : the interantennular septum is a prominent plate. Antennal peduncle slender, the flagellum of no great length.

Epistome well defined and remarkably long fore and aft. Buccal cavern square ; the external maxillipeds, which completely close it, have the merus about as large as the ischium, the palp articulating not far from the antero-external angle of the merus, and the exognath slender and concealed.

Chelipeds in the male subequal, massive, especially as to the palm. Legs long and slender.

The abdomen of the male does not quite fill all the space between the last pair of ambulatory legs.

77. *Elamena sindensis*, n. sp.

Carapace broadly piriform, smooth, flat, with no distinction of regions: its edge, which is slightly turned up, is entire and unarmed. Front a prominent broad triangular lamina, somewhat rounded at tip. No post-ocular tooth. Interantennular septum very prominent. Eyes not quite concealed beneath the front.

Male chelipeds about  $1\frac{2}{3}$  times as long as the carapace, palm massive and somewhat swollen, fingers stout and pointed and meeting throughout their length. Female chelipeds little longer than carapace, slender, with a slender palm and longish fingers spooned at tip.

Legs slender, the 1st pair not three times as long as the carapace: in all, there is a distinct tooth at the end of the anterior border of both the merus and carpus, and the dactylus is long compressed and falcate with two or three teeth at the end of its posterior border.

In the Indian Museum are 7 specimens from Karachi: the carapace of a male is 5 millim. long and 6 in greatest breadth.

78. *Elamena truncata* (Stimpson ?).

? *Trigonoplax truncata*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 109.

*Elamena truncata*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 323: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 395.

Carapace orbiculate-ovate, smooth, flat, with no distinction of regions, its edge, which is slightly turned up and entire and unarmed, shows the faintest traces of angulation in 2 or 3 places. No post-ocular tooth; eyes quite concealed beneath the front. The front, though it projects slightly beyond the carapace is *broadly truncated*, having its free margin cut quite straight. Interantennular septum very prominent. The female chelipeds and the legs are as in the preceding species, the anterior border of the merus and carpus of all the legs ending in a strong tooth.

In the Indian Museum is a female from the Nicobars.

TRIGONOPLAX, Edw.

*Trigonoplax*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 224.

This is best regarded as a subgenus of *Elamena*, from which it differs only in the following unimportant particulars:—(1) the edge of the carapace is not turned up, (2) the interantennular septum is a mere ridge, (3) the chelipeds in the male, as in the female, are very slender.

79. *Elamena (Trigonoplax) unguiformis*, De Haan.

*Elamene unguiformis*, De Haan, Faun. Japon. Crust. p. 75, pl. xxix. fig. 1 and pl. H : J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 394.

*Trigonoplax unguiformis*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 224 : Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 31.

Carapace smooth, flat, lamellar, broadly pentagonal with the postero-lateral sides about a third as long as any of the others, the regions not defined, the sides entire, unarmed. Front a broad, horizontal, triangular lamina. No post-ocular tooth : eyes not concealed by the front, though the eyestalks are. Interantennular septum a mere ridge.

Epistome as long as broad. Chelipeds and legs smooth and slender.

Chelipeds not stouter than the legs, about  $1\frac{1}{2}$  times as long as the carapace : fingers slender, as long as the slender sub-cylindrical palm, their tips spooned.

The anterior border of the meropodite of all the legs ends in an inconspicuous denticle, the dactylus of all is long, subfalciform, and strongly compressed, and has two or three denticles at the tip of the posterior border. The 2nd and 3rd pair of legs, which are the longest, are more than three times the length of the carapace.

In the Indian Museum are 5 specimens from the Andamans. The carapace of one is 12 millim. long and 14 in greatest breadth.

## HYMENICUS, Dana.

*Hymenicus*, Dana, Amer. Journ. Sci. (2) XII. 1851, p. 290, and U. S. Expl. Exp. Crust. pt. I. p. 387 : Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 224.

Differs from *Elamena* only in the following particulars :—

(1) the front is tridentate and the ridge that defines the edge of the carapace dorsally is continued across its base between the eyes : (2) the interantennular septum, as in *Trigonoplax*, is a mere ridge : (3) on either lateral border of the carapace teeth are sometimes present : (4) the external maxillipeds do not quite meet across the buccal cavern and their exognath is not hidden in its proximal portion.

*Rhynchoplax* of Stimpson (Proc. Ac. Nat. Sci. Philad. 1858, p. 109) is probably synonymous.

*Key to the Indian species of Hymenicus.*

- I. Median spine of the rostrum of moderate length :  
3 teeth on either lateral border of the carapace ... *H. Wood-Masoni*.
- II. Median spine of the rostrum very long : no teeth on  
the lateral borders of the carapace ... .. *H. inachoides*.

80. *Hymenicus Wood-Masoni*, n. sp.

Body and chelipeds tomentose. Carapace dorsally flat or sunken, longer than broad, circular without the rostrum, the regions demarcated by fine grooves.

The front, which is delimited from the rest of the carapace by a fine raised line running across its base between the eyes, is cut into 3 prominent teeth, the middle one of which is somewhat the largest. The antennules fold beneath the front.

A small post-ocular denticle: a large tooth on the lateral border of the carapace above the base of the 1st pair of legs, another, hardly smaller, midway between this and the front, a third, much smaller, midway between this and the post-ocular denticle.

Chelipeds in the adult male more than twice the length of the carapace, very much stouter than the legs, the palm being specially massive. When denuded, the upper border of the arm is dentate and there is a stout spine near the far end of the outer border of this joint: there are several sharp tubercles on the upper surface of the wrist, the outer surface of the palm is reticulate in places, and the fingers which are stout and as long as the palm, have elegantly interlocking teeth.

In the female the chelipeds are considerably shorter and, though stouter than the legs and formed on the male pattern, are not nearly so stout as in the male.

The legs have long, curved dactyli, which are armed with small recurved teeth at the distal end of the posterior border: the 2nd pair, which are a little the longest, are over  $2\frac{1}{2}$  times the length of the carapace

Carapace of male (including rostrum) 7.5 millim. long and 6 broad.

Specimens were collected by the late Professor Wood-Mason at Port Blair in the Andamans, and at Port Canning near Calcutta.

81. *Hymenicus inachoides*, n. sp.

Carapace somewhat tomentose, flat, elongate-triangular, ending in a rostrum of three long teeth of which the middle one is about a third the length of the rest of the carapace, the other two being more than half the length of the middle one. The regions are all well defined by grooves. No spines on the lateral borders of the carapace. Post-ocular denticle hardly distinguishable. The antennules fold beneath the front.

Chelipeds of the adult male somewhat tomentose, not  $1\frac{1}{2}$  times the length of the carapace: arm slender, with a tooth near the distal end of the outer border; palm short, high, produced and somewhat swollen below; the fingers a little longer than the palm, stout, and finely toothed.



Legs long and slender, with long dactyli furnished with hook-like teeth at the end of the posterior border: the 2nd pair of legs are nearly three times the length of the carapace.

A single male from Port Canning near Calcutta: its carapace is 8.5 millim. long and 6 millim. in its greatest breadth.

**Family GRAPSIDÆ Dana.**

*Key to the Indian Genera.*

I. The antennules fold beneath the front in the ordinary way:—

1. No oblique hairy ridge on the exposed surface of the external maxillipeds:—

i. A very wide gap between the external maxillipeds, the exopodites of which appendages are narrow, and the palp of which appendages articulates at or near the antero-external angle of the merus: the abdomen of the male fills all the space between the last pair of ambulatory legs (*Grapsinæ*):—

A. Front less than half the greatest breadth of the carapace: merus of the external maxillipeds longer than broad:—

a. Fingers with broad spooned tips: flagellum of exopodite of external maxillipeds well developed.

GRAPSUS.

b. Fingers acute, not spooned: flagellum of exopodite of external maxillipeds absent.....

GEOGRAPSUS.

B. Front more than half the greatest breadth of the carapace: merus of the external maxillipeds broader than long:—

a. Antennæ completely excluded from the orbit.....

METOPOGRAPSUS.

b. Antennæ in the orbital hiatus...

PACHYGRAPSUS.

ii. A moderate gap between the external maxillipeds, the exopodites of which appendages are broad, and the palp of which appendages articulates near the middle of the anterior border of the broad merus: the abdomen of the male does not quite fill all the space between the last pair of legs (*Varuninæ*):—

A. Exognath of the external maxillipeds not as broad as the ischiognath: terminal joints of legs thin broad and compressed.....

VARUNA.

- B. Exognath of the external maxillipeds as broad as or broader than the ischiognath: dactyli of the legs compressed but not broadened:—
- a. Carapace flat and depressed.... PTYCHOGNATHUS.
- b. Carapace deepish, strongly convex in both directions..... PYXIDOGNATHUS.
2. An oblique hairy ridge on the exposed surface of the external maxillipeds (*Sesarminæ*):—
- i. Carapace little, sometimes not at all, broader than long, the pterygostomian regions and sidewalls with a sieve-like reticulation: lower border of orbit not abnormally prominent:—
- A. Antennæ lodged in the orbital hiatus:—
- a. Carapace nearly square: front abruptly and vertically deflexed..... SESARMA.
- b. Antero-lateral borders of carapace arched: front obliquely deflexed..... SARMATIUM.
- B. The tooth at the inner angle of the lower border of the orbit meets the front, so as to exclude the antennæ from the orbit:—
- a. Carapace dorsally smooth and nude..... METASESARMA.
- b. Carapace dorsally verrucose and densely tomentose..... CLISTOCELOMA.
- ii. Carapace much broader than long, the pterygostomian regions, etc., not reticulated: lower border of orbit prominent beyond the front. Front gradually declivous. General appearance much like *Macrophthalmus*..... METAPLAX.
- II. The antennules fold nearly longitudinally in deep notches in the front visible in a dorsal view (*Plagusinæ*):—
1. Merus of the external maxillipeds of good size and as broad as the ischium..... PLAGUSIA.
2. Merus of the external maxillipeds small and much narrower than the ischium..... LILOPHUS.

## Sub-family GRAPSINÆ, Dana (pt.).

## GRAPSUS, Lamk., Kingsley.

*Grapsus* (part) Lamark, Syst. Anim. Sans Vertèbr.: Latreille, Hist. Nat. Crust. et Ins. VI. p. 56, and Gen. Crust. p. 32.

*Grapsus*, Leach, Trans. Linn. Soc. XI. 1815, pp. 309, 323.

*Grapsus* (part) Desmarest, Consid. Gen. Crust., p. 129, and Dict. Sci. Nat. XXVIII. p. 247: Milne Edwards, Hist. Nat. Crust. II. 83, and Ann. Sci. Nat., Zool., (3) XX. 1853, p. 166: Dana, U. S. Expl. Exp. Crust. pt. I. p. 336.

*Grapsus*, Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 188 and 192: Miers, Challenger Brachyura, p. 254.

*Goniopsis*, De Haan, Fann. Japon. Crust. p. 33.

Carapace little broader than long, much depressed, the regions fairly well defined, the branchial groove particularly clear, the branchial regions with regular obliquely transverse ridges, the gastric region with a transverse squamiform sculpture. The lateral borders are arched and are armed with a tooth, placed immediately behind the acute outer orbital angle.

Front about half the breadth of the anterior border of the carapace, strongly deflexed: along the line of flexion are 4 tubercles, the outer of which on either side correspond with the supra orbital angles.

Orbits of moderate size, deep, distinctly divided into two fossæ: their lower border is deeply notched near the outer angle: the wide inner orbital hiatus is filled partly by the antennal peduncle and partly by a strong isolated tooth that belongs to the inner of the two fossæ into which the orbit is divided.

The antennules fold nearly transversely in rather narrow fossæ: the interantennular septum is very broad. The antennal flagellum is short, and lies practically in the orbital cavity: the excretory tubercle of the basal antenna-joint is singularly prominent.

Epistome of good length fore and aft, well defined; its wings run up towards the orbital hiatus. Buccal cavity square with the antero-lateral corners rounded off. The external maxillipeds are widely distant, leaving between them a rhomboidal gap in which the mandibles are exposed: the ischium and merus are both narrow, the merus being slightly shorter than the ischium, and the palp, which is coarse—especially as to its carpus—articulates at the antero-external angle of the merus.

Chelipeds subequal in both sexes and much shorter than the legs, though, in the male, of a somewhat stouter make: hands and fingers short and stout, the tips of the fingers broad and hollowed *en cuillère*.

Legs broad and compressed, especially as to the merus: the dorsal surface of some of the joints has a sort of reticulate or squamiform sculpture, and the dactyli are thorny.

The abdomen in both sexes consists of 7 segments, and in the male its base is as broad as the sternum between the last pair of legs.

*Distribution*: rocks and reefs of all the tropical and subtropical seas.

The *Grapsi* of Indian seas are found in considerable number wherever there are rocks. They live out of water and are very cunning and active: if they cannot succeed in dodging their pursuer they

fling themselves into the sea and in that way escape capture. Their colour in life is a dark|bottle-green.

## 82. *Grapsus grapsus* (Linn.).

Seba, Thesaurus, III, p. 43, pl. xviii. figs. 5, 6.

*Cancer grapsus*, Linnæus, Syst. Nat. (ed. xii.) p. 1048: Fabricius, Ent. Syst. II. p. 438 and Suppl. p. 342.

*Grapsus maculatus* (Catesby, 1743), Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 167, pl. vi. fig. 1: Hoffmann, in Pollen and Van Dam, Faun. Madagasc., Crust., p. 21: Brocchi, Ann. Sci. Nat., Zool., (6) II. 1875, Art. 2, p. 78 (male appendages): Kingsley, Proc. Ac. Nat. Sci. Philad. 1879, p. 401, and 1880, p. 192: de Man, Notes Leyden Mus. V. 1883, p. 159: Miers, Zool. H. M. S. Alert, pp. 518, 544, and Challenger Brachyura, p. 255: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 236: R. I. Pocock, Journ. Linn. Soc., Zool., XX. 1890, p. 512: de Man, Notes Leyden Mus. XIII. 1891, p. 49: Koelbel, Ann. Nat. Hofmus. Wien, VII. 1892, p. 114: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 391: A. Milne Edwards and Bouvier, Hirondele Crust. (Monaco, 1894) p. 47: de Man, Zool. Jahrb. Syst. IX. 1895-97, p. 79: Whitelegge, Mem. Austral. Mus. III. 1897, p. 139: Nobili, Boll. Mus. Torino, XII. 1897, p. 3. *Grapsus maculatus* var. *pharaonis*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 285.

*Grapsus pictus*, Latreille, Hist. Nat. Crust. et Ins. VI. p. 69, pl. xlvi. fig. 2, and Genera Crust. p. 33: Lamarck, Hist. Nat. Anim. Sans Vert. V. p. 248: Dumeril, Dict. Sci. Nat. XIX. p. 322: Desmarest, Consid. Gen. Crust. p. 130, pl. xvi. fig. 1: Milne Edwards, in Cuvier Règne An. pl. xxii. fig. 1, and Hist. Nat. Crust. II. 86: Milne Edwards and Lucas, Voy. Amer. Merid., Crust. p. 28: Gay, Hist. Fisica Chili, pt. III. Zool. p. 166: Dana, U. S. Expl. Exp. Crust. pt. I. p. 336: Desbonne and Schramm, Crust. Gaudal. p. 49: Martens, Archiv f. Nat. XXXVIII. 1872, p. 106: Miers, Cat. Crust. New Zeal. p. 36, and P. Z. S. 1877, p. 73, and Phil. Trans. 1879, p. 489, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 310: Smith, Trans. Connect. Acad. IV. 1880, p. 256: Tenison Woods, Proc. Linn. Soc. N. S. W. V. 1880-81, p. 117: Ozorio, Journ. Sc. Nat. Lisb. XI. 1885-87, p. 227. *Grapsus pictus* var. *ocellatus*, Studer, Abh. Ak. Berlin, 1882, Gazelle Crust. p. 14: *Grapsus pictus* var. *Webbi*, Hilgendorf, SB. Nat. Freunde Ges. 1882, p. 24.

*Grapsus ornatus*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 168.

*Grapsus pharaonis*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 168: Heller, SB. Ak. Wien. XLIII. 1861, i. p. 362: Hoffmann in Pollen and Van Dam, Faun. Madagasc. Crust. p. 20, pl. v. figs. 32-35: Richters, in Mobius, Meeresf. Maurit. Crust. p. 156.

*Grapsus Webbi*, Milne Edwards, Ann. Sci. Nat. (3) XX. 1853, p. 167: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 102.

*Grapsus altifrons*, Stimpson, Ann. Lyc. Nat. Hist. N. Y. VII. 1862, p. 230.

*Grapsus grapsus*, Ives, Proc. Ac. Nat. Sci. Philad. 1891, p. 190: Ortman, Zool. Jahrb. Syst. VII. 1893-94, p. 703: Faxon, Mem. Mus. Comp. Zool., XVIII. 1895, p. 30: Rathbun, Proc. U. S. Nat. Mus. XXI. 1898, p. 604.

*Goniopsis picta*, De Haan, Faun. Japon. Crust. p. 33, and Krauss Sudaf. Crust. p. 46.

Carapace somewhat discoidal in shape, owing to the curvature of

the sides: its regions well defined: the transverse and oblique ridges are salient, and the surface between the latter is coarsely reticulate.

Front deep and almost vertically deflexed, overhanging the epistome and much concealing the antennules, its free edge crenate.

Length of the epistome one-third or more of its greatest breadth. The tooth at the inner angle of the orbit is blunt.

Chelipeds in the male hardly longer than the carapace, shorter in the female: inner border of ischium and arm strongly spinate, and there are one or two less acute spines at the far end of the outer border of the arm: wrist with fine scattered tubercles on its upper surface, and with its inner angle produced to form a talon-shaped spine: palm nearly as high as long, its outer surface sculptured, its upper border culminating in a tooth: the fingers have very broad rounded tips, and the length of the dactylus in the male is nearly twice the length of the upper border of the palm.

Of the legs the 1st pair are very decidedly the shortest and the 3rd pair the longest, the latter being about twice the length of the carapace: the 4th pair are longer than the first by a dactylus, and shorter than the 2nd by about two-thirds of a dactylus. Only in the last pair of legs does the breadth of the merus approach half the length of the same joint: the far end of the upper border of the merus is spine-like and there are usually 2 or 3 spines at the far end of the lower border.

In the Indian Museum are 18 specimens from the Laccadives, the Andamans, the Coromandel coast, and Ceylon. The carapace of a large specimen is 64 millim. long and 68 millim. broad.

### 83. *Grapsus strigosus* (Herbst).

*Cancer strigosus*, Herbst, Krabben, III. i. p. 55, pl. xlvii. fig. 7. *Grapsus strigosus*, Bosc, Hist. Nat. Crust. I. p. 208: Latreille, Hist. Nat. Crust. et Ins., VI. p. 70, etc.: Milne Edwards, Hist. Nat. Crust. II. 87: Gay, Hist. Fis. Chili, III. Zool. p. 168: Dana, U. S. Expl. Exp. Crust. pt. I. p. 338: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 169: Stimpson, Journ. Bost. Soc. Nat. Hist. VI. 1857. p. 466: Kinahan, Journ. Roy. Soc. Dubl. I. 1858, p. 340: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 102: Hess, Archiv f. Nat. XXXI. 1865, i. pp. 147, 171: Heller, Novara Crust. p. 47: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71 and IX. 1873, p. 286 (*ubi synonym.*): Hilgendorf in v. d. Decken's Reis. Ost-Afr. III. i. p. 87: Hoffmann, in Pollen & Van Dam, Faun. Madag. Crust. p. 20, pl. v. fig. 31: Lockington, Proc. Calif. Acad. VII. 1876, p. 151: Kossmann, Reise roth. Meer., Crust. p. 60: Miers, P. Z. S. 1877, p. 136, and Ann. Mag. Nat. Hist. (5) II. 1878, p. 410: Hilgendorf, MB. Ak. Berl. 1878, p. 808: E. Nauck, Zeits. Wiss., Zool. XXXIV. 1880, p. 32 (*gastric teeth*): Kingsley, Proc. Ac. Nat. Sci. Philad. XXXII. 1880, p. 194: Haswell, Cat. Austral. Crust. p. 97: Miers, Zool. H. M. S. Alert, pp. 518, 544, and Challenger Brachyura, p. 256: Müller, Verh. Nat. Ges. Basel, VIII. p. 475: de Man,

Archiv f. Nat. LIII. 1887, i. p. 365, and Journ. Linn. Soc. Zool. XXII. 1888, p. 148 : Cano, Boll. Soc. Nap. III. 1889, p. 236 : Walker, Journ. Linn. Soc., Zool., XX. 1886-1890, p. 110 : Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 390 : de Man, Zool. Jahrb. Syst. IX. 1895-97, p. 80 : Ortman, Zool. Jahrb., Syst., 1893-94, p. 705 : Wedenissow, Bull. Soc. Ent. Ital. 1894, p. 415.

