

MATERIALS

FOR A

CARCINOLOGICAL FAUNA OF INDIA.

No. 2.

THE BRACHYURA OXYSTOMA.

BY

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From the Journal, Asiatic Society of Bengal, Vol. LXIV, Part II, No. 2, 1895.

Description of a New Species of Oxyrhynch Crab of the Genus Parthenope.
—By A. ALCOCK, M. B., C. M. Z. S., Superintendent of
the Indian Museum.

[Read 3rd July.]

The species here described is a true *Parthenope* as delimited by Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 668.

PARTHENOPE INVESTIGATORIS, n. sp.

Carapace almost equilaterally triangular, the sides very slightly curved: its surface is deeply eroded and rugose as in *P. horrida* and *spinosissima*, but is almost devoid of the sharp tubercles found in those species: the antero-lateral borders are slightly crenulate: the produced postero-lateral angle is rounded and nearly smooth: the posterior border bears five small eroded lobules — a very small one in the middle line, with two larger ones on either side — with intervening granules. The gastric region is enormously inflated as in *P. spinosissima*, and descends almost vertically to the vertically deflexed rostrum, the latter being fused with the interantennular tooth. The hepatic regions are rounded laterally, not strongly angulated as they are in *P. horrida* and *spinosissima*. The external maxillipeds, when closed, have the inner edges in the closest contact throughout.

The chelipeds have the *merus* very short and squat — its breadth about two-thirds of its length — with two compressed teeth on its short anterior (inner) border, a few blunt teeth followed by a blunt lobe on its posterior (outer) border, a strong tubercle in the middle of its upper surface, and numerous pearly tubercles and nodules on its lower surface: the *carpus* is granular and pustular: the *hand* has five sharp almost equal sized teeth on the lower border (two of them being on the immobile finger), several large nodules on the outer surface, and several large unequal sized spiny lobules on its inner surface: the *mobile finger* is spiny.

The ambulatory legs are compressed: the *merus* is compressed-triangular, with the edges, especially the anterior edge, spiny: the *carpus* is indistinctly nodular: the *propodus* is also slightly nodular, with a few spinules on its posterior margin: the *dactylus* is closely covered with spinules up to its tip.

The sternum, in the female, is excavated between the chelipeds.

The abdominal terga, in the female, are raised into strong quadrangular convexities down the middle line, and on either side near the edge.

Loc.—Pedro Shoal, ? depth; and Laccadives, 28 fms.

Length of carapace of largest specimen (female) .45 millim., greatest breadth 61 millim.

The position of the above species in the *key to the Indian species of the genus Parthenope*, page 279 *ante* is thus shown :—

- I. Carapace remarkably rugose (or spinose); chelipeds of the ordinary *Lambrus* form :—
1. Carapace somewhat pentagonal, not vertically deflexed from the front of the gastric region: abdominal terga of the female with a series of large eroded pits down either side *P. horrida.*
 2. Carapace somewhat equilaterally triangular, vertically deflexed from the front of the gastric region: abdominal terga of the female with a series of convexities or nodules down the middle line, and on either side—
 - i. Edges of carapace very strongly spinate: carpus of chelipeds and of ambulatory legs (like all the other parts of the body) strongly spinate: abdominal convexities of female spinate *P. spinosissima.*
 - ii. Spinature very little developed: edges of carapace crenulate: carpus of chelipeds and of ambulatory legs granular or nodular: abdominal convexities of female not spinate *P. investigatoris.*
- II. The whole body and all the appendages beset with delicate paxilliform tubercles which unite to form a lace-work or frosting: chelipeds tapering, with long slender spiny fingers which are nearly as long as the palm *P. (Parthenomerus) efflorescens.*

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*From the Journal, Asiatic Society of Bengal, Vol. LXV. Part II, No. 2, 1896.*

*Materials for a Carcinological Fauna of India. No. 2. The Brachyura Oxystoma.—By A. ALCOCK, M.B., C.M.Z.S., Superintendent of the Indian Museum.*

Plates VI—VIII.

Received 7th May. Read 3rd June.

The limits of the Tribe of Oxystoma here adopted are those originally established by De Haan in the Fauna Japonica, and since recognized by Ortmann in his account of the Decapod Crustacea of the Strasburg Museum.

I can hardly, however, go as far as Ortmann in uniting the *Leucosiidæ* and *Raninidæ* in one section, *Leucosiinea*, co-ordinate in value with the *Dorippinea* and *Calappinea*. Rather, it seems to me, the affinities of the *Raninidæ* are, through *Cyclodorippe*, with the *Dorippidæ*. But on the whole it seems enough to recognize the *Raninidæ* as true Oxystomes of equal rank with the *Calappidæ*, *Leucosiidæ* and *Dorippidæ*, just as De Haan practically does.



No one who has examined any of the deep-sea Dorippoids can, I think, find any difficulty in accepting De Haan's comprehensive views of the relations of the Oxystoma.

For instance, in the Indian genus *Cymonomops*\* (which differs but little from *Cyclodorippe*), although the general external form is as plainly as possible that of *Dorippe*, yet a detailed examination shows a number of Raninoid characters:—The chelipeds are Raninoid, so are the external maxillipeds (especially in their long narrow merus and short narrow exognath), so are the antennules: the fact also that the efferent branchial openings are not in front of the bases of the chelipeds is suggestive. In *Cyclodorippe*, moreover, the oviducts open, as in the *Raninidæ*, on the bases of the third pair of legs.

We have, in fact, in some of these deep-sea forms the clearest evidence of the close relation of the *Ranina* type to the *Dorippe* type, and quite sufficient justification for accepting De Haan's scheme of the Oxystoma almost without modification.

The following is a list of the known Indian genera of Oxystomes:—

**Calappidæ Calappinæ**:—*Calappa*, *Mursia*, *Cryptosoma*.

**Calappidæ Matutinæ**:—*Matuta*.

**Leucosiidæ Leucosiinæ**:—*Actæomorpha*, *Oreophorus*, *Tlos*, *Heteronucia* (nov.), *Ebulia*, *Nursia*, *Nucia*, *Parilia*, *Randallia*, *Myra*, *Leucosia*, *Onychomorpha*, *Philyra*, *Pseudophilyra*.

**Leucosiidæ Iliinæ**:—*Myrodes*, *Iphiculus*, *Pariphiculus* (nov.), *Nursilia*, *Heterolithadia*, *Arcania*, *Iwa*.

**Dorippidæ Dorippinæ**:—*Dorippe*, *Ethusa*.

**Dorippidæ Tymolinæ**:—*Cymonomops*.

**Raninidæ**:—*Notopus*, *Raninoides*, *Lyreidus*,

#### Tribe OXYSTOMA or LEUCOSOIDEA.

*Oxystomes*, Milne-Edwards, Hist. Nat. Crust. II. 96 (*partim*), and *Raniniens* Milne-Edwards *op. cit.* II. 190.

OXYSTOMATA, DE HAAN, FAUN. JAPON. CRUST. pp. 111–119.

*Leucosoidea* vel *Oxystomata*, Dana, U. S. Expl. Exp. Crust. I. 389, and *Raninidea* vel *Anomura Leucosidica*, Dana, *op. cit.* pp. 400, 403.

*Oxystomata* or *Leucosiidea*, Miers, Challenger Brachyura, p. 337, and *Raninidea*, Henderson, Challenger Anomura, p. 26.

*Oxystomata*, Ortmann, Zool. Jahrbuch., Syst., VI. 1892, pp. 550, 551.

Epistome reduced or absent. The efferent branchial channels terminate in the middle of the buccal area, the buccal cavern is therefore produced forwards and is generally of an elongate triangular shape; and the efferent channels themselves, whether covered by the external maxillipeds or not, are immediately closed in by an elongate lamellar process of the exopodites of the first maxillipeds.

\* Illustrations of the Zoology of the 'Investigator,' Crustacea pl. xiv. fig. 9.

The afferent branchial openings are found either in the usual place in front of the bases of the chelipeds, or at the sides of the endostome.

Branchiæ from six to nine on either side.

The antennules fold either longitudinally or obliquely, very rarely transversely.

In the male the genital ducts protrude either through the bases of the fifth pair of legs or through the fifth thoracic sternum close by.

The *Oxystoma* may be divided into four families as follows:—

Family I. *Calappidæ*. Carapace of the ordinary brachyurous shape. The afferent branchial openings are found in front of the bases of the chelipeds. The antennæ are small. The legs are normal in position. The vasa deferentia perforate the bases of the fifth pair of legs. The branchiæ are nine in number on either side. The external maxillipeds either completely cover the buccal cavern and have their palp hidden in repose (*Matutinæ*), or do not close the buccal cavern and have their palp always exposed (*Calappinæ*).

Family II. *Leucosiidæ*. The carapace is of the ordinary brachyurous shape. The afferent branchial channels are found on either side of the endostome. The vasa deferentia perforate the sternum near the bases of the fifth pair of legs. The legs are normal in position. The antennæ are small, sometimes obsolete. The external maxillipeds completely close the buccal cavern and have the palp completely hidden in repose. The branchiæ are less than nine (six in many forms) in number on either side.

Family III. *Dorippidæ*. The carapace is short, so that the first two or three abdominal terga, instead of being tucked up beneath it, are completely exposed in the dorsal plane of the body. The last two pairs of legs are much reduced in size and have a peculiar position in the dorsal plane of the body. The antennæ are large. The antennules are usually too large to fold into their fossettes. The vasa deferentia emerge through the sternum near the bases of the fifth pair of legs. The afferent branchial openings are found either in front of the bases of the chelipeds or not. The external maxillipeds either do cover the buccal frame (*Tymolinæ*), or do not (*Dorippinæ*). The branchiæ are less than nine in number on either side.

Family IV. *Raninidæ*. Carapace remarkably elongate, but not covering the abdominal terga, the first 4 or 5 of which lie exposed in the dorsal plane of the body. The last pair of legs also is raised in the dorsal plane of the body. The antennæ are large. The antennules also are large, and do not fold into fossettes. The vasa deferentia protrude through the bases of the fifth pair of legs: *the oviducts pierce the bases*

of the third pair of legs. The sternum is broad anteriorly, very narrow or linear posteriorly. The afferent branchial openings are not found in front of the bases of the chelipeds, and afferent currents probably reach the branchial chamber between the posterior border of the carapace and the bases of the last pair of legs. The external maxillipeds completely cover the buccal cavern, and their palp is concealed in repose: their exopodite is but little longer than the ischium. The branchiæ are less than nine in number on either side.

### Family CALAPPIDÆ.

*Calappiens*, Milne-Edwards, Hist. Nat. Crust. II. 100.

*Calappidea* and *Matutoidea*, De Haan, Faun. Japon. Crust. pp. 124, 126.

*Calappidæ* and *Matutidæ*, Dana, U. S. Expl. Exp., Crust. I. pp. 390, 391.

*Calappidæ* and *Matutidæ*, Miers, 'Challenger' Brachyura, pp. 282, 293.

Carapace more or less oval or subcircular, commonly with either (1) a single denticle or a heavy spine at the junction of the antero-lateral and postero-lateral borders, or (2) a postero-lateral vault-like expansion over the ambulatory legs (*Calappa*). Front generally about as wide as the orbit. The antennules generally fold obliquely. The antennæ are generally small.

The external maxillipeds may (*Matutinæ*) or may not (*Calappinæ*) completely close the buccal cavern, and their palp may (*Matutinæ*) or may not (*Calappinæ*) be concealed in repose.

The efferent branchial channels together form a deep channel in the endostome the channel being covered in below by a long lamellar process of the internal (first) maxillipeds. The afferent branchial openings have the normal position in front of the bases of the chelipeds.

The chelipeds are ponderous and greatly enlarged, and are practically symmetrical (except sometimes as to the fingers)\*: the hands especially are of great size—forming often the most conspicuous part of the chelipeds, and are so curved as to shut closely against the pterygostomial regions of the carapace, thus acting as a sort of buckler.

The abdomen usually (always in Indian forms) consists in the adult male of 5 segments, the 3rd–5th terga being fused together, and of 7 separate segments in the female (and young male). The branchiæ in all Indian forms are nine in number on either side.

In the male the vasa deferentia perforate the bases of the fifth pair of legs.

In the following list of genera belonging to the family *Calappidæ*

\* In the exotic genus *Platymera* one cheliped is larger than the other.

those belonging to the Indian fauna are printed in Roman type, and those known to me by autopsy are marked with an asterisk.

Family **Calappidæ**.

Subfamily I. *Calappinæ*.

Alliance I. CALAPPOIDA.

\* *Calappa*.

*Paracyclois*, Miers, 'Challenger' Brachyura, p. 288, pl. xxiv. figs. 1, 1a-1c.

\* *Platymera*, Milne-Edwards, Hist. Nat. Crust. II. 107; and Milne-Edwards and Lucas, Voy. Amer. Merid. Crust. pl. xiii.

\* *Mursia*.

*Acanthocarpus*, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 152; and A. Milne-Edwards, Bull. Mus. Comp. Zool. VIII. 1880-81, pl. i.

\* *Cryptosoma*.

Alliance II. ORITHYIOIDA.

*Orithyia*, Fabr., Milne-Edwards, Hist. Nat. Crust. II. 110, and in Cuvier, Règne Animal, Crust., pl. viii. figs. 1, 1a-1c.

Subfamily II. *Matutinæ*.

Alliance I. MATUTOIDA.

\* *Matuta*.

Alliance II. HEPATOIDA.

*Osachila*, Stimpson, Bull. Mus. Comp. Zool., II. 1870-71, p. 154; and Faxon, 'Albatross' Stalk-eyed Crustacea, pl. v. figs. 2, 2a, 2b.

\* *Hepatus*, Latr., Milne-Edwards, Hist. Nat. Crust. II. 116, and in Cuvier Règne Animal, Crust. pl. xiii. figs. 2, 2a-i.

Subfamily CALAPPINÆ.

*Calappidæ*, Dana *loc. cit.*, and Miers *loc. cit.*

Merus of external maxillipeds not elongate and acute (except in the exotic and somewhat aberrant genus *Orithyia*), and never concealing the palp in repose. Legs gressorial (except in the exotic genus *Orithyia*.)

## Subfamily MATUTINÆ.

*Matutidæ*, Dana, *loc. cit.*, and Miers, *loc. cit.*

Merus of external maxillipeds elongate and acute, entirely concealing the palp in repose. Legs natatorial.

## Key to the Indian genera of Calappidæ.

- I. *Calappinæ*:—Merus of external maxillipeds not elongate or acute, and never concealing the flagellum in repose: ambulatory legs gressorial:—
1. Carapace with a postero-lateral shield-like expansion or series of broad serrations, forming a vault beneath which the four ambulatory legs can be completely or largely concealed in flexion: basal joint of antennæ much dilated ... .. CALAPPA.
  2. Carapace without any trace of a postero-lateral shield-like expansion: basal joint of antennæ slender:—
    - i. Carapace transversely oval, with a large spine at the junction of the antero-lateral and postero-lateral borders ... MURSIA.
    - ii. Carapace sub-circular or longitudinally suboval, with a small denticle at the junction of the antero-lateral and postero-lateral borders ... .. CRYPTOSOMA.
- II. *Matutinæ*:—Merus of external maxillipeds elongate and acute, and completely concealing the flagellum in repose: ambulatory legs in the form of swimming paddles. (Carapace sub-circular, with a large spine at the junction of the antero-lateral and postero-lateral borders: antennæ rudimentary) ... .. MATUTA.

CALAPPA, Fabricius, Edw.

*Calappa*, Fabricius, Ent. Syst., Suppl. p. 345.

*Calappa*, Milne-Edwards, Hist. Nat. Crust. II. 102.

*Calappa*, Lophos, Camara, Gallus, De Haan, Fauna Japonica, Crust. pp. 69, 70, 125.

*Calappa*, Miers, 'Challenger' Brachyura, p. 283.

Carapace strongly convex, rounded in front, much broadened behind by a pair of clypeiform expansions, or wings, beneath which the four pairs of ambulatory legs are concealed in flexion.

Front small, somewhat triangular, projecting little or not at all beyond the level of the orbits, bilobed.

Orbits small, circular: eyestalks short and thick.

The antennules fold nearly vertically beneath the front.

The basal joint of the antennæ is very broad, and fills a wide hiatus at the inner angle of the orbit: the flagellum is short usually.

There is no distinct epistome; but the endostome is prolonged, as far as the antennular fossæ, in the form of a canal, which is divided longitudinally by a deep vertical septum into two channels, each channel being completed below by a lamellar process from the first pair of maxillipeds.

The external maxillipeds do not meet across the mouth, but leave exposed between them the mandibles, and, in front of them, the aforementioned plate-like prolongations from the first pair of maxillipeds.

The chelipeds are very large, and in flexion are closely apposed to the front half of the carapace, so as to form a sort of buckler: the meropodite, or "arm," has near its distal end, externally, a transverse wing-like expansion, complementary to the wing-like expansions of the carapace: the propodite, or "hand," is strongly compressed, its upper border forming a high, sharply dentate or crenulate, crest. Except for the fingers, the chelipeds are equal and symmetrical; both the fingers, namely, of one hand have on their outer aspect, near the base, a stout projecting lobule.

The abdomen in the adult male\* consists of only five separate pieces, owing to the fusion of the 3rd, 4th and 5th somites. In the young male, as in the adult female, it consists of seven separate somites.

*Key to the Indian species of Calappa.*

- I. Extreme length of the carapace either quite or nearly equal to its extreme breadth:—
  1. Carapace as long as broad: clypeiform expansions ill developed:—
    - i. Carapace sub-circular, with 7 longitudinal parallel lines of bullous tubercles ... .. *C. pustulosa.*
    - ii. Carapace sub-quadrangular, without regular lines of tubercles ... .. *C. wood-masoni.*
  2. Carapace a little broader than long: clypeiform expansions well-developed ... .. *C. gallus.*

\* ? *C. gallus*, of which species I have not seen adult males.

- II. Extreme length of the carapace about two-thirds of its extreme breadth: free margin of clypeiform expansions strongly lacinate:—
1. Carapace, in the adult, nearly smooth: clypeiform expansions well-developed.  
[*Inhabitants of shallow water*]:—
    - i. Anterior border of endostomial septum deeply concave: no spine in the middle line, on the posterior border ... .. *C. lophos.*
    - ii. Anterior border of endostomial septum strongly convex: a spine in the middle line, on the posterior border ... .. *C. philargius.*
  2. Carapace, in the adult, more or less covered with pustular tubercles: clypeiform expansions little developed.  
[*Habitat deep water*] ... .. *C. exanthematos.*
- III. Extreme length of the carapace very much less than two-thirds of its extreme breadth: free margin of clypeiform expansions either smooth throughout, or broadly dentate:—
1. Extreme length of carapace rather more than half its extreme breadth: surface of carapace with numerous sharpish tubercles: antero-lateral border of clypeiform expansions with broad teeth the points of which are either acute or have the form of up-curved spines:—
    - i. Antero-lateral border of carapace coarsely serrate ... .. *C. hepatica.*
    - ii. Antero-lateral border of carapace, and of clypeiform expansions, with strongly up-curved spines ... .. *C. spinosissima.*
  2. Extreme length of carapace rather less than half its extreme breadth: surface of carapace with wavy beaded lines only: free edge of clypeiform expansions smoothly moulded and entire ... .. *C. fornicata.*

1. *Calappa fornicata*, Fabr.

*Cancer calappoides*, Rumph, Amboinsche Rariteitkamer I. 21, pl. xi. figs. 2, 3.

*Cancer heracleoticus*, Seba, Thesaurus III. 51, pl. xx. figs. 7, 8.

*Cancer calappa*, Linn., Mus. Lud. Utr. p. 449, and Syst. Nat., 12th ed. I. ii. 1048 : Herbst, Krabben I. ii. 196, pl. xii. figs. 73, 74 : Fabricius, Ent. Syst. II. 454.

*Calappa fornicata*, Fabricius, Ent. Syst. Suppl. p. 345 : Bose, Hist. Nat. Crust. I. 183 (nec pl. iii. fig. 3) : Latreille, Hist. Nat. Crust. et. Ins. V. 394 : Desmarest, Consid. Gen. Crust. p. 109 : MILNE-EDWARDS, HIST. NAT. CRUST., II. 106 : Dana, U. S. Expl. Exped., Crust. pt. I. p. 394, pl. xxv. fig. 1 : A. Milne-Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 72, and X. 1874, p. 56 : Hilgendorf in Von Der Decken's Reisen in Ost.-Afr. III. i. p. 92 : Brito Capello, Jorn. Sci. Lisboa, III. 1870-71, p. 133, pl. ii. fig. 5 : E. Nauck, Zeits. Wiss. Zool. xxxiv. 1880, p. 46 (gastric teeth) : A. Ortmann, Zool. Jahrbucher, Syst. etc. VI. 1892, p. 569.

Carapace in length less than half the extreme breadth ; its surface nearly smooth anteriorly, marked with transverse wavy beaded lines posteriorly ; its antero-lateral borders crenulated.

Clypeiform expansions very large, their breadth (transverse measurement) equal to their length (oblique antero-posterior measurement) ; their edge smoothly moulded, and in unbroken continuity with the smoothly moulded posterior border of the carapace. Outer part of the pterygostomian regions densely hairy.

Front slightly projecting beyond the level of the orbits, bilobed, its breadth at the tip rather less than the breadth of the orbit.

Endostomial septum extending vertically from the level of the front to the level of the mouth ; its anterior border strongly convex and projecting.

Transverse wing-like expansion near the distal end of the arm with its edge smooth and entire.

Outer surface of palm with squamiform tubercles and transverse wavy beaded ridges : upper margin, or crest, of palm bluntly dentate.

Three specimens, including a male and ovigerous female of remarkable size, are in the Museum collection, from the Andamans.

The eggs are singularly minute.

2. *Calappa hepatica* (Linn.)

*Cancer hepaticus*, Linn., Mus. Lud. Utr., p. 448, and Syst. Nat. ed. xii. I. ii. 1048.

*Calappa hepatica*, De Haan, Faun. Japon. Crust., p. 70 : Miers, Cat. Crust. New Zealand, p. 55, and Phil. Trans. Roy Soc. Vol. 168, 1879, p. 491, and Zoology H. M. S. 'Alert' pp. 185, 257, 518, 550, and 'Challenger' Brachyura, p. 285 : Haswell, Cat. Austral. Crust., p. 136 : Filhol, Crust. Nouvelle Zélande, p. 406 : [Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 249] : A. Ortmann, Zool. Jahrbuch., Syst. etc., VI. 1892, p. 568 : J. R. Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 395.

*Cancer tuberculatus*, Herbst, Krabben, I. ii. 204, pl. xiii. fig. 78 : Fabricius, Ent. Syst. II. 454.



*Calappa tuberculata*, Fabricius, Ent. Syst., Suppl., p. 345: Bosc, Hist. Nat. Crust. I. 183: Latreille, Hist. Nat. Crust. et. Ins., V. 393: Desmarest, Consid. Gen. Crust., p. 109, pl. 10, fig. 1: MILNE-EDWARDS, HIST. NAT. CRUST., II. 106: Owen, Zool. Beechey's Voy. "Blossom," Crust. p. 80: Krauss, Südafr. Crust., p. 52: Dana, U. S. Expl. Exp., Crust. pt. I. p. 393: Stimpson, Proc. Ac. Nat. Sci. Philad., 1858, p. 162: Heller, Crust. Roth. Meer. in SB. Ak. Wien, 1861, XLIII. p. 372, and 'Novara' Crust. p. 69: Hess, Archiv. fur Naturges. XXXI. 1865, pp. 157 and 172: E. Martens, Verh. zool.-bot. Ges. Wien, XVI. 1866, p. 381: A. Milne-Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 72, and X. 1874, p. 55: Hilgendorf in Von Der Decken's Reisen in Ost.-Afr. III. i. 92: Brito Capello, Journ. Sci. Nat. Lisboa, III. 1870-71, p. 133, pl. ii. fig. 8: Hoffman in Pollen and Van Dam, Faun. Madagasc. V. 2. 1874, Crustacea, p. 25 (part), pl. vi. figs. 39, 41, 42: Brocchi, Ann. Sci. Nat. (6) II. 1875, Art. 2, p. 101, pl. xviii. figs. 160, 161, (male appendages): Kossmann, Reise Roth. Meer., Crust., p. 63: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 116: Hilgendorf, MB. Ak. Berl. 1878, p. 809: Richters, in Möbius, Meeresf. Maurit. p. 157: de Man, Notes Leyden Mus. II. 1880, p. 184, and Archiv. fur Naturges. LIII. i. 1887, p. 388: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 46 (gastric teeth): Lenz and Richters, Abh. Senck. Ges. XII. 1881, p. 425: Muller, Verh. Ges. Basel VIII. 1886, p. 473.

*Calappa tuberculosa*, Guérin Méneville, Icon. R. A., Crust. pl. 12, figs. 2, 2a, 2b.

*Calappa sandwichien* (*Calappa tuberculata* var.) Eydoux and Souleyet Voy. 'Bonite,' Vol. I., Zool., p. 245, pl. iii., figs. 9, 10.

Length of carapace a little more than half the extreme breadth. In the anterior two-thirds the surface of the carapace is tuberculate and granular, in the posterior third it is marked with squamiform tubercles and beaded ridges: the antero-lateral borders are coarsely dentate or serrate.

Clypeiform expansions greatly developed, their breadth being equal to their length: their anterior border shows the points of four teeth, but the postero-lateral border forms a continuous curve, broken only on the under surface by three or four faint sutures.

Posterior border of the carapace beaded, unarmed.

Outer part of the pterygostomial regions densely hairy.

Front emarginate, not projecting beyond the level of the orbits, its breadth at the tip markedly less than the breadth of the orbit.

The endostomial septum extends vertically from the level of the front to the level of the mouth; its anterior border strongly convex and projecting.

Transverse wing-like expansion of the distal end of the arm with its edge four-lobed. Outer surface of palm with numerous sharp tubercles: upper surface of wrist tuberculate: anterior end of arm with some sharp granules: crest of palm crenulate, not sharply dentate.

Andamans, Nicobars, Maldives, Laccadives, Persian Gulf.

In the very young, the extreme length of the carapace is not much

less than three-fourths of the extreme breadth, owing not only to less development of the clypeiform expansions, but to the relative less breadth of the body.

### 3. *Calappa spinosissima*, Edw.

*Calappa spinosissima*, Milne Edwards, Hist. Nat. Crust. II. 106: A. Milne Edwards, Nouv. Archiv. du Mus. X. 1874, p. 55: Richters, in Möbius Meeresf. Maurit, p. 157.

*Calappa tuberculata* (part) Hoffmann in Pollen and Van Dam, Faun. Madagasc. V. ii. Crustacea, p. 25, pl. vi. figs. 40, 43, 44.

Differs from *C. hepatica* only in the following characters:—

(1) the serrations on the antero-lateral border of the carapace, as also the teeth on the antero-lateral border of the clypeiform expansions, are in the form of sharp up-curved spines:

(2) the postero-lateral border of either clypeiform expansion has three spines where, in *C. hepatica*, there are only sutures on the under surface:

(3) some of the tubercles on the outer surface of the palm have sharp spinous points.

From a single small specimen, which is all that the Indian Museum at present possesses, it is impossible to express any opinion as to whether this species is, as Hoffmann appears to have regarded it, a variety of *C. hepatica*, or not.

### 4. *Calappa lophos*, (Herbst).

*Cancer lophos*, Herbst, Krabben, I. ii. 201, pl. xiii. fig. 77.

*Calappa lophos*, Fabricius, Ent. Syst. Suppl., p. 346: Bosc, Hist. Nat. Crust. I. 184: Latreille, Hist. Nat. Crust. et Ins. V. 394: Milne Edwards, Hist. Nat. Crust. II. 104: De Haan, Faun. Japon. Crust. p. 72, pl. xx. fig. 1: Heller, 'Novara' Crust. p. 69: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 315, and 'Challenger' Brachyura, p. 286: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 46, (*gastric teeth*): de Man, Archiv. fur Naturges. LIII. 1887, i. p. 389: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 395.

? *Calappa guerini*, Brito-Capello, Jorn. Sci. Nat. Lisb. III. 1870-71, pp. 128, 133 pl. ii. fig. 2.

The length of the carapace is not quite two-thirds the extreme breadth.

Carapace smooth, except for a few lumps anteriorly and a few scattered granules posteriorly: its antero-lateral borders beaded and finely festooned: its posterior border beaded, and bounded on either side by a tooth.

Clypeiform expansions nearly as broad (transverse measurement) as long (oblique antero-posterior measurement), and formed of about 6 large lacinated teeth.

Outer part of the pterygostomian regions densely hairy.

Front bifid, its least breadth equal to the breadth of the orbit, beyond the level of which it does not project.

Endostomial septum extending, posteriorly, from the level of the front to the level of the mouth, but deeply excised anteriorly.

Margin of the transverse wing-like expansion of the distal end of the arm four-lobed, the two anterior lobes each with a spine: upper surface of wrist and outer surface of palm nearly smooth: crest of palm deeply 6- or 7-toothed.

Andamans; the whole of the east coast of India, from the Ganges Delta to Pondicherry; Ceylon, Persian Gulf.

In the *young* the carapace is traversed longitudinally in its anterior three-fourths, by 7 or 8 lines of sharpish tubercles, and is marked in its posterior third by a pair of large ocelli, one in each epibranchial region.

From an examination of a very large series of these young I feel nearly sure that Capello's *C. guerini* is to be referred to this species.

##### 5. *Calappa philargius* (L.)

*Cancer philargius*, Linn. Mus. Lud. Ulr. p. 432, and Syst. Nat. ed. xii. I. ii. 1042: Herbst, Krabben, I. ii. 203.

*Cancer inconspectus*, Herbst, Krabben, II. ii. 162, pl. xl. fig. 3.

*Calappa cristata*, Fabricius, Ent. Syst. Suppl. p. 346: Latreille, Hist. Nat. Crust. et Ins. V. 393: MILNE-EDWARDS, HIST. NAT. CRUST. II. 105, pl. xx. figs. 1, 2: Stimpson, Proc. Ac. Nat. Sci. Philad., 1858, p. 62: Ortmann, Zool. Jahrb., Syst. etc., VI., 1892, p. 565.

*Calappa inconspecta*, Bosc, Hist. Nat. Crust. I. 185.

*Calappa philargius*, De Haan, Faun. Japon. Crust. p. 71, pl. xix. fig. 1: E. Nauck, Zeits. Wiss. Zool., XXXIV. 1880, p. 46 (*gastric teeth*): de Man, Archiv. fur Naturges., LIII. 1887, i. p. 388, and Journ. Linn. Soc., Zool., Vol. XXII. 1888, p. 196: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 396.

The extreme length of the carapace is two-thirds the extreme breadth.

Differs from *C. lophos* only in the following characters:—

(1) there is a large tooth in the middle of the posterior border, and the tooth bounding that border on either side is more salient:

(2) the endostomial septum, instead of being deeply excised anteriorly, has its anterior border strongly convex and projecting.

Mergui, Andamans, Ceylon, Persian Gulf.

In the *young* the teeth of the posterior and postero-lateral borders are more prominent and less oblique; and the carapace is traversed fore and aft by 7 or 8 rows of sharp tubercles.

6. *Calappa exanthematosa*, Alcock and Anderson.

*Calappa exanthematosa*, Alcock and Anderson, Journal Asiatic Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 177, and Illustrations of the Zoology of the R. I. M. S. 'Investigator,' Crustacea, pl. xv. figs., 1, 1a.

Extreme length of carapace a little more than two-thirds the extreme breadth.

The carapace is greatly inflated, especially in the branchial regions : its surface in rather more than its anterior half is covered with large round, or oval, smooth mamillary tubercles having a red base and a shining yellow apex, and exactly resembling smallpox pustules ; and is covered posteriorly with smaller round, or oval, slightly elevated patches, which exactly resemble smallpox papules. The antero-lateral borders of the carapace are quite smooth in their anterior half, and have 4 or 5 coarse serrations in their posterior half : the posterior border is beaded, and is bounded on either side by a tooth.

The clypeiform expansions are little developed, their extreme transverse dimension being less than one-third their extreme dimension in an inwardly oblique antero-posterior direction : they consist of about seven serrated teeth.

The pterygostomial regions have only a few scanty hairs.

The front is bifid, the breadth of its tip is half again that of the orbit, beyond which it does not project.

The flagellum of the antenna is nearly twice the breadth of the orbit in length.

The endostomial septum is narrow, not extending vertically to the level of the mouth, and quite plainly shows its origin out of a fold of the endostome : its anterior border is cut straight, and projects obliquely.

The wing-like expansion at the end of the arm has its edge finely serrate and 4-dentate. The upper surface of the wrist and the outer surface of the palm are more or less covered with pustules similar to those on the carapace. The palm has its crest sharply 6- or 7-dentate and its lower surface uniformly covered with beadlike granules.

The sterna corresponding to the 2nd, 3rd and 4th pairs of legs are much inflated.

Bay of Bengal, off the Madras coast, 91-112 fms.

In the *young* the tubercles on the carapace are sharper, and extend further backwards.

7. *Calappa gallus*, (Herbst.)

*Cancer gallus*, Herbst, Krabben, III. iii. 46, pl. Iviii. fig. 1.

*Calappa gallus*, Milne Edwards, Hist. Nat. Crust. II. 105 : De Haan, Faun. 151

Japon. Crust. p. 70 : Dana, U. S. Expl. Exp. Crust. pt. I. p. 393 : A. Milne Edwards in Maillard's l'île Réunion, Annexe F. p. 10, and Nouv. Archiv. du Mus. X. 1874, p. 55 : Brito Capello, Journ. Sci. Nat. Lisb. III. 1870-71, p. 133, pl. ii. fig. 4 : F. Müller, Verh. Ges. Basel, VIII. 1886, p. 473 : Miers, 'Challenger' Brachyura, p. 286 : Ozorio, Journ. Sci. Nat. Lisb., XI. 1885-87, p. 227 : de Man, Arch. fur Naturges., LIII. 1887, i. p. 383, and Journ. Linn. Soc., Zool. XXII. 1888, p. 197 : Ortmann, Zool. Jahrbuch., Syst., &c., VI. 1892, p. 567 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 395.

The extreme length of the carapace is nearly five-sixths the extreme breadth.

The carapace, the outer surface of the wing-like expansion of the arm, the upper surface of the wrist, and the outer surface of the palm, are covered with coarse tubercles, which become squamiform on the posterior part of the carapace.

The antero-lateral border of the carapace is crenulate, and the posterior border is finely beaded and quite unarmed.

The clypeiform expansions are well developed, their extreme transverse dimension being about two-thirds their extreme antero-posterior dimension: the free edge of each has about six strong teeth with beaded edges.

The pterygostomian regions have only a few scanty hairs.

The front is emarginate, and projects well beyond the orbits, forming a laminar rostrum.

The endostomial septum extends vertically from the level of the front to the level of the mouth: its anterior border is angularly convex.

The wing-like expansion of the end of the arm is conspicuously four-lobed: the crest of the palm is 6- or 7-dentate.

Mergui, Andamans, Ceylon, Persian Gulf.

In the *young* the tubercles of the carapace and chelipeds are sharper and crisper, and the antero-lateral borders of the carapace are sharply serrate.

### 8. *Calappa pustulosa*, n. sp. Plate VI. fig. 1.

Carapace subcircular, the clypeiform expansions consisting of five short broad teeth, the last of which is in advance of the level of the posterior border: its surface is covered with large bullous tubercles arranged in seven parallel longitudinal rows: the antero-lateral borders are smooth in their anterior half, crenulated in their posterior half: the posterior border is bounded on either side by a faint prominence.

The pterygostomian regions have a few scanty hairs.

The front is sharply bilobed, its tip is not quite so broad as the orbit, beyond the level of which it projects.

The endostomial septum does not extend vertically from the level of the front to the level of the mouth, except at its posterior limit.

The crest at the distal end of the arm is four-lobed: the upper surface of the wrist and the outer surface of the palm have numerous bullous tubercles like those on the carapace: the crest of the palm is serrate.

The abdomen is as in *C. lophos*.

The sterna corresponding to the 2nd, 3rd and 4th legs are inflated.

Off Ganjam and Orissa Coasts, 25 fathoms.

9. *Calappa wood-masoni*, n. sp. Plate VI. fig. 2.

Very closely allied to *C. depressa*, Miers, 'Challenger' Brachyura, p. 287, pl. xxiii. fig. 2.

The extreme length of the carapace is a little greater than the extreme breadth.

Carapace depressed; its surface crisply tuberculate, except between the eyes, the tubercles becoming squamiform posteriorly: the anterolateral borders crisply crenulate, the posterior border entire and unarmed.

The clypeiform expansions are slightly developed, and plainly consist of about 7 convex carinate teeth fused together except at the tip.

Pterygostomial region with few scanty hairs.

Rostrum sharply and deeply bilobed, each lobe being again subdivided at tip; projecting well beyond the level of the orbits, and rather broader than them.

Flagellum of antenna nearly half the length of the carapace.

Endostomial septum extending vertically from the level of the front to the level of the mouth; its free edge greatly thickened, its anterior edge sharply excised.

Crest at the distal end of the arm broadly and faintly four-partite: upper surface of wrist and outer surface of palm crisply tuberculate: crest of palm sharply serrate.

Penultimate segment of the male abdomen the shortest of all except the first.

Off south coast of Ceylon, 34 fathoms.

The above description applies to the *young*, no adults having been obtained.

MURSIA, Desmarest, Edw.

*Mursia*, Desmarest, Consid. Gen. Crust., p. 108, pl. 9, fig. 3.

*Mursia*, [Latreille, in Cuvier, Règne Animal, ed. 2, p. 39] and Milne-Edwards in Cuvier, Règne Animal, ed. 3, p. 54.

*Mursia*, Milne-Edwards, Hist. Nat. Crust. II. 109.

*Mursia*, De Haan, Faun. Japon. Crust. p. 68 and p. 125.

*Mursia*, Miers, Challenger Brachyura, p. 290, (*ubi synonym.*).

*Thealia*, Lucas, Ann. Soc. Entomol. France (1) VIII. 1839, p. 577.

Carapace oval, moderately convex, rounded in front, rather suddenly contracted behind, the evenly-arched antero-lateral margins ending in a large lateral epibranchial spine.

Front with a small acuminate tip.

Orbits rather large, oval, with at least one closed but distinct fissure in the upper margin, and with two wide gaps in the lower margin, in one of which the basal joint of the antenna is lodged. Eyes large, eyestalks short and thick.

The antennules fold obliquely. The basal joint of the antennæ is not dilated.

There is no distinct epistome, but, as in *Calappa*, the endostome is prolonged into a canal, which however is but incompletely divided longitudinally, the septum being little more than a ridge anteriorly, though well developed posteriorly. As in *Calappa* the first pair of maxillipeds give off each a lamellar process to complete this efferent canal below.