*Grapsus albo-lineatus*, Lamarck, Hist. Nat. Anim. Sans Vert. V. p. 249 (*vide* Edw.).

*Gonioposis flavipes*, Macleay, Ill. Ann. S. Africa, p. 66, and Krauss, Sudafr. Crust. p. 46 (*apud* Miers).

*Goniopsis strigosa*, De Haan, Faun. Jap. Crust. p. 33 : Macleay, *loc. cit.* : Krauss, *loc. cit.*

*Grapsus granulatus*, *pelagicus*, and *Peroni*, Milne Edwards, Ann. Sci. Nat. (3) XX. 1853, p. 169 (*vide* A. M. E.).

The chief differences between this species and *G. grapsus* are the following:—

The branchial grooves of the carapace are not so well cut, the transverse and oblique ridges are low and smooth, and the surface between the oblique ridges is quite smooth.

The front is not so deep and is obliquely deflexed, hardly overhanging the epistome and not concealing the antennules, and its free edge is not so distinctly crenulate. The tooth at the inner angle of the orbit is subacute. The length of the epistome is not nearly a third its greatest breadth.

In the chelipeds, the tooth at the inner angle of the wrist is nearly straight, not talon-like, the length of the upper border of the palm is nearly two-thirds the length of the dactylus, and the tips of the fingers are not so broad and blunt.

In the legs the meropodite is broader, its greatest breadth being half its length. Moreover the difference in size between the 1st and 4th pairs of legs is much less marked.

In the Indian Museum are 76 specimens, from the Baluchistan and Sind coast, the Malabar coast, Ceylon, the Coromandel coast, the Arakan and Tenasserim coast, Mergui, the Andamans, and the Nicobars.

The carapace of the largest specimen (a female) is 59 millim. long and 63 millim. broad.

#### GEOGRAPSUS, Stimpson.

*Geograpsus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 101 : Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 188, 195 : Miers, Challenger Brachyura, p. 260.

*Orthograpsus*, Kingsley, *l. c.* pp. 188, 194.

Closely resembles *Grapsus*, but differs in the following important particulars:—

The carapace is more quadrate, the sides being very little arched, it is also broader and less depressed. The lobe at the inner inferior

angle of the orbit is not so completely isolated. The antennal peduncle is not so massive, nor is its "urinary tubercle" conspicuous. The epistome is shorter fore and aft, and is much less well defined.

The chelipeds are altogether of a different type, being vastly more massive than the legs, and in the adult male at least as long as the longest legs: the fingers are pointed. Though the dactyli of the legs are thorny, they are not so closely covered with thorns, nor are the thorns so coarse, as in *Grapsus*. Between the coxæ of the 2nd and 3rd pair of legs is a narrow fossa fringed with hair leading to the branchial cavity.

The two Indian species of the genus are land-crabs and are found in the jungles of the Andaman and Nicobar islands and in the villages of the Laccadive islands. They are extremely vigilant and active.

#### 84. *Geograpsus Grayi* (Edw.).

*Grapsus Grayi*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 170.

*Geograpsus rubidus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 103.

*Geograpsus Grayi*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 288; Miers, Phil. Trans. 1879, p. 489, and Zool. H. M. S. Alert, pp. 518, 545, and Challenger Brachyura, p. 261; Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 196; Richters, in Mobius, Meeresf. Maurit. p. 156; Haswell, Cat. Austral. Crust. p. 98; Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 707; de Man, Zool. Jahrb., Syst. IX. 1895-96, p. 80; Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 266.

Carapace subquadrilateral, a little convex, the lateral borders well defined anteriorly, ill defined and slightly convergent posteriorly: transverse markings fine, curved or oblique on the branchial regions, almost invisible on the gastric region.

The four tubercles along the line of flexion of the front are not salient; the edge of the front in a dorsal view is concave. The notch near the outer end of the lower border of the orbit is small and narrow. The epistome is rather ill defined.

Chelipeds in both sexes a little unequal: squamiform markings are present but, except on the arm, are indistinct, as also are the scattered granules on the upper surface of the palm. The larger cheliped may be a little under or a little over twice the length of the carapace. The inner border of the ischium is denticulate, the inner border of the arm is expanded to form a dentate lobe, and the inner angle of the wrist is spiniform.

The greatest breadth of the meropodites of the legs is less than half their length. The first pair of legs are slightly shorter than the 4th: the 2nd pair are the longest of all, being about twice the length of the carapace. The last 3 joints of all the legs are bristly.

Colours in life yellow-ochre, the greater part of the dorsum of the carapace livid bluish or purplish.

In the Indian Museum are 24 specimens from the Andamans, Nicobars, and Laccadives.

The carapace of a large male is 40 millim. long and 49 broad.

85. *Geograpsus crinipes* (Dana).

*Grapsus crinipes*, Dana, Proc. Ac. Nat. Sci. Philad. 1851, p. 249, and U. S. Expl. Exp. Crust., pt. I, p. 341, pl. xxi. fig. 6.

*Geograpsus crinipes*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 101 : Heller, Novara Crust. p. 48 : Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 115 : Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 196 : Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 706 : de Man, Zool. Jahrb., Syst. IX. 1895-97, p. 83 : Whitelegge, Mem. Austral. Mus. III. 1897, p. 139.

*Grapsus rubidus*, Hilgendorf, in v. d. Decken's Reisen Ost-Afr. Crust., p. 87, pl. v. : Hoffmann, in Pollen & Van Dam, Faun. Madagasc. Crust. p. 22.

Differs from *G. Grayi* in the following particulars : —

The carapace is quite flat, and the lateral borders, which are thin and well defined throughout their extent, are slightly *divergent* posteriorly : the transverse markings are distinct and *nearly straight*.

The four tubercles along the line of flexion of the front are salient, and the free edge of the front is quite straight. The notch near the outer end of the lower border of the orbit is large, and the lobule external to the notch is denticulate. The epistome is well defined from the palate by a granular or pectinate ridge.

The chelipeds in the male are nearly equal, but in the *female* they are unequal. The squamiform markings on the arm, wrist, and lower portion of the hand are distinct, as also are the vesiculous granules on the upper surface of the palm and dactylus.

The greatest breadth—near the far end—of the meropodites of the last 3 pairs of legs is *more than half* their length.

Colour in life bright red.

In the Indian Museum are 2 males and a female from the Andamans, a male from the Nicobars, and a female from the Laccadives. The carapace of a female is 40 millim. long and 45 broad.

METOPOGRAPSUS, Edw.

*Metopograpsus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 164 : Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 188, 190 : Miers, Challenger Brachyura, p. 257.

Carapace quadrate, little broader than long, somewhat depressed, the regions not well defined, the branchial groove distinct, *fine oblique*



grooves are present on the lateral parts of the branchial regions: the antero-lateral, or outer orbital angle, is acute, but there are no teeth on the lateral border behind it.

Front very broad, more than half the extreme width of the carapace, deflexed: along the line of flexion are four depressed lobes, the outer one of which on either side sometimes shows a tendency to split into two.

Orbits of moderate size, occupying the corners of the carapace: the lower border is notched near its outer end: the orbital hiatus is filled by a special lobe which belongs to the inner of the two fossæ into which the orbit is divided and this lobe completely excludes the antennæ from the orbit. The antennules fold nearly transversely in fossæ of good size. The antennæ have a short and slender flagellum: the basal joint of the peduncle is not very massive.

Epistome well defined, but short fore and aft. Buccal cavity square with the anterior corners rounded off. The external maxillipeds leave between them a rhomboidal gap in which the mandibles are exposed: the merus is shorter than the ischium, and carries the coarse palp at or near the antero-external angle.

Chelipeds either subequal or unequal, the larger one much more massive than the legs but shorter than the 2nd and 3rd pairs of these: fingers rather short and stout, with the tip spooned.

Legs broad and compressed, especially as to the merus, which joint—like the arm of the chelipeds—usually has some squamiform markings: the last three joints have bristly edges and the dactylus is thorny.

The abdomen in both sexes consists of 7 separate segments, and in the male its base is as broad as the sternum between the last pair of legs.

An Indo-Pacific genus.

#### 86. *Metopograpsus messor* (Forsk.) Edw.

*Cancer messor*, Forskal, Descrip. Anim. in itin. orient. p. 88. *Grapsus messor*, Milne Edwards, Hist. Nat. Crust. II. 88: Krauss, Sudafr. Crust. p. 43: Hoffmann in Pollen & Van Dam, Faun. Madag. Crust. p. 23: Sluiter, Tijds. Nederl. Ind. XL. 1881, p. 164. *Metopograpsus messor*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 165: Heller, SB. Ak. Wien, XLIII. 1861, p. 362, and Novara Crust. p. 44: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71: Kossmann, Reise roth. Meer., Crust. p. 57: Hilgendorf, MB. Ak. Berl. 1878, p. 808: Miers, Phil. Trans. 1879, p. 489, and Zool. H. M. S. Alert, pp. 184, 245, 518, 545, and Challenger Brachyura, p. 258: de Man, Notes Leyden Mus. II. 1880, p. 183, and Journ. Linn. Soc. Zool. XXII. 1887-1888, p. 144, pl. ix. fig. 11, and Archiv f. Naturges. LIII. 1888, i. p. 361, pl. xv. fig. 6, and in Weber's Zool. Ergebn. Niederl. Ost. Ind. II. p. 314:

Richters, in Mobius, Meeresf. Maurit. p. 156: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 190: Lenz & Richters, Abh. Senck. Nat. Ges. XII. 1881, p. 425: Müller, Verh. Nat. Ges. Basel, VIII. p. 475: Ozorio, Journ. Sci. Nat. Lisb. XI. p. 227: Henderson, Trans. Linn. Soc., Zool., (2) V, 1893, p. 390: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 701: Whitelegge, Mem. Austral. Mus. III. 1897, p. 139: Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 265.

*Grapsus Gaimardi*, Savigny, Descr. Egypt. Crust. pl. ii. fig. 3.

*Metopograpsus Eydouzi* and *intermedius*, Milne Edwards, Ann. Sci. Nat., Zool., (2) XX. 1853, p. 165 (sec. Kingsley, l.c.).

*Pachygrapsus athiopicus*, Hilgendorf, in v. d. Decken, Reisen Ost-Afr., Crust. p. 88, pl. iv. fig. 2 (fide Kossmann, l.c., and Hilgendorf, l.c.).

Carapace about four-fifths as long as broad, the sides distinctly convergent posteriorly; besides the oblique markings on the lateral parts of the epibranchial regions, there are some fine transverse markings on the post-frontal region.

Front about three-fifths the greatest breadth of the carapace, its free edge beaded, thin and prominent but hardly laminar, and slightly sinuous. Orbits little oblique, their major diameter is a little more than a third the width of the front: the inner angle of the lower border is denticulate.

Chelipeds unequal, the length of the larger one about  $1\frac{1}{2}$  times that of the carapace: there are wrinkles or squamiform markings on the upper surface of the arm and wrist and—along with some vesiculous granules—on the upper and lower borders of the hand. The inner border of the ischium is denticulate, the inner border of the arm is spinate and is expanded distally to form a lacinate lobe, and there is a spine, which may be double, at the inner angle of the wrist: the fingers have blunt tips, and the dactylus is not very much longer than the upper border of the palm.

Of the legs the 1st pair is the smallest and the 3rd pair the longest—about twice the length of the carapace: in all, the upper border of the merus ends in a spine and the lobe at the far end of the lower border is spinate: in the last three pairs the greatest breadth of the merus is half its length.

The terminal segment of the male abdomen is simply triangular.

In the Indian Museum are 56 specimens, from Karachi, Bombay, the Orissa coast, the Ganges Delta, the Arakan coast, and the Andamans. The carapace of the largest specimen is  $23\frac{1}{2}$  millim. long and 30 millim. broad.

#### 87. *Metopograpsus maculatus*, Edw.

*Metopograpsus maculatus*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 165: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 145, pl. x. figs. 1-3.

Distinguished from the only other Indian species by the following characters:—

The carapace is much more elongate, its length being seven-eighths of its breadth, its sides are very markedly convergent posteriorly, and there are no transverse markings on the post-frontal region.

The front is nearly three-fourths the greatest breadth of the carapace, and its free edge is decidedly laminar and nearly straight.

The orbits are oblique: their major diameter is less than a third the breadth of the front and the inner angle of their lower border is not denticulate.

The fingers of the chelæ, though their tips are spooned, are not very blunt: the dactylus is much longer than the upper border of the palm.

Except perhaps in the last pair of legs, the meropodites are narrower, their greatest breadth being decidedly less than half their length.

In the male abdomen the terminal segment has a somewhat three-lobed appearance.

In the Indian Museum are two specimens from Mergui. It seems to me very doubtful whether they are distinct from *M. latifrons*, White (Jukes, Voy "Fly," II. 337, pl. ii. fig. 2).

#### PACHYGRAPSUS, Randall, Stimpson.

*Pachygrapsus*, Randall, Proc. Ac. Nat. Sci. Philad. 1839, p. 126: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 166: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 101: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 188, 198: Miers, Challenger Brachyura, p. 259.

Differs from *Metopograpsus* only in the following particulars:—

(1) the tooth or lobe at the inner angle of the lower border of the orbit is small and does not fill the orbital hiatus, so that the antennæ are not excluded from the orbit; (2) there may be a tooth or two on the lateral border of the carapace immediately behind the outer orbital angle.

*Distribution*: West Indies eastwards, through the Mediterranean, to the American Pacific coast.

#### 88. *Pachygrapsus minutus*, A. M. Edw.

*Pachygrapsus minutus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 292, pl. xiv. fig. 2: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 201: de Man, Notes Leyden Mus. V. 1883, p. 158, and Archiv f. Naturges. LIII. 1887, i. p. 368, and Journ. Linn. Soc., Zool., XXII. 1888, p. 148: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 240.

Carapace a good deal broader than long, its whole dorsal surface marked with fine transverse and oblique lines: the lateral borders are

strongly convergent posteriorly, and have no spine behind the acute outer orbital angle.

Front about three-fifths the greatest breadth of the carapace, moderately deflexed, its free edge slightly sinuous. Orbits little oblique, their major diameter more than a third the breadth of the front, their lower border not denticulate.

The chelipeds in the male are subequal and vastly more massive than the legs, and are about twice the length of the carapace, and, except for some squamiform markings on the arm, are smooth: the inner border of the ischium and both borders of the arm are crenulate, and the distal end of the inner border of the arm is expanded to form a denticulate lobe: the inner angle of the wrist is dentiform: the fingers are stout and blunt.

Of the legs the two middle pairs are the longest, being not twice the length of the carapace. In all the last three joints are bristly, and the merus has a spine at the far end of the anterior border and two largish spines at the far end of the posterior border.

The terminal joint of the male abdomen is simply triangular.

A small species: the carapace of the single specimen (from Mergui) in the Indian Museum is 6.5 millim. long and 10 millim. broad.

#### Subfamily VARUNINÆ.

##### VARUNA, Edw.

*Varuna*, Milne Edwards, Dict. Hist. Nat. XVI. p. 511 (1830), and Hist. Nat. Crust. II. 94, and Ann. Sci. Nat. Zool., (3) XX. 1853, p. 176: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 188, 205: Miers, Challenger Brachyura, p. 265.

*Trichopus*, De Haan, Faun. Japon. Crust. p. 32.

Carapace very little broader than long, depressed, with thin sharp edges, the regions fairly well indicated. Front a little more than half the breadth of the anterior border and a little more than a third the greatest breadth of the carapace, straight, prominent, sublaminar, little deflexed. Antero-lateral borders of the carapace arched, cut into 3 teeth including the outer orbital angle.

Orbits small, of good depth, their lower border broken and incomplete. The antennules fold obliquely and the interantennular septum is broad. Antennæ of fair size, standing in the orbital hiatus.

Epistome of good length, well defined. Buccal cavern square. The external maxillipeds gape, but not very widely: their exognath is not nearly as broad as the ischium: their merus is shorter, but anteriorly much broader, than the ischium, its antero-external angle being considerably produced, so that the palp articulates near the middle of the anterior border.

Chelipeds equal, but variable in size. In old males they are considerably longer, and vastly more massive, than the legs: in the female they are shorter, and though stouter are not vastly stouter than the legs. The fingers, though sharp pointed, are a little hollow-tipped.

The legs have the three terminal joints compressed, dilated, and plumed, for swimming: the 2 middle pairs are the longest, the last pair is the shortest.

The abdomen in both sexes consists of 7 separate segments: in the male it does not completely cover the sternum between the last pair of legs.

*Distributed* throughout the Indo-Pacific, ascending estuaries even into freshwater. Commonly found at sea on drift logs.

### 89. *Varuna litterata* (Fabr.) Edw.

*Cancer litteratus*, Fabricius, Ent. Syst. Suppl. p. 342: Herbst, Krabben, III. i. 58, pl. xlviii. fig. 4.

*Grapsus litteratus*, Bosc, Hist. Nat. Crust. I. p. 203, and Latreille, Hist. Nat. Crust. et Ins. VI. p. 71.

*Varuna litterata*, Milne Edwards, Dict. d'Hist. Nat. XVI. p. 511.

*Trichopus litteratus*, De Haan, Faun. Japon. Crust. p. 32: Dana, U. S. Expl. Exp. Crust. pt. I. p. 336, pl. xx. fig. 8.

*Varuna litterata*, Milne Edwards, Hist. Nat. Crust. II. p. 95, and Ann. Sci. Nat. Zool., (3) XX. 1853, p. 176: Lucas, Hist. Nat. Anim. Artic., Crust., p. 72, pl. iii. fig. 4: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 103: Heller, Novara. Crust. p. 51, A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71, and IX. 1873, p. 295: Brocchi, Ann. Sci. Nat. (6) II. 1875, (*male appendages*): Miers, Cat. Crust. New Zealand, p. 40, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 310, and Challenger Brachyura, p. 266: Tozzetti, Magenta Crust. p. 122, pl. viii. figs. 2 a-g: Hilgendorf, M.B. Ak. Berl. 1878, p. 808: Neumana, Crust. Heidelb. Mus., p. 27: Nauok, Zeits. Wiss. Zool. XXXIV. 1880, p. 29 (*gastric teeth*): Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 205: Sluiter, Tijds. Nederl. Ind. XL. 1881, p. 164: Haswell, Cat. Austral. Crust. p. 103: Filhol, Crust. Nouv. Zel. in Miss. Pile Campbell, p. 390: de Man, Archiv fur Nat. LIII. 1887, i. p. 371, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 315, and Zool. Jahrb., Syst. IX. 1895, p. 112: Henderson, Trans. Zool. Soc. (2) V. 1893, p. 391: Ortmann, Zool. Jahrb. Syst., VII. 1898-94, p. 718: Max Weber, Zool. Jahrb. Syst. X. 1898, p. 157: Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 267.

Carapace curiously pitted and frosted above, the regions well enough defined by grooves, which in places are broad shallow and uneven; the disposition of these grooves in the middle of the carapace makes a letter H. The borders of the carapace are thin and are sharply defined and finely beaded or milled: the antero-lateral borders are arched and are cut into three teeth, including the outer orbital angle: the postero-lateral boundary of the carapace, on each side, is a distinct facet.

The chelipeds vary, according to sex and age, from a little over once (in the female) to a little over twice (in old males) the length of the carapace. The borders of the arm are denticulated, especially the inner border; the inner angle of the wrist forms a large sharp spine with some spinules at its base; the inner surface of the palm is more or less granular, the outer surface has some fine reticulate markings and—running parallel with the lower border, on to the fixed finger—a raised line: the fingers are stout and strongly toothed, the dactylus being longer than the upper border of the palm.

The 2nd and 3rd pair of legs, which are about equal, are over  $1\frac{1}{2}$  times the length of the carapace: the 1st pair are a little more than a dactyl-length, the 4th pair a little less than a dactyl-length longer than the carapace. The only armature of the legs, which are typical swimming paddles, is a subterminal spine on the anterior border of the meropodite.