The external maxillipeds do not meet across the mouth, but, as in *Calappa*, leave exposed between them the mandibles, and, in front, the plate like prolongations of the first maxillipeds.

The chelipeds are enlarged, much as in *Calappa*; but the meropodite, or "arm," instead of a transverse crest near the distal end of its outer surface, has merely a ridge with one or two spines: the palm is compressed and its upper border forms a dentate crest, but not such a high one as that of *Calappa*. As in *Calappa* the chelipeds are only asymmetrical as regards the fingers, which on one hand have on their outer aspect, near the base, a stout lobule.\* The legs are large, the first two pairs being at least as long as the chelipeds.

The abdomen in the male is as broad in the proximal half as it is in the female: in the adult male it consists of five segments, the 3rd, 4th and 5th being intimately fused, the sutures even being hardly distinguishable: in both sexes the tergum of the 1st somite is almost entirely concealed, and that of the 2nd somite strongly carinate transversely.

*Mursia* is practically *Calappa* without the wings to the carapace, and with large strong legs: the widely fissured orbital floor, the less

\* In *Mursia hawaiiensis*, Mary J. Rathbun, Proc. United States National Museum, xvi. 1893, p. 252, the chelipeds are described as very unequal.

pronounced endostomial septum, and the slender basal-antennary joint are the other important points of difference.

#### 10. *Mursia bicristimana*, Alcock and Anderson.

*Mursia bicristimana*, Alcock and Anderson, Journ. Asiatic Soc. Bengal, Vol. LXIII. 1894, pt. 2, p. 179; and Ill, Zool. 'Investigator' Crust. pl. xxiv. fig. 5 (in the press).

The length of the carapace is about seven-ninths of the breadth immediately in front of the lateral epibranchial spine; and the length of the epibranchial spine is from one-third (in the young) to less than one-fourth (in the adult) the length of the carapace.

The surface of the carapace is closely granular, and in addition there are *seven rows of tubercles*, one in the middle line, and three on each side radiating over the branchial regions: the antero-lateral margins are finely beaded and evenly and sharply festooned: the postero-lateral margins are without the angular bend inwards seen in *M. armata*: *the posterior margin is bounded on either side by a laminar denticle, not by a great projecting lobule as in M. armata.*

The outer parts of the pterygostomial and subhepatic regions are covered with a dense felt of long hairs.

The rostrum is trilobed, its breadth at the level of the lobes being about one half more than the greatest breadth of the orbit.

The transverse ridge near the distal end of the arm is very hairy, and is armed distally with two spines, the outer and larger of which is more than half the length of the lateral epibranchial spine. *This ridge is continued along the palm as a sharp longitudinal crest* (more prominent even than that of *Platymera*) which is unevenly trilobed, the proximal lobe being spiniform, the middle lobe broad and obtuse, and the distal lobe narrow and obtuse. The upper surface of the wrist, and the outer surface of the palm and fingers, are closely and sharply granular: the upper edge, or crest, of the palm is 7- serrate.

The ambulatory legs are large stout and compressed, those of the first three pairs being a little longer than the chelipeds. In these three pairs the *meropodite is lamellar, its greatest breadth being considerably more than a third its length*; the carpus has its outer surface traversed longitudinally by three beaded carinae, the middle one of which ends in a spine; and the propodite is lamellar with the outer (anterior) edge subcarinate and the upper surface traversed longitudinally by two or three raised lines of fine beading.

The second abdominal tergum in both sexes is raised into a stout carina, the height of which is more than a third the transverse diameter of the tergum: this carina is three lobed, the lobes being separated only



by fissures. In the female, as in the male, the 3rd-5th terga are fused, although the lines of fusion are quite distinct in the former sex.

Colours in life salmon pink.

Off Ceylon, 142-400 fms., and 180-217 fms.

In the form of the legs, in the ornamentation of the chelipeds, and in the shape of the carapace, this species bears a strong resemblance to *Platymera*. Even in the articulation of the flagellum with the merus of the external maxillipeds the appearances are somewhat those of *Platymera*.

On the other hand the form of the endostomial channels, and of the processes of the first maxillipeds which close those channels ventrally, as well as the practical symmetry of the chelipeds, are all as in *Mursia*.

But a comparison of this species with specimens of *Mursia armata* and *Platymera gaudichaudii* leads to the belief that all three are congeneric.

The dimensions of an adult male are as follows:—

breadth of carapace 67 millim., excluding the lateral epibranchial spines;

length of carapace 47 millim.

length of first pair of ambulatory legs about 90 millim.

#### CRYPTOSOMA, Brullé,

*Cryptosoma*, Brullé in Webb and Berthelot's Hist. Nat. des îles Canaries, Crustacés, p. 16.

*Cryptosoma*, Milne-Edwards, Hist. Nat. Crust., II. 110.

*Cryptosoma*, Miers, Challenger 'Brachyura,' p. 292.

*Cycloes*, De Haan, Faun. Japon. Crust., p. 68, and p. 125.

Carapace heart-shaped or subcircular.

Front rather narrow, and often emarginate.

Orbits, as in *Mursia*, large, oval, with a distinct suture or a fissure in the roof, and with two gaps in the floor, in one of which the slender basal-antennary joint is lodged. Eyes large, eyestalks short and thick.

The antennules fold obliquely.

The external maxillipeds meet sufficiently to conceal all the underlying (*i.e.*, really overlying) parts, and to completely close the buccal frame as far as the front. Concealed by the external maxillipeds there is, however, an endostomial efferent branchial channel closed by lamellar processes from the 1st pair of maxillipeds.

The antero-internal angle of the merus of the external maxillipeds is prolonged obliquely forwards to form a prominent lobule above the articulation of the palp.

The chelipeds are as in *Calappa* and *Mursia*: the meropodite, or "arm" has the same transverse ridge or crest near its distal end, externally; the palm is strongly compressed, with its upper border raised into a sharp serrated crest; and the chelipeds as a whole are symmetrical, except that on one hand the fingers have each, at the base, on their outer surface, a coarse tooth or lobule.

The legs are compressed and are of moderate size: none of them approach the chelipeds in length.

The abdomen in both sexes is much as in *Calappa*: in the male the 3rd, 4th and 5th terga are intimately fused together, and with almost complete obliteration of sutures; in the female all seven segments are perfectly distinct. In the majority of species the second abdominal tergum, in both sexes, is strongly carinate transversely, as in *Mursia*.

#### 11. *Cryptosoma granulosum*, (De Haan).

*Cycloes granulosa*, De Haan, Faun. Japon. Crust. p. 71, pl. xix. fig. 3.

*Cryptosoma granulosum*, Miers, 'Challenger' Brachynura, p. 293: Alcock and Anderson, J. A. S. B., Vol. LXIII. 1894, pt. 2, pp. 198 and 203.

Carapace conspicuously longer than broad, its surface, like the exposed surfaces of the chelipeds, finely and very closely granular: in its anterior half there are also some small tubercles, most of which fall into seven nearly longitudinal rows, one row being in the middle line. The antero-lateral borders are very finely crenulate, and end at a tiny lateral-epibranchial denticle. The convergent postero-lateral borders, and the posterior border, are very finely and closely beaded. The outer parts of the pterygostomian and subhepatic regions are covered with a felt of fine short hairs.

The front is bidentate and projects beyond the level of the orbits: the latter occupy all the rest of the anterior border.

The antennary flagella are very short.

The transverse ridge at the distal end of the arm is granular, and is armed with three spines gradually increasing in size from within outwards: the upper surface of the wrist has several small tubercles: the outer surface of the hand has, at its base, an oblique crest, which ends acutely and is continued obliquely upwards as a line of small tubercles; a second line of tubercles runs parallel with this, obliquely across the middle of the hand: the crest of the hand is 8-dentate.

The last pair of legs has its four terminal joints distinctly lamellar.

The carina of the second abdominal tergum is in both sexes trilobed, the middle lobe being much smaller than the lateral lobes.

Andamans, depth not recorded: Maldives, 20-30 fms.

## MATUTA, Fabr., Edw.

*Matuta*, Fabricius, Ent. Syst., Suppl. p. 369.

*Matuta*, Milne-Edwards, Hist. Nat. Crust. II. 113.

*Matuta*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1877) p. 243, and 'Challenger' Brachyura, p. 294.

*Matuta*, de Man, Notes Leyden Mus. III. 1881, p. 109.

Carapace somewhat depressed, usually subcircular, with the postero-lateral borders sharply convergent, and usually with a great horizontal spike at the lateral epibranchial angle, on either side.

There are usually six more or less distinct tubercles, disposed quite symmetrically, in the middle of the carapace, and there is commonly an eminence, or even an acute tubercle, in the front half of the postero-lateral border.

The front is about as wide as the orbit, and consists of three nearly equal lobes, the middle one of which projects as a laminar rostrum with the end usually bifid or emarginate.

The orbits are large and roughly reniform: in the middle of the upper border are two short sutures, placed close together; at the external angle is a wide gap communicating with a deep groove in the pterygostomial region; while at the internal angle is a fissure communicating with the antennular fossa. The eyestalks are stout but somewhat elongate.

The antennules fold nearly longitudinally. The antennæ are almost rudimentary, and occupy a space between the basal-antennular joint and the lower wall of the orbit.

The external maxillipeds completely cover the mouth and all the mouth-parts, up to the level of the front, the patulous efferent branchial orifice being visible only from above. In repose the palp of the external maxillipeds lies completely concealed within a deep groove in the dorsal face of the long subacute meropodite.

On removal of the external maxillipeds a deep undivided efferent canal is seen in the roof of the endostome, which groove is closed below by an elongate lamellar process of the first pair of maxillipeds.

The chelipeds are shaped on the *Calappa* plan, but are quite singular in having, on the inner face, near the crest of the palm, two raised obliquely-striated areas—one linear, the other broadly oval—which in two species at any rate, and probably in all, are used as stridulating organs. The meropodite, or "arm," has the transverse distal crest low, and only well-pronounced at the outer angle, where there is a prominent lobule. The propodite or "hand" is compressed, but not so much so as in *Calappa*, and has its upper border cristate, and its outer surface definitely sculptured. The fingers, as well as the rest of the chelipeds, are quite symmetrical.

The four ambulatory legs have the form of swimming-paddles, the two terminal joints being broadened and compressed—in the first and last pairs of legs enormously so.

The abdomen in the adult male consists of 5 segments, owing to the intimate fusion of the 3rd, 4th and 5th terga: in the female and young male all 7 terga are distinctly separate. In both sexes the first tergum is almost entirely concealed beneath the carapace.

In the adult male the *third* tergum is very strongly carinate transversely, and the second moderately so. In the female and young male both the *second* and *third* terga are strongly carinate, and if there is any inequality it is the *second* that is most prominent.

Owing partly to their great similarity, and partly to the insufficient descriptions of earlier authors, the discrimination of the species of *Matuta* has always been a matter of difficulty.\*

The first species described and figured is the *Cancer lunaris* of Rumph (Amboinsche Rariteitkamer p. 11, pl. vii., fig. S. 1705), a species characterized by the possession of an entire (*i.e.*, not bifid) rostrum and of a very sharply defined tubercle near the middle of either posterior border.

This species must, I believe, be (1) the species called *M. banksii* by Leach, Miers, and subsequent authors, (2) the *M. picta* of Hoss and Miers, (3) the *M. distinguenda* of Hoffmann, and (4) the *M. obtusifrons* of Miers. I think also that the *M. granulosa* of Miers and de Man is only a slightly abnormal form of Rumph's species.

Rumph's name having unfortunately been accepted for a quite different post-Linnæan species, cannot now be used; and Rumph's species must therefore bear the earliest applicable post-Linnæan name—namely *M. banksii*, Leach.

*M. banksii* according to Leach can be recognized by a very strong tubercle behind the lateral spine.

The second known species of *Matuta* is the *Cancer americanus* of Seba (Thesaurus III. 52, pl. xx., figs. 10, 11. 1758), of which it is impossible to say more than that it roughly represents the form of the genus *Matuta*.

Herbst (Krabben, etc., 1790–1799) described and figured two species of *Matuta*. One (Krabben, I. ii. 140, pl. vi. fig. 44), he called *C. lunaris*, and this he says is Rumph's species, quoting Rumph's Latin and vernacular names: the other (I. ii. 143) he called *C. victor* of Fabricius. Subsequently, however (III. ii. 43) he re-named *C. victor* *C. lunaris*, figured it on pl. xlviii. fig. 6, and stated that his *C. victor* and *C. lunaris* are the same species.

Herbst's two figures—pl. vi. fig. 44 and pl. xlviii. fig. 6—are so different, however, that doubts must still remain as to whether they both really do refer to the same species, and it does not seem to me that Hilgendorf's observations, to be presently referred to, clear these doubts up. I believe myself that Herbst's plate vi. fig. 44 might still be regarded, as Herbst at first seems to have regarded it, as representing Rumph's *Cancer lunaris*.

Fabricius who (Entomol. Syst., Suppl. p. 369, 1798) instituted the genus *Matuta*, included in it two species—*M. victor* and *M. planipes*. We know, from Hilgendorf's paper to be presently considered, to what species of modern authors these refer.

\* Unfortunately I have not been able to see Latreille's article on the genus *Matuta* in the *Encyclopédie Méthodique*, Vol. X.

Leach (Zool. Miscellany III. pp. 12-14, 1817), gave brief diagnoses of four species of *Matuta*. One of these—*M. banksii*—I believe to apply to Rumph's *Cancer lunaris*.

A second—*M. lesneurii*—is referred by Miers, and I think with justice, to the *M. victor* of Fabricius.

A third—*M. peronii*—is also, and I think rightly, referred by Miers to *M. victor*, Fabr.

The fourth—*M. lunaris*—is regarded by Miers, whose paper will be considered in the sequel, as applicable to *M. picta* of Hess, a species characterized by having a simple rostrum and a tubercle in the postero-lateral border. Now Leach's figure shows a distinctly bilobed rostrum, and has no tubercle on the postero-lateral border, so that I do not see how the name *M. picta* can apply to it. Leach's *M. lunaris* seems to me rather to agree with the species described by Henderson as *M. miersii*.

To sum up, it seems to me that three species were known to Leach, namely *M. banksii*, Leach, (Rumph's species), *M. victor* Fabr. and perhaps the species now known as *M. miersii*, Henders.

The great naturalist Milne-Edwards only admitted two species of *Matuta*, namely *M. lunaris* and *M. victor*, and it is only because I have been able to examine over 400 specimens from all parts of the Indian coasts, that I venture to disagree from him.

I can reconcile his description of *M. lunaris* with the *M. lunaris* of Leach and with Guérin's figure of *M. peronii* (not Leach's); but on the strength of Hilgendorf's statements I do not see how it can be reconciled with Herbst's *Cancer lunaris*. Milne-Edwards italicizes the fact that the carpus of the penultimate pair of legs is *bicarinatæ*: now the only species known to me that agrees with his description in other respects, and has also the carpus of the penultimate legs full and indistinctly bicarinatæ, is Henderson's *M. miersii*.

The *M. victor* of Milne-Edwards seems to be Fabricius' species, although I do not think that the whole of the synonymy can be accepted.

Miers' classical attempt (Trans. Linn. Soc. Zool. (2) I. 1875-79 [1877] p. 243) to simplify the confusion existing in this group, although forming a careful critical and extremely valuable paper, yet fails for the reason that the character selected by Miers for the primary subdivision of the genus—namely the sculpture of the hands and fingers—varies not only according to sex (as Miers indeed fully recognized), but also according to age.

In Miers' system the adult males of *M. victor*, Fabr. and of *M. lunaris* Hbst. Hilgendorf, belong to one section of the genus, and the young males to the other section.

One has, of course, to be very careful in deciding that any given small specimen of *Matuta* corresponds with the young of any given large specimen; but when one finds, for example, that a small male individual, taken on the same spot with a large male and female, exactly resembles the adults in all important characters, and differs from the adult male, and agrees with the adult female, just in those very characters where the adult female differs from the adult male; when, therefore, such a young one can be confused with no other known species; and when moreover these agreements and differences are found to have a general correspondence throughout the whole genus; then one can with some confidence assign that young individual to its place.

One of the most constant differences, throughout the genus, between the adult

male on the one hand, and the female and young male on the other hand, is found in the second and third abdominal terga: in all adult males the third abdominal tergum is very strongly carinated transversely, and the second is carinated also, but not nearly so strongly: in all adult females both the second and the third terga are either equally strongly carinate, or, if one is more prominent than the other, it is the second.

The other differences between the sexes are those (emphasized by Miers) that occur in the sculpture of the hand and fingers; and these differences also apply between the adult male and the young male, which Miers does not appear to have taken into consideration.

The nine species separated by Miers can, in my opinion, be reduced to three, namely, *M. banksii* Leach (Rumph's species), *M. victor*, Fabr., and *M. lunaris* Hbst. Hilgendorf.

The next paper to be referred to is that by Hilgendorf (Monatsber. Ak. Berl. 1878 [1879] p. 810), which is a most authoritative contribution, since the writer had been able to examine Fabricius' types of *M. victor* and *M. planipes*, and apparently also Herbst's specimens. Dr. Hilgendorf states definitely (1) that *M. victor* Fabr. is the species carefully described and figured as *M. victrix* by Miers (*loc. cit.*); (2) that the species figured by Herbst. *on pl. xlviii. fig. 6* is the unequivocally recognizable *M. rubro-lineata* of Miers (*loc. cit.*); and (3) that the *M. planipes* of Fabricius is *M. lunaris* of Herbst. It is most unfortunate that Dr. Hilgendorf does not tell us whether *both* of Herbst's figures refer to the same species, or not. We now know, without any ambiguity, what Herbst's *pl. xlviii. fig. 6* is; but we are still in doubt as to the meaning of *pl. vi. fig. 44*.

The last reference necessary is to de Man's paper (Notes Leyden Mus. III. 1881, p. 109), on the species of *Matuta* in the Leyden Museum, a paper that embodies the results of an examination of no less than 270 specimens. With most of Dr. de Man's synonymy I entirely agree, although I am unable to follow him in the acceptance of *M. granulosa*, *M. maculata* and *M. picta* as distinct species.

Dr. de Man rightly recognizes the value of the sculpture of the hand and fingers in the discrimination of the species; but, equally with Mr. Miers, he takes no due notice of the fact that this character varies with age, at any rate in the male sex. He considers that the development of the tubercles on the surface and lateral margins of the carapace furnishes a character of only secondary importance, in which opinion I cannot quite agree with him if he includes the tubercle on the postero-lateral border.

It remains only to refer to the opinions of those who, like M. A. Milne-Edwards and Dr. Ortman, regard all the forms of *Matuta* as varieties of a single species. This view would seem to imply that the characters by which the species are usually recognized are variable,—either indefinitely so, or in response to some local peculiarities of the environment. Of this I can find no evidence.

Certain of the characters that I have used in separating the species in the Indian Museum Collection are, as far as an examination of over 400 specimens goes, perfectly well defined, whether in the young or in the adult, and whether from the same locality or not.

The characters of the first importance in the separation of the species are those emphasized by Milne Edwards, namely (1) the form of the carpus of the penultimate pair of legs—whether full and

“bicarinate,” or compressed and unicarinate, and (2) the extent of the raised postero-lateral border—whether stopping short of the great lateral spine, or prolonged into the border of that spine. With regard to the first of these characters, it may be remarked that the distinction drawn is between a distinctly compressed carpus, and a distinctly inflated carpus. With regard to the second, the distinction drawn is between a sharply-raised border that (in any position of the carapace and in any light) can be plainly seen to form a considerable part of the hinder border of the great lateral spine, and a border that stops at the base of the spine or even further behind. The sculpture of the lower part of the outer surface of the hand is also very definite in all the species, and—if age and sex be taken into due consideration—the sculpture of the median ridge of the hand and of the dactylus. The presence or absence of a tubercle on the postero-lateral border is also of importance.

*Key to the species of Matuta.*

- [I. Carapace pentagonal, lateral epibranchial spine rudimentary ... .. *M. inermis.\** ]
- II. Carapace more subcircular than pentagonal, lateral epibranchial spine greatly developed (*Indian species*):—
  - 1. Front just equal to the orbit in width, rostrum simple or faintly emarginate: a sharply defined acute tubercle near the middle of the posterolateral border *M. banksii.*
  - 2. Front distinctly wider than the orbit, rostrum distinctly bilobed: postero-lateral border with or without an obscurely defined eminence near its middle:—
    - i. Postero-lateral border elevated throughout, forming a considerable part of the hinder border of the great lateral spine, and without any trace of a tubercle or eminence: lower surface of hand very rough in the adults of both sexes ... .. *M. miersii.*

\* *M. inermis*, Miers, Zoology H. M. S. 'Alert,' p. 256, pl. xxvi. fig. C. Known only from the Melanesian part of the Indo-Pacific area.

ii. Postero-lateral border elevated posteriorly, gradually subsiding at or behind the great lateral spine, and with an obscurely defined eminence: lower surface of hand quite smooth in the adult male, a little rough in the female and young:—

a. A distinct spine at the angle of the hand where it comes in contact with the external angle of the arm: carapace covered with minute red dots ... .. *M. victor*.

b. Only a tubercle at the angle of the hand where it touches the external angle of the arm: carapace covered with spots, rings, and vermicular lines... .. *M. lunaris*.  
(*M. planipes*.)

## 12. *Matuta banksii*, Leach.

*Cancer lunaris*, Rumph, Amboinsche Rariteitkamer, I. p. 11, pl. vii. fig. S. (1705).

?? *Cancer lunaris*, Herbst, Krabben I. ii. 140, pl. vi. fig. 4 (*nec* III. i. 43, pl. xviii. fig. 6).

?? *Matuta victor*, Bosc, Hist. Nat. Crust. I. 225, pl. iv. fig. 3, (*nec* Fabr.)

*Matuta banksii*, Leach, Zool. Miscell III. p. 14. (1817).

*Matuta victor*, Desmarest, Consid. Crust. p. 101, pl. vii. fig. 2 (*nec* Fabr.)

*Matuta victor* var. *quinta et sexta*, De Haan, Faun. Japon. Crust. p. 128.

*Matuta banksii*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876) p. 245, pl. xl. figs. 1, 2, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 315, and 'Challenger' Brachyura. p. 295: de Man, Notes Leyden Mus. III. 1881, p. 115, and Archiv. fur Naturgesch. LIII. 1887, i. p. 389, and in Weber's Zool. Ergeb. Niederl. Ost.-Ind. II. 1892, p. 351: A. O. Walker, Journ. Linn. Soc. Zool. XX. 1890, p. 111: Zehntner. Rev. Suisse de Zool. II. 1894, p. 183, pl. viii. fig. 15.

*Matuta picta*, Hess, Arch. für Naturges. XXXI. i. 1865, pp. 158, 172, pl. vi. fig. 13: Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79, (1876) p. 246, pl. xl. figs. 5-7, and 'Challenger' Brachyura, p. 295: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 46 (*gastric teeth*): de Man, Notes Leyden Mus. III. 1881, p. 118, and Zool. Jahrbucher, II. 1887, p. 703: Haswell, Cat. Austr. Crust. p. 135.



*Matuta distinguenda*, Hoffmann in Pollen and Van Dam's Fauna Madagasc., Crust. p. 27, pl. vi. figs. 49-52, pl. vii. figs. 53-57 (1874): Lenz and Richters, Abh. Senk. Ges. XII. 1881, p. 425.

*Matuta obtusifrons*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876), p. 247, pl. xl. figs. 8 and 9, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 316.

? *Matuta granulosa*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876) p. 245, pl. xxxix. figs. 8, 9, and 'Challenger' Brachyura, p. 295: de Man, Notes Leyden Mus. III. 1881, p. 114: Haswell, Cat. Austral. Crust. p. 134.

*Matuta victor*, varr. 5 and 6, and ? 4, Ortmann, Zool. Jahrbucher, Syst., &c., VI., 1891-92, pp. 572, 573.

Carapace coarsely granular in the epibranchial, post-gastric and cardiac regions. All six tubercles are almost always very distinct, both in the young and adult.

The antero-lateral borders are crenulate, the last three crenulations forming three large blunt teeth. The posterior and postero-lateral borders form a continuous granular slightly-elevated ridge, which stops at a sharply-defined tubercle, or tooth, situated considerably in rear of the lateral epibranchial spine. The length of this lateral spine (measured along its front border) is always less than one-fourth the breadth of the carapace.

Front just equal in width to the orbit: rostrum either entire, or faintly emarginate.

Hand with the upper border, or crest, trilobed, and the lower border dentate as far as the base of the immobile finger. Below the crest are two obliquely-longitudinal rows of tubercles, the lower somewhat broken and irregular. Below these, the hand is traversed longitudinally, as far as the finger-cleft, by a row of 5 teeth, of which the 2nd (counting from the proximal end) is enlarged and acute, and the 4th is also somewhat enlarged and acute, but less so in the adult male than in the female and young male. The surface of the hand, below the ridge, is roughened, and is traversed—from the angle where the hand touches the arm, to the immobile finger—by a row of molariform tubercles, which is continued to the tip of the immobile finger as a ridge and furrow: the first of these tubercles, at the angle where the hand touches the arm, is enlarged and acute. The dactylus in the female and young male is convex and smooth: in the adult male it is longitudinally traversed by a sharp ridge, which becomes milled at the distal end.

The carpus of the penultimate pair of legs is full and even inflated, and shows more or less distinct traces of a second dorsal longitudinal carina.

Colour in spirit bright yellow, with a fine close discontinuous reticulum of red markings, which give to the whole, when viewed from a distance, a rich chestnut-brown appearance. The legs are also of the

same bright yellow colour, with copious chestnut-brown markings. Under surface light yellow.

In the Indian Seas only at the Andamans and Nicobars.

The branchial cavity in this species is often occupied by a Bopyrid.

I have examined 63 specimens in the Indian Museum collection, comprising 19 adult males, 28 females, and 16 young males.

13. \* *Matuta victor*, Fabr., Hilgendorf. †

*Cancer victor*, Fabricius, Ent. Syst. II. 449 (*vide* Hilgendorf). 1793.

*Matuta victor*, Fabricius, Ent. Syst. Suppl., p. 369 (*vide* Hilgendorf).

*Matuta victor*, Milne Edwards in Cuvier, Règne Animal, Crust. pl. vii. and Hist. Nat. Crust. II. 115.

*Matuta victor*, var. *prima et secunda*, De Haan, Faun. Japon. Crust. p. 127.

*Matuta victor*, Hilgendorf in Von der Decken's Reisen in Ost.-Afr. III. i. Crust. p. 93, pl. iii. fig. 2: Hoffmann in Pollen and Van Dam's Faun. Madagasc., Crust., p. 27, pl. vi. figs. 45-48: HILGENDORF, MB. AK. BERL. 1878, p. 810.

*Matuta victrix*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876) p. 243, pl. xxxix. figs. 1-3, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 315, and Zool. H. M. S. 'Alert' pp. 185, 256, and 'Challenger' Brachyura, p. 295: de Man, Notes Leyden Mus. III. 1881, p. 110, and Archiv für Naturges. LIII. 1887, i. p. 389: Haswell, Cat. Austral. Crust. p. 133: J. R. Henderson, Madras Journ. Lit. Sci. 1886-87, p. 65, and Trans. Linn. Soc. Zool. (2) V. 1893, p. 396: Ortmann, Zool. Jahrbucher, Syst. etc. VI. 1891-92, varr. 1 and 2 pp. 571-572.

*Matuta victrix* var. *crebrepunctata*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876), p. 244, pl. xxxix. fig. 4, and 'Challenger' Brachyura, p. 295: de Man in Weber's Zool. Ergeb. Niederl. Ost.-Ind. II. p. 351.

*Matuta peronii*, Leach (*nec* Guérin), Zool. Miscell. III. p. 13, pl. 127, figs. 1, 2.

*Matuta lesueurii*, Leach, Zool. Miscell. III. p. 14.

*Matuta maculata*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876) p. 246, pl. xl. figs. 3, 4, and 'Challenger' Brachyura, p. 295: de Man, Notes Leyden Mus. III. 1881, p. 116.

Carapace finely granular in the epibranchial, post-gastric and cardiac regions. The two anterior tubercles are obsolescent; the other four are visible, but are not conspicuous in the adult.

The antero-lateral borders are crenulate, two — sometimes three — of the crenulations being somewhat enlarged, but never forming stout teeth. The posterior and postero-lateral borders form a continuous finely-beaded slightly-elevated ridge, which ends on a faintly-marked elevation, situated considerably in rear of the lateral spine. The length of the

\* The specific name *victor* is here regarded as a noun substantive in apposition to *Matuta*, just as in the name *Felis leo*, the masculine noun *leo* is in apposition to the feminine noun *felis*. It seems unnecessary to change the old established name *M. victor* for a name based on the personal claims of the goddess *Matuta*.

† No references are given, except such as appear to be unequivocally applicable to *M. victor* as re-defined by Miers and confirmed by Hilgendorf.

lateral spine is always very much more than one-fourth—often more than one-third—the breadth of the carapace.

The front is wider than the orbit: the rostrum is sharply bilobed.

Hand with the crest trilobed—the proximal lobe broad, the others acute, and with the lower border dentate (female and young male) or bluntly crenulate (adult male) as far as the base of the immobile finger. Below the crest, on the upper aspect of the hand, are two obliquely-longitudinal rows of tubercles, the lower of which is somewhat broken and irregular. Below these the hand is traversed longitudinally by a ridge, which varies according to age and sex: in the adult male it is strongly salient and is continued nearly to the tip of the immobile finger, and has at its proximal end a tubercle followed by a spine: in the female and younger male it becomes nearly obsolete at the base of the immobile finger, and is broken up into five lobes, of which the second (counting from the proximal end) and the fourth are spines—the second being very large. The surface of the hand below this ridge is smooth in the adult male, except for a strongish spine at the angle where the hand touches the arm; but in the female and younger male it is traversed just above the lower border by a raised but broken ridge, which is most distinct on the immobile finger. The dactylus varies also according to sex and age: in the adult male its external surface is traversed from base to tip by a strongly-milled ridge: in the adult female and youngest males there is little trace of ridge, and none of milling: and the ridge and milling gradually appear in the male with growth, often showing on one hand before the other.

The carpus of the penultimate pair of legs is compressed, and is surmounted dorsally by a single carina.

Colours of carapace, in spirit, dull yellowish-brown to dull olive-green, with a multitude of speckles.

Indian coasts—Penang, Tavoy, Arakan, Andamans, Ganges Delta, Máhánaddi Delta, Madras, Ceylon, Malabar coast, Karáchi.

I have examined 41 adult males, 120 females, and 49 young males in the Indian Museum collection.

This grows to a larger size than any other species of *Matuta*.

#### 14. *Matuta lunaris* (Herbst) Hilgendorf.<sup>1</sup>

? *Cancer lunaris*, Herbst, Krabben I, ii. 140, pl. vi. fig. 44, (1790).

*Matuta planipes*, Fabricius, Ent. Syst. Suppl. p. 369 (*vide* Hilgendorf), 1798.

*Matuta lunaris*, Herbst (*nec* Ramph) Krabben, III. i. 43, pl. xlvi. fig. 6 (*vide* Hilgendorf), 1799.

<sup>1</sup> No references are given except such as appear to be unequivocally applicable to the *M. lunaris* of Hilgendorf.

*Matuta appendiculata*, Bosc, Hist. Nat. Crust. I. 225.

*Matuta victor*, var. *tertia et quarta*, DeHaan, Faun. Japon. Crust. pp. 127 and 128.

*Matuta lunaris*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876) p. 247, pl. xl. figs. 10-11 (♀ and young ♂), and 'Challenger' Brachyura, p. 295: HILGENDORF MB. AK. BERL. 1878, p. 810: de Man, Notes Leyden Museum, III. 1881, p. 112: Henderson, Madras Journ. Lit. Sci. 1886-87, p. 66, fig. 6, and Trans. Linn. Soc. Zool. (2) V. 1893, p. 396.

*Matuta rubrolineata*, Miers, Trans. Linn. Soc. Zool. (2) I. 1875-79 (1876), p. 244, pl. xxxix. figs. 5, 6.

*Matuta lineifera*, Miers, *op. cit.*, p. 245, pl. xxxix. fig. 7: Haswell Cat. Austral. Crust. p. 134.

*Matuta circulifera*, Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 315, pl. xiv. fig. 5, and Challenger Brachyura, p. 295.

*Matuta laevidactyla*, Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 316 (footnote), and 'Challenger' Brachyura, p. 296 (♀ and young ♂).

*Matuta victor*, var. 3, Ortmann, Zool. Jahrbucher, Syst. &c. VI. 1891-92, p. 572.

Except in colour this species resembles *Matuta victor* very closely, differing only in the following characters:—

(1) the carapace is almost smooth, and the tubercles in the adult, but not in the young, are *all* indistinct:

(2) instead of a spine at the angle where the hand comes in contact with the distal lobule of the arm, there is only a tubercle, or a pair of tubercles:

(3) the fourth lobe of the median longitudinal ridge on the outer surface of the hand is not enlarged or acute: so that, in both sexes, and at all ages, there is only one large spine on the outer surface of the hand. Apart from this, exactly the same sexual and growth-differences occur in the hand as in *M. victor*:

(4) the colour of the carapace, in spirit, is bright yellow with vermicular red lines, which usually form spots or incomplete rings on the anterior half of the carapace and narrow longitudinal loops posteriorly.

I have heard this species stridulate.

Indian coasts—Mergui, Andamans, Burma, Sunderbunds and Gangetic Delta, Máhánaddi Delta, Madras, Bombay, Karáchi.

In the Indian Museum collection are 5 adult males, 55 females (many ovigerous), and fifteen young males.

The question of uniting this species with *M. victor*, as a variety, has to be carefully considered. After examining 210 specimens of *M. victor* and 75 of *M. lunaris* I find that the differences between them hold good irrespective of age or sex, and I would therefore regard the two species as perfectly distinct. I acquiesce in the name *M. lunaris* only on the supposition that Hilgendorf's remarks apply to *both* of Herbst's figures. If they do not apply to Herbst's pl. vi. fig. 44, then the Fabrician name *M. planipes* would have the priority.

15. *Matuta miersii*, Henderson.

? *Matuta peronii*, Guérin Méneville, Icon. Règne Animal, pl. i. fig. 1 (*nec* Leach).

PP *Matuta lunaris*, Leach, Zool. Miscell. III. p. 13, pl. 127, figs. 3-5.

? *Matuta lunaris*, Milne-Edwards, Hist. Nat. Crust. II. 114 (*nec* Rumph, *nec* Herbst).

*Matuta miersii*, Henderson, Madras Journ. Lit. Sci. 1886-87, p. 66, figs. 1-4, and Trans. Linn. Soc. Zool. (2) V. 1893, p. 396.

Carapace granular upon the eminences that support the tubercles, and towards the lateral epibranchial spines. All six tubercles of the carapace almost always distinct, both in the young and adult.

The antero-lateral borders are crenulate, the last three crenulations forming three large blunt teeth. The posterior and postero-lateral borders form a continuous, beaded, strongly-elevated ridge, which runs about half way along the edge of the lateral epibranchial spine and has in its course no trace of a tubercle or eminence. The length of the lateral spine is always, even in the young, less — often much less — than one-fourth the breadth of the carapace.

The front is wider than the orbit: the rostrum is distinctly bilobed.

Hand with the upper-border trilobed,—the lobes being almost always equal and acute, and with the lower border dentate, in both sexes and at all ages, as far as the base of the immobile finger. Below the crest, on the upper aspect of the hand, are two obliquely longitudinal, regular, unbroken rows of close-set teeth. Below these the hand is traversed longitudinally, as far as the finger-cleft, by a row of 5 teeth, the second of which (counting from the proximal end) is enlarged and acute. The surface of the hand below this ridge, as well as the surface of the immobile finger, is roughened, and is traversed longitudinally, at least as far as the middle of the finger, by a row of molariform tubercles, which row is sometimes incompletely double; but none of the tubercles are acute.

The characteristic sculpture of the hand is the same in the young and adult, in both sexes.

The carpus of the penultimate pair of legs is full, not compressed, and shows more or less distinct traces of a second dorsal carina.

Colour of carapace in spirit: olive yellow with red dots which are arranged in broadish vermicular lines and rings.

This is the smallest of all the species of *Matuta*: the largest male in the collection of the Indian Museum has a carapace-breadth of only 29 millim., and the largest ovigerous female a carapace-breadth of only 20 millim., although there is a single female — non-ovigerous — as large as the largest male.

It can be at once distinguished from *M. banksii* — which it most nearly resembles — by the complete absence of a tubercle on the postero-

lateral border; and by this border being elegantly beaded, raised in very strong relief, and continued far along the edge of the lateral spine.

In the Indian Seas this species has only been found on the Madras coast.

Although I have frequently dredged it, I have never done so in less than nine fathoms. I have on more than one occasion heard it make a musical noise audible at several yards distance.

As Henderson has remarked, a *Sacculina* is often found parasitic on the male.

In the Museum collection are 14 adult males, 40 females, and 15 young males.

#### Family LEUCOSIIDÆ.

*Leucosiens*, Milne-Edwards, Hist. Nat. Crust. II. 118.

*Leucosidea*, De Haan, Faun. Japon. Crust. p. 129.

*Leucosiidæ*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 390.

*Leucosiadæ*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 277.

*Leucosiidæ*, Miers, 'Challenger' Brachyura, p. 297.

Carapace circular or oval or polygonal. Eyes and orbits very small: front narrow but many times wider than the orbit. The antennules fold more or less obliquely. The antennæ are small, sometimes obsolete. The external maxillipeds completely close the buccal cavern, except that very commonly there is a crevice in front: their palp or flagellum springs from a groove in their dorsad surface near the inner edge, and is completely concealed when the maxillipeds are in repose: the exognath is broad, sometimes remarkably broad.

The afferent branchial channels occupy the sides of the endostome on either side of the deep median endostomial groove which, as in the *Calappidæ*, serves as an efferent branchial channel. The afferent channels are covered in by the exognaths of the external maxillipeds; the efferent channel is covered in immediately, as in the *Calappidæ*, by a pair of lamellar processes from the first maxillipeds.

The chelipeds are symmetrical and have no remarkable peculiarity of form.

The abdominal terga are very rarely distinctly separate: commonly in both sexes the 3rd-6th are intimately fused with obliteration of sutures, sometimes however the 6th also is independent, and in a few forms the sutures are not obliterated.

The vasa deferentia emerge through the 5th thoracic sternum on either side, near the bases of the 5th legs.

The *Leucosiidæ* are such a natural group, and the various forms of which it is composed show so many intergradations, that any attempt to split it up into "sub-families" must be received with caution.

Among the genera known to me by autopsy, however, two extremes of form are plainly recognizable, and I propose to use these two extremes as the bases of two natural alliances or sub-families.

The first alliance is typified by *Leucosia* and *Philyra*, the second by *Ilia* and *Iphiculus*.