In the Indian Museum are 63 specimens from the seas of India. The carapace of the largest male is 50 millim. long and 56 millim. broad.

#### PTYCHOGNATHUS, Stimpson.

*Ptychognathus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 104; Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 188, 203; de Man, Zool. Jahrb., Syst., IX. 1895, p. 90. *Gnathograpsus*, A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 180. *Cælochirus*, Nauck, Zeits. Wiss. Zool. XXXIV. 1880, pp. 30, 66 (*teste* de Man).

Very closely resembles *Varuna*, from which it differs only in the following particulars:—

(1) the exopodite of the external maxillipeds is of remarkable breadth, being at least as broad as, and usually much broader than, the ischium of those appendages:

(2) the regions of the carapace are not always so well defined.

(3) the dactyli of the legs, though compressed, are not so broad.

*Distribution*: Islands of the Indo-Pacific, entering fresh water above any tidal influence.

#### *Key to the Indian species of Ptychognathus.*

I. Carapace hardly broader than long: front prominent, straight or hardly sinuous: the antennules fold very obliquely:—

1. Teeth of the antero-lateral border sharp and salient: regions of the carapace fairly well defined: fingers of the female chelæ nude:—

i. Inner angle of the wrist dentiform, but not produced: a large shaggy patch of hairs on the inner surface of the hand of the male... *P. dentata*.

- ii. Inner angle of the wrist produced to form a long spine: a patch of hair on the outer surface of the hand of the male, near the finger cleft..... *P. onyx*.
- 2. Teeth of the antero-lateral border not salient, inconspicuous: regions of the carapace not, or hardly, indicated:—
  - i. A subterminal patch of bristles on the outer surface of the fixed finger of the female..... *P. andamanica*.
  - ii. Fingers of female nude ..... *P. pusilla*.
- II. Carapace decidedly broader than long: front little prominent and decidedly sinuous: the antennules fold nearly transversely..... *P. barbata*.

90. *Ptychognathus dentata*, de Man.

*Ptychognathus dentatus*, de Man, in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 318, pl. xviii. fig. 9.

Carapace inappreciably broader than long, flat but not particularly depressed, its regions quite distinct, as also are the cervical and branchial groves and a pair of post-frontal tubercles: on the posterior part of each epibranchial region, obliquely parallel with the postero-lateral borders, is a fine ridge.

Front prominent, laminar, nearly straight, its extent is two-fifths the greatest breadth of the carapace.

Antero-lateral borders of the carapace cut into three sharp salient teeth, of which the first is much the largest, and the third much the smallest.

Upper border of the orbit very sinuous. The antennules fold very obliquely. Anterior border of the buccal cavern not granular, but having a median horizontal tooth.

Exognath oval, with a smooth and strongly convex surface: its greatest breadth in the male is more than twice that of the ischiognath, but in the female is only a little more than that of the ischiognath.

Chelipeds of the male more than  $1\frac{1}{2}$  times the length of the carapace, smooth: inner angle of the wrist acute, but not spiniform: palm higher than long, inflated at the postero-inferior angle, and having a tussock of hairs in the middle of its inner surface: dactylus more than twice the length of the upper border of the palm, longer slenderer and less strongly toothed than the fixed finger: both fingers though hollowed at the tip are sharp-pointed. In the female the chelipeds are about as long as the carapace; the inner angle of the wrist is spiniform; the palm is not swollen and is nude, and its outer surface is traversed, near the lower border, by a fine raised line which extends nearly to the tip of the fixed finger.

The 2nd and 3rd pairs of legs are about  $1\frac{1}{2}$  times, the 1st pair are not quite  $1\frac{1}{2}$  times, and the 4th pair are not  $1\frac{1}{3}$  times, the length of the carapace: on the anterior border of the merus of the first three pairs is a subterminal spine.

The sidewall of the carapace and the basal joints of the legs have little tomentum.

In the Indian Museum are 2 males and an egg-laden female from "the Bay of Bengal" and 2 young females from Upper Tenasserim.

The carapace of the largest male is 19 millim. long and not quite 20 millim. in its greatest breadth.

91. *Ptychognathus onyx*, n. sp.

Very closely related to *P. spinicarpus*, Ortm., and to *P. Polleni* and *affinis*, de M., if these species are distinct.

This species very nearly resembles *P. dentata*, from which it differs, young males being compared with females of the same size, only in the following particulars:—

(1) the carapace though otherwise similar is much thinner and more depressed and its markings are not quite so distinct:

(2) in the middle of the anterior border of the buccal cavern is a slight prominence, but no distinct tooth:

(3) the exognath (*in the young male*) is, as in the female of *P. dentata*, but little broader than the ischiognath:

(4) in the chelipeds of the young male the inner angle of the wrist is produced to form a long spine; there is no hair on the inner surface of the palm, but on the outer surface, in the finger-cleft and extending along the fixed finger, there is a tuft of hair; the outer surface of the palm also, as in the female of *P. dentata*, is traversed, close to the lower border, by a raised line, which runs to the tip of the fixed finger; finally the fingers are blunter, and the dactylus is only about twice as long as the upper border of the palm.

Practically the chief distinction between this species and *P. dentata* is that in the male of this species the inner angle of the wrist forms a long spine, and the hair is on the outside instead of on the inside of the hand.

In the Indian Museum are two young males probably from Tavoy. The carapace is a little over 12 millim. long and 13 millim. broad.

92. *Ptychognathus andamanica*, n. sp.

Closely related to *P. pusilla*, of which it may be an Andaman variety.

Carapace not much broader than long, quite flat, much depressed, the regions are hardly indicated, even when the carapace is quite dry,



but the H-shaped mark in the middle is always plainly visible, the whole surface is closely and finely punctate: there are no post-frontal tubercles, but on the posterior part of either epibranchial region there is a fine line running obliquely-parallel with the postero-lateral borders.

Front prominent, laminar, slightly sinuous, its extent is two-fifths the greatest breadth of the carapace.

The antero-lateral borders are cut into 3 not very acute or distinct lobes (including the outer orbital angle), of which the first is much the largest, and the last much the smallest.

Upper border of the orbit slightly sinuous: the antennules fold very obliquely. The anterior border of the buccal cavern is granular and a little concave.

The exognath is long and elliptical; its breadth in the female, is nearly twice that of the ischiognath.

The chelipeds in the female (male unknown) are about as long as the carapace, and their outer surface is very finely reticulate-granular: inner angle of wrist pronounced, but not spiniform: palm without hair, but there is a characteristic brush of stiffish hair at the tip of the fixed finger on its outer surface. The fingers have broad tips, especially the fixed finger, which is stouter and more strongly toothed than the dactylus: the dactylus is about twice as long as the upper border of the palm: the outer surface of the palm and fixed finger is traversed, near the lower border, by a fine raised granular line.

The legs have not much tomentum on the basal joints, but the anterior border of the meropodites is rather thickly fringed: the subterminal denticle on the anterior border of the meropodites is small, blunt, inconspicuous, or obsolescent. The 2nd and 3rd pair of legs, which are the longest, are about  $1\frac{1}{2}$  times, the 1st pair are not  $1\frac{1}{4}$  times, and the 4th pair are little more than once, the length of the carapace.

In the Indian Museum are two young females from a freshwater stream at the base of Saddle Hill in North Andaman Island. Their colour is dark mottled green. The carapace is a little over 13 millim. long and about 14 millim. broad.

### 93. *Ptychognathus pusilla*, Heller.

*Ptychognathus pusillus*, Heller, Novara Crust. p. 60: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880. p. 204: de Man, Notes Leyden Mus. V. 1883, p. 161, and Zool. Jahrb. Syst. IV. 1888-89, p. 440, and in Weber's, Zool. Ergebn Niederl. Ost-Ind. II. p. 825, and Zool. Jahrb. Syst. IX. 1895, p. 99, and X. 1898, pl. xxviii. fig. 22: Ortmann, Zool. Jahrb., Syst. VII. 1898-94, p. 712.

This species, which was first found in the Nicobar Islands, is not represented in the Museum collection and I have never seen it.

94. *Ptychognathus barbata* (A. M. Edw.).

*Gnathograpsus barbatus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 316, pl. xvii. fig. 4.

*Ptychognathus barbatus*, Ortmann, Zool. Jahrb. Syst. VII, 1893-94, p. 712; de Man, Zool. Jahrb., Syst., IX. 1895, p. 105.

Carapace decidedly broader than long, flat, depressed, the regions indistinct: the two postfrontal tubercles are fairly distinct, but there is no distinct raised line on the posterior part of the epibranchial regions, running obliquely parallel with the posterior borders, such as is present in all the other Indian species. There is a good deal of tomentum on the sides of the carapace.

Front decidedly sinuous, not prominent, its extent is a little more than two-fifths the greatest breadth of the carapace.

The antero-lateral borders of the carapace are cut into 3 not very conspicuous teeth (including the outer orbital angle) of which the first is much the largest and the third much the smallest, as usual.

Upper border of the orbit little sinuous: the antennules fold nearly transversely. Anterior border of the buccal cavern finely granular.

The exognath is elliptical, with a slightly convex surface: in the male its greatest breadth is more than that of the ischiognath, in the female it is slightly narrower than in the male.

Chelipeds in the male about  $1\frac{2}{3}$  times the length of the carapace, the inner angle of the wrist little pronounced; the hand massive, with a tuft of hair in the finger-cleft and running some little distance along the outer surface of both fingers; the fingers are rather blunt, the dactylus, which is about twice the length of the upper border of the palm is longer slenderer and less strongly toothed than the fixed finger, against which it closes rather obliquely. In the female the chelipeds are about as long as the carapace and are not very massive, the inner angle of the wrist is dentiform, there is no hair on the hand or fingers, and the outer surface of the hand and fixed finger is traversed near the lower border by a raised line.

The leg-joints are less expanded and less abundantly plumed than in the other Indian species, and there is no subterminal spine on the anterior border of the meropodites. The 2nd and 3rd pairs of legs are about  $1\frac{2}{3}$  times, the 1st pair about  $1\frac{1}{2}$  times, and the last pair a little over once, the length of the carapace.

In the Indian Museum are 3 specimens from Diamond Island off the Pegu coast and from Akyab, (besides numerous specimens from Samoa). The carapace of an apparently adult male is 11 millim. long and 14 millim. broad.

## PYXIDOGNATHUS, A. M. Edw.

*Pyxidognathus*, A. Milne Edwards, Bull. Soc. Philom. Paris (7) III. 1878, p. 109; de Man, Notes Leyden Mus. V. 1883, p. 160, and Journ. Linn. Soc., Zool., XXII. 1888, p. 148.

*Hypsilograpsus*, de Man, Notes Leyden Mus. I. 1879, p. 72 (*ipso teste*).

This genus is closely related to *Varuna* and *Ptychognathus*. It differs from *Varuna* in the same particulars that *Ptychognathus* does, that is to say, the exognath of the external maxillipeds is much broader than the ischiognath, and the dactyli of the legs though compressed are not dilated. It further differs, both from *Varuna* and *Ptychognathus* in the following characters:—

(1) the carapace is decidedly transverse, is deep, and is dorsally strongly convex in both directions: it is also anteriorly declivous with the front deflexed, and its antero-lateral borders are hardly arched:

(2) the antennules fold transversely:

(3) the lower border of the orbit is complete, except of course at the orbital hiatus:

(4) the carpopodites and propodites of the legs are not particularly broad.

*Distribution*: Indo-Pacific in fresh or brackish water.

*Key to the Indian species of Pyxidognathus.*

- |  |                        |
|--|------------------------|
| I. A single spine on the posterior border of the meropodites of the legs .....       | <i>P. fluviatilis.</i> |
| II. More than one spine on the posterior border of the meropodites of the legs ..... | <i>P. deianira.</i>    |

95. *Pyxidognathus deianira*, de Man.

*Pyxidognathus deianira*, de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 148, pl. x. figs. 4-6.

Carapace about  $\frac{3}{4}$  as long as broad, convex, smooth, without distinction of regions excepting a faintish H-shaped mark in the middle. Free edge of front sinuous or four-lobed, as in the next species.

Antero-lateral borders of the carapace cut into three prominent acute teeth (including the outer orbital angle), the first of which is the largest, and the last of which is spine-like.

Upper border of orbit slightly sinuous, lower border finely denticulate.

Exognath of the external maxillipeds, in the male, very much broader than the ischiognath, and having a smooth convex surface.

Chelipeds in the young male about  $1\frac{1}{2}$  times the length of the carapace: inner border of ischium, arm, and wrist denticulate; inner angle of

wrist spiniform; the upper border of the palm is granulate, a finely beaded raised line traverses the lower part of the outer surface of the palm and fixed finger, and there is a very short series of granules near the middle of the inner surface of the palm: the palm is nearly as high as long, and the dactylus is much longer than the upper border of the palm and closes against the fixed finger by the tip only.

The 2nd pair of legs, which are the longest, are not much short of twice the length of the carapace; the 4th pair, which are the shortest, are but little longer than the carapace. In all the legs, the meropodite has some fine rugosities on its upper surface, a spine near the far end of the anterior border, and some spines on the posterior border—these being most numerous in the case of the 4th pair of legs: and in all, the edges of the 3 terminal joints are hairy but not plumose, nor are these joints broadened or compressed.

In the Indian Museum are two very small male specimens from Mergui.

96. *Pyxidognathus fluviatilis*, n. sp.

Carapace transverse, markedly convex, finely punctate, the regions indicated only by an H-shaped mark in its centre.

Front between two-fifths and a third the greatest breadth of the carapace, deflexed, sinuous or four-lobed, the two middle lobes broad, the outer lobes (= inner orbital angles) subacute.

Antero-lateral borders of the carapace slightly arched, cut into three prominent acute teeth (including the outer orbital angle) of which the first is the largest and least acute, and the third is spine-like.

Orbits of good depth, the upper border slightly sinuous, the lower border defined by a granular ridge running close behind the prominent denticulated ridge that bounds the infra-orbital region of the carapace.

Anterior border of buccal cavern prominent, finely crenulate. Exognath in the female broader than the ischiognath, and having a smooth convex surface.

Chelipeds in the female about as long as the carapace, more massive than the legs: inner angle of wrist acuminate: a raised line runs along the outer surface of the palm and fixed finger, close to the lower border: fingers rather sharp though spooned at tip, dactylus hardly twice the length of the upper border of the palm, longer and rather less strongly toothed than the fixed finger.

All the leg-joints are plumed, and all the dactyli are long compressed and recurved. In all the legs there is a very strong spine in the distal

half of the posterior border of the meropodite, and in the first 3 pairs there is a smaller subterminal spine on the anterior border of the same joint. The 2nd and 3rd pairs of legs are about  $1\frac{3}{4}$  times, the 1st pair are not quite  $1\frac{1}{2}$  times, and the 4th pair are about  $1\frac{1}{4}$  times the length of the carapace.

Colour mottled dark green. A single female was found clinging to the floats of a fisherman's net in the R. Ichamutty above Bongong in the Jessore District: its carapace is 15 millim. long and 19 millim. broad.

The legs are obviously adapted for swimming, and the recurved dactyli and spiny meropodites appear to be adaptations to a swift current.

The chief difference between this species and *P. deianira*—the female of the former being compared with the male of the latter—is that in this species the three terminal joints of the legs are more compressed and the posterior border of the meropodites is armed with a single spine.

#### Sub-family SESARMINÆ, Dana.

##### SESARMA, Say.

*Sesarma*, Say, Journ. Acad. Nat. Sci. Philad. I. 1817, p. 76: Milne Edwards, Hist. Nat. Crust. II. 71, and Ann. Sci. Nat. Zool. (3) XX. 1853, p. 181: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 301: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 213: Miers, Challenger Brachyura, p. 269: de Man, Zool. Jahrb., Syst., II. 1886-87, p. 641 and IX. 1895-97, p. 128: Bürger, Zool. Jahrb., Syst., VII. 1893-94, p. 613.

*Pachysoma*, De Haan, Faun. Japon. Crust., p. 33.

*Holometopus*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 187.

Carapace squarish or actually square (the sides being straight and usually nearly parallel), usually deep (though occasionally shallow and much depressed), seldom very convex: the gastric region is almost always very well delimited, and is commonly divided into 5 subregions, and in most cases the 4 antero-lateral subregions project as 4 prominent post-frontal tubercles.

The side-walls of the carapace have everywhere a characteristic fine-meshed reticulate texture as regular as that of a sieve. This appearance is due to a multitude of small uniform granules arranged in pairs in close-set parallel rows: between each pair of granules is a little row of bristles, one of which in each row is long and points diagonally forwards.

The front occupies half, or more, of the anterior border of the carapace, and is obliquely or vertically deflexed.

The orbits, which occupy the rest of the anterior border of the carapace, are oval and of good depth: below their outer angle is a deepish gap leading into a system of grooves which open into a notch at the antero-lateral angle of the buccal cavern. At the inner angle of the orbit is the usual tooth, belonging to the inner of the two fossæ into which (as in all the crabs of this subfamily) the orbit is so plainly divided. The eyes are of no great length.

The antennules fold nearly transversely into rather narrow fossæ: the inter-antennular septum is very broad.

The antero-external angle of the 2nd joint of the antennal peduncle is a good deal produced: the antennal flagellum, which is slender and rather short, lies in the orbital hiatus.

Epistome well defined, prominent, rather short fore and aft. Buccal cavern square. The external maxillipeds leave between them a large rhomboidal gap, which is a good deal filled up by a hairy fringe: they are obliquely traversed, from a point behind the antero-external angle of the ischium to the antero-internal angle of the merus, by a conspicuous line or crest of hairs: the palp, which is rather coarse, is attached to the rounded summit of the obliquely-directed merus.

Chelipeds massive—not always so in the female—usually subequal, of no great length: palm high and short, the fingers though subacute, are hollowed at the tip.

The legs do not usually differ very markedly in length, though the third pair are the longest and the first and last (4th) pairs the shortest: the meropodites are thin, and are usually, but not always, broad.

The abdomen in both sexes consists of 7 separate segments: in the male it occupies the whole breadth of the sternum between the bases of the last pair of legs. In both sexes the second segment, as well as the exposed portion of the first, are narrow fore and aft. In the female the last segment is small and narrow from side to side, and is more or less impacted in the broad 6th segment: in the male also the last segment is much narrower than the one that precedes it.

*Distribution:* all tropical and subtropical seas: not found in the Mediterranean.

I am not inclined to adopt the subgenera proposed by Dr. de Man, although I must admit that his system is convenient in practice, for identifying species.

I may also mention here that specific distinctions based merely on the sculpture of the dactylus of the male chelæ are inadmissible, as the sculpturing frequently differs in the two fingers of the same individual.

Key to the Indian species of *Sesarma*.