In *Leucosia* and *Philyra* the merus of the external maxillipeds is as long as the ischium measured along the inner border; the fingers are stout and compressed, taper gradually from a broad base, and are usually shorter than the hand; the hand is stout, compressed, and if anything a little broader at its distal end than at its base; and when the specimen is laid face downwards on the table, with the chelipeds resting on the table in a semi-flexed position, the fingers open and close in a horizontal plane.

In *Ilia* and *Iphiculus*, on the other hand, the merus of the external maxillipeds is only half the length of the ischium measured along the inner border; the fingers are slender and of almost the same diameter from the base to near the hook-like tip, and are very much longer than the hand; the hand is either subglobular, or tapering-cylindrical with a swollen base; and when the specimen is placed in the position above described, the fingers open and close in either a vertical or oblique plane, and in *Iphiculus* the dactylus can, without any breakage or unnatural dislocation of parts, be moved through an arc of about 120°.

Speaking only of the genera known to me by autopsy, the following, though they differ a good deal from *Leucosia* in the characters under consideration, do not differ nearly so much as they do from *Ilia*:—*Pseudophilyra*, *Myra*, *Parilia*, *Randallia*, *Ebalia*, *Nursia*, *Merocryptus*, *Onychomorpha*. *Tlos* and *Oreophorus* also, although their fingers move in a nearly vertical plane, yet in other respects show no close affinities with the *Ilia* type, but rather, through *Nursia*, with the *Leucosia* type; and *Actæomorpha* goes with *Oreophorus*.

On the other hand, the following Indian genera belong to the *Ilia* alliance:—*Myrodes*, *Iphiculus*, *Nursilia*, *Arcania*. *Ixa* also, although its fingers are much shorter than the hand, clearly in other respects belongs to this alliance.

I would define these two subfamilies as follows:—

1. Subfamily *Leucosinæ*. Merus of external maxillipeds more, often much more, than half the length of the ischium measured along the inner border: fingers stout, gradually narrowing from base to tip, seldom much longer, commonly shorter, and often very much shorter than the hand, either opening in a horizontal plane or if in a vertical plane then the immobile finger is markedly more massive than the dactylus, the tip of the dactylus hardly ever movable through an arc

of over  $60^\circ$ : hands stout, generally longer than broad, and compressed, hardly ever broader at the base than at the distal end — when short broad and swollen (as often occurs in the Oreophoroid alliance) then the immobile finger is markedly more massive than the dactylus.

2. Subfamily *Iliinæ*. Merus of external maxillipeds half or less than half the length of the ischium measured along the inner border: fingers slender, almost of the same diameter from base to near tip, either very much longer than the hand, or if shorter than the hand then of filiform slenderness; either opening and closing in a vertical plane, or if in a nearly horizontal plane then the tip of the dactylus is movable through an arc of about  $120^\circ$ : hands either short swollen and subglobular, or tapering-cylindrical with a swollen base, always much broader at the base than at the point of origin of the fingers.

The following is a list of the genera of Leucosoid Crabs, so far as known to me, arranged in accordance with the classification here proposed. Indian genera are printed in Roman type, and all genera known to me by autopsy are marked with an asterisk:—

#### Family **Leucosiidæ**.

##### Sub-family I. *Leucosinæ*.

##### ALLIANCE I. OREOPHOROIDA.

\* *Actæomorpha*.

? *Carcinaspis*, Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 161.

*Cryptocnemus*, Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 161.

\* *Heteronucia*, *n. gen.*

\* *Merocryptus*, A. Milne-Edwards, Journ. Mus. Godeff. I. iv. p. 84 (260). 1873. [Transition towards *Nursia*].

\* *Oreophorus*.

*Spelæophorus*, A. Milne-Edwards, Ann. Soc. Ent. Franc. (4) V. 1865, p. 148.

\* *Tlos*.

*Uhlias*, Stimpson, Ann. Lyc. Nat. Hist., New York, X. 1874, p. 117.

##### ALLIANCE II. NURSIODA.

\* *Ebalia*.

*Lithadia*, Bell, Trans. Linn. Soc. XXI. 1855, p. 305.

\* *Nursia*.

*Phlyxia*, Bell, Trans. Linn. Soc. XXI. 1855, p. 303.

[*Bellidilia*, Kinahan, Journ. Roy. Dub. Soc. I. 1858, p. 128: regarded by Miers, 'Challenger' Brachyura, as synonymous with (*Phlyxia* and) *Ebalia*.]



ALLIANCE III. NUCIOIDA.

- \* Nucia.
- \* Parilia.
- \* Raudallia.

ALLIANCE IV. MYROIDA.

- Leucosilia*, Bell, Trans. Linn. Soc. XXI. 1855, p. 295.
- \* Myra (= *Myropsis*, Stimpson).
- Persephona*, Leach, Zool. Miscell. III. 22 (1817) [= *Guaia*, Milne-Edwards, vide Bell, Trans. Linn. Soc. XXI. 1855, p. 292.

ALLIANCE V. LEUCOSIOIDA.

- \* Leucosia.
- \* Onychomorpha (perhaps the only known representative of a distinct alliance).
- \* Philyra.
- \* Pseudophilyra.

Sub-family II. *Ilinæ*.

ALLIANCE I. MYRODOIDA.

- Callidactylus*, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 157.
- \* Myrodes.

ALLIANCE II. IPHICULOIDA.

- \* Iphiculus.
- \* Pariphiculus, *n. gen.*

ALLIANCE III. NURSILIOIDA.

- \* Heterolithadia.
- \* Nursilia.

ALLIANCE IV. ILIOIDA.

- \* Arcania (= *Iphis*, Leach).
- \* *Ilia*, Leach, Zool. Miscell. III. 19: Milne-Edwards, Hist. Nat. Crust. II. 123.
- Iliacantha*, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 155: Miers 'Challenger' Brachyura, p. 301.
- \* Ixa.

## I. Key to the Indian genera of the sub-family Leucosiinae.

- I. Carapace convex or subglobular; subcircular, oval, or hexagonal in outline; its surface may sometimes be more or less covered with bead-like or vesiculous granules, but it is generally quite smooth and often polished to the naked eye; the hepatic regions may sometimes form independent convexities, and the intestinal region may sometimes be delimited by a groove or by creases, but as a rule the regions are merged in the general convexity of the carapace. The eyes are very small; and the orbits are complete—the edge of the roof being not, or little, emarginate, and the outer wall, though marked by closed sutures, not being fissured: there is little or no space between the edge of the floor of the orbit and the free edge of the buccal cavern—the two practically coinciding: antennae distinct:—
1. Chelipeds massive: posterior margin of carapace smooth, although sometimes, especially in the young, its extreme ends may be dentiform: intestinal region never tumid and acuminate: merus of external maxillipeds nearly as long as, or sometimes even longer than, the ischium measured along the inner border:—
    - i. Front narrow, prominent, forming a distinct snout projecting beyond the subhepatic or pterygostomian regions which are never puffed out: buccal cavern elongate: the exopodite of external maxillipeds narrow and elongate, with the outer margin straight:—
      - a. Either a circumscribed cavity or a deep depression in the ventrad surface of the carapace above the base of the chelipeds ..... LEUCOSIA.
      - b. No cavity in the carapace above the base of the chelipeds ..... PSEUDOPHILYRA.
    - ii. Front broad and remarkably truncated, the whole or the greater part of the edge of the buccal cavern being seen beyond it in a dorsal view: buccal cavern broad: exopodite of external maxillipeds broad (often remarkably expanded), its outer and anterior borders forming a continuous nearly semicircular curve ..... PHILYRA.
  2. Chelipeds only moderately stout, or even rather slender: three spines or long petaloid processes on the posterior border, the middle one of which belongs to the tumid intestinal region: merus of external maxillipeds not quite two-thirds the length of the ischium measured along the inner border: pterygostomian regions always puffed out beyond the level of the true antero-lateral margin of the carapace ..... MYRA.

- II. Carapace strongly convex, or globular; circular or oval in outline, the regions usually, but not always, defined by distinct grooves: orbits rather incomplete, the roof being markedly emarginate, and the outer wall being often cleft by fissures (which are sometimes quite-closed sutures): a space of remarkable depth between the edge of the lower wall of the orbit and the free edge of the buccal cavern: posterior margin of carapace most commonly, but not always, armed with spines or tubercles: front truncated, narrow, almost always sunk behind the level of the edge of the buccal frame: pterygostomian regions remarkably puffed out, often convex beyond the front: merus of external maxillipeds not much shorter than the ischium measured along the inner border: antennæ very distinct:—
1. Buccal cavern transversely oblong, much broader than long, owing to the enormous width of the afferent branchial canal and of the exognath, the latter foliaceous with the outer and anterior borders forming a continuous semicircular curve: carapace ovoidal, finely scabrous: chelipeds slender—in the adult male more than four times the length of the carapace..... PARILIA.
  2. Buccal cavern triangular, exognath not expanded: surface of carapace pustulous or densely vesiculous (if smooth to the naked eye the vesiculous appearance can be detected under a lens):—
    - i. Carapace almost circular and globular: legs slender: chelipeds from once and a half to twice and a half the length of the carapace..... RANDALLIA.
    - ii. Carapace transversely oval, manifestly broader than long, its lateral margins coarsely spinate: legs remarkably stout: chelipeds very short and stout .. NUCIA.
- III. Carapace consisting of two parts namely (1) a low convex subcircular perfectly smooth crown, formed by the carapace proper, and (2) a thin broad unbroken brim formed by the front and the confluent lateral and posterior margins: merus of external maxillipeds considerably longer than the ischium: eyes and orbits as in I: antennæ obsolete..... ONYCHOMORPHA.
- IV. Carapace very rarely approaching a subcircular or ovoidal shape, commonly broad and polygonal; its surface always broken, nodular, tuberculous, wrinkled, or eroded; most commonly the regions are well delimited by grooves or by inequalities of level: almost always a distinct space between the edge of the floor of the orbit and the free edge of the buccal cavern: antennæ often indistinct, sometimes obsolete:—
1. Edge of roof of orbit markedly emarginate, so that the retracted eye is a good deal exposed to dorsal view: antennular fossæ in open communication with orbits: space between floor of orbit and free edge of buccal cavern rather narrow: fingers opening in a horizontal plane, and of normal shape: antennæ minute, but distinguishable:—
    - i. Carapace pentagonal or hexagonal, little or not at all broader than long, its lateral borders not expanded, its regions usually tumid and well defined by grooves or in-

- equalities of surface: antennary flagella minute but distinct: merus of external maxillipeds a great deal more than half the length of the ischium measured along the inner border.....
- ii. Carapace usually much broader than long, broadly and irregularly pentagonal, its margins thin depressed and expanded, with the edges often jagged; its posterior margin being on a well-defined plane, distinct from, and much lower than, the general plane of the carapace; its surface usually traversed by ridges radiating from the centre, which do not define the regions: antennary flagella minute and difficult to detect: merus of external maxillipeds not much more than half the length of the ischium measured along the inner border .....
2. Orbits very complete, and not in open communication with the antennular fossæ: a broad space between edge of floor of orbit and free edge of buccal cavern: antennary flagella obsolete or very minute: carapace very markedly broader than long, its surface remarkably nodular, or eroded, or both; expanded laterally so as sometimes to partly or entirely conceal the legs in flexion: merus of external maxillipeds a good deal more than half the length of the ischium: immobile finger markedly more massive than the dactylus:—
- i. Lateral expansions of carapace entirely concealing the legs in flexion: basal antennal joint though tightly filling the gap at the inner canthus of the orbit, yet quite independent: fingers clumsy, cupped on the inner face, closing in a vertical plane, the immobile finger monstrous:—
- a. Carapace enormously convex, honeycombed by large symmetrically-disposed undermined caverns and channels.....
- b. Carapace humped behind, flattened and cupped at the sides, the lateral margins formed each of three broad foliaceous lobes which are fused but still display the sutures.....
- ii. Sides of carapace only partly or slightly concealing the legs in flexion: basal antennal joint fused with the orbit, which except for a narrow fissure in the lower wall forms an unbroken ring:—
- a. Antennæ quite obsolete: fingers shorter than palm, opening obliquely: abdomen in both sexes with all the segments separate: meropodites of legs somewhat concealed, in flexion, by the carapace.....
- b. Antennary flagella present, very minute: fingers longer than palm, opening vertically: abdomen of female (male unknown) with the 3rd-6th terga indistinguishably fused: legs hardly at all concealed, even in flexion, by the carapace

EBALIA.

NURSIA.

OREOPHORUS.

TLOS.

ACTEOMORPHA.

HETERONUCLA.

II. Key to the Indian genera of the sub-family Ikinæ.

- I. Hands not much longer than broad, short squat swollen or subglobular: fingers always much longer than the hand, opening either in an obliquely vertical or sometimes in a nearly horizontal plane:—
1. The whole body and appendages covered with a close spongy pubescence:—
    - i. Carapace much broader than long, its antero-lateral margins armed with large spines increasing in size from before backwards: tip of dactylus movable through an arc of about  $120^{\circ}$  ..... IPHICULUS.
    - ii. Carapace oval (longitudinally) or globular, its margins with small dentiform tubercles: tip of dactylus movable through an arc of about  $70^{\circ}$  ..... PARIPHICULUS.
  2. Carapace practically free of pubescence:—
    - i. Carapace longer than broad, elongate-oval, smooth, shaped almost exactly as in *Myra*: tip of dactylus movable through an arc of about  $120^{\circ}$  ..... MYRODES.
    - ii. Carapace broader than long, not smooth:—
      - a. Carapace polygonal, with the lateral margin laminar and sinuous or jagged, and with some definite ridges and spines on the surface—shaped, in fact, much as in *Nursia*: tip of dactylus movable through an arc of about  $130^{\circ}$  ..... NUKSILIA.
      - b. Carapace oval, its surface closely granular and nodular, the hepatic regions much sunken: tip of dactylus movable through an arc of about  $70^{\circ}$  ..... HETEROLITHADIA.
- II. Hands much longer than broad, tapering from a swollen base: fingers opening in a nearly vertical plane, the tip of the dactylus movable through an arc of  $60^{\circ}$  to  $70^{\circ}$ :—
1. Carapace more or less globular, its margins with definitely-disposed large spines or tubercles: fingers either longer or not very much shorter than the hand ..... ARCANIA.
  2. Sides of the carapace produced into two huge cylindrical sausage-shaped processes: median regions of the carapace separated from the lateral regions by broad channels or grooves: figures not half the length of the hand ..... IXA.

*Actæomorpha*, Miers.

*Actæomorpha*, Miers, Journ. Linn. Soc. Zool., Vol. XIII. 1878, p. 184.

Carapace Cancroid, convex, granular. Front broad, not projecting much. Orbits quite complete. *Antennary flagella absent, basal joint present and fused with the orbit to form its inner wall.* The antennules fold obliquely.

The external maxillipeds close the buccal cavern completely: their exopodite is narrow, with the outer edge almost straight: the triangular merus is about two-thirds the length of the ischium measured along the inner border.

Chelipeds massive, not, or hardly, longer than the carapace: hand short and broad, and about the same length as the stout compressed fingers.

True legs short and stout: the meropodites, in flexion, are somewhat hidden beneath the carapace.

The abdomen in both sexes has all seven terga distinctly separate, and in the male is narrow-ovate.

In general appearance *Actæomorpha*, as Miers states, much resembles the Cancroid *Actæa granulata*: it is, however, a true Leucosid, and closely related to *Oreophorus*, as Miers has stated.

*Key to the Indian species of Actæomorpha.*

- |                                                              |     |     |     |                       |
|--------------------------------------------------------------|-----|-----|-----|-----------------------|
| 1. Regions of carapace separated by deep clean cut channels  | ... | ... | ... | <i>A. morum.</i>      |
| 2. Regions of carapace separated by shallow shelving grooves | ... | ... | ... | <i>A. lapillulus.</i> |

16. *Actæomorpha morum*, n. sp. Plate VIII. fig. 3.

Carapace broader than long, somewhat oval, strongly convex, closely covered—like the whole body—with large smooth crowded vesiculous granules. The regions of the carapace as a whole are completely isolated from a broad marginal ring by a broad sculptured circumferential groove, a very narrow bridge alone connecting the front with the gastric region: and the regions are again most elegantly isolated from each other (1) by two obliquely-longitudinal channels that cut off the acutely-triangular gastro-cardiac region from the somewhat reniform branchial regions, and (2) by a transverse channel that cuts off the semi-oval intestinal region—the channels being all in communication with the marginal channel. The isolated marginal ring consists of the front, which is thickened, broad, and slightly prominent; of the posterior margin, which is thickened, slightly curved, and slightly prominent; and of four sharp-cut lateral lobes on either side.

The eyes and orbits are visible in a dorsal view.

The chelipeds and legs are closely crowded with large granules, which on the under surface are smooth and vesiculous, and on the upper surface are spiniform. The chelipeds in the female are about as long as the carapace: the hands are about as long as the fingers: the fingers are traversed by close rows of tiny granules nearly to the tip. The legs are stout and short, with very slender hairy dactyli: in flexion they are somewhat hidden by the carapace.

Orange colour in spirit.

Two females from a bottom of sand and shells, off the Ganjam Coast, 28 to 30 fathoms. They do not seem to be quite adult, and the carapace is 10 millim. long and 12 millim. broad.

17. *Actaeomorpha lapillulus*, n. sp.

Carapace broader than long, strongly convex, crowdedly pustulous: its regions are all well-defined by shallow grooves, and the branchial and intestinal regions are also separated from the margin by shallow grooves. The front is somewhat prominent, and is obscurely bilobed; the hepatic regions though dorsally sunken are angularly convex in the antero-lateral margin, the lateral margins are coarsely and bluntly three-lobed, and the posterior margin is thickened and somewhat prominent. The eyes are hardly visible in a dorsal view. The under surface of the body is closely granular.

The chelipeds are everywhere nodular and pustulous, and the legs are more or less granular on the under surface, and are covered on the dorsal surface with crowded spiniform granules. The chelipeds in the female are about as long as the carapace, and the hands are about as long as broad and not much longer than the fingers. The legs are stout and short, and are somewhat hidden by the carapace in flexion,—that surface of the carapace being somewhat grooved by the pressure of the meropodites.

Colours in spirit: yellowish white, mottled with orange.

Two males and a female from off Ceylon, 34 fms., and a female from off Ceylon 32 fms., the bottom in both cases consisting of broken coral and shells.

The largest specimen—a female not quite adult—has a carapace 9 millim. long and 11 millim. broad.

*Oreophorus*, Rüppell.

*Oreophorus*, Rüppell, Beschreibung, etc., Kurzschwänzigen Krabben des rothen Meeres, p. 18 (1830).

*Oreophorus*, Milne-Edwards, Hist. Nat. Crust. II. 130.

*Oreophorus*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 306, and Cat. Lencos. Brit. Mus. p. 18.

Carapace broadly semi-elliptical or subpentagonal, so that its postero-lateral margins overhang and completely conceal the legs in flexion (much as in *Calappa*); strongly convex, nodose, and often symmetrically eroded or honey-combed. The front forms a distinct, slightly upturned, triangular projection, with the orbits almost on its under surface.

Eyes small; orbits quite complete, the inner canthus being completely closed by the tight-fitting basal antennal joint. No antennary flagella. Antennules folding obliquely.

The external maxillipeds close the buccal cavern completely: their exopodite is narrow, with the outer edge almost straight: the triangular merus is nearly two-thirds the length of the ischium, measured along the inner border.

Chelipeds massive, not very much longer than the carapace: hand short and broad: fingers about twice as long as the hand, their inner surface hollowed like a spoon: the immobile finger enormously massive.

True legs small, and hidden, when flexed, by the lateral expansions of the carapace.

The abdomen of the male consists of three pieces, and is acutely triangular; that of the female consists of four pieces.

In India these little crabs are found only on bottoms of dead coral shingle, to the eroded fragments of which the crabs themselves have a most extraordinary likeness, the likeness being increased by an encrusting growth of *Foraminifera*, *Polyzoa*, etc., to which the crabs like the shingle, are subject.

#### 18. *Oreophorus reticulatus*, Adams & White.

*Oreophorus reticulatus*, Adams and White, 'Samarang' Crustacea, p. 54, pl. vi. fig. 1 (1850): Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 307, and Cat. Lencos. Brit. Mus. p. 19: A. Milne-Edwards, Ann. Soc. Ent. Franc. (4) V. 1865, p. 151: Miers, Zool. H. M. S. 'Alert,' pp. 185, 254: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 111.

Carapace with three caverns, diminishing in size from before backwards, excavated just inside the front and lateral margins on either side. The caverns have undermined edges, and the first communicates with the second by a tunnel, while the second may sometimes (young) have an open communication with the third, and sometimes (adults) only the remains of a communication.

The intestinal region and the true posterior margin are insulated from the rest of the carapace by an undermined channel, which sends forwards a short branch on either side of the cardiac region. The



branchial regions are remarkably tumid, and their surface, like that of the non-excavated parts of the carapace, is reticulate-punctate: the floors of the caverns are either smooth or granular; the floor of the channel has bead-like granules scattered over it.

The whole under surface of the body is rough and granular.

The chelipeds are not quite  $1\frac{1}{2}$  times the length of the carapace, and are nodular and granular: the hand is rather broader than long, and not much more than half the length of the fingers: along the outer surface of both fingers is a row of pits. The legs are slender, and are covered up to the tips of the dactyli with crisp, clavate, spiniform, or arborescent granules.

An adult (ovigerous) female has the carapace nearly 11 millim. long, and 14 millim. broad.

In the Indian Museum are 12 females and a young male from off Ceylon, 34 fms., off the Malabar coast, 28 fms., and from the Persian Gulf.

The abdomen of the young male is sunk below the level of the sternum.

18a. *Oreophorus reticulatus*, var. *alcicornis*, nov.

Differs from the common form in the following particulars:—

(1) The caverns are much larger, the two just behind the front being separated by a very narrow bridge.

(2) On either branchial region are three coarse spines—one on the summit and two on the lateral border: the spine on the summit is vertical and has a bifid tip.

(3) The eyes are not at all visible in a dorsal view.

A single adult female from off the Ganjam Coast, 28 fms.

Carapace 14 millim. long, 19 millim. broad.

*Tlos*, Adams and White.

*Tlos*, Adams and White, 'Samarang' Crustacea, p. 57.

*Tlos*, A. Milne-Edwards, Nouv. Archiv. du Mus. X. 1874, p. 51.

*Tlos* differs from *Oreophorus* chiefly in having the anterior and lateral parts of the carapace flat and the margin of the carapace turned up, so that although the cardiac and parts of the branchial regions are convex, the carapace as a whole is cupped. This is in marked contrast with the inflated form of *Oreophorus*, and constitutes the only difference between the two forms.

19. *Tlos petræus*, A. Milne-Edwards.

*Tlos petræus*, A. Milne-Edwards, Nouv. Archiv. du Mus. X. 1874, p. 51, pl. iii. fig. 1.

Carapace broadly pentagonal; with the front somewhat produced, bluntly triangular, and slightly emarginate. The margins of the carapace are thickened, roughened, and somewhat upturned. Each wing of the carapace shows a division into three broad lobes, but the divisions are only sutures, not gaps. Except for a ridge running from the front to the cardiac region, and except for a granular node just external to the cardiac region on either side and for a little thickening between each node and the postero-lateral angle, the surface of the carapace is smooth and concave. The under surface of the body is granular. The orbits are almost ventral in position, and the eyes are not visible in a dorsal view.

The chelipeds in the female are not quite as long as the carapace: the arm is trigonal with enlarged granules along all its borders, the wrist and hand are rough, and the dactylus is fluted. The hand is as broad as long, and is continued without any sort of constriction into the great shovel-shaped immobile finger, which is about as long as the hand and vastly more massive than the dactylus. The legs are compressed, and have their dorsal and ventral surfaces granular: in flexion they are hidden beneath the wings of the carapace.

In the abdomen of the male the terga although a good deal fused are all separately recognizable, and there is a denticle in the middle line on the 4th and 6th.

An adult (ovigerous) female has the carapace 7 millim. long, and 10 millim. broad.

Andamans, Off Ceylon 34 fms., Pedro Shoal 20 fms. Eight specimens.

20. *Tlos patella*, n. sp. Plate VIII. fig. 4.

Carapace transversely oval, and closely covered with granules which under the lens are fungiform: the carapace is traversed by a longitudinal ridge, and the branchial regions are convex in their posterior part; but the wings of the carapace are cupped dorsally, much as in *T. petræus*, and are divided by closed sutures into three broad lobes.

The front hardly breaks beyond the general outline of the carapace, and has its edge thickened. The eyes can just be seen in a dorsal view.

The intestinal region is convex backwards, and the bilobed (true) posterior margin still more so.

The under surface of the body is granular, much like the upper surface.

The chelipeds in the female are about one-fourth longer than the carapace, and are closely covered with small flat smooth granules: the arm is trigonal, with larger granules along the edges: the hand is somewhat inflated, a little longer than broad, and not much more than half the length of the fingers: the fingers are curved and are hollowed on the inner face: the immobile finger is distinctly constricted off from the hand, and is not vastly more massive than the mobile finger.

The legs are as in *T. petraeus*.

The largest adult (ovigerous) female has the carapace 9 millim. long and 11 millim. broad.

*Loc.* Andamans. Seven females.

#### *Heteronucia*, n. gen.

Carapace strongly convex, broader than long, its surface both granular and tubercular (or coarsely spinous): the regions distinct.

Front bidentate, sunk behind the edge of the mouth-parts and of the puffed out pterygostomian regions.

Orbits complete but shallow, not concealing the rather large eyes in flexion. The basal antennal joint is fused with the orbit and with the front, and the extremely minute antennary flagellum is entirely inside the orbital wall. The antennules fold obliquely.

The epistome is exceptionally broad.

The external maxillipeds completely close the buccal cavern; the exopodite is narrow, with the outer edge straight; the merus is about two-thirds the length of the ischium measured along the inner border.

The chelipeds are massive and are about half again as long as the carapace: the hand is short, broad and swollen: fingers a good deal longer than the hand, stout, closely meeting throughout their extent, curved and concave on their inner face, opening vertically: the immobile finger is a good deal more massive than the dactylus.

Legs stout, the meropodites slightly hidden in flexion.

This species has, at first sight, a general resemblance to *Nucia speciosa*, but is at once distinguished by the form of the orbits, antennæ and chelipeds.

#### 21. *Heteronucia vesiculosa*, n. sp. Plate VIII. fig. 1.

The whole surface of the body and of the appendages (except the fingers and dactyli) is covered with crowded vesiculous granules without any space between them.

Carapace a good deal broader than long, strongly convex: on either lateral margin are eight coarse spines or acute tubercles, the first of which is at the antero-external angle of the buccal cavern, the last of which is at the junction with the posterior border: in addition the

whole dorsum of the carapace is occupied by a "pyramid" (as on the billiard table) of 8 or 9 similar coarse spines or acute tubercles—the apex of the pyramid being on the intestinal region—and there is, further, a coarse denticle on either hepatic region: the surface of all these is densely vesiculous.

The front is broadly bidentate, and the whole of the front edge of the buccal cavern and of the tips of the external maxillipeds can be seen beyond it in a dorsal view. There is a tubercle near the base of the distal piece of the exognath.

The chelipeds are stout, and are rather more than half again as long as the carapace: the hand is subglobular: the fingers are somewhat longer than the hand, are elegantly grooved, meet in all their extent, open nearly vertically, and are hollowed and curved inwards; the dactylus is less massive than the immobile finger: at the base of the dactylus, on the upper surface of the hand is a small tubercle.

The abdomen of the female consists of 4 pieces—the 3rd to 5th terga being fused.

Colours in spirit light orange yellow.

An ovigerous female has the carapace 5 millim. long and 6 millim. broad.

*Loc.* Off Ceylon, 34 fms.

#### *Nursia*, Leach.

*Nursia*, Leach, Zool. Miscell. III. p. 18.

*Nursia*, Milne-Edwards, Hist. Nat. Crust. II. 137.

*Nursia*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 307, and Cat. Lencos. Brit. Mus. p. 19.

Carapace with a broad, usually depressed, symmetrically-wrinkled surface, and with expanded, foliaceous, sinuous, scalloped, or jagged lateral and posterior margins,—the lateral margins somewhat concealing the true legs in flexion. Front projecting beyond the epistome and usually well beyond the eyes.

Orbits with two sutures in the roof, and a gap at the inner canthus, and with the upper-outer wall so emarginate as to leave the fully-retracted eye exposed to dorsal view.

Antennules folding obliquely. Antennæ, minute, situated in the inner canthus of the orbit.

Buccal cavern about as long as it is broad at base, and somewhat narrowed anteriorly; the exognath not dilated, its outer edge a little curved: the triangular merus is a little over half the length of the ischium, measured along the inner edge.

The chelipeds relatively to the legs are very massive: in the male they vary from  $1\frac{1}{2}$  times to over twice the length of the carapace:

arms sharply trigonal; hands a good deal compressed; fingers stout and compressed, about half or two-thirds the length of the hand.

The abdomen of the male consists, usually, of 3 pieces, that of the female of 4.

*Key to the Indian species of Nursia.*

- I. An oblique ridge crossing either hepatic region, in addition to the longitudinal, transverse, and epibrauchial ridges: upper surface of hand convex, but without a conspicuous median ridge:—
  1. The posterior margin of the carapace has the form of two blunt semicircular lobes: the lateral margins are sinuous, or only bluntly jagged: chelipeds in the adult male less than twice the length of the carapace:—
    - i. Lateral margins jagged: front with a coarse thickened granular edge, and not projecting much beyond the eyes: carapace much broader than long ... .. *N. plicata.*
    - ii. Lateral margins sinuous: front in the form of a large ovate snout, projecting far beyond the eyes: carapace nearly as long as broad:—
      - a. Outer surface of wrist and hand bluntly and inconspicuously carinate: ridges of carapace coarse and granular: snout semi-circularly rounded ... .. *N. blanfordi.*
      - b. Outer surface of wrist and hand sharply and conspicuously cristate: ridges of carapace clean-cut: snout ovate-pointed ... .. *N. nasuta.*
  2. The posterior margin of the carapace has the form of two sharp laminar teeth: the lateral margins are sharply jagged: front sharply 4-denticulate:

- chelipeds, in the adult male, more than twice the length of the carapace *N. hardwickii*.
- II. No trace of an oblique ridge on the hepatic regions or of a transverse ridge behind the branchial regions, the longitudinal and epi-branchial ridges alone present: posterior margin not manifestly bilobed: upper surface of hand traversed from base to finger-cleft by a distinct ridge:—
1. Carapace convex: front broadly bidentate ... .. *N. persica*.
  2. Carapace almost laminar: front broadly pointed ... .. *N. abbreviata*.
- III. No ridges at all on the carapace: margins not manifestly sinuous ... .. *N. rubifera*.

22. *Nursia plicata*, (Herbst) *nec auctorum*.

*Cancer plicatus*, Herbst, Krabben III. iv. 2, pl. lix. fig. 2.

Carapace about three-quarters as long as broad, with the posterior margin in the form of two semi-circular dorsally-concave lobes. The foliaceous lateral margins are scalloped, each into four blunt teeth: in front of the first of these (which is rounded off), on either side, is a thickened marginal nodule; and the last, on either side, are united by a coarse granular ridge running across the carapace parallel with the posterior margin, which it cuts off from the rest of the carapace. This ridge culminates, in the middle line, in a coarse granular tubercle.

The middle of the carapace forms a coarsely-granular eminence surmounted by 3 tubercles in a triangle. From it six blunt coarsely-granular ridges radiate, as follows:—one forwards, in the middle line, to the front; one backwards, in the middle line, to the transverse ridge; one obliquely forwards, across the hepatic region on either side, to the nodule on the hepatic margin; and one obliquely backwards to the penultimate lateral tooth on either side. The spaces between the ridges are markedly concave, and are usually smooth.

The front hardly projects beyond the eyes, and has a coarse thickened granular edge: it is usually obscurely bilobed, and never quadridentate.

The surfaces of the external maxillipeds, of the pterygostomian regions, of the thoracic sterna, and of the proximal part of the male abdomen are distinctly granular.

The chelipeds in the adult male are  $1\frac{3}{4}$  times, in the adult female about  $1\frac{1}{4}$  times the length of the carapace: the arm has only its outer border

carinate,—the carina being coarse and granular; the base of its upper surface, the inner border, and the base of the under surface and the under border are also granular to the naked eye: the outer edges of the wrist and hand are coarsely and inconspicuously carinate: the fingers are stout, are rather strongly bent inwards, and have the opposed edges almost edentulous: *the dactylus is more than three-quarters the length of the outer border of the hand*, in both sexes.

The true legs are not much longer than the arm, and are compressed: in all the merus and propodite are sharply carinate dorsally and ventrally, the carpus has two sharp dorsal crests, and the dactylus is closely pubescent.

The abdomen of the male consists of two linear basal pieces and a small triangular apical piece, and between the two a long triangular plate with a median sub-terminal tooth.

Length of carapace of the largest male, 15 millim., breadth 20 millim.: length of carapace of largest female 16 millim., breadth 22 millim.

Old spirit specimens are uniform flesh-colour: but fresh spirit specimens are a bright brick red, with the wings of the carapace, and a median longitudinal band including the front, yellowish white.

In the Indian Museum are 8 adult males, 6 adult and egg-laden females, and one young, from the Orissa Coast, Tinnevely coast, Palk Straits, Bombay, Karáchi, and the Persian Gulf. [Besides these there are 4 adult females and a male from Hongkong].

### 23. *Nursia hardwickii*, Leach.

*Nursia hardwickii*, Leach, Zool. Miscell. III., p. 20: Desmarest, Consid. Crust. p. 163: Milne-Edwards, Hist. Nat. Crust. II. 137.

*Nursia plicata*, Bell, Trans. Linn. Soc. Vol. XXI. 1855 p. 307, pl. xxxiv. fig. 4, and Cat. Leucos. Brit. Mus., p. 19 (*nec* Herbst): Stimpson, Proc. Ac. Nat. Sci. Philad. 1858. p. 161 (?): Miers, Trans. Linn. Soc. Zool., (2) I. p. 240, pl. xxxviii. fig. 28: Haswell, Cat. Austral. Crust. p. 127 (?): de Man, Notes Leyden Mus. III. 1881, p. 129: A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. p. 111 (?): J. B. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 404.

The general form is that of *N. plicata* Herbst, but much finer and cleaner cut; and with the anterior part of the carapace narrower and the front projecting.

*The posterior margin of the carapace has the form of two sharp-cut laminar teeth*; and the three last teeth on either lateral margin are thin and sharp.

The crests on the carapace are thin and sharp, and very finely granular; and the elevation from which they radiate is defined by three sharp denticles: the transverse ridge that unites the two last marginal teeth across the carapace culminates, in the middle line, in a denticle.

The front distinctly projects beyond the eyes; *its margin is thin and sharp and is cut into four teeth*: the antero-lateral margins do not run up to the level of the tip of the front, involving the orbits, as they do in *N. plicata*.

The granulation on the ventral surfaces, unlike that of *N. plicata*, is hardly visible to the naked eye.

*The chelipeds in the adult male are  $2\frac{1}{3}$  times, in not-quite-half-grown males  $1\frac{2}{3}$  times, and in adult females  $1\frac{1}{2}$  times the length of the carapace*: to the naked eye they are perfectly smooth: the outer edges of the arm, wrist and hand are sharply carinate: *the dactylus in the male is little more than half the length of the outer edge of the hand.*

Uniform flesh-colour in spirit.

Length of carapace in the adult male 14 to 15 millim., breadth about 19 millim.; in the adult female length 12 to 13 millim., breadth about 16 millim.

In the Indian Museum collection are 18 adult males, 8 adult females, and 2 young males taken at various places along the Coromandel coast, from Ganjam to Pondicherry.

#### 24. *Nursia blanfordi*, n. sp. Plate VII. fig. 5.

Carapace, except that it is nearly as long as broad, of the same general appearance as in *N. plicata*, Herbst, with the same two semi-circular lobes on the posterior margin, and the same number of *blunt* teeth on the lateral margin,—the teeth, however, being blunter, and the first two on either side nearly confluent.

The ridges that radiate from the centre of the carapace, though of the same coarse and coarsely-granular form as in *N. plicata*, differ somewhat in arrangement: the median longitudinal ridge, the ridges that run obliquely outwards to the hepatic margin on either side, and the transverse ridge that unites the last lateral teeth across the carapace, are the same; but the epibrauchial ridges that run to the penultimate lateral tooth on either side are so little oblique in the greater part of their extent as to form an almost transverse crest across the carapace, parallel with the first-mentioned transverse ridge and with the posterior margin. The triangle of denticles on the mid-gastric region, and the denticle on the second transverse crest are as distinct and sharp, especially in the male, as they are in *N. hardwickii*.

The front has the form of a semi-circular foliaceous snout, projecting far beyond the eyes, and somewhat recurved upwards.

Both the exopodite and the endopodite of the external maxillipeds are traversed longitudinally by a raised line of enlarged granules.

The chelipeds in the male are about  $1\frac{3}{4}$  times, in the female about



$1\frac{1}{2}$  times, the length of the carapace, and their surface is everywhere finely granular, except on the fingers, which are of the same form and proportions as in *N. plicata*: the arm is trigonal, with all the edges sharp, and the outer edges of the wrist and hand are coarsely, but distinctly, carinate.

The legs have the merus, carpus and propodite faintly carinate dorsally.

The abdomen of the male consists of 3 pieces, the large middle piece having a subterminal denticle.

Colours in spirit, uniform light brownish.

The ovigerous female has the carapace 8 millim. long and 8.5 millim. broad: the male is slightly smaller.

Persian Gulf, 52 fathoms, dredged by Mr. W. T. Blanford, F. R. S., to whom the Indian Museum collections owe so many valuable additions. Also from the Mekrân coast. Six specimens are in the Indian Museum.

25. *Nursia nasuta*, n. sp. Plate VII. fig. 6.

Resembles *N. blanfordi* in almost all its characters, especially in having the carapace nearly as long as broad, and the front in the form of a large curved foliaceous snout; but differs in the following particulars:—

(1) the front is sharper and even longer, and in shape is pointed-ovate:

(2) the ridges of the carapace are little granular, and the oblique ridges that cross the hepatic regions are obsolescent:

(3) the outer edge of the wrist and of the hand are raised each into a thin sharp high crest:

(4) the size is even more minute, the largest specimens (ovigerous females) having the carapace from 5 to 6 millim. long and from 5.25 to 6.25 millim. broad.

*Loc.* Off the Malabar coast, 28 fathoms. Two adult males and 6 adult females.

26. *Nursia persica*, n. sp. Plate VII. fig. 7.

Carapace about nine-tenths as long as broad, its lateral margins expanded and cristiform, but not scalloped, only sinuous (much as in *N. abbreviata*), forming three shallow lobules on either side: posterior margin laminae, perfectly straight, with a spot of dark red (in spirit) pigment in the middle line.