- I. Carapace deepish, its length decidedly less than its breadth between the antero-lateral angles, its sides nearly parallel—never markedly divergent posteriorly :—
  1. The inner border of the arm bears, near its far end, a large acute tooth: on the upper surface of the palm of the male are at least two characteristic oblique comb-like ridges: the upper surface of the movable finger of the male is milled :—
    - i. Posterior border of the meropodites of the legs entire :—
      - a. No tooth on the lateral border of the carapace behind the orbital angle :—
        - a. Front more than half the extent of the anterior border of the carapace..... *S. quadratum.*
        - β. Front exactly half the extent of the anterior border of the carapace..... *S. pictum.*
      - b. A tooth on the lateral border of the carapace, behind the orbital angle ..... *S. bidens.*
    - ii. Distal end of the posterior border of the meropodites of the legs acutely serrate (no tooth behind the outer orbital angle)... ..... *S. Andersoni.*
  2. The inner border of the arm does not end in a large spine or acute lobe, though it may be a little dilated distally: there are no oblique pectinated ridges on the upper surface of the palm, and the upper surface of the movable finger of the male though it may be granular is not milled :—
    - i. A tooth at the inner angle of the wrist (a tooth on the lateral border of the carapace behind the orbital angle):—
      - a. The breadth of the carapace between the antero-lateral angles is equal to, or more than, the breadth between the epibranchial teeth..... *S. Edwardsi.*
      - b. The breadth of the carapace between the antero-lateral angles is decidedly less than the breadth between the epibranchial teeth, the sides of the carapace being markedly sinuous..... *S. Meinerti.*
    - ii. No spine at the inner angle of the wrist :—
      - a. Carapace and appendages not uniformly tomentose: two acute teeth—the second of which is hardly visible—on the lateral border, behind the acute orbital angle..... *S. intermedium.*

- b. Carapace and appendages covered with a short but very dense fur, amid which are prominent tubercle-like tufts of hair: lateral borders cut into three blunt lobes (including the orbital angle) of equal size..... *S. lanatum.*
- II. Carapace nearly square, its length being little less than its breadth between the antero-lateral angles: the inner border of the arm ends in an acute serrated lobe: a very finely pectinated ridge traverses the upper surface of the palm, fore and aft, close to the upper border: (a tooth on the lateral border of the carapace behind the orbital angle):—
1. Carapace deep, its sides nearly parallel: a transverse granular ridge on the inner surface of the palm: dactyli of the legs of good length:—
- i. Upper border of movable finger of male with an elegantly milled crest of 40 to 60 fine lamellæ..... *S. tæniolatium.*
- ii. Upper border of movable finger of male with a coarsely crenulate crest..... *S. tetragonum.*
2. Carapace shallow and depressed, its sides divergent posteriorly: no transverse granular crest on the inner surface of the palm: dactyli of the legs short: (a milled crest of about 25 very fine lamellæ on the upper border of the movable finger of the male),..... *S. Brockii.*
- III. Carapace somewhat elongate (its length being decidedly more than its breadth at the antero-lateral angles), shallow and depressed:—
1. No tooth on the lateral border of the carapace behind the orbital angle: legs with remarkably broad meropodite and remarkably short propodite: upper border of movable finger of male with an elegantly milled crest of about 40 fine lamellæ..... *S. latifemur.*
2. Two teeth on the lateral border behind the orbital angle: movable finger without any milling:—
- i. Post-frontal tubercles of the gastric region serrated: legs with meropodites of good breadth and dactyli of good length..... *S. politum.*
- ii. Post-frontal tubercles smooth: legs with rather narrow meropodites and short dactyli..... *S. oceanicum.*
- IV. The length of the carapace is just equal to its breadth at the antero-lateral angles: legs long and slender, with elongate dactyli:—
1. Carapace shallow, depressed, perfectly square, its sides quite parallel: two little teeth on the lateral border behind the orbital angle..... *S. Finni.*
2. Carapace deepish, its sides strongly divergent posteriorly where its breadth is much greater than its length: two teeth (not including the orbital angle)



on the lateral border, the posterior one being very small:—

- i. Third pair of legs not three times the length of the carapace..... *S. longipes*.
- ii. Third pair of legs more than three-and-a-half times the length of the carapace..... *S. kraussi*.

97. *Sesarma quadratum* (Fabr.).

*Cancer quadratus*, Fabricius, Ent. Syst. Suppl. p. 341.

*Ocypoda quadrata*, Bosc, Hist. Nat. Crust. I. p. 198.

*Ocypoda plicata*, Latreille, Hist. Nat. Crust. &c. VI. p. 47.

*Sesarma quadrata*, Milne Edwards, Hist. Nat. Crust. II. 75, and Ann. Sci. Nat., Zool., (3) XX. 1853, p. 183.

*Sesarma quadratum*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 302: Miers, Phil. Trans. Vol. 168, 1879, p. 490.

*Sesarma quadrata*, Richters, in Mobius' Meeresf. Maurit. p. 157: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 217: Lenz and Richters, Abh. Senck. Nat. Ges. XII. 188, p. 425: de Man, Zool. Jahrb. Syst. II. 1887, p. 655, pl. xvii. fig. 2 and p. 683, and IV. 1889, p. 434, and IX. 1895-97, pp. 181, 182, and Notes Leyden Mus. XII. 1890, p. 99, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. p. 328: Thallwitz, Abh. Mus. Dresden, 1890-91, No. 3, p. 37: Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 392: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 724.

*Grapsus (Pachysoma) affinis*, De Haan, Faun. Jap. p. 66, pl. xviii. fig. 5.

*Sesarma affinis*, Krauss, Sudaf. Crust. p. 45: Milne Edwards, Ann. Sci. Nat. Zool. (3) XX., 1853, p. 183: Heller, Novara Crust. p. 62: de Man, Notes Leyden Mus. II. 1880, p. 22: Miers, Ann. Nag. Nat. Hist. (5) V. 1880, p. 312: Kingsley, *l.c. supra*, p. 213: Ortmann, *l.c. supra*, p. 724.

*Sesarma unguolata*: Milne Edwards, Ann. Sci. Nat., Zool. (3) XX. 1853, p. 184: Kingsley, *l.c. supra*, p. 218.

*Sesarma aspera*, Heller, Novara Crust. p. 63, pl. vi. fig. 1: Kingsley, *l.c. supra*, p. 214: Müller, Verh. Nat. Ges. Basel, 1886, p. 476: de Man, Zool. Jahrb. II. 1887, p. 656 and Journ. Linn. Soc. Zool. XXII. 1887-88, p. 169.

*Sesarma melissa*, de Man, Zool. Jahrb. Syst., II. 1887, p. 656, and Journ. Linn. Soc., Zool., XXII. 1888, p. 170, pl. xii. figs. 5-7, and Zool. Jahrb. Syst., IV. 1889, p. 434.

Carapace hardly convex, decidedly broader than long, its length being about four-fifths its breadth between the antero-lateral angles, deep; the 4 post-frontal lobes prominent equal and a little rugose transversely, the rugæ being sparsely tufted with hair; the cardiac and intestinal regions very much less distinct than the gastric: some oblique striations on the epibranchial regions.

Front decidedly more than half the greatest breadth of the carapace, not very deep, its free margin usually but slightly sinuous. Lateral borders of carapace nearly parallel, a little divergent anteriorly, without any tooth behind the acute orbital angle.

The chelipeds differ in the sexes, being about  $1\frac{1}{2}$  times the length

of the carapace in the male and much more massive than the legs, but in the female hardly  $1\frac{1}{2}$  times the length of the carapace and not more massive than the legs. In both sexes the outer surface of the arm wrist and palm are granular, the granules on the arm and wrist having a squamiform arrangement, the inner border of the arm bears a subterminal spine of large size, the upper border of the arm ending in a much smaller spine, the inner angle of the wrist is not dentiform, and the inner surface of the palm is more or less granular. In the male the palm is a little swollen below and has, on its upper surface, some short oblique crests, of which two are most elegantly pectinated: in the female the palm is not swollen and the crests are simply granular. The dactylus is less than twice the length of the upper border of the hand (palm) and its dorsal surface is elegantly milled with from 11 to 19 blunt, rather coarse, transverse lamellæ: in the female this milling is incomplete and very indistinct. In neither sex is there any great gap between the closed fingers.

The meropodites of the legs are foliaceous, their greatest breadth in the 2nd and 3rd pairs being more than half their length, their anterior border ends at an acute subterminal spine, and their dorsal surface has some fine transverse squamiform sculpture. The anterior border of the last three joints of the legs, and part of the posterior border of the last two, is fringed with tufts of bristles. The 3rd pair of legs, which are slightly the longest, are about twice the length of the carapace, and their dactylus is about three-fourths the length of their propodite.

In the Indian Museum are 42 specimens from both coasts of the Peninsula, Ceylon, the Andamans and the Nicobars.

In a male of good size the carapace is 16 millim. long and 20 millim. broad.

#### 98. *Sesarma pictum*, De Haan.

*Grapsus (Pachysoma) pictus*, De Haan, Faun. Japon. Crust. p. 61, pl. xvi. fig. 6.

*Sesarma picta*, Krauss, Sudafr. Crust. p. 45: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 184: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 106: de Man, Notes Leyden Mus. II. 1880, p. 22, and Zool. Jahrb., Syst., II. 1887, p. 657, and IX. 1895-97, pp. 181, 182, and Journ. Linn. Soc., Zool., XXII. 1888, p. 171: Bürger, Zool. Jahrb., Syst., VII. 1893-94, p. 626: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 725.

Agrees with *S. quadratum* in everything but the following particulars:—

(1) the carapace is not so broad, its length being about five-sixths of its breadth between the antero-lateral angles:

(2) the front is not so broad, its extent being only half the breadth of the carapace:

(3) the meropodites of the legs are not so broadly foliaceous, their greatest breadth, in the middle two pairs, being less than half their length.

The Indian Museum possesses a single specimen from Mergui.

### 99. *Sesarma bidens* (De Haan).

*Grapsus (Pachysoma) bidens*, De Haan, Faun. Japon. Crust. p. 60, pl. xvi. fig. 4, and pl. xi. fig. 4.

*Sesarma bidens*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 353: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 185: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 105: Heller, Novara Crust. p. 64: Hilgendorf, in v. d. Decken's Reisen Ost-Afr., Crust., p. 91, pl. iii. fig. 3a: Hoffmann, in Pollen & Van Dam, Faun. Madag. Crust. p. 24: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 818, and Zool. H. M. S. Alert, pp. 184, 246: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 214: de Man, Notes Leyden Mus. II. 1880, p. 23, and Zool. Jahrb., Syst., II. 1887, p. 658, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II, p. 330: Lenz & Richters, Abh. Senck. Nat. Ges. XII. 1881, p. 425: Bürger, Zool. Jahrb., Syst., VII. 1893-94, p. 628: Ortmann, *ibid.* p. 726: Nobili, Ann. Mus. Genova (2) XX. 1899, p. 269.

*Sesarma Dussumieri*, Milne Edwards, *l. c. supra*: Tozzetti "Magenta" Crust. p. 145, pl. ix. figs. 8 a-f: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 215: de Man, Zool. Jahrb. Syst. II. 1887, p. 659, and IX. 1895-97, p. 208, and Journ. Linn. Soc., Zool., XXII. 1888, p. 177, pl. xii. figs. 8-12: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 726.

*Sesarma lividum*, A. Milne Edwards, Nouv. Archiv. du Mus., V. 1869, Bull. p. 25, and IX. 1873, p. 303, pl. xvi. fig. 2: Brocchi, Ann. Sci. Nat., Zool., (6) II. 1875, Art. 2, p. 83 (*male appendages*): Kingsley, *tom. cit. supra*, p. 216: de Man, Archiv. f. Naturges. LIII. 1887, i. p. 361, pl. xvii. fig. 1, and Zool. Jahrb. Syst. II. 1887, p. 659, and Journ. Linn. Soc., Zool., XXII. 1888, p. 180.

*Sesarma Haswelli*, de Man, Zool. Jahrb., Syst., II. 1887, p. 658, and Journ. Linn. Soc., Zool., XXII. 1888, p. 175.

This species very closely resembles *S. quadratum*, from which it differs in the following characters:—

(1) there is a small sharp tooth on the lateral border of the carapace, immediately behind the outer orbital angle:

(2) the carapace is slightly less transverse (though decidedly broader than long):

(3) the transverse ridges on the upper surface of the dactylus of the male chelæ are coarser and shorter and more tubercle-like.

In the Indian Museum are 52 specimens from the coasts of the Bay of Bengal, Andamans, Nicobars and Ceylon.

100. *Sesarma Edwardsi*, de Man.

*Sesarma Edwardsi*, de Man, Zool. Jahrb., Syst., II. 1887, p. 649, and Journ. Linn. Soc., Zool., XXII. 1888, p. 185, pl. xiii. figs. 1-4: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 721.

Differs from *S. quadratum* in the following particulars:—

(1) the carapace is squarer and less transverse, and the four post-frontal lobes of the gastric region are more prominent; the front also is slightly, but distinctly, broader:

(2) there is a sharp tooth on the lateral border of the carapace immediately behind the antero-lateral angle:

(3) the upper border of the arm does not end in a spine, and though there may be a slight subterminal dilatation of the crenulated inner border of the arm there is *no large spine*:

(4) there is a *sharp tooth or spine just below the inner angle of the wrist*:

(5) the upper surface of the wrist and outer surface of the palm are covered—usually very closely covered—with vesiculous tubercles; and there are smaller and sharper tubercles on the upper surface of the dactylus and the lower surface of the fixed finger of the chelæ:

(6) there are no oblique pectinated crests on the palm:

(7) *the male abdomen is singularly broad.*

In the Indian Museum are 126 specimens, most of which came from the Burma coast from Arakan to Tavoy, the rest from the Gangetic delta, the Andamans and Ceylon.

In the variety separated by de Man as *crassimana* the abdomen is not quite so broad as it is in the typical form, and the palm of the male is larger and more swollen.

101. *Sesarma intermedium* (De Haan).

*Grapsus (Pachysoma) intermedius*, De Haan, Faun. Japon. Crust. p. 61, pl. xvi. fig. 5.

*Sesarma intermedia*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 186: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 105: Heller, Novara Crust. p. 64: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 216: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 314: de Man, Notes Leyden Mus. II. 1880, p. 25, and Zool. Jahrb., Syst., II, 1887, p. 649, and Journ. Linn. Soc., Zool., XXII. 1888, p. 182: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 721.

Differs from *S. quadratum* in the following particulars:—

(1) the carapace is more quadrate and less transverse, the post-frontal lobes are less prominent and much smoother, and the front is broader:

(2) there is a tooth—and sometimes also a second rudimentary tooth—on the lateral border immediately behind the orbital angle:

(3) there is no large subterminal spine on the inner border of the arm, nor does the upper border end in a spine :

(4) in the corner of the upper surface of the palm there are in the male some oblique granular lines, but no pectinated crests ; and on the inner surface of the palm there is a conspicuous transverse granular crest :

(5) the upper surface of the dactylus of the male chelæ is granular in its proximal half, but is not milled with transverse lamellæ.

From *S. Edwardsi* it is distinguished by numerous characters, but the absence of a spine at the inner angle of the wrist is sufficiently characteristic.

In the Indian Museum are 5 specimens from Mergui.

#### 102. *Sesarma Meinerti*, de Man.

*Sesarma Meinerti*, de Man, Zool. Jahrb., Syst., II. 1887, pp. 648, 668, and IX. 1895-97, p. 166 : Bürger, Zool. Jahrb. Syst. VII. 1893-94, p. 617, and Ortman, *ibid.* p. 720.

*Sesarma tetragona*, Edw. (*nec* Fabr.), Milne Edwards, Hist. Nat. Crust. II. 73, and Ann. Sci. Nat., Zool., (3) XX. 1853, p. 184 : A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71, and IX. 1873, p. 304, pl. xvi. fig. 4 : Hilgendorf, in v. d. Deeken's Reisen Ost-Afr., Crust. p. 90 : Hoffmann, in Pollen & Van Dam, Faun. Madag. Crust. p. 23 : Hilgendorf, MB. Ak. Berl. 1878, p. 809 : Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 218.

Carapace convex, especially fore and aft, a little broader than long, deep: the 4 post-frontal lobes prominent, unequal—the outer ones being much narrower than the middle pair; the cardiac and intestinal regions are quite distinct, and the usual-oblique striations are found on the epibranchial regions: the whole dorsal surface of the carapace is rather profusely covered with tufts of hair.

Front decidedly more than half the greatest breadth of the carapace, which is just behind the orbital angles, not very deep, its free edge sinuous. Lateral borders of the carapace somewhat sinuous, armed with a large tooth behind the orbital angle: there may even be a trace of a second epibranchial tooth.

Chelipeds subequal, almost equally massive in both sexes, about twice as long as the carapace. The outer surface of the arm and wrist is finely rugose, that of the palm is only pitted: neither the upper nor the inner border of the arm end in a tooth: inner angle of wrist pronounced but not dentiform: no pectinated crests, of any kind on the palm: the fingers are a good deal arched and meet only at tip, the upper surface of the dactylus in the male has a row of inconspicuous denticles: on the inner surface of the palm there is an oblique granular crest.

The meropodites of the legs are foliaceous, but their breadth is not twice their length; but otherwise the legs are as in *S. quadratum*.

The abdomen of the male is decidedly narrow.

In the Indian Museum are 26 specimens from the Andamans and one from Madras. The carapace of a large one is 33 millim. long and 38 millim. broad: in the female the carapace is not so broad.

#### 103. *Sesarma Andersoni*, de Man.

*Sesarma Andersoni*, de Man, Zool. Jahrb., Syst., II. 1887, p. 657, and Journ. Linn. Soc. Zool. XXII. 1888, p. 172, pl. xii. figs. 1-4.

Carapace moderately deep, hardly convex, considerably broader than long, the four post-frontal lobes of the gastric region only moderately prominent, nearly equal, pitted; the cardiac and intestinal regions faintly indicated; the oblique striations of the epibranchial regions very sharp and distinct, one of them almost projects beyond the lateral border as a tooth behind the orbital angle.

Front more than half the greatest breadth of the carapace, not very deep, its free margin a little convex but nearly straight. The lateral borders of the carapace are slightly convergent posteriorly: except for the afore-mentioned projection of the first branchial ridge there is no tooth behind the orbital angle.

Chelipeds much larger in the male than in the female, but the difference is not so marked as in *S. quadratum*. The inner border of the arm ends in a very acute denticulated lobe: the palm is traversed on the outer surface, near the lower border, by a fine raised line, and on the upper surface in the male are numerous short parallel oblique striæ one of which at least is most elegantly pectinate: in the female these crests are less numerous and less distinct: the upper surface of the dactylus of the male is milled, the lamellæ increasing in size and coarseness from behind forwards.

At the distal end of the posterior border of the meropodites of the legs are three or four strong spines, decreasing in size from behind forwards, but there is no subterminal spine on the anterior border: in other respects, except that the dactyli are slightly shorter, the legs are very similar to those of *S. quadratum*. The male abdomen is broad.

In the Indian Museum are 8 specimens from Mergui: the carapace of the largest is 7 millim. long and 9 millim. broad.

#### 104. *Sesarma lanatum*, n. sp.

Carapace deepish, dorsally flat, everywhere covered, as also are the appendages, with a dense fur amid which are freely scattered little dense

adherent tufts of hair resembling tubercles. When this covering is removed the surface of the carapace is smooth and polished, with the gastric region and its four post-frontal tubercles distinct.

The length of the carapace is considerably less than its breadth between the antero-lateral angles.

Front a little more than half the breadth of the carapace, obliquely deflexed, its free margin nearly straight. The lateral borders of the carapace are nearly parallel and anteriorly are cut into three blunt lobes of nearly equal size—including the outer orbital angle.

The chelipeds when denuded have a smooth surface and sharp borders: they are similar in the two sexes, except that they are much more massive in the male. There is a blunt angular projection at the far end of the inner border of the arm, the inner angle of the wrist is pronounced but not dentiform, and the upper border of the palm is traversed fore and aft by a fine sharp crest: in the male the palm is at least as high as long: the upper border of the dactylus is faintly crenulate in its proximal two-thirds.

The meropodites of the legs are foliaceous, but their breadth is less than half their length: their borders are entire. The dactyli of the legs are claw-like, their length being about three-fourths that of the propodites.

The abdomen of the male is narrow.

In the Indian Museum are 4 specimens from Bombay and Karachi: the carapace of the largest is  $8\frac{1}{2}$  millim. long and 10 millim. broad.

#### 105. *Sesarma tæniolatum*, White.

*Sesarma tæniolatum*, White, List Crust. Brit. Mus. p. 38 (1847): Miers, P. Z. S. 1877, p. 137, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 313: de Man, Notes Leyden Mus. II. 1880, p. 26: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 218: de Man, Zool. Jahrb., Syst., II. 1887, pp. 647, 666, and IX. 1895-97, p. 166, and Journ. Linn. Soc., Zool., XXII. 1888, p. 181, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. p. 330: Bürger, Zool. Jahrb., Syst., VII. 1893-94, p. 615, and Ortmann, *ibid.* p. 720.

*Sesarma Mederi*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 185: Tozzetti, "Magenta" Crust. p. 136, pl. ix. figs. 1 a-i.

Carapace deep, nearly flat dorsally, square, its length being slightly less than its breadth between the antero-lateral angles. All the regions are quite well defined, and the 4 post-frontal tubercles—the middle two of which are not very much broader than the outer ones—are very prominent. The whole dorsum of the carapace is covered with tufts of hair, which are largest and longest anteriorly. There are some oblique striæ on the sides of the epibranchial regions.

Front half, or a little more than half, the breadth of the carapace,

not very deep, its free margin strongly sinuous. Lateral borders of the carapace nearly parallel, armed with one acute tooth behind the acute outer orbital angle.