The carapace, which is rather strongly convex, is traversed longitudinally, in the middle line, by a broad sharp-edged ridge that ends

at a tubercle in the intestinal region, and is again crossed transversely by a similar ridge, which is strongly convex forwards: these are the only ridges on the carapace.

The front has the form of two broad sharp-cut teeth which are prominent beyond the eyes.

The outer margins both of the endopodite and of the exopodite of the external maxillipeds are granular and somewhat raised.

The exposed surfaces of the thoracic sterna, and of the carapace round the bases of the chelipeds, are covered with large granules (in the female—male unknown).

The chelipeds in the female are very little longer than the carapace: the arm is sharply trigonal, with the edges coarsely granular: the wrist and hand have the upper surface rough: the edges of the hand are sharp, and the upper surface of the hand is traversed, from its base to the finger-cleft, by a sharp finely-beaded ridge, as in *N. abbreviata*: the fingers (in the female) are about two-thirds as long as the hand, and are finely denticulate.

The legs are slender and compressed, with the merus, carpus and propodite sharply carinate dorsally.

Colours in spirit: mottled like Castile soap.

Length of carapace 9 millim., breadth 10.5 millim.

A single ovigerous female from the Persian Gulf.

This species well illustrates the close relation between *Nursia* and *Tlos*.

#### 27. *Nursia abbreviata*, Bell.

*Nursia abbreviata*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 308, pl. xxxiv. fig. 5, and Cat. Leucos. Brit. Mus. p. 20: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 404.

Carapace about eight-ninths as long as broad, abnormally depressed—almost laminar—except in the mid-gastric region, which is somewhat angularly elevated: its borders, behind the front, are thin, foliaceously expanded and sinuous, forming 7 shallow lobules, the least distinct of which is the posterior border, which again is very inconspicuously subdivided by a faint emargination in the middle line: the whole of the free edge of the carapace is finely beaded, and slightly upturned, so as to emphasize the depressed appearance of the carapace.

An anteriorly-convex milled carina crosses the carapace from one lateral margin to the other, and is met in the middle line by a milled ridge running from the front: these are the only ridges on the carapace. There is granular elevation in the cardiac region, otherwise the carapace is smooth. The front is broad and prominent with the edge a little convex.

The pterygostomian region is traversed by a sharp ridge that runs parallel with the antero-lateral border.

The external maxillipeds, the edge of the sternum, and the entire edge of the fossa that receives the abdomen, are ornamented with beadlike granules, in the male.

The chelipeds in the male are a little more than half again as long as the carapace and in the female are not one-fourth longer than the carapace: the arm is sharply trigonal, with all the edges granular and the surfaces smooth: the upper surface of the wrist and hand are traversed, up to the finger cleft, by a sharply-raised beaded ridge: the fingers are about two-thirds the length of the hand, and meet only at tip.

The abdomen of the male consists of three pieces, the long middle piece having a sub-terminal denticle.

Colours in spirit: yellowish-brown mottled with greenish-brown, which on the arm, on the base of the hand, on the base of the fingers, and on the legs, forms cross-bands.

Eight males and five adult females, from Karáchi, the carapace of the largest male and female being 9 millim. long, and 10 millim. broad. Three very young specimens from the Coromandel coast are almost certainly this species.

### 28. *Nursia rubifera*, Müller.

*Nursia rubifera*, Müller, Verhandl. Naturforsch. Ges. Basel, VIII. 1886, p. 480, pl. iv. figs. 4, 4a, 4b.

Carapace broader than long, outline oval,—very inconspicuously polyhedral, edge cockled and finely granular. Front prominent, *bilobed*. Two isolated granular tubercles in the middle line—one in the gastric, one (smaller) in the cardiac region; but *no ridges*. Outer border of exognath strongly curved. Chelipeds in the male about half again as long as the carapace: arm sharply trigonal, with all three edges granular: a sharp longitudinal ridge on upper surface of hand: fingers meeting throughout their extent.

Irregular lilac stripes on the carapace and cross-bands on legs.

*Loc.* Trincomalee.

Not in the Indian Museum collection. Known here only from Müller's description and figures.

The species, as Müller says, is nearest allied to *N. abbreviata*, and is also closely related to *N. persica*.

### *Ebalia*, Leach.

*Ebalia*, Leach, Malac. Pod. Brit. text of pl. xxv. and Zool. Miscell. III. p. 18.

*Ebalia*, Milne Edwards, Hist. Nat. Crust. 11. 128.

*Ebalia*, Bell, Brit. Stalk-eyed Crust. p. 139, and Trans. Linn. Soc. Vol. XXI. 1855, p. 303, and Cat. Leucos. Brit. Mus. p. 16.

*Ebalia*, Miers 'Challenger' Brachyura p. 303 (part).

Carapace rhomboidal or pentagonal or hexagonal; commonly, but not always, a little broader than long; its regions generally well defined and tumid, the tumid portions nodular or granular: its posterior margin is generally a little prominent and either bilobed, or with its extreme ends dentiform.

The front is not much produced in Indian species, except in *Ebalia* (*Phlyxia*) *erosa*.

In the orbital wall, as usual, there are three sutures, and a gap at the inner canthus: the edge of the roof of the orbit is considerably emarginate. The antennules fold obliquely or nearly transversely. The antennæ are minute but distinct.

The buccal cavern is moderately elongate: the exopodite of the external maxillipeds is not dilated, its outer edge is a little curved: the triangular merus of the external maxillipeds is about  $\frac{3}{4}$  the length of the ischium measured along the inner border.

The chelipeds are variable: they are usually massive. In the typical *Ebalia* forms they are short—not much more than half again as long as the carapace—and stout, with short broad hands not much differing in length from the stout compressed fingers.

The abdomen of the male consists of 3 or 4 pieces.

*Key to the Indian species of Ebalia.*

- I. Front much produced: carapace markedly longer than broad ..... *E. erosa*.
- II. Front not produced: carapace either a little broader than long or a very little longer than broad:—
  1. Edge of buccal cavern projecting a little beyond the front: posterior border of the carapace with three rounded teeth in the male and two (much less distinct) in the female: a large granular "broad arrow" on the carapace the ends of the wings of which project beyond the postero-lateral margin... *E. sagittifera*.
  2. Edge of front projecting beyond the epistome: ends of posterior margin thickened and obscurely dentiform.

- i. Dorsum of carapace deeply and very elegantly trilobed longitudinally..... *E. diadumena*.
- ii. Carapace hexagonal, dorsum with 4 granular swellings arranged in a "cross"... *E. wood-masoni*.

I have not included the species referred to by Dr. Henderson as *Ebalia pfefferi* and *Ebalia fallax* in this key, because the first appears to belong to Dana's genus *Nucia*, which in my opinion has no close affinity with Leach's genus, while the second is quite clearly a form belonging to the *Ilia* alliance, as it has the *Ilia* fingers hands and external maxillipeds.

29. *Ebalia diadumena*, n. sp. Plate VII. fig. 4.

Carapace rhomboidal, a little broader than long, its dorsal surface divided into three tumid crisply granular and most elegantly shaped lobes (a gastro-cardiaco-intestinal and two branchial—forming a sort of *fleur de lys*) by two extremely deep smooth longitudinal furrows. On the middle lobe the gastric and cardiac regions are separated by a shallow groove, and the cardiac and intestinal by a deep furrow. The hepatic regions are also distinctly circumscribed, but are altogether on a much lower plane than the rest of the carapace, and like the front are only indistinctly granular.

The front is divided, from its hardly emarginate edge down to the gastric region, by a narrow deepish longitudinal groove. Behind the front the angular pterygostomial ridge is somewhat prominent. The lateral margins are finely crenulate: the posterior margin is almost straight, with the ends somewhat dentiform.

The surfaces of both branches of the external maxillipeds are tumid and granular.

The chelipeds in the female (male unknown) are not very much longer than the carapace: the arm is trigonal and the greater part of all its surfaces is crisply granular, as also are large parts of the surfaces of the wrists and hands: the fingers are not much shorter than the hand and are elegantly striate-granular: the hand is not very much longer than broad.

The carapace of the adult female is 4 millim. long and 4.5 millim. broad.

A single ovigerous female from Palk Straits.

Colours in spirit lilac brown, the furrows on the carapace dark violet brown.

30. *Ebalia woodmasoni*, n. sp. Plate VII. fig. 3.

Carapace sharply hexagonal, its length just exceeds its breadth in the male, its breadth is equal to its length in the female.

Four large well-defined (especially in the male) granule-capped swellings or tubercles mark, respectively, the cardiac, intestinal, and branchial regions, and two small indistinct swellings mark the hepatic regions: the hollows between the larger swellings are elegantly punctulate.

Antero-lateral borders finely and inconspicuously, postero-lateral and posterior borders finely and distinctly beaded; the posterior border prominent and straight, with its ends more prominent—giving it a bilobed appearance.

Front angularly emarginate or broadly bidentate. Eyes rather large and not well concealed by the orbits.

Exposed parts of sternum granular, the first segment, in the male, with a strong longitudinal ridge or boss near the base of either cheliped.

Chelipeds in both sexes half again as long as the carapace: arm trigonal, its upper surface with some rows of enlarged beadlike granules along both borders, its under surface with a broad tapering band of similar granules: hand nearly twice as long as broad, and from  $\frac{1}{4}$  to  $\frac{1}{3}$  longer than the fingers.

Abdomen of male with a very strong terminal tooth on its penultimate segment.

In the male the carapace is 5 millim. long and 4.8 millim. broad, in the adult female it is 5 millim. in both dimensions.

*Loc.* Andamans.

This species appears to be near *Ebalia quadrata*, A. M.-E., from Bass' Straits, and to Miers' *Ebalia rhomboidalis*, *minor* and *bituberculata*, from Japan.

31. *Ebalia sagittifera*, n. sp.

Carapace hexagonal, although hardly longer than broad yet of an elongate appearance, owing to the unusual length and very gradual convergence of the postero-lateral borders: the whole antero-lateral margin is sharp, slightly curled and elegantly striated or milled: the edge of the subhepatic regions, or pterygostomial ridges, are extremely prominent, standing out on either side like a pair of little wings. In the male the posterior margin bears a petaloid tubercle at either end and a denticle in the middle line: in the adult female the lateral tubercles are indistinct and the median tubercle absent.

The front is emarginate, and part of the edge of the buccal cavern can be seen beyond it in a dorsal view.

On the carapace are three broad granular ribs which unite to form a "broad-arrow," point forwards: the middle ridge begins about the middle of the gastric and ends in the middle of the intestinal region, the lateral ribs run obliquely backwards and outwards, parallel with the antero-lateral margins, across the branchial regions, their ends projecting well beyond the postero-lateral borders in the male, but not so much in the female.

The chelipeds are about half again as long as the carapace: the arm is trigonal with the edges raised and granular: the wrist and hand have a raised row of granules along the inner edge of their upper surface: the hand is about two-thirds as broad as long, and the fingers are about two-thirds the length of the hand.

The abdomen of the male consists of only two pieces, and is without a denticle.

Colours in spirit: mottled dark green and greenish brown, legs and chelipeds with black-speckled cross-bands.

Length of carapace of male 5 millim. long, 4.5 millim. broad; of ovigerous female 6 millim. long, 5.75 millim. broad.

*Loc.* Karáchi.

As in *Ebalia erosa* the space between the lower edge of the orbit and the edge of the buccal frame is much reduced. This species appears to be closely related to *Ebalia hypsilon*, Ortmann, in Semon's Zool. Forschungsreisen Austral. u. Malay. Arch., Crust. p. 36, pl. ii. fig. 7.

### 32. *Ebalia erosa*, (A. Milne Edwards).

*Phlyxia erosa*, A. Milne Edwards, Journ. Mus. Godeff. I. iv. 1873, p. 262, and Nouv. Archiv. du Mus. X. p. 47, pl. iii. fig. 2; Haswell, P. L. S. N. S. Wales, IV. 1879, p. 54, and Cat. Austral. Crust. p. 125; Miers, P. Z. S. 1884, pp. 10, 13.

*Ebalia erosa*, Miers, 'Challenger' Brachyura p. 305; Ortmann, Zool. Jahrbuch. Syst., etc., VI. 1892, p. 580.

Carapace longer than broad, somewhat piriform, with a produced narrow bidentate front from which a prominent ridge runs straight back to the cardiac region, with the hepatic and subhepatic regions angularly prominent, and with three dentiform projections—one of which is the acuminate tip of the tumid intestinal region—on the prominent posterior margin. On the posterior half of the carapace there are some large symmetrically disposed tubercles, usually about 9 in number (3 on either branchial region and 3 on the cardiac region) and sometimes more or less confluent: the three on the cardiac region are always very distinct and are so connected as to form an elegant V, or with the ridge from the front an "anchor," and however much the branchial tubercles may be confluent one on either side of the V is

always enlarged and acuminate. The tubercles, the tumid intestinal region, and sometimes also the intervening hollows, are crisply granular.

The buccal cavern is elongate.

The chelipeds in both sexes are little longer than the carapace, and are rather slender: they are finely granular, especially the arms. The hand is a little broader at its proximal than at its distal end, where it is about half as long as broad: the fingers are little more than half the length of the hand.

Colours in spirit ivory white.

The carapace of the male is about 6 millim. long and 5 millim. broad: that of the adult female is 9 millim. long and 7 millim. broad.

Numerous specimens are in the Indian Museum, from the Maldives and Andamans.

#### *Nucia*, Dana.

*Nucia*, Dana, U. S. Expl. Exped., Crust. pt. I. p. 397.

*Nucia*, Bell, Cat. Leucos. Brit. Mus. p. 24.

Carapace strongly convex, broad, transversely somewhat ovoidal in shape, its surface uneven and densely covered with vesiculous or pustulous granules, and with the regions usually well demarcated.

The front is narrow, broadly bidentate, and somewhat sunk behind the level of the front edge of the buccal cavern. The pterygostomial regions are puffed out so as to increase the squat and sunken appearance of the front. There is a remarkably broad interval between the orbits and the edge of the buccal cavern.

The eyes are large, and the orbits have the upper edge deeply emarginate so that the retracted eye is hardly at all concealed. The antennules fold obliquely, and the antennæ have the basal joint rather closely filling the gap at the inner canthus of the orbit and the flagellum small but distinct.

The buccal cavern is moderately elongate: the exognath is not dilated and has the outer border almost straight: the triangular merus of the endognath is not much shorter than the ischium measured along its inner edge.

The chelipeds are very short and stout: the legs also are remarkably stout.

In the Indian Museum Collection, the only representative of this genus is a male specimen of *Nucia speciosa*, Dana, from Upolu. This is, quite clearly, closely allied to the species named *Randallia pustulosa* and *Randallia lamellidentata* by Wood-Mason. [Whether these are really *Randallia* as defined by Stimpson it is difficult to say; but they are certainly congeneric with Miers' *Randallia granulata* ('Challenger' Brachyura, p. 317, pl. xxvi. fig. 1)].



33. *Nucia pfefferi*, (de Man).

*Ebalia pfefferi*, de Man, Archiv. für Naturges. LIII. 1887, i. p. 390, pl. xvii. fig. 4: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 402.

As there seems to be some doubt whether this species is really distinct from *Nucia speciosa*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 397, pl. xxv. fig. 5a I must here be content to give only the references. It is included in the Indian fauna on the authority of Dr. J. R. Henderson.

*Randallia*, Stimpson.

*Randallia*, Stimpson, Journal Boston Soc. Nat. Hist. Vol. VI. 1857, p. 471.

*Randallia*, Miers, 'Challenger' Brachyura, p. 316.

Carapace circular and convex, almost globular; with the front narrow, usually broadly bidentate, and somewhat sunk behind the level of the front edge of the buccal cavern. The subhepatic or pterygostomian regions are convex and puffed out, so as to increase the squat and sunken appearance of the front. There is a remarkably broad vertical interval between the orbits and the edge of the buccal cavern.

The surface of the carapace is, typically, covered with vesicular or pustulous granules, but these are sometimes visible only with a lens: the regions are usually, but not always, distinctly demarcated by grooves.

The posterior margin is generally, but not always, armed with spines or petaloid lobules or tubercles.

The orbits are almost as imperfect as they are in *Parilia*: their upper edge is deeply emarginate, there is a wide gap at the inner canthus, and there are three very distinct sutures, or sometimes actual fissures, in the upper-outer wall.

The antennules fold obliquely: in one Indian species their basal joint forms a close-fitting operculum to the antennulary fossa. The antennæ are very distinct, and are loosely lodged in the inner canthus of the orbits.

The buccal cavern is triangular and somewhat elongate: the exognath is not dilated and its outer margin is almost straight: the triangular merus of the endognath is about  $\frac{2}{3}$  the length of the ischium measured along its inner edge.

Chelipeds either massive or moderately stout, of moderate length; fingers stout, about as long as the hand, which is not more—but is usually much less—than half the length of the carapace.

Although there is, as usual, some fusion among the abdominal terga, yet the sutures are never wholly obliterated as they are in most other Leucosines.

## Key to the Indian species of Randallia.

- I. The basal joint of the antennules forms a close-fitting operculum to the antennulary fossa: the whole body and appendages are covered with a dense velvety pubescence: front very indistinctly emarginate ..... *R. lanata.*
- II. The antennules fold loosely in their fossæ: body and appendages devoid of pubescence: front distinctly bidentate:—
1. Carapace granulous or pustulous, the regions defined by grooves:—
- i. Front separated from the carapace by a conspicuous transverse groove: intestinal region tumid but not culminating in a spine: tip of exognaths (and often of adjoining points) blister-like ..... *R. pustulilabris.*
- ii. No deep groove at the base of the front: intestinal region culminating in a spine, the tip of which overhangs the posterior margin of the carapace: end of exognaths sharp:—
- (a) Chelipeds rather elongate and slender, twice the length of the carapace: hand subcylindrical and rather elongate: antero-lateral margins of carapace with simple tubercles or spines ..... *R. pustulosa.*
- (b) Chelipeds short and stout, less than twice the length of the carapace: hand short and stout, its outer border, like that of the fingers, very sharply cristiform: antero-lateral margins of carapace with laminiform teeth ..... *R. lamellidentata.*
2. Carapace smooth and polished to the naked eye, the regions not or hardly defined:—
- i. Chelipeds rather elongate and slender, more than twice the length of the

- carapace: three round laminiform lobes on the posterior margin of the carapace ..... *R. eburnea*.
- ii. Chelipeds short and stout, less than twice the length of the carapace: posterior margin of carapace differing from that of all the other species in being quite smooth ..... *R. glans*.

34. *Randallia lanata*, n. sp.

The whole of the body and its appendages covered with a close, short, light-coloured, velvety pubescence.

Carapace circular, globular, with all the regions well defined by grooves; its surface covered, beneath the pubescence, with rather distant pustulous granules. Behind the front all the margins of the denuded carapace are armed with blunt dentiform tubercles or granules. There is a not very distinct notch between the hepatic and branchial regions.

The front has an almost straight edge, and although it is for the genus rather prominent, the ends of the external maxillipeds can be seen beyond it in a dorsal view.

The orbits are so emarginate above as to afford little concealment to the retracted eye, which is rather large.

The antennules fold obliquely, their basal joint forming a close-fitting operculum to the antennular fossæ.

The chelipeds are similar in both sexes, being stout and about half again as long as the carapace: the hand is very stout, is not much longer than broad, and is about one-third the length of the carapace: the fingers are stout and are about three-fourths the length of the hand. The legs are stoutish.