The chelipeds are similar in the two sexes, except that they are a good deal more massive and more sharply sculptured in the male. They are not quite twice the length of the carapace: the outer surface of the arm and wrist are granular-rugose, the outer surface of the palm is granular, and there is a transverse granular ridge on the inner surface of the palm: the upper border of the arm is crest-like and ends in a sharp tooth, and the distal end of the inner border forms an acute angular serrate lobe: the inner angle of the wrist is dentiform: close to and nearly parallel with the upper border of the palm runs a fine and very finely and evenly pectinate crest: along the upper border of the dactylus runs a very elegantly milled crest of from 40 to 60 fine teeth. In the male the palm is at least as high as long, the fingers meet only at tip, and the dactylus is about twice the length of the upper border of the palm.

The meropodites of the legs are foliaceous, but their greatest breadth is not quite half their length: there is a sharp subterminal spine on their anterior border only. The dactyli of the legs are two-thirds, or more, the length of the propodites. The 3rd pair of legs, which are the longest, are a little more than twice the length of the carapace.

In the Indian Museum are 9 specimens, from Mergui, the Andamans, and Penang. The carapace of a large specimen is nearly 38 millim. long and nearly 40 broad.

#### 106. *Sesarma tetragonum* (Fabr.).

*Cancer tetragonus*, Fabricius, Ent. Syst., Suppl. p. 341.

*Cancer fascicularis*, Herbst, Krabben etc. III. i. 49, pl. xlvii. fig. 5.

*Sesarma tetragona*, de Man, Zool. Jahrb., Syst., II. 1887, p. 646: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 392.

This species closely resembles *S. tæniolatum*, from which it differs in the following characters:—

- (1) the carapace is slightly broader:
- (2) the subterminal lobe of the inner border of the arm is smaller, while the tooth at the inner angle of the wrist is more pronounced:
- (3) the fine striated crest along the upper border of the palm is shorter:
- (4) the crest of the upper surface of the movable finger of the chelæ is coarsely crenulate.



In the Indian Museum are 8 specimens from Ceylon, Madras, the Mahanaddi Delta, and the Ganges Delta. The carapace of a large one is 40 millim. long and 43 millim. broad.

107. *Sesarma Brockii*, de Man.

*Sesarma Brockii*, de Man, Zool. Jahrb., Syst., 1887, p. 651, and IX. 1895-97, p. 171, and Archiv f. Naturges. LIII. 1887, i. p. 373, pl. xvi. fig. 3: Thallwitz, Abhand. Zool. Mus. Dresden, 1890-91, No. 3, p. 39: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 721.

Resembles *S. tæniolatum*, but differs in the following characters:—

(1) the carapace is *shallow* and much depressed, its length is just equal to its breadth between the antero-lateral angles, its dorsal surface is not so hairy, and its sculpture though similar is not so deeply cut: the front is not so sinuous.

(2) the lateral borders of the carapace are *slightly divergent* posteriorly, and there are *two* teeth—the posterior of which is, however, extremely small—behind the outer orbital angle:

(3) no subterminal spine on the upper border of the arm: no transverse granular crest on the inner surface of the palm:

(4) the milled crest along the upper border of the dactylus of the chelæ is lower and has only about 25 teeth:

(5) the legs are longer, their meropodites are narrower and their dactyli—except in the case of the 1st pair of legs—are *barely half the length of their propodites*.

In the Indian Museum there is a young male from the Andamans. In this specimen the chelipeds are not massive and are very little longer than the carapace.

108. *Sesarma latifemur*, n. sp.

Closely related to *S. elongatum*, A. M. Edw.

This species belongs to the same natural group as *S. tæniolatum*, from which it differs only in the following characters:—

(1) the carapace is *shallow* and much depressed, and its length is decidedly *more* than its breadth between the antero-lateral angles, its dorsal surface is not quite so hairy and its post-frontal lobes are deeper cut:

(2) the lateral borders of the carapace are decidedly *divergent* posteriorly and have no tooth behind the orbital angle:

(3) the male chelipeds are little longer than the carapace: the crest-like upper border of the arm does not end in a spine: the inner

angle of the wrist, though well pronounced, is not spiniform: the transverse beaded ridge on the inner surface of the palm is very short:

(4) the dactylus of the chelæ is not nearly twice the length of the upper border of the palm, and the milled crest on its upper surface consists of not more than 40 teeth:

(5) the meropodites of the legs are remarkably foliaceous, their greatest breadth, in the case of the 2nd and 3rd pairs, being more than half their length: all the leg joints are thinner and flatter:

(6) the dactyli of the legs are remarkably short, their length, in the case of the 2nd and 3rd pairs, being *less than half* the length of their propodites.

In the Indian Museum is a single male from the Andamans: its carapace is nearly 35 millim. long, and a little over 30 millim. broad across the antero-lateral angles.

#### 109. *Sesarma politum*, de Man.

*Sesarma polita*, de Man, Zool. Jahrb. Syst. II. 1887, p. 654: Journ. Linn. Soc., Zool., XXII. 1888, p. 189, pl. xiii. figs. 7-9.

Carapace shallow and much depressed, a good deal longer than broad, all the regions well defined: the four post-frontal lobes of the gastric subregions are deep-cut and very prominent, their anterior overhanging edges are serrated and their surface bears some transversely arranged sharpish tubercles: the two middle lobes are decidedly larger than the outer ones. There are no oblique striæ on the epibranchial regions.

Front more than half the breadth of the carapace, its free margin markedly sinuous. The lateral borders of the carapace are nearly parallel though slightly sinuous: there are two well cut teeth behind the outer orbital angle.

Chelipeds equal, and not so very much longer than the carapace: the outer surface of the arm wrist and hand are closely beset with small tubercles, which in places have a squamiform look, and the inner surface of the palm is granular but has no transverse ridge: the inner and outer borders of the arm, the inner border of the wrist, and the upper border of the palm and movable finger are conspicuously serrulate, and there is also a noticeable dilatation near the far end of the inner border of the arm. There are no pectinated crests of any sort on the palm, and the fingers—both surfaces of which are smooth and polished—have no large gap between them when closed.

The legs are shortish, the 3rd pair being hardly  $1\frac{2}{3}$  times the length

of the carapace, and rather slender. The meropodites are nearly three times as long as broad, they have a subterminal spine on the anterior border and in the case of the 1st pair their posterior border is distinctly serrulate. The dactyli are rather short, their length, in the third pair, being less than two-thirds the length of the propodite: they are remarkably tomentose.

In the Indian Museum there is a single specimen from Mergui: its carapace is 38 millim. long and 35 millim. broad.

110. *Sesarma oceanicum*, de Man.

*Sesarma oceanica*, de Man, Zool. Jahrb., Syst., IV. 1889, p. 429, pl. x. fig. 9, and Notes Leyden Mus. XIII. 1891, p. 52.

Carapace shallow, depressed, its length greater than its breadth between the antero-lateral angles; all the regions are fairly well defined and the 4 post-frontal lobes of the gastric subregions are prominent, the middle pair being more than twice as broad as the two outer ones: the surface of the carapace is granular anteriorly and punctate posteriorly, and near the sides are numerous short oblique striæ.

Front half the breadth of the carapace, deepish, its free margin a little sinuous: orbits not at all oblique: the lateral borders of the carapace have a slight, but distinct, convex curve, and there are two teeth—the posterior of which is extremely small—behind the outer orbital angle.

Chelipeds equal, not much longer than the carapace: the outer surface of the arm and wrist are rugose and both surfaces of the palm are studded with sharpish granules: there is a small angular lobe near the far end of the inner border of the arm, and the inner angle of the wrist is dentiform: the palm is not quite as high as long, close to and nearly parallel with its upper border is a fine and finely granular ridge: the dactylus is about half as long again as the upper border of the palm, and there are some sharpish granules along its upper surface.

The legs are slender: their meropodites are more than three times as long as broad and are not foliaceous, they have a subterminal spine on the anterior border only: their dactyli are shortish, those of the 3rd pair being less than two-thirds the length of their propodites, and are densely plumed: the 3rd pair of legs are about  $2\frac{1}{3}$  times the length of the carapace.

In the Indian Museum is a single specimen from the Nicobars: its carapace is 20 millim. long, and 16.5 millim. across the antero-lateral angles.

111. *Sesarma Finni*, n. sp.

Near *S. maculata*, de Man.

Carapace shallow, depressed, flat, perfectly square, its length being equal to its breadth at the antero-lateral angles and its sides being parallel: the regions are indicated, but not emphasized, and the 4 post-frontal lobes are sharply prominent, the middle pair being much broader than the outer ones.

Front half the breadth of the carapace, deepish, its free edge nearly straight: two little teeth on the lateral border of the carapace, behind the outer orbital angle.

In the chelipeds of the female the outer surface of the arm wrist and hand are granular; the upper border of the arm ends acutely, and the inner border ends in a spine; the inner angle of the wrist is pronounced, but is not dentiform; and the upper surface of the palm is traversed, fore and aft, close to the upper border, by a fine and finely milled ridge.

Legs long and slender, the 3rd pair being more than  $2\frac{1}{2}$  times the length of the carapace: their meropodites are not foliaceous, being about three times as long as broad, and they have a subterminal spinule on the anterior border only: their dactyli are long and slender, those of the 3rd pair being more than three-fourths the length of the propodite: the propodites and dactyli of all the legs are fringed with short stiff sharp bristles.

The species is represented by a small female from the Andamans: its carapace is not quite 11 millim. in either diameter.

112. *Sesarma longipes*, Krauss.

*Sesarma longipes*, Krauss, Sudafr. Crust. p. 44, pl. iii. fig. 2: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 199: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 216: de Man, Zool. Jahrb., Syst., II. 1887, p. 651.

The length of the carapace is equal to its breadth at the antero-lateral angles, but as the lateral borders of the carapace diverge considerably, from before backwards, the *greatest* breadth of the carapace (at the level of the 2nd pair of legs) is considerably more than the length.

Carapace deepish, very slightly convex; its regions are not very well defined, but the median longitudinal groove of the gastric region is deep, and the 4 post-frontal lobes are sharply prominent, the middle pair being much broader than the outer ones.

Front half the extent of the anterior border of the carapace, the free margin slightly sinuous: the divergent lateral borders of the carapace have a tooth of good size behind the outer orbital angles.

Chelipeds in the female not half as long again as the carapace: the outer surface of the arm and wrist are rugulose, and both surfaces of the palm are studded with sharpish granules: the upper border of the arm ends acutely, but there is no spine at the end of the inner border; the inner angle of the wrist is pronounced, almost dentiform; there are no granular or pectinated crests of any kind on the palm: the fingers are little bent and leave no large gap between them when closed, there are some sharpish granules along the upper border of the dactylus, and along the lower border of the fixed finger.

The legs are remarkably uneven in length, the third pair being more than  $2\frac{1}{2}$  times the length of the carapace; the meropodites are not exactly foliaceous, their greatest breadth being hardly two-fifths of their length, and they have a subterminal spine on the anterior border only; the dactyli are remarkably long, those of the third pair being as long as their propodites.

In the Indian Museum are 2 females from the Andamans: the carapace of the larger one is 18 millim. long and 20 millim. in its greatest breadth posteriorly.

### 113. *Sesarma Kraussi*, de Man.

*Sesarma Kraussi*, de Man, Zool. Jahrb., Syst., II. 1887, p. 652, and Journ. Linn. Soc., Zool., XXII. 1888, p. 193, pl. xiv. figs. 1-3.

Differs from *S. longipes*, which it closely resembles, in the following characters:—

(1) the four post-frontal lobes are not so prominent, the outer ones, indeed, being very inconspicuous:

(2) the free edge of the front is more sinuous, owing to the depth of the median notch:

(3) there are two distinct teeth on the lateral border of the carapace, behind the outer orbital angle:

(4) the outer surface of the wrist and both surfaces of the palm are nearly smooth, and there is a row of sharp granules along the outer surface of the fixed finger: the upper border of the arm does not end acutely:

(5) the legs are even longer and slenderer, the 3rd pair being more than  $3\frac{1}{2}$  times the length of the carapace: the meropodites of the legs are at least 3 times as long as broad.

In the Indian Museum is a single male from the Nicobars: its carapace is 9 millim. long and 11 millim. in greatest breadth.

Heller ("Novara" Crust. pp. 64, 65) includes the following species in the Indian fauna:—

*S. Eydouxi*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. p. 184 (Madras).

*S. indica*, Milne Edwards, *tom. cit.* p. 186 (Ceylon, Nicobars).

*S. gracilipes*, Milne Edwards, *tom. cit.* p. 182 (Nicobars).

#### SARMATIUM, Dana.

*Sarmatium*, Dana, Silliman's Amer. Journ. Sci. (2) XII. 1851, p. 283, and Proc. Ac. Nat. Sci. Philad. 1851, p. 251, and U. S. Expl. Exp. Crust. pt. I. p. 357; Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 212; de Man, Zool. Jahrb., Syst., II, 1887, p. 659.

*Metagrapsus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 188.

This genus, which I almost agree with Dr. de Man in regarding as only a subgenus of *Sesarma*, differs from *Sesarma* in the following particulars:—

(1) the front, instead of being abruptly and vertically deflexed, is gradually declivous and obliquely deflexed:

(2) the antero-lateral borders of the carapace are usually a little arched, instead of being in the same straight line with the postero-lateral borders:

(3) the abdomen of the male does not completely coincide with the breadth of the sternum at the level of the 5th pair of legs; and in the female the terminal segment is not deeply impacted in the penultimate segment.

*Distribution*: West Indies, West coast of Africa, Indo-Pacific.

#### 114. *Sarmatium crassum*, Dana.

*Sarmatium crassum*, Dana, Proc. Ac. Nat. Sci. Philad. 1851, p. 251; U. S. Expl. Exp. Crust. pt. I. p. 358, pl. xxiii. figs. 1 *a-d*: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX, 1853, p. 189; Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 212; de Man, Zool. Jahrb. Syst. II. 1887, p. 660.

Carapace deep, broader than long, broader behind than in front, smooth, with very faint indications of regions and no oblique striæ on the epibranchial regions: of the post-frontal lobes the two middle ones alone are distinct, and they are not prominent, they occupy almost all the space between the orbits.

The front is half the extent of the anterior border of the carapace, its free edge is very little concave in the middle line. The antero-lateral borders of the carapace are distinctly arched and are cut into 2 broad blunt lobes (one of which is the orbital angle) followed by a small tooth.

Chelipeds "of male short, hand above transversely four to five-plicate, externally nearly smooth, moveable finger with four short rudiments of spines, carpus mostly smooth, a few seriate granules above." In the female the transverse plications of the upper surface of the hand are very indistinct and the dactylus is smooth.

Legs not much compressed: the meropodites are not broadened, there is a spinule at the distal end of their anterior border: the dactyli are slender but are shorter than the propodites.

In the Indian Museum is a young female from the Nicobars: its carapace is 8 millim. long and 9 broad.

Henderson (Trans. Linn. Soc., Zool., (2) V. 1893, p. 393) describes a variety of *Sarmatium indicum* (Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 174, pl. xxvi. figs. 1-5) from Cochin.

#### METASESARMA, Edw.

*Metasesarma*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 188: Kingsley, Proc. Acad. Nat. Sci. Philad. 1880, p. 211: de Man, Zool. Jahrb., Syst. IX. 1895-97, p. 128.

The most marked difference between this genus and *Sesarma*, which it closely resembles, is that the tooth at the inner angle of the orbit meets the thickened angle of the front, so as to completely exclude the antennæ from the orbit.

The regions of the carapace are not defined, and the post-frontal tubercles are inconspicuous: the front is vertically deflexed as in *Sesarma*, but is deeper and overhangs the epistome: the reticulate appearance of the pterygostomial and neighbouring regions is finer, closer, and more confused: the orbits are more open below: the antennæ are much smaller: the legs are not so broad and compressed.

The *Metasesarmata* are land and fresh-water crabs of the Indo-Pacific region.

#### 115. *Metasesarma Rousseauxii*, Edw.

*Metasesarma Rousseauxii*, Milne Edwards, Ann. Sci. Nat., Zool. (3) XX. 1853, p. 188, and Archiv. du Mus. VII. 1855, p. 158, pl. x. figs. 1 a-c: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 211: de Man, Zool. Jahrb., Syst., IV. 1889, p. 439, and IX. 1895-97, p. 138, and X. 1898, pl. xxix. fig. 28, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. p. 350: Henderson, Trans. Linn. Soc., (2) V. 1893, p. 392: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 717.

*Sesarma Aubryi*, de Man (nec A. M. Edw.), Journ. Linn. Soc., Zool., XXII. 1888, p. 168.

Carapace deepish, a little broader than long, smooth to the naked eye, slightly convex fore and aft: a short semilunar groove separates the gastric from the cardiac region, and there is a median longitudinal post-frontal groove of some depth: the middle pair of post-frontal tubercles are distinct, though not prominent, but the outer ones are hardly distinguishable.

Front a little more than half the breadth of the carapace, vertical, deep, somewhat spatulate, the free edge convex and very slightly sinuous.

Sides of the carapace slightly curved and convergent posteriorly, no tooth behind the outer orbital angle.

The chelipeds are longer and more massive in the male, but are otherwise similar in both sexes: in the male they are less than  $1\frac{1}{2}$  times the length of the carapace. To the naked eye they are smooth, except for a patch of vesiculous granules in the middle of the inner surface of the palm. The inner angle of the wrist is sharply pronounced, and the upper border of the palm and of the base of the dactylus have a few small blunt serrulations. The palm is as high as long, the dactylus is about  $1\frac{1}{2}$  times the length of the upper border of the palm, the fingers, though a little hollowed at tip, are subacute and have no gap between them when closed.

Legs rather slender, smooth and unarmed to the naked eye: the meropodites are not broadened: the dactyli are as long as their propodites and like them are fringed with dark spine-like bristles. The 3rd pair of legs, which are the longest, are less than twice the length of the carapace.

In the Indian Museum are 61 specimens from the Andamans and Nicobars, Mergui, Ganges Delta, Madras, and Minnikoy (Laccadives). Many of the specimens were taken on land, hiding under timber, in which situation their curious mottled coloration must be protective. The largest specimen has a carapace 14 millim. long by nearly 17 broad.

#### CLISTOCÆLOMA, A. M. Edw.

*Clistocaloma*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 310: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 219.

Differs from *Sesarma* only in the following characters:—

(1) the tooth at the inner angle of the lower border of the orbit meets the front, as in *Metasesarma*, so as to completely exclude the antennæ from the orbit:

(2) the reticulation of the sidewalls of the carapace resembles that of *Sesarma*, but, on denudation, the lines of granules are found to be absent, so that the meshwork is made up of hairs entirely:

(3) the merns of the external maxillipeds is shorter.

From *Metasesarma* this genus is distinguished by the lobulation of the dorsum of the carapace and the dentate lateral borders.

If *Metasesarma* is to be classed as a subgenus of *Sesarma* as it has been, and with undoubted reason, by Dr. de Man, the same course might be taken with *Olistocæloma*.



116. *Olistocœloma balansæ*, Edw.

*Olistocœloma balansæ*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 311, pl. xvii. fig. 1.

The whole body and the appendages, except the tips of the dactyli of the legs, are everywhere covered with a dark dense adherent fur, amid which, on the dorsal aspect, are numerous clumps of tomentum that look like tubercles: the legs, in addition, have a shaggy fringe of coarse hair.

Carapace square, as long as broad, somewhat depressed: when denuded it is smooth and polished, with all the regions well defined and boldly and symmetrically lobulated, and the post-frontal lobes prominent, the outer ones being again subdivided into two tubercles.

Front much more than half the breadth of the carapace, nearly vertically deflexed, deepish, its free margin sinuous and turned up to form a trenchant horizontal edge.

The lateral borders of the carapace are cut, anteriorly, into three lobes including the outer orbital angle.

Chelipeds subequal, nearly similar in size in both sexes, not more massive than the legs, shorter even than the 1st pair of legs, which are little longer than the carapace. When denuded they are smooth, except that the upper surface of the wrist is a little lumpy: the inner border of the arm is a little convex distally, but does not expand into an undoubted lobe: the palm is higher than long, but is by no means swollen or massive, and in the male only its upper surface is traversed, obliquely fore and aft, as close as possible to the upper border, by a fine microscopically-pectinate crest: the fingers are subacute, though slightly hollowed at tip, and have no wide gap between them when closed, and the fixed finger is shorter and deeper than the dactylus, the dactylus is nearly twice as long as the upper border of the palm, and in the male its upper border is milled with about 14 or 15 lamellæ.

Legs markedly unequal: the third pair, which are the longest, are not quite twice as long as the carapace. In all, the meropodites are thin and broad, and the dactyli are not two-thirds as long as their propodites.

In the Indian Museum are a male and two females from the Nicobars. The carapace of the largest is 19 millim. in either diameter.

117. *Olistocœloma merguianse*, de Man.

*Olistocœloma merguianse*, de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 195, pl. xiii. fig. 10, and Notes Leyden Mus. XII. 1890, p. 92: and Zool. Jahrb., Syst., IX. 1895-97, p. 339, and X. 1898, pl. xxxi. fig. 40.

This species differs from *C. balansæ* in the following particulars:—

(1) the carapace is decidedly broader than long, its lobulations are not nearly so bold and convex, and the outer post-frontal lobules may be entire:

(2) the free edge of the front is not turned up to form a trenchant horizontal crest, although it is well defined:

(3) the chelipeds of the male are far more massive than any of the legs; the inner border of the arm is dilated distally; the palm is a good deal swollen, the pectinate crest that traverses its upper surface is longer, and its inner surface is more granular; the fingers are more widely separated when closed, and the lamellar tubercles along the upper border of the dactylus are more numerous:

(4) it is a smaller species.

In the Indian Museum are 10 specimens from the Nicobars: the carapace of the largest egg-laden female is 10 millim. long and 12 broad.

#### METAPLAX, Edw.

*Metaplas*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XVIII. 1852, p. 161.

*Rhaconotus*, Gerstaecker, Archiv f. Naturges. XXII. 1856, i. p. 140, and Kingsley, Proc. Ac. Nat. Sci. Philad., 1880, p. 213.

*Metaplas*, de Man, Journ. Linn. Soc., Zool., XXII. 1888, pp. 153-155.

Carapace quadrilateral, somewhat depressed, a good deal broader than long, the regions well or fairly defined and the cervical and branchial grooves distinct.

Front declivous, its breadth about a third or a fourth that of the carapace, the convexity of its free edge impinges on the epistome to help in forming the broad interantennular septum.

Lateral borders of the carapace straight, or a little arched anteriorly, nearly parallel, cut into 4 or 5 teeth of which the last one or two are very inconspicuous. The posterior part of the sidewalls of the carapace with some hairs curving towards the incurrent branchial opening.

Orbits of good depth: their outer wall incomplete, their lower border crenulate: the eyes do not fill the orbits and the eyestalks are not prolonged.

The antennules fold nearly transversely: the septum between them is broad. The antennæ lie in the orbital hiatus, their basal joint is extremely short, their flagellum is of fair length.

Epistome short, but well defined and prominent: buccal cavern squarish: the external maxillipeds leave between them a large rhomb-

oidal gap, in which the mandibles are exposed: a broad oblique groove, bounded internally by a line of hairs, runs from a point behind the antero-external angle of the ischium to the anterior edge of the merus: the merus is truncated, and the foliaceous propodite articulates near its antero-external angle.

The chelipeds differ very markedly in the sexes: in the female they are shorter and slenderer than the legs, but in the male they are longer and much more massive than the legs. In the male there is always a short oblique horny crest, either on or close to and parallel with, the inner border of the arm, as in many species of *Macrophthalmus*: it probably, as Dr. de Man suggests, is scraped against the lower border of the orbit to produce a musical sound.

Legs slender, the first and last pairs much shorter than the 2nd and 3rd pairs—the 3rd pair the longest.

The abdomen in the male does not quite cover the sternum between the bases of the last pair of legs: it may have all 7 segments distinct, or, rarely, the 3rd 4th and 5th segments may be fused together: in the female all 7 segments are separate and the 7th is small and deeply impacted in the 6th, as in *Sesarma*.

*Distribution*: Estuaries and mudflats of the Oriental littoral.

The species of *Metaplex* have many points of resemblance with the Ocypodoid genus *Macrophthalmus*, and this is all the more likely to lead to confusion as the two genera share the same habitat and have the same manner of life; but there is no doubt of the true position of *Metaplex* among the *Sesarminæ*.

#### Key to the Indian species of *Metaplex*.

- I. Anterior border of carpi and propodites of legs spiny: chelipeds in the male 3 times the length of the carapace..... *M. crenulata*.
- II. Anterior border of carpopodites and propodites of legs smooth: male chelipeds less than 3 times the length of the carapace:—
  1. Dactylus of cheke of male without any prominent lobe on its dentary edge: chelipeds of male equal:—
    - i. 3rd 4th and 5th abdominal segments fused together in the male..... *M. indica*.
    - ii. All the abdominal segments separate:—
      - a. Length of the carapace about three-fourths the breadth: orbital portion of lower border of orbit with 4 or 5 teeth... *M. dentipes*.
      - b. Length of the carapace less than three-fourths the breadth: orbital portion of lower border of orbit with 9 or 10 teeth... *M. distincta*.

Dactylus of chelæ of male with a prominent lobe projecting on the dentary edge: chelipeds of male markedly unequal:—

- i. Palm of larger cheliped of male longer than high. *M. elegans*.
- ii. Palm of larger cheliped of male higher than long. *M. intermedia*.

118. *Metaplaux indica*, Edw.

*Metaplaux indicus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 161, and Archiv. du Mus. VII. 1855, p. 165, pl. xi. figs. 2-2c.

Carapace about two-thirds as long as broad, deepish, a little convex, its surface smooth, the regions and the cervical and epibranchial grooves faint.

Front about a third the greatest breadth of the carapace. Lateral borders of the carapace nearly straight, cut into 4 teeth, of which the first 2 are large, the 3rd very small, and the 4th very inconspicuous.

Lower border of the orbit of the male continued to the level of the first notch in the lateral border of the carapace, unevenly crenulate.

Chelipeds of the male equal, more than  $2\frac{1}{2}$  times the length of the carapace, smooth and unarmed, to the naked eye: arm long and slender, projecting far beyond the carapace, its muscular crest is almost on the inner border, close to its proximal end: palm nearly twice as long as high, increasing in height from its proximal to its distal end: fingers slender, acute, not noticeably channelled and only moderately incurved, neither of them have any large lobes on their dentary edge, the dactylus is hardly shorter than the upper border of the palm, and though it is deflexed is not hooked.

Legs quite unarmed, the carpopodites and propodites of the two middle pairs remarkably tomentose: the third pair of legs are a little more than twice as long as the carapace.

The 3rd 4th and 5th abdominal segments of the male are fused together—though the sutures are not obliterated on either side, but only in the middle—to form a single piece.

In the female the chelipeds are very slender, quite smooth, a little longer than the carapace, and the lower border of the orbit is finely and evenly serrulate.

In the Indian Museum are a male and a female from Karachi: the carapace of the male is 10 millim. long and 14.5 millim. broad.

119. *Metaplaux distincta*, Edw.

*Metaplaux distinctus*, Milne Edwards, Ann. Sci. Nat., Zool., (3) XVIII. 1852, p. 162, pl. iv. fig. 27: de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 158, pl. x. figs. 7-9: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 391.

Differs from *M. indica* in the following characters:—

(1) the carapace is more than two-thirds—nearly three-quarters—as long as broad :

(2) the lower border of the orbit of the male is prolonged to the level of the second notch in the lateral border of the carapace, and its orbital portion is cut into 9 or 10 little, blunt, obscurely-bilobulate teeth, which decrease very regularly in size from within outwards :

(3) the chelipeds of the male are hardly  $2\frac{1}{2}$  times the length of the carapace; the arm has denticulate borders—the inner border being a little dilated distally—and is not elongate and slender, its muscular crest runs obliquely away from the inner border and is nearer to the middle of that border: the palm is only about half again as long as high: the fingers are obliquely-truncated and channelled at tip, the fixed finger has a lobe (though not a very large one) on its dentary edge, the dactylus is hardly shorter than the upper border of the palm and has a strong hook-like curve :

(4) the anterior border of the meropodites of the legs is armed, in the first and last pairs with a single subterminal spine, in the middle two pairs with several spines; the tomentum on the carpopodites and propodites of the middle two pairs of legs is not so thick :

(5) the abdomen of the male consists of 7 separate segments.

In the Indian Museum are 8 specimens from Madras, Coconada, Mergui, and the Nicobars: the carapace of the largest male is 15 millim. long and 21 broad.

#### 120. *Metaplaea dentipes* (Heller).

*Helice dentipes*, Heller, Novara Crust. p. 62, pl. v. fig. 5: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 220.

*Metaplaea dentipes*, de Man, Journ. Linn. Soc., Zool., XXII, 1888, p. 162, pl. xi. figs. 1-3.

This is little more than a large variety of *M. distincta*, from which it differs in the following particulars:—

(1) the carapace is less transverse, its length being slightly more than three-fourths of its breadth :

(2) the lower border of the orbit of the male is divided, in its orbital portion, into 4 or 5 blunt, broad, compressed teeth decreasing in size from within outwards, and each tooth has a little cusp at its outer end :

(3) in the chelipeds, the inner border of the arm is more dilated distally; the lobe on the dentary edge of the fixed finger is not so convex, and the dactylus is as long as the upper border of the palm

and is not so strongly hooked; the dactylus also sometimes has an enlarged tooth—not a distinct lobe—near the middle of its dentary border:

(4) the anterior border of the meropodites of the legs is very often quite free from spines, but sometimes there are inconspicuous spinules where spines exist in *M. distincta*.

In the Indian Museum are 23 specimens from the banks of the Hooghly, the mud-flats of Arakan and Tenasserim, and Mergui. The carapace of a large male is a little over 21 millim. long and 29 millim. broad.

#### 121. *Metaplaea elegans*, de Man.

*Metaplaea elegans*, de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 164, pl. xi. figs. 4-6, and Zool. Jahrb., Syst., VIII. 1894-95, p. 596.

*Metaplaea crassipes*, de Man, in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 325, pl. xix. fig. 12 (*ipso teste*).

Resembles *M. indica* in the form of the carapace, but can be recognized by the following characters:—

(1) the grooves of the carapace are fainter:

(2) the lower border of the orbit instead of being irregularly cut into dentiform lobules is very finely and regularly pectinate:

(3) the chelipeds in the male are not  $2\frac{1}{2}$  times as long as the carapace and are distinctly unequal, the hand of one being decidedly larger than its fellow: the arm is not elongate, its edges are granular, and its musical crest, which is very fine, stands at the middle of the inner border, running obliquely parallel with that border: the larger palm is only a little longer than high and its inner surface is granular, its fingers are obliquely truncate and strongly channelled, and both of them have a lobe near the middle of their dentary border, the dactylus also is strongly curved, at any rate in the larger hand:

(4) in the first pair of legs the meropodites have a single subterminal spine on the anterior border, in the 2nd pair there are from three to six spines, and in the 3rd and 4th pairs from seven to ten: moreover at the extreme distal end of the posterior border of the meropodites of the two middle pairs of legs there may be two or three spinules:

(5) the abdomen of the male is broader, and has all 7 segments separate.

In the Indian Museum are 32 specimens from the Godavari Delta and from Mergui: the carapace of the largest male is 10.5 millim. long and 16 broad.

122. *Metaplas intermedia*, de Man.

*Metaplas intermedius*, de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 166, pl. xi. figs. 7-9.

Differs from *M. indica* in the following characters:—

(1) In the male the lower border of the orbit is continued a little beyond the first notch in the antero-lateral border of the carapace, and at its inner end it is cut into a series of 5 or 6 little even teeth that decrease in size from within outwards, and then it gradually becomes minutely and regularly pectinate:

(2) the chelipeds of the male are markedly unequal, the difference in size being in the hand: their length is about  $2\frac{1}{2}$  times that of the carapace: the arm is of no great length and is somewhat broadened across the middle, its edges are granular, and its muscular crest lies in the middle of the inner border, close to and nearly parallel with that border: the palm has granular edges and is much compressed at its antero-inferior corner; in the larger cheliped *the hand is at least as high as long*: the fingers are obliquely truncated and strongly channelled; in the larger hand the dactylus is hooked and has a lobe on its cutting edge near the proximal end, while the fixed finger is broad, is thin and compressed at its basal end, and presents on its cutting edge a notch (corresponding with the lobe on the dactylus) followed by a high lobe that descends obliquely to the tip of the finger:

(3) near the far end of the anterior border of the meropodites of the legs is a spine:

(4) the abdomen of the male has all 7 segments distinct, and is rather broadly triangular.

In the Indian Museum are 11 specimens from the Godavari Delta, the Gangetic Delta and Mergui. The carapace of the largest male is  $9\frac{1}{2}$  millim. long and 15 broad.

123. *Metaplas crenulata*, Gerstaecker.

*Rhaconotus crenulatus*, Gerstaecker, Arch. f. Naturges. XXII. i. 1856, p. 142, pl. v. fig. 5: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 213.

*Metaplas crenulatus*, de Man, Journ. Linn. Soc., Zool., XXII. 1888, p. 156, and Zool. Jahrb., Syst., IV, 1889, p. 439.

Carapace about three-fourths as long as broad, convex, with the regions well defined and the cervical and epibranchial furrows deep and coarse, its surface pitted.

Front about a fourth the greatest breadth of the carapace. Lateral borders of the carapace cut into five teeth, the edges of which are serrated; the anterior part of the lateral borders is distinctly arched.

The lower border of the orbit, in the male, extends beyond the first notch of the lateral border of the carapace, its inner end is sharp entire and sinuous, but all the rest of its extent is elegantly beaded.

Chelipeds of the male three times the length of the carapace, the borders of the wrist and hand, and the inner border of the wrist, sharply granular or serrulate: arm long and slender, somewhat dilated at its proximal end, the muscular crest close to the proximal end and almost on the inner border: the palm gradually increases in height from behind forwards, its greatest height is about half its length, along the middle of its inner surface is a row of granules ending in a granular patch: fingers slender, acute, incurved, not channelled, the extreme length of the dactylus is only about three-fourths that of the upper border of the palm: there are no prominent lobes on the dentary edges of the fingers.

Both borders of the meropodites of the legs, as well as the anterior border of the carpopodites and propodites, are spinulate. The third pair of legs are nearly as long as the male chelipeds.

In the abdomen of the male, which is narrow, all 7 segments are distinct, the penultimate segment being square.

In the female the chelipeds are very slender and are about  $1\frac{1}{2}$  times the length of the carapace, and the lower border of the orbit is elegantly pectinate.

In the Indian Museum are 11 specimens from the Sunderbunds and Mergui. The carapace of the largest male is 30 millim. long and 40 broad.

#### Sub-family PLAGUSIINÆ, Dana.

##### PLAGUSIA, Latreille.

*Plagusia* (part), Latreille, Gen. Crust. et Ins. p. 33 (1806): Desmarest, Consid. Gen. Crust. p. 126 (part): De Haan, Faun. Japon. Crust. p. 31: Milne Edwards (part), Hist. Nat. Crust. II. 90, and Ann. Sci. Nat. Zool., (3) XX. 1853, p. 178: Miers, Ann. Mag. Nat. Hist. (5) I. 1878, p. 148, and Challenger Brachyura, p. 271: Kingsley, Proc. Ac. Nat. Sci. Philad., 1880, pp. 189, 223.

*Philyra*, De Haan, l.c. *supra*.

Carapace subcircular, depressed, the antero-lateral borders toothed. The interorbital space is broad, being nearly a third the greatest breadth of the carapace; but there is no true front, so that the antennular fossæ, into which the antennules fold nearly vertically, are visible in a dorsal view as deep clefts in the anterior border of the carapace. The interantennular septum is broad. Orbits deep: the antennæ stand in the wide orbital hiatus, their flagellum is short.



Epistome short: buccal cavern squarish, its anterior border is crenate and projects strongly in a horizontal direction. The external maxillipeds do not meet across the buccal cavern, but the space between them, which is not very broad, is occluded by bristles: their merus is as broad as the ischium and carries the palp at its summit: *their exognath has no flagellum.*

Chelipeds and legs dorsally rugose. Chelipeds subequal: in the male they are more massive than the legs, and longer than those of the first and last pairs, in the female they are shorter and slenderer than any of the legs: the fingers are stout and have rounded hollowed-out tips.

Legs very stout, with broad massive meri and short stout serrated dactyli.

The abdomen of the male is triangular and rather broad: it covers all the sternum between the last pair of legs, and it may have all 7 segments distinct or the 3rd 4th and 5th fused. In the female the abdomen is broad and consists of 7 segments, but the 3rd 4th and 5th do not move independently of one another.

*Distribution*: all warm seas, and extending into the Mediterranean.

In habit the *Plagusia* to a certain extent resemble the *Grapsi*, dodging about rocks that are awash at high tide, and hiding in crannies when pursued. They also resemble *Varuna* in being able to make themselves at home on drift timber in the open sea. This will account for the very wide range of some of the species.

The presence of two species in the Mediterranean implies nothing, of itself, for they may very probably have been carried there by ships. On the "Investigator" one could always see a *Plagusia* adhering to the ship's side near the water-line.

#### 124. *Plagusia depressa* var. *squamosa* (Hbst.).

? *Cancer depressus*, Herbst (*nec* Fabr.), Krabben &c. I. ii. 117, pl. iii. figs. 35 a-b.

*Cancer squamosus*, Herbst, I. ii. 260, pl. xx. fig. 113 (v. Hilgendorf, SB. Ges. Nat. Freunde, 1882, p. 24).

*Plagusia squamosa*, Latreille, Gen. Crust. p. 34, and Nouv. Dict. Hist. Nat. XXVI. p. 533, and (?) Encycl. Méthod. X. 1825, p. 145: Lamarck, Hist. Nat. Anim. Sans Verh. p. 246: Milne Edwards, Hist. Nat. Crust. II. 94: Krauss, Sudafr. Crust. p. 42: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 178: Heller, SB. Akad. Wien, XLIII. 1861, p. 363, and Novara Crust. p. 51: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 298: Richters, in Möbius, Meeresf. Maurit. p. 157: Hilgendorf, SB. Ges. Nat. Freunde, Berlin, 1882, p. 24.

*Plagusia tuberculata*, Lamarck, l. c. p. 247: Latreille, Encycl. Méthod. X. p. 146: Milne Edwards, l. c. p. 94: Miers, Ann. Mag. Nat. Hist. (5) I. 1878, p. 148: Haswell, Cat. Austral. Crust. p. 110: Müller, Verh. Ges. Basal, VIII. 1886, p. 476: de Man, Notes Leyden Mus. V. 1888, p. 168, and Zool. Jahrb., Syst., IX. 1895-97,

p. 358 : Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 730 : M. J. Rathbun, P. U. S. Nat. Mus. XXI. 1898, p. 605.

*Plagusia immaculata*, Lamarck, l. c. p. 247 : Miers, l. c., p. 150, and Challenger Brachyura, p. 273, pl. xxii. fig. 1 : Haswell, l. c. : de Man, Archiv für Naturges. LIII. 1887, i. p. 371 : Cano, Boll. Soc. Nat. Napol. III. 1889, p. 246 : Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 391 : Ortmann, l. c. : Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 271.

*Plagusia depressa*, Latreille (nec Fabr.), Encycl. Méth. X. 145 : Milne Edwards, Hist. Nat. Crust. II. 93, and Ann. Sci. Nat., Zool., (3) XX. 1853, p. 179 : Heller, Novara Crust. p. 51.

*Plagusia orientalis*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 103, and Ann. Lyc. Nat. Hist. New York, VII. 1860, p. 231.

All the regions of the carapace are distinct, and the surface is covered with flat pearly or squamiform tubercles which are fringed anteriorly with little close-set bristles of uniform length.

The tubercles vary: sometimes they are prominent, sometimes depressed, and sometimes they are almost obsolete on the most convex portions of the carapace. The little fringes of bristles also vary: sometimes they fill all the space between the tubercles, sometimes they can only be made out with a lens, sometimes they are absent.

The antero-lateral border of the carapace is armed with four teeth (including the orbital angle) which decrease in size from before backwards. The epistome is prominent beyond the anterior border of the carapace and is usually cut into seven lobes.

The chelipeds of the adult male are massive and are about half again as long as the carapace, but in the female they are slender and only about as long as the carapace. The inner angle of the wrist is coarsely dentiform: the tubercles on the upper surface of the palm and dactylus are arranged in high relief in longitudinal rows, those on the outer surface of the palm—especially at the upper part of it—have a tendency to fall into transverse rows.

On the posterior edge of the dorsal surface of the basipodites of the legs is a subacute tooth or blunt lobe with entire edges, this tooth being most conspicuous in the 2nd and 3rd pair of legs: on the anterior border of the meropodites there is a single strong spine, subterminal in position: the upper surface of the carpopodites propodites and dactyli is traversed longitudinally by a dense strip of long bristles. The 3rd pair of legs, which are the longest, are not quite twice the length of the carapace.

In the Indian Museum are 31 specimens from the Bay of Bengal and Arabian Sea: many of them were taken from drift timber in the open sea. Old specimens are commonly encrusted with barnacles and acorn-shells. The largest specimen in the collection has a carapace 54 millim. long and 56 broad.

## LIOLOPHUS, Miers.

*Leiolophus*, Miers, Cat. Crust. New Zealand, p. 46 (1876), and Ann. Mag. Nat. Hist. (5) I. 1878, p. 153.

*Acanthopus*, De Haan, Faun. Japon. Crust. p. 39: Dana, U.S. Expl. Exp. Crust. pt. I. p. 372: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 180 (*nom. præocc.*).

As in *Plagusia*, the antennæ fold nearly vertically in deep slits—visible in a dorsal view—cut in the anterior border of the carapace, the slits dividing the interorbital space into three deep lobes; and the exognath of the external maxillipeds has no flagellum.

The difference from *Plagusia* is as follows:—

The carapace is extremely flat and depressed—being quite disk-like—and is longer than broad: the interantennular septum is of no great breadth: the epistome is almost linear: the merus of the external maxillipeds is very small, being much narrower than the ischium, and is disposed obliquely in repose: the chelipeds and legs, though in places spiny, are not rugose: the legs are much slenderer, and though the meropodites are broad they are very thin: the copulatory organ of the male ends in a claw: finally, the exognath of the external maxillipeds is extremely short and slender.

As in the Indian species of *Plagusia*, the abdomen of the male consists of 5 segments, the 3rd 4th and 5th being fused. The abdomen of the female is similar in this respect to that of the male,

*Distribution*: as *Plagusia*, but not in the Mediterranean.

125. *Leiolophus planissimus* (Hbst.).

*Cancer planipes*, Seba, Thesaurus III. p. 49, pl. xix. fig. 21 (1758).

*Cancer planissimus*, Herbst, Krabben &c. III. iv. 3, pl. lix. fig. 3 (1804).

*Plagusia clavimana*, Latreille, Gen. Crust. p. 34: Lamarck, Hist. Nat. Anim. Sans Vert., Crust., p. 247: Desmarest, Dict. Sci. Nat. XXVIII. p. 246: Latreille, Encycl. Méthod. X. p. 146: Desmarest, Consid. Gen. Crust. p. 127, pl. xiv. fig. 2: Milne Edwards, Hist. Nat. Crust. II. 92, and in Cuvier, Règne Animal, Crust. pl. xxiii. fig. 3: Hess, Archiv f. Nat. XXXI. 1865, i. p. 154: Desbonne et Schramm, Crust. Guadaloupe, p. 50: Richters in Möbius' Meeresf. Maurit. p. 157.

*Plagusia serripes*, Lamarck, *loc. cit.*: Latreille, Encycl. Méthod. *loc. cit.*

*Acanthopus planissimus*, De Haan, Faun. Japon. Crust. p. 30: Dana, U. S. Expl. Exp. Crust. pt. I. p. 372: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. p. 180: Heller, SB. Ak. Wien, XLIII. 1861, p. 364: Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1862, p. 232: Heller, Novara Crust. p. 51: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 299: Brocchi, Ann. Sci. Nat., Zool., (6) II. 1875, Art. 2 (*male appendages*): Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 31 (*gastric teeth*).

*Acanthopus clavimanus*, Krauss, Sudaf. Crust., p. 42.

*Acanthopus gibbesi*, Milne Edwards, Ann. Sci. Nat. Zool. *loc. cit.*

*Leiolophus planissimus*, Miers, Cat. Crust. N. Z. p. 46, and Ann. Mag. Nat. Hist. (5) I. 1878, p. 153, and P. Z. S. 1879, p. 38, and Zool. H. M. S. Alert, pp. 518, 545:

Filhol, Crust. N. Z., Miss. Pile Campbell, p. 894: Haswell, Cat. Austral. Crust. p. 112: Müller, Verh. Ges. Nat. Basel, 1886, p. 476: de Man, Arch. f. Nat. LIII. 1887, i. p. 372, and Notes Leyden Mus. XV. 1893, p. 287, and Zool. Jahrb., Syst., IX. 1895-97, p. 358: Pocock, Journ. Linn. Soc., Zool., XX. 1890, p. 513: Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 391: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 731: Whitelegge, Mem. Austral. Mus. III. 1897, p. 139: M. J. Rathbun, Ann. Inst. Jamaica, I. 1897, p. 36.

Carapace thin, disk-like, covered with little short bristles which, however, leave certain symmetrical raised linear patches bare: the meropodites of the legs are clad in the same way, and have two long bare stripes.

The front, the antennular and supra-orbital angles, and the epistome are all acutely spinous: the antero-lateral border of the carapace is armed with 4 acute spines: the middle of the upper border of the orbit is more or less serrate. The eyes are large and reniform.

The chelipeds vary according to age and sex, but the arm and wrist are always armed with spines; the palm is smooth, nude, oval, and somewhat compressed; and the fingers are short, blunt, and hollowed at tip. In the adult male the palms, or one of them, are remarkably deep.

The anterior border of the meropodites of all the legs is armed along its whole length with remarkably large and even spines, the posterior border ends in a spine: in the case of the first two meropodites there is a second row of spinules parallel with the anterior border, but this is very indistinct in the meropodites of the 3rd pair, and quite absent in those of the 4th.

The colour in life is dark green, the nude streaks being bright green. In the Indian Museum are 36 specimens from the Andamans, Ceylon, and Laccadives: the carapace of the largest is 23 millim. long and 21 broad.

### Family GEOCARCINIDÆ, Dana.

#### Key to the Indian Genera.

- I. Fronto-orbital border more than half the maximum breadth of the carapace: interantennular septum broad: epistome well defined and prominent: dactyli of legs with 4 rows of spines:—
  1. Buccal cavern not elongate: exognath of external maxillipeds without a flagellum: opposed edges of the basal joints of the 2nd and 3rd pairs of legs heavily fringed with hair much as in *Ocyropa*:—
    - i. Antero-lateral borders of carapace dentate..... GRAPSODES.
    - ii. Antero-lateral borders of carapace entire..... EPIGRAPSUS.

2. Buccal cavern elongate : exognath of external maxillipeds with a flagellum : no hairy fringe on the basal joints of the 2nd and 3rd pairs of legs..... CARDIOSOMA.
- II. Fronto-orbital border less than half the greatest breadth of the carapace : interantennular septum narrow : epistome ill-defined and sunken : dactyli of legs with 6 rows of spines : exognath of external maxillipeds without a flagellum..... PELOCARCINUS.

**GRAPSODES, Heller.**

*Grapsodes*, Heller, *Novara Crust.* p. 58 : Kingsley, *Proc. Ac. Nat. Sci. Philad.* 1880, pp. 188, 197.

Carapace depressed, little broader than long, declivous anteriorly, the regions faintly indicated, the dorsal surface without ridges or wrinkles, the lateral borders well arched and irregularly dentate.

Front about half the width of the anterior border, or about a third the greatest breadth of the carapace, strongly deflexed, its free edge nearly straight.

Orbits small, shallow, the lower border is wanting except for the tooth at the inner angle. The antennules fold nearly transversely in fossæ which are widely open externally : interantennular septum very broad. Antennal flagella slender and very short, standing in the orbital hiatus.

Epistome of moderate length fore and aft. External maxillipeds having a rhomboidal gap between them, in which the mandibles are visible : the merus is narrower than, but about the same length as, the ischium, and is a little oblique : the palp, which though coarse is small, articulates at the antero-external angle of the merus.

Chelipeds in both sexes subequal : in the male they are very much more massive than the legs and longer than the first and last pairs : in the female they are relatively shorter and much less massive than in the male. The tips of the fingers are acute.

Legs stout, their joints are not particularly broad or compressed but have their edges armed with stout bristles : the dactyli are long, acute, and thorny. The 2nd and 3rd pair of legs are the longest, and between their bases is a recess fringed with hairs resembling that found in *Ocypoda* and *Gelasimus*, and probably indicating terrestrial or amphibious habits.

The abdomen in both sexes consists of seven segments, and in the male its base covers all the breadth of the sternum between the last pair of legs.

*Distribution* : Islands of East Indian Archipelago.

This genus is really identical with *Epigrapsus* (= *Nectograpsus*), from which it only differs in having the regions of the carapace even more indistinct, the lateral borders of the carapace entire, the male chelipeds remarkably unequal, and the dactylus of the legs alone hirsute.

126. *Grapsodes notatus*, Heller.

*Grapsodes notatus*, Heller, Novara Crust. p. 58, pl. v. fig. 2: Miers, P. Z. S. 1877, p. 136: J. S. Kingsley, Proc. Ac. Nat. Sci. Philad., 1880, p. 197: de Man, Notes Leyden Mus. V. 1883, p. 160.

Carapace five-sixths as long as broad, the regions defined, though faintly, the surface smooth except sometimes for some granules near the lateral borders. The antero-lateral borders are cut into three shallow teeth or lobes behind which are some inconspicuous crenulations. On the line of flexion of the front are two eminences separated by a notch. Epistome and pterygostomian regions tomentose.

The chelipeds differ considerably in the sexes, though always smooth. In the adult male they are nearly twice the length of the carapace, the inner angle of the wrist is pronounced but not spiniform, the palm (which is as high as long) has a strong bulge at the infero-posterior angle, the dactylus (which is twice as long as the upper border of the palm) is much longer than the immobile finger and closes very obliquely, and there are two molariform teeth, one near the base of the dactylus, the other nearer the tip of the immobile finger.

In the female the chelipeds are hardly  $1\frac{1}{2}$  times the length of the carapace, the inner angle of the wrist is dentiform or spiniform, the palm is not enlarged or inflated, and the fingers are of nearly equal length, meet in the greater part of their extent, and are finely denticulated except near the tips.

The second pair of legs, which are the longest, are about twice the length of the carapace, the third pair are a little shorter than the second, and the first and last pair are about  $1\frac{1}{2}$  times the length of the carapace.

In the Indian Museum are 8 specimens from the Nicobars. The carapace of the largest male is 25 millim. long and 30 millim. broad, but a female is somewhat larger than this.

That this species is probably terrestrial is evidenced by the vaulted branchial cavities, and also by the folding of the membrane that lines them, which is practically the same as that of *Ocypoda*, *Cardiosoma*, and *Pelocarcinus*.

## EPIGRAPSUS, Heller.

*Epigrapsus*, Heller, Verh. zool.-bot. Ges. Wien, XII. 1862, p. 522: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, pp. 188, 192: Miers "Challenger" Brachyura, p. 265.

*Nectograpsus*, Heller, Novara Crust. p. 56.

This genus is really identical with *Grapsodes*, from which it differs in no single point of importance.

The trivial characters that separate it from *Grapsodes* are the following:—

The regions of the carapace are hardly distinguishable, and the lateral margins are entire: the chelipeds in the male are markedly unequal, one of them being longer and vastly more massive than the legs, the other being hardly larger than those of the female (which resemble those of *Grapsodes*): though the legs resemble those of *Grapsodes* in proportions and in the singular length of the dactyli, they differ in having only the terminal joint hirsute.

*Distribution*: Islands of the East Indian Archipelago and Polynesia.

127. *Epigrapsus politus*, Heller.

*Epigrapsus politus*, Heller, Verh. zool.-bot. Ges. Wien, XII. 1862, p. 522: Kingsley, Proc. Ac. Nat. Sci. Philad. 1880, p. 192: Miers, Challenger Brachyura, p. 266: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 703: de Man, Zool. Jahrb. Syst. IX. 1895-97, p. 79.

*Nectograpsus politus*, Heller, Novara Crust. p. 57, pl. v. fig. 3.

Carapace about seven-eighths as long as broad, perfectly smooth, the outer orbital angle not pronounced and the lateral margins entire in the adult. The line of flexion of the front is a little concave in the middle. Epistome and pterygostomian regions tomentose.

Chelipeds smooth, equal in the female, markedly unequal in the male. In the male the larger cheliped is more than twice the length of the carapace, the inner angle of the wrist is not pronounced, the palm is about as high as long and has a strong bulge at its postero-inferior angle, the dactylus is much longer than the immobile finger, and the dactylus has 2 or 3 small molariform teeth while the immobile finger has a single one.

In the female the chelipeds are little longer than the carapace, have the inner angle of the wrist pronounced, the palm not enlarged or inflated, and the fingers finely and inconspicuously toothed and nearly equal in length.

The smaller cheliped of the male is but little larger than those of the female.

Of the legs the 2nd pair are the longest, being twice the length of the carapace, and the 3rd pair are slightly shorter: the 1st pair are nearly  $1\frac{1}{2}$  times, the 4th pair about  $1\frac{1}{3}$  times the length of the carapace.

In the Indian Museum are 4 specimens, from the Andamans and Nicobars: the carapace of the largest male is 14 millim. long and 16 millim. broad.

#### CARDIOSOMA, Latreille.

*Cardisoma*, Latreille, Encycl. Méthod. X. p. 685 (1825): De Haan, Faun. Japon. Crust. p. 27: Milne Edwards, Hist. Nat. Crust. II. 22, and Ann. Sci. Nat. Zool. (3) XX. 1853, p. 203: Smith, Trans. Connect. Acad. Sci. II. 1870, p. 142: Miers, Challenger Brachyura, p. 219: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 732.

? *Discoplas*, A. Milne Edwards, Ann. Soc. Entom. France, (4) VII. 1867, p. 243, and Nouv. Archiv. du Mus. IX. 1873, p. 293.

Carapace deep, convex fore and aft, transversely oval, with the lateral borders tumid and strongly arched owing to the vault-like expansion of the gill-chambers, the pterygostomian regions densely tomentose.

The fronto-orbital border is much more than half, and the deflexed and nearly straight front is about a fourth, the greatest breadth of the carapace. Orbits deep, with the outer angle defined by a denticle, and with the tooth at the inner angle well developed but distant from the front: the eyes are very loose in the orbits.

The antennules fold obliquely beneath the front, by which they are a good deal concealed: the inter-antennular septum is very broad. The antennæ lie in the orbital hiatus, which their broad basal joint nearly fills: their flagellum is very short.

Epistome short, prominent and well defined: buccal cavern elongate squarish, the external maxillipeds do not close it but leave between them a rhomboidal gap in which the mandibles are exposed. In the external maxillipeds the merus is a longish joint and carries the palp, which is large and not at all concealed, at its antero-external angle: the exognath, which carries a flagellum, is exposed in much the greater part of its extent. The exognaths of the other maxillipeds are heavily fringed with coarse hair.

The chelipeds, which are much more massive than the legs, may either be equal or markedly unequal, differing little in the sexes: they alter considerably with age—one or both—the arm and fingers becoming elongated, and the whole hand increasing in size until it becomes longer than the carapace is broad and more than half as high as the carapace is long.

The legs are stout: some of their joints are fringed with bristles, and



their long strong dactyli are square in section and have a series of spines along all four edges.

The abdomen in both sexes consists of 7 separate segments, and in the male its base covers the whole width of the sternum between the last pair of legs.

The branchiæ are eight in number on either side: the gill chambers are vaulted and remarkably capacious, and they are lined by a thick vascular membrane folded to form a sort of pocket, and as in several other crabs—such as *Gelasimus* and *Ocypoda*—that spend most of their time out of water, a sort of “choroid process” of this membrane, shaped like a gill-plume, projects laterally over the pleura of the penultimate pair of legs.

The species of this genus live on land. They are very common in the jungles of the Andamans where they may be found in the day time crouching under roots, fallen logs, &c., sometimes in burrows near the shore.

*Distribution*: West Indies and neighbouring coasts of America, Cape Verde Is. and West Coast of Africa, Indo-Pacific from Madagascar to Chili.

#### Key to the Indian species of *Cardiosoma*.

- I. Carapace very strongly convex fore and aft, the regions indistinct: breadth of the orbit not much more than half its length: merus of the legs with bristles only at its distal end..... *C. carnifex*.
- II. Carapace very moderately convex fore and aft, the regions distinct: breadth of the orbit about two-thirds its length: merus of the legs with bristles along its whole length..... *C. hirtipes*.

#### 128. *Cardiosoma carnifex*, (Hbst.).

*Cancer carnifex* and *hydromus*, Herbst, Krabben etc. II. v. 163, 164, pl. xli. figs. 1, 2 (1794).

*Cardiosoma carnifex*, Latreille, Encycl. Méthod. X. p. 635: Milne Edwards, Hist. Nat. Crust. II. 23: Guérin, Icon. Règne An., Crust. pl. v. fig. 2: Dana, U. S. Expl. Exp. Crust. pt. I. p. 377: Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 204: Heller, Novara Crust. p. 35: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1863, p. 71, and IX. 1873, p. 264: Hoffmann, in Pollen and van Dam, Faun. Madagasc., Crust. p. 12: Brocchi, Ann. Sci. Nat., Zool., (6) II. 1875, Art. 2, p. 85, pl. xvii. figs. 117, 118 (*male appendages*): Miers, P. Z. S. 1877, p. 137, and Phil. Trans. 1879, p. 490, and Challenger Brachyura, p. 220: Hilgendorf, MB. Ak. Berl. 1878, p. 801: de Man, Notes Leyden Mus. II. 1880, p. 31, and in Weber's Zool. Ergebn. Niederl. Ost.-Ind. II. p. 285: Richters, in Möbius, Meeresf. Manrit. p. 157: Lenz and Richters, Abh. Senck. Nat. Ges. XII. 1881, p. 422: Taschenberg, Zeitschr. f.

Naturwiss. LVI. 1893, p. 171: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 380: Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 271.

*Cardisoma Guanhumis* var. *carnifera*, Ortmaun, Zool. Jahrb., Syst., VII. 1893-94, p. 735.

*Cardisoma obesum*, Dana, Proc. Ac. Nat. Sci. Philad. V. 1851, p. 252, and U. S. Expl. Exp. Crust. pt. I. p. 375, pl. xxiv. fig. 1: Milne Edwards, Ann. Sci. Nat., t.c. p. 205: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 100: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 114: P de Man, Notes Leyden Mus. II. 1880, p. 35.

*Cardisoma Urvillei*, Milne Edwards, Ann. Sci. Nat. t.c. p. 204: de Man, Notes Leyden Mus. t.c., p. 33.

Carapace strongly convex fore and aft, especially in the young, the regions are indicated by inequalities of level, but the posterior limit of the gastric region and the cardiaco-intestinal region are defined by grooves: the posterior areola of the gastric region is always tumid.

The antero-lateral border of the carapace is defined by a fine raised line, becoming indistinct with age, which is not continuous with the small tooth at the outer orbital angle, but starts at a little denticle of its own.

The sides of the front (inner boundaries of the orbit) are very oblique: the sinuous upper border of the orbit runs very slightly backward to the base of the outer orbital tooth: the greatest width (height) of the orbit is little more than half the length of that cavity. The basal antenna-joint is large, touching the front.

The breadth of the buccal cavern, measured across the middle of the external maxillipeds, is equal to its length in the middle line.

In both sexes the chelipeds are unequal: they are smooth, except for a few small tubercles or wrinkles or denticles or granules along the edges of some of the joints: the inner angle of the wrist is dentiform, the palm is higher than long, especially in the larger hand, the stout fingers meet only at tip, especially in the larger hand.

The size of the larger cheliped varies with age. In adults of moderate size it is about twice the length of the carapace, the ischium hardly projects beyond the carapace, and the length of the dactylus is about equal to the height of the palm. In old specimens, especially in the male sex, it is about  $2\frac{3}{4}$  times the length of the carapace, the ischium projects far beyond the carapace, and the length of the dactylus is  $1\frac{1}{2}$  times the height of the palm.

In the legs there are stiff bristles, not very thickly set, at the distal end of the merus, on the anterior border and surface of the carpus and on both borders of the propodite.

The 7th segment of the male abdomen is half or less than half the length of the 6th, measured in the middle line.

In the Indian Museum there are 13 specimens from the Andamans and the Coromandel coast (besides specimens from Tahiti and Madagascar).

Ortmann considers that this form is only a variety of the West Indian *O. Guanhumii*, with which he regards the West African *O. armatum* as synonymous. So far as I can judge from single specimens of these two supposed species, I should think that this view is correct.

### 129. *Cardiosoma hirtipes*, Dana.

*Cardiosoma hirtipes*, Dana, Proc. Ac. Nat. Sci. Philad. 1851, p. 253, and U. S. Expl. Exp. Crust. pt. I. p. 376, pl. xxiv. figs. 2, *a-d*: Milne Edwards, Ann. Sci. Nat., Zool., (3) XX. 1853, p. 205: Hess, Archiv f. Naturges. XXXI. 1865, i. p. 140: Heller, Novara Crust. p. 35: Miers, Cat. Crust. New Zealand, p. 53: de Man, Notes Leyden Mus. II. 1880, p. 34, and Archiv f. Naturges. LIII. 1887, i. p. 349, pl. xiv. fig. 3: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 26 (*gastric teeth*): Filhol, Crust. N. Z. in Miss. Pile Campbell, p. 460: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 787: Whitelegge, Mem. Austral. Mus. III. 1897, p. 138: Nobili, Ann. Mus. Genov. (2) XX. 1899, p. 271.

*Discoplax longipes*, A. Milne Edwards, Ann. Soc. Entomol. France, (4) VII. 1867, p. 284, and Nouv. Archiv. du Mus. IX. 1873, p. 294, pl. xv. (*sec* Ortmann, *l.c.*).

This species is easily distinguished from *C. carnifex* by the following characters:—

(1) the carapace is much less convex, the regions are much more distinctly defined, and the gastric region is distinctly subdivided, by grooves, into 3 areolæ: moreover there are some fine oblique striæ on the sides of the epibranchial regions:

(2) the sides of the front, or inner boundaries of the orbit, are not nearly so oblique: the upper border of the orbit is less sinuous and runs slightly forwards to the outer orbital angle: the greatest width of the orbit is nearly two-thirds the length of that cavity. The basal antenna joint does not touch the front:

(3) the breadth of the buccal cavern, measured across the middle of the meri of the external maxillipeds, falls considerably short of the length measured in the middle line:

(4) the chelipeds may be unequal but are far more commonly equal, even in old specimens in which the palms and fingers have grown long and the palm become enlarged:

(5) the bristles on the legs are more thickly set, and they occur along the whole of the anterior border of the merus:

(6) the 7th segment of the male abdomen is more than half the length of the 6th, measured in the middle line.

In the Indian Museum are 16 specimens from the Nicobars and Andamans (besides 4 from the "South Seas" and Madagascar).

In life the carapace is dark violet and the chelæ bright cinnabar red.

#### PELOCARCINUS, Edw.

*Gecarcoidea*, Milne Edwards, Hist. Nat. Crust. II. 25 (1837).

*Pelocarcinus*, Milne Edwards, Ann. Sci. Nat. Zool. (3) XX. 1853, p. 209, and Archiv. du Mus. VII. 1854-55, p. 183: A. Milne Edwards, Nouv. Archiv. du Mus. (3) II. 1890, p. 171 (*et synonym.*).

*Hylæocarcinus*, Wood-Mason, J.A.S.B. XLII. 1873, pt. 2, p. 258, and Ann. Mag. Nat. Hist. (4) XIV. 1873, p. 189.

*Limnocarcinus*, de Man, Notes Leyden Mus. I. 1879, p. 65.

*Gecarcoidea*, Grtman, Zool. Jahrb., Syst., VII. 1893-94, pp. 732, 736.

Carapace transversely oval, somewhat depressed, with the lateral borders tumid and strongly arched owing to the vault-like expansion of the gill-chambers: the gastric region particularly well defined.

The extent of the fronto-orbital border is less than half the greatest breadth of the carapace, that of the strongly deflexed and nearly straight front is from a sixth to a seventh the greatest breadth of the carapace.

Orbits deep, broadly oval, demarcated dorsally by a sharpish slightly raised border, their outer angle not defined, a wide gap in their lower border: at the inner angle there is a strong tooth which may or may not, even in the same species from the same jungle, meet the front: if it does so, the antennæ, which are much reduced in size, are excluded from the orbit.

The antennules fold obliquely beneath the front, and the inter-antennular septum is not very broad.

Epistome sunken, hairy posteriorly so as to appear ill defined from the palate. Buccal cavern rounded anteriorly, not nearly closed by the external maxillipeds, which leave between them a wide rhomboidal gap in which the mandibles are exposed.

The external maxillipeds are rather short: their merus lies obliquely, and its anterior edge is excavated for the insertion of the palp, which is short and coarse and is completely exposed: their exognath is very short and almost entirely concealed and is without a flagellum. The exognaths of the other maxillipeds are heavily fringed with hair.

Chelipeds much more massive than the legs, usually equal in both sexes, though larger and longer in the male than in the female.

Legs stout: in all, the anterior border of the carpus and all the borders of the propodite and dactylus are spiny, there being six rows of spines on the dactylus.

The abdomen in both sexes consists of 7 separate segments, and in the male its base covers all the breadth of the sternum between the last pair of legs.

The gill-chamber and its lining membrane, and the number of branchiæ, are as in *Cardiosoma*.

The *Pelocarcini* are land-crabs. The single Indian species is very common in the jungles of the Andamans, where, especially on the smaller islets, it grows to a large size.

*Distribution*: Brazil, Andamans and Nicobars, Celebes, Philippines, New Guinea, Loyalty Is.

Ortmann (*l.c.*) throws doubt on the locality Brazil, but, as it appears to me, without sufficient reason, seeing that the elder Milne Edwards states definitely that the type of the species was found in that country by a collector of the Paris Museum. *Pelocarcinus* is by no means the only form of animal life that has this very curious and suggestive distribution, which we also find, among Mammals in the Tapirs, among Birds, as Mr. Finn informs me, in the Piculets of the genus *Picumnus*, among Reptiles in the *Ilysiidæ*, and among fishes in the freshwater eels of the genus *Symbranchus*.

### 130. *Pelocarcinus Humei* (Wood-Mason).

*Hylæocarcinus Humei*, Wood-Mason, Journ. As. Soc. Bengal, Vol. XLII, 1873, pt. 2, p. 260, pls. xv, xvi, and Ann. Mag. Nat. Hist. (4) XIV, 1874, p. 190.

Carapace transversely oval, becoming broader with age, its lateral borders tumid and ill defined. The gastric region is particularly well delimited and is divided into three subregions—two antero-lateral and one postero-median—the anterior two of which are separated from one another by a deep groove: the cardiac-intestinal region is fairly well defined.

In adults the carapace is smooth, except for some oblique striæ on the lateral borders, which become squamiform markings on the pterygostomial regions, these regions being devoid of tomentum.

Front nearly vertically deflexed, somewhat spatulate but with the free edge straight. The tooth at the inner angle of the orbit does not usually touch the front, but sometimes it does and excludes the small antennæ from the orbit.

The chelipeds in the adult male are usually equal and are about  $2\frac{1}{2}$  times the length of the carapace: the arm projects a long way beyond the carapace, and its upper and inner borders are rugose or irregularly tuberculate; the inner angle of the wrist is truncated; the palm is enlarged, its length is about  $1\frac{1}{2}$  times its height and about as long as the

dactylus; the fingers, though they only meet at tip, are not widely separated.

In the adult female the chelipeds are about  $1\frac{1}{2}$  times the length of the carapace: the arm projects but little, the hand is not much enlarged, and the fingers almost meet throughout their length.

In many young females the inner edge of the wrist is serrated and there are also a few denticles along the upper border of the palm.

The second pair of legs, which are the longest, are hardly twice the length of the carapace.

Colours in life: carapace violet with some dirty yellow markings: chelipeds and legs yellowish with a livid reddish tinge.

In the Indian Museum are specimens from the Nicobars and from numerous islands of the Andaman group. The largest one has a carapace 82 millim. long and 110 broad.

#### Family PALICIDÆ, Rathbun.

##### PALICUS, Philippi.

*Cymopolia*, Roux, Crust. Médit. pl. xxi. 1828: Milne Edwards, Hist. Nat. Crust. II. 158: Miers, Challenger Brachyura, p. 333 (*nom præocc.*).

*Palicus*, Mary J. Rathbun, Proc. Biol. Soc., Washington, XI, 1897, pp. 93, 165 ["Philippi, Zweiter Jahresber. d. Vereins f. Naturk. in Cassel, 11, 1838."].

Carapace depressed, broader than long, covered with granules and with symmetrical tubercles or rugosities that have a tendency to fall into transverse series.

Front about a third the greatest breadth of the carapace, little or not at all deflexed, usually lobed or toothed. Lateral borders of the carapace hardly curved, serrated anteriorly.

Orbits deep, the upper border is cut into several teeth by deep clefts, and there are usually two clefts in the lower border.

The antennules fold nearly transversely beneath the front: the interantennular septum is a narrow plate. The antennæ commonly have the basal joint, which stands in the orbital hiatus, enlarged: the flagellum is well developed.

Epistome sunken, not defined. Buccal cavern square. The external maxillipeds do not close the buccal cavern anteriorly: their merus is very small and is much narrower than the ischium: the ischium has its antero-internal angle and the merus its antero-external angle much produced: the palp articulates near the middle of the concave summit of the obliquely-placed merus.

Chelipeds short and usually slender in the female: in the adult male one of them may be enlarged—rarely both.

The two middle pairs of legs are much the largest: the first pair, except that they are much shorter and slenderer, resemble the middle pairs, but the fourth pair are weak, sometimes filiform, and are elevated above the third pair as in *Dorippe*, etc.

The abdomen in both sexes consists of 7 separate segments, the basal segments being very narrow fore and aft and the 1st linear.

In the female the genital openings are on the 2nd segment of the sternum close to the suture between it and the first.

*Distribution*: Atlantic coasts of Central America and of the United States, Cape Verde and Mediterranean, Indo-Pacific from Seychelles to California.

The Indian species of *Palicus* live among coral shingle at a depth of from 10 to 40 fathoms, where their mottled coloration and granular rugose carapace afford a good concealment.

*Key to the Indian species of Palicus.*

- I. Posterior border of the propodites and dactyli of the first 3 pairs of legs entire:—
  1. Front cut into two lobes:—
    - i. Lobes of front broad: propodites and dactyli of the two middle pairs of legs sub-foliaceous..... *P. Jukesii.*
    - ii. Lobes of front subacute: propodites and dactyli of the two middle pairs of legs compressed but not broadened ..... *P. Whitei.*
  2. Front cut into four lobes, the middle two sub-acute, the outer ones broad..... *P. Wood-Masoni.*
- II. Posterior border of the propodites and dactyli of the first 3 pairs of legs elegantly serrate:—
  1. Front cut into four blunt teeth: propodites and dactyli of the two middle pairs of legs broadly foliaceous ..... *P. serrripes.*
  2. Front cut into four acute teeth: propodites and dactyli of the two middle pairs of legs compressed but not foliaceous ..... *P. investigatoris.*

131. *Palicus Jukesii* (White).

*Cymopolia Jukesii*, White, in Jukes' Voy. H. M. S. "Fly," p. 338, pl. ii. fig. 1: Miers Zool. H. M. S. "Erebus" and "Terror," Crust. p. 3, pl. iii. figs. 4-4c, and Challenger Brachyura, p. 335: Haswell, Cat. Austral. Crust. p. 138: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 405.

Carapace with the regions well defined, and with the surface thrown into four transverse wrinkles, the two middle ones of which are the most convex and best defined: the whole surface is also closely

covered with vesiculous and crystalline granules, which are largest on the convexities.

Front divided into two broad rounded lobes: antero-lateral border of the carapace cut into three teeth including the orbital angle: posterior border of the carapace raised, but not cut into well-spaced lobules.

Upper border of the orbit with two deep notches between the inner and outer orbital angles, both of these angles having a concave margin: lower border with two deep notches. There is a leaf-like lobule on the granular eye-stalk, another at the outer angle of the basal antenna-joint, and another in the gap between the antenna and the outer angle of the buccal cavern. The exposed surface of the ischium of the external maxillipeds is obliquely traversed by two ridges which meet at the produced antero-internal angle of the joint.

The chelipeds of the *adult* male are granular and downy and are usually markedly unequal. The larger one is stout, is more than  $1\frac{1}{2}$  times the length of the carapace and has a swollen (subcylindrical) club-shaped palm of which the length is not twice the greatest height: the fingers are short and stumpy, the dactylus being little more than a third the length of the palm, and meet only at tip: the smaller cheliped of the male is short and slender, sometimes however it is almost as large as its fellow.

In the female the chelipeds are equal, are hardly longer than the carapace and hardly stouter than the last pair of legs: they have a palm which is as slender and nearly as long as the ischium, and incurved fingers which nearly meet throughout their length.

In the first 3 pairs of legs the merns is stout and broad with a granular dorsal surface and coarsely and unevenly serrulate edges, the anterior edge ending in a crest-like tooth; the carpus is dorsally carinate, and its anterior border has the form of a two-lobed carina; and the propodite and dactylus are subfoliaceous owing to the depth of the thin sharp carinae of their edges—these carinae being plumed. The 4th pair of legs are short weak and granular as far as the dactylus, which is much shorter than the propodite.

The 1st pair of legs are a little longer, the 4th pair a little shorter, than the carapace: the 2nd and 3rd pairs are about  $1\frac{2}{3}$  times the length of the carapace.

In both sexes all the abdominal terga, except the last, are transversely carinate, the carinae of the 2nd and 3rd terga being most conspicuous. Also on either side of the sternum there are two crests, one behind the base of the last pair of legs, the other almost in a line with the 3rd abdominal carina.



In the Indian Museum are 32 specimens, from the Andamans (up to 36 fath.), the Maldives (15-30 fath.), and Ceylon (34 fath.). The carapace of the largest female is 13 millim. long and 15 broad.

132. *Palicus Whitei* (Miers).

*Cymopolia Whitei*, Miers, Zool. H. M. S. "Alert," pp. 518, 551, pl. xlix. fig. C.

At once distinguished from *P. Jukesii*, which it closely resembles, by the sharper and more prominent lobes of the front, and by the slenderer form of the first 3 pairs of legs, in which the edges of the meri are not serrated, the anterior borders of the carpi are not cristiform, and the propodites and dactyli are not in any way subfoliaceous, their edges not being produced to form high thin carinæ.

Other differences, to be noted on closer inspection, are the following:—

The transverse arrangement of the rugæ of the carapace is not marked: the faint transverse carinæ of the 5th and 6th abdominal terga are absent.

In the Indian Museum are 2 adult females and a non-adult female, from the Andamans.

133. *Palicus Wood-Masoni*, n. sp.

Carapace with the regions distinct and areolated in high relief: except posteriorly, the areolæ have no tendency to arrange themselves transversely: the convexities of the areolæ, but not the interspaces, bear clumps of crystalline granules.

Front cut into 4 teeth, the middle pair narrower, slightly more prominent, and on a rather lower plane than the others: lateral border of the carapace cut into three teeth, including the very large and acute orbital angle: posterior border raised and irregularly lobulate.

In the upper border of the orbit there are three deep notches, in the lower border a notch and a fissure.

There is only one cheliped in the single specimen known: it is short, not stouter than the legs, and has some blunt denticles on the far end of the arm, on the wrist, and on the upper surface of the hand.

In the first 3 pairs of legs the meri are stout and have a granular dorsal surface and coarsely serrulate edges, the anterior edge ending in a coarse spine; the carpi are dorsally carinate, and their anterior edge has the form of a two-lobed crest; while the propodites and dactyli are elongate and compressed with thin, but not cristiform, plumed edges. The filamentous 4th pair are granular up to the dactylus, which is not much shorter than the propodite.

The 1st pair of legs are about  $1\frac{1}{2}$  times, the 2nd and 3rd pairs are about  $2\frac{1}{4}$  times, the length of the carapace, while the 4th pair are about as long as the carapace.

In the male (female unknown) the first 5 abdominal terga are transversely carinated, but the 4th and 5th carinæ are faint. The sternum is also carinated on either side of the abdomen, as in *P. Jukesii*, but the crests are much lower.

In the Indian Museum is a single male specimen from the Andamans: its carapace is 9 millim. long and 11 broad.

#### 134. *Palicus serripes*, Alcock & Anderson.

*Cymopolia serripes*, Alcock & Anderson, Journ. As. Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 208: Illustrations of the Zoology of the Investigator, Crust. pl. xxiv. fig. 7.

Carapace with the regions well defined and cut up into a multitude of symmetrical convex areolæ, its whole surface is covered with crystal-line granules which are enlarged on the convexities of some of the areolæ.

Front cut into 4 teeth, the middle two of which, though deflexed and on a lower plane, are much sharper and more prominent than the others: lateral borders of the carapace posteriorly divergent, cut into five ragged teeth, inclusive of the orbital angle: posterior border cut into from eight to ten well spaced even tooth-like lobes.

Upper border of orbit with 3 deep notches, lower border with a notch and a fissure: eyestalks sharply granular. Ischium of the external maxillipeds longitudinally grooved.

The chelipeds of the female (male unknown) though shorter than the carapace are stouter than the first pair of legs: they may be subequal or unequal: the arm, wrist, and the upper surface of the palm are sharply granular, the palm is rather full and is not elongate, being about half again as long as high and less than half again as long as the fingers.

The 1st pair of legs are about as long as the carapace: their merus is sharply granular and its anterior border ends in a spine: their propodite and dactylus are thin and compressed but not broadened, and their posterior border is evenly serrated.

The 2nd and 3rd pair of legs are a little over  $1\frac{1}{2}$  times the length of the carapace: their merus is very stout and broad, with a granular dorsal surface and sharply though irregularly serrated edges: their carpus has the anterior border cristiform and irregularly serrate, and the posterior border subcristiform up to a terminal spine: their propodite and dactylus are short and broadly foliaceous, with the posterior

border elegantly and evenly serrated and the anterior border fringed with long hair.

The 4th pair are filiform, not nearly as long as the carapace, and are granular up to the dactylus which is slightly longer than the propodite.

In the female the first 3 abdominal terga are transversely carinate: the carina of the first tergum, which alone is prominent, ends off in a sort of scroll, which flanks the postero-lateral angles of the carapace.

In the Indian Museum are 9 specimens, all adult females, from off the Madras coast in the neighbourhood of Palk Strait and from off Ceylon 34 fathoms. The carapace of the largest is 9.5 millim. long and 11 broad.

135. *Palicus investigatoris*, n. sp.

This species is closely related to *P. serripes*, but differs in the following characters:—

The areolæ of the carapace are capped, not by clusters of granules, but by sharp little tubercles between which the surface is smooth: except on the lateral regions of the carapace there is only one such tubercle to each areola:

(1) the four teeth of the front are all equally acute: the five teeth of the lateral borders of the carapace, though irregular in size, are all very sharp and clean cut: the teeth of the posterior border are smaller and sharper:

(2) there is no fissure towards the inner end of the lower border of the orbit:

(3) there are denticles or sharp tubercles, instead of granules, on the arm, wrist, and upper surface of the hand:

(4) the legs only differ in the case of the 2nd and 3rd pairs in which none of the joints are so broad: the serration of the edges of the merus is different, the terminal spine of the anterior border being greatly enlarged; the anterior border of the carpus has a spine at each end, but is not otherwise serrated; and the dactylus and propodite, though thin and compressed, and otherwise quite like those of *P. serripes*, are not broadened, being much less foliaceous.

In the Indian Museum is a single non-adult male from off the Andamans: its carapace is nearly 7 millim. long and 8 millim. broad.

Family PTENOPLACIDÆ.

PTENOPLAX, Alcock & Anderson.

*Archæoplax*, Alcock and Anderson, Journ. As. Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 180.

*Ptenoplax*, Alcock and Anderson, Illustrations of the Zoology of the Investigator, Crust. pl. xv. 1895: Alcock, Investigator Brachyura, p. 78.

As the generic diagnosis has already been published in this Journal (*loc. cit.* *Archæoplax*) the above references are sufficient.

136. *Ptenoplax notopus*, Alcock & Anderson.

*Archæoplax notopus*, Alcock and Anderson, Journ. As. Soc. Bengal, LXIII. pt. 2, 1894, p. 181, pl. ix, fig. 3.

*Ptenoplax notopus*, Alcock and Anderson, Ill. Zool. Investigator, Crust., pl. xv. fig. 2: Alcock, Investigator Brachyura, p. 79.