In both sexes all seven abdominal terga are plainly and independently recognizable though not all independently movable: in the female (even in the ovigerous adult) the abdomen is somewhat narrow.

In the adult male the carapace is 7 millim. long and 6.5 millim. broad, in the adult female it is 8.5 millim. in both diameters.

Andaman Sea usually at over 30 fathoms.

35. *Randallia pustulilabris*, n. sp.

*Leucosilia granulosa*, Alcock and Anderson, J. A. S. B. Vol. LXIII. pt. 2, 1894, p. 207, and Ill. Zool. Investigator, Crustacea, pl. xxiv. fig. 3 (*in the press*).

Carapace slightly broader than long, globular: truncated anteriorly,

so that the external maxillipeds are visible beyond the front: very densely covered, as are also the chelipeds, with bead-like granulations: the regions delimited by shallow yet distinct furrows. The rostrum consists of two divergent hollow lobes, the tips of which are curved slightly outwards, beneath which the antennules are lodged, as in the other species of this genus: *immediately behind the rostrum the carapace is traversed from side to side by a deep groove.* The antero-lateral margin is interrupted by a deep notch, in front of which is a coarse blunt hepatic tooth, while behind it is a stronger epibranchial tooth. The lateral angle is also marked by a prominent granule. The posterior margin is almost straight and bears three dentiform tubercles, of which the median is hardly conspicuous. The hepatic regions are inflated, as are also the sides of the gastric region. The intestinal region forms a tumid boss, on the summit of which the granulations are obsolescent.

The tips of both rami of the densely granular external maxillipeds are strongly bent upwards, as in all the other species of this genus, that of the exognath ending in a large blister-like tubercle. [Sometimes also the outer angles of the buccal cavern, the tips of the frontal teeth, and the edges of the orbit end in similar, but smaller, blister-like swellings].

The chelipeds in the male are a little less than twice the length of the carapace, and are stout: the fingers are stout, and are about as long as the hand, which is rather more than two-fifths the length of the carapace. Legs smooth: dactyli with a few hairs.

The 3rd to the 5th abdominal terga are fused in the male, but are independently recognizable, and the 6th has a terminal denticle—not very conspicuous: in the female the 3rd to the 6th are fused.

|                                   | Male.        | Female.      |
|-----------------------------------|--------------|--------------|
| Length of carapace.....           | 6.5 millim.  | 7.5 millim.  |
| Breadth of carapace.....          | 7.0 millim.  | 9.0 millim.  |
| Greatest span (of chelipeds)..... | 24.0 millim. | 26.5 millim. |

Besides being smaller, and having the chelipeds of slightly greater relative length, the male differs from the female in being much more sharply granular.

Numerous males and egg-laden females, from different parts of the Malabar Coast in 26–30 fathoms, from the North Maldive Atoll in 15–30 fms., and from Mergui in 40 fms.

I have thought it justifiable to change the name of this species from *granulosa* to *pustulilabris*, as Miers, 'Challenger' *Brachyura* (1886) p. 317 has already used the very similar name *granulata* for a species belonging to this genus as here defined.

36. *Randallia glans*, n. sp.

Carapace globular, usually in the male smooth and polished to the naked eye though closely punctate-granular under the lens, in the female densely covered with vesicular granules that are often visible without any magnification: all its borders smooth and full, and except for a broad and shallow notch in the antero-lateral border, between the branchial and hepatic regions, its regions are not in any way defined.

Front narrow, broadly bidentate, the tips of the teeth somewhat produced and bent outwards: its base is separated from the rest of the carapace by an indistinct groove.

External maxillipeds smooth and polished to the naked eye in the male, somewhat more granular in the female—just like the carapace.

Chelipeds stout: in the male a little less than twice the length of the carapace, everywhere very densely granular, the granules being vesicular and being plainly visible without a lens on the arm at any rate: fingers stout, as long as the hand, which is between  $\frac{1}{2}$  and  $\frac{2}{3}$  the length of the carapace. Legs smooth: dactyli with a few hairs.

In the male the 3rd-5th abdominal terga are fused but are independently recognizable, and the 6th has a strong terminal denticle; in the female the 3rd-6th are fused.

The carapace of the adult male is 6 millim. in either diameter, that of the ovigerous female is 7.5 millim. long and 8 millim. broad.

Andaman Sea, about 50 fms.

This species is closely related to *R. pustulilabris*.

37. *Randallia lamellidentata*, Wood-Mason.

*Randallia lamellidentata*, Wood-Mason, Illustrations of the Zoology of the 'Investigator' Crustacea, pl. v. figs. 5, 5a, 5b: Alcock, Ann. Mag. Nat. Hist. May, 1894, p. 404.

Carapace rhomboidal with the angles rounded off—subcircular; its surface behind the front covered with unequal-sized rather scattered pustulous tubercles; its regions well defined by grooves of some depth.

Front bluntly bidentate. On the antero-lateral margin are three broad lamelliform teeth, the front one of which is on the pterygostomian ridge (which as usual forms the front part of the antero-lateral margin), and there is a fourth similar tooth at the junction of the antero-lateral and postero-lateral margins. The postero-lateral margins are full and the pustulous tubercles extend on to them.

The short posterior margin is elegantly bilobed, with a few pearly granules round the lobes, and is overhung by the tip of the horizontal spine in which the intestinal region culminates.

The ventral surface of the carapace, the thoracic sterna, abdominal

terga (in the male) and external maxillipeds are all granular, the granules above the base of the chelipeds being enlarged and pearly.

The chelipeds in the male are about two-thirds as long again as the carapace, and are massive and granular: at the distal end of the outer edge of the somewhat trigonal arm the granules are enlarged and almost spiniform, as are also one or two at the distal end of the outer surface of the wrist. The hand is not much longer than broad and hardly one-third the length of the carapace; its outer edge is in the form of a remarkably thin and deep crest: the fingers are stout and rather longer than the hand, their outer (non-opposed) edges are cristiform.

The legs are granular, the granules on the dorsum of the propodites carpopodites and distal end of the meropodites being spiniform, as also on the outer surface of the ischium and merus of the last pair: the dactyli are hairy.

The 3rd-6th abdominal terga of the male are fused but are all very distinctly and independently recognizable, the 6th has a terminal denticle.

The largest male, dredged in the Andaman Sea at 350 fms., has the carapace between 16 and 17 millim. long and 18 millim. broad (without spines).

### 38. *Randallia pustulosa*, Wood-Mason.

*Randallia pustulosa*, Wood-Mason, Ann. Mag. Nat. Hist. March, 1891, pp. 266 and 267, and Illustrations of the Zoology of the 'Investigator' Crustacea, pl. v. fig. 4.

Carapace subcircular, subspherical; covered with unequally large pustulous tubercles the surface of which, like the surface between them, is finely and closely granular under the lens; all the regions are well defined by broad grooves.

The front is narrow and broadly bidentate. The lateral margins are full and inflated, and carry in the adult a series of tubercles, in the young a series of blunt spines: in the antero-lateral margin, between the hepatic and branchial regions, is a conspicuous notch, which corresponds with a groove or depression in the pterygostomian face of the carapace.

The short posterior border has a spine or dentiform lobe at either end, and is overhung by the long spine in which the tumid intestinal region culminates.

The whole under surface is densely granular in the young male, but in the female the fused 4th-6th abdominal terga and the inner half of the ischium of the external maxillipeds are smooth.

The chelipeds in the adult female and young male (adult male unknown) are twice the length of the carapace and are everywhere

finely granular. The hand is subcylindrical and elongate, being half as long as the carapace; the fingers are stout and about as long as the hand, they are finely denticulate, with enlarged denticles at regular distant intervals.

The legs are stoutish and, to the naked eye, smooth: the dactyli are fringed with hairs.

In the (young) male the 3rd-6th abdominal terga are fused but without any obliteration of sutures: in the adult female the 4th-6th are fused and the sutures obliterated.

Carapace of an adult female about 31 millim. in either diameter.

*Loc.* Andaman Sea, 240-220 fms., and 250 fms., Laccadive Sea, 406 fms.

In the young the carapace is quite spherical, with its edges spiny and its surface closely and crisply granular—the young, in short, has a very strong general resemblance to the adult of *R. pustulilabris*.

In the adult female the brood-pouch communicates with the branchial chambers on either side by means of a foramen, as in *Parilia*.

### 39. *Randallia eburnea*, n. sp.

Carapace subcircular, convex, subspherical, perfectly smooth to the naked eye though closely covered with vesicular granules under the lens; its regions, except the intestinal, hardly defined.

The front is narrow, and is broadly bidentate; the edge of the buccal cavern is more prominent beyond it than in any of the other species. Between the convex subhepatic border and the branchial border is a broad notch: near the middle of the branchial border is a rounded deflexed tooth: the antero-lateral margin from the front to this tooth is finely denticulate.

The fissures in the outer wall of the orbit are very distinct.

The posterior margin is elegantly three lobed, the lateral lobes being broad and semicircular, the middle lobe being narrower: all three are laminar.

The external maxillipeds are granular and pubescent distally.

The chelipeds are longer and more slender than in any of the other species, being a little more than  $2\frac{1}{2}$  times the length of the carapace: they are perfectly smooth to the naked eye though closely granular under the lens, the granules on the arms being vesicular. The hands are subcylindrical and about two-thirds the length of the carapace: the fingers are stout and between  $\frac{2}{3}$  and  $\frac{3}{4}$  the length of the hand, their opposed edges are finely denticulate, with enlarged denticles at distant regular intervals. Legs smooth, the dactyli with a few fine hairs at tip only.

Although the 3rd-5th abdominal terga are fused they are all three independently recognizable.

Carapace of (apparently adult) male 14 millim. in either diameter.

*Loc.* Off Laccadive Islands, 30 fms.

*Parilia*, Wood-Mason.

*Parilia*, Wood-Mason, Ann. Mag. Nat. Hist., March 1891, p. 264.

Carapace strongly convex, especially posteriorly, somewhat oval transversely, with three spines on the posterior margin; the surface finely granular, the regions fairly well-defined.

The front is narrow and bidentate, and the epistome projects well beyond it,—the epistome being, for an Oxystome, deep—as in *Randallia* and *Nucia*.

The eyes are small, and the orbits imperfect, for not only have they two fissures (not mere sutures) in the roof, and a broad fissure in the outer wall, and a broad gap communicating with the antennary and antennular fossæ, but their upper-outer wall is deeply emarginate.

The antennules fold a little obliquely. The antennæ are distinct, and stand in the gap at the inner canthus of the orbit, which they do not nearly fill.

The buccal cavern is considerably broader than long, owing to the enormous width of the afferent branchial channels and of the foliaceous expansion of the exopodite that covers them: the outer edge of the latter is strongly curved: the triangular merus of the endognath is very nearly as long as the ischium, measured along the inner edge.

The chelipeds in the adult male are several times the length of the carapace, and are slender, though more massive than the legs: the hands are several times the length of the stoutish fingers.

The abdomen in the male consists of five distinct pieces: in the female it consists of seven, but the 4th, 5th and 6th are not separately movable.

Branchial chambers greatly inflated, especially posteriorly: branchiæ large, and six in number on either side. [Brood-pouch of the female very large and communicating with the branchial chamber on either side, at base, by a foramen.]

40. *Parilia alcockii*, Wood-Mason.

*Parilia alcockii*, Wood-Mason, Ann. Mag. Nat. Hist., March 1891, p. 264, and Ill. Zool. 'Investigator,' Crust. pl. v. figs. 3, 3a ♀: Alcock and Anderson, J. A. S. B. Vol. LXIII. pt. 2, 1894, p. 177.

Carapace about seven-eighths as long as broad, transversely oval,



but with the anterior margin—between the outer angles of the afferent branchial channels—perfectly straight.

The antero-lateral margin is broadly indented at the junction of the hepatic and branchial regions, and bears four denticles; and there are three denticles on the posterior margin, the middle one of which is the smallest: just above the posterior margin is another transverse row of three denticles,—one in the middle of the intestinal region and one on the posterior wall of the branchial region on either side.

The carapace is strongly convex, the convexity gradually increasing from before backwards and then suddenly dropping, like a simian cranium, which in profile it much resembles: the surface is everywhere finely granular.

The regions of the carapace are well delimited by broad shallow grooves and lines of dimples, the branchial regions each forming an enormous tumid expanse. A slightly raised ridge traverses the carapace, in the middle line, from the base of the front to the intestinal denticle.

The front is broadly bilobed, each lobe being convex dorsally and acuminate: beyond it in a dorsal view is seen the epistome and the whole length of the edge of the buccal cavern.

The surface of the external maxillipeds and the ventral surface of the carapace are finely granular, but the sternum and the greater part of the abdomen are smooth. In the middle of the sternum of the female, between the genital openings, is an erect spine.

The external maxillipeds have a narrow triangular endopodite, the merus of which is strongly curved upwards towards the front; and a foliaceous exopodite, which is much shorter than the endopodite, and which is semicircular in shape and two-thirds as broad as long—broader even than in *Philyra globosa*, Fabr.

The chelipeds as in *Myra fugax*, vary according to age and sex: in the adult male they are  $4\frac{1}{2}$  times, in the female and young male  $2\frac{1}{2}$  times, the length of the carapace, and are only about twice as massive as the legs: their surface up to nearly the end of the hand is finely scabrous. The arm is cylindrical: the hand in the female is cylindrical, but in the male somewhat clavate. The hand in the male is more than 3 times, in the female only twice the length of the fingers: the fingers are stout, gently curved in the female, somewhat sinuous in the adult male, and their opposed edges are almost edentulous.

The legs in the male are shorter than the arm; in the female they are a little longer than the arm: they are cylindrical, and finely scabrous on the dorsal surface: the dactyli are obtusely pointed, and have both their edges closely fringed with longish stiff hairs.

Colours in spirit rusty reddish.

The carapace of the average adult male is 50 millim. long and 56 millim. broad, of the adult female 40 millim. long and 48 millim. broad.

Fairly common on soft muddy bottoms along the east coast of India between 70 and 250 fathoms.

In the Indian Museum collection are 96 specimens of both sexes and all ages.

#### *Myra*, Leach.

*Myra*, Leach, Zool. Miscell. III. p. 23.

*Myra*, Milne-Edwards, Hist. Nat. Crust. II. 125.

*Myra*, Bell, Trans. Linn. Soc. Vol. XXI, 1855, p. 296, and Cat. Leucos. Brit. Mus. p. 12.

*Myra*, Miers, 'Challenger' Brachynra, p. 312.

? *Myropsis*, Stimpson, Bull. Mus. Comp. Zool. Vol. II. p. 156.

Carapace ovoid (or globular in *Myropsis* and in the *young* of most Indian species of *Myra*), terminating posteriorly in three spines,—two on, and one in the middle line immediately above, the posterior border. (But in *Myropsis* and in the *young* of several species of *Myra* there is a pair of additional spines,—one on either postero-lateral border just above the last pair of legs). The surface of the carapace is either smooth or granular, never nodular or eroded, and resembles that of *Leucosia* in not having all the regions demarcated, at any rate in the adult.

The front is well delimited from the carapace, and although the dentiform prolongations of the septa of the branchial channels may sometimes project beyond it, yet the whole of the edge of the buccal cavern is never in the adult seen beyond it in a dorsal view.

The hepatic region—the side-wall of which commonly forms a distinct facet—is generally separated from the branchial region by a broad notch in the antero-lateral margin, this being continuous with a depression in the pterygostomian face of the carapace and with a longitudinal groove in the side-wall of the carapace,—the whole foreshadowing the thoracic sinus of *Leucosia* (? in *Myropsis*).

The orbits are deep, and although the upper edge is a little emarginate, the retracted eye is completely concealed: the three sutures in the roof and outer wall are very distinct: as in *Leucosia* the floor practically coincides with the roof of the buccal cavern, as regards its edge at any rate.

The antennæ are loosely lodged in a gap at the inner canthus of the orbit. The antennules fold obliquely.

The buccal cavern is elongate: the acutely-triangular merus of

the external maxillipeds is not much more than half the length of the ischium measured along the inner edge: the 2nd segment of the exognath generally has the outer edge elegantly curved, but is not dilated except a little at the base.

The chelipeds though much more massive than the legs, and rather more massive than those of *Ilia*, *Arcania* and their immediate allies, are not nearly so massive as those of *Leucosia*, *Philyra*, etc. In some species at any rate they vary much in length according to age and sex, but they are seldom less, and are often more, than twice the length of the carapace. The fingers are stout and vary in length, being sometimes a little longer than, but in the adult males of one species only half the length of, the hand.

The abdomen of the male usually consists of 4 pieces, that of the female of 5.

The species of this genus are often difficult to discriminate owing to the changes that they undergo in growth. The following key will, it is believed, serve for the determination of adult forms.

*Key to the Indian species of Myra.*

- I. Carapace broadly oval (longitudinally), with a broad notch in the antero-lateral margin between the hepatic and branchial regions:—
  1. Side-wall of hepatic region forming a distinct facet, behind which the lateral margins of the carapace are defined by a beaded line: spines of the posterior margin more or less acute: fingers either shorter or hardly longer than the hand:—
    - i. Spines of the posterior margin long and acute: carapace finely granular—the granules hardly visible to the naked eye: chelipeds slender (in the adult male nearly thrice the length of the carapace): hand long (in the adult male often nearly twice the length of the fingers, and about two-thirds the length of the carapace) ... *M. fugax.*
    - ii. Spines of the posterior margin short, the middle one acute,

those on either side dentiform: carapace crisply granular, the granules of good size: chelipeds stoutish, not quite twice the length of the carapace even in the adult male: hand short:—

a. Front not projecting beyond the dentiform ends of the walls of the branchial channels: hand about half length of carapace: fingers about two-thirds length of hand ..... *M. affinis.*

b. Front shaped much as in *Leucosia*, projecting well beyond the free edge of the branchial channels: hand hardly two-fifths the length of the carapace: fingers as long as the hand ..... *M. brevimana.*

2. Side wall of hepatic regions convex, not distinctly faceted in the adult: lateral margins of the carapace full, and not defined by any beaded line: armature of the posterior margin consisting of three petaloid lobules: fingers longer than the hand ..... *M. darnleyensis.*

[ II. Carapace subcircular, with five marginal spines and spinules at its posterior end ..... *M. pentacantha.* (probably the young of *M. fugax*)].

III. Carapace narrowly and acutely oval (longitudinally) its shape recalling that of *Raninoides*, without any marked notch between the hepatic and branchial regions ..... *M. elegans.*

41. *Myra fugax*, (Fabr.)

*Cancellus anatum tertius*, Rumph, Amboin. Rariteitk. I. 27, pl. x. fig. C.  
*Cancer punctatus*, Herbst, Krabben, I. ii. 89, pl. ii. figs. 15, 16.

*Leucosia fugax*, Fabricius, Ent. Syst. Suppl. p. 351: Bose, Hist. Nat. Crust. I. 236: Latreille, Hist. Nat. Crust. et Ins. VI. 119, pl. t. figs. 1, 2.

*Myra fugax*, Leach, Zool. Miscell. III. p. 24: Desmarest, Consid. Crust. p. 169, pl. xxviii. fig. 2: Milne Edwards, in Cuvier, Règne Animal, Crust. pl. xxv. fig. 3, and Hist. Nat. Crust. II. 126: De Haan, Faun. Japon. Crust. p. 134, pl. xxxiii. fig. 1: Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 293, and Cat. Leucos. Brit. Mus. p. 12: Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 160: A. Milne Edwards, Nouv. Archiv. du Mus. X. 1874, p. 45: Hilgendorf, MB. Ak. Berl. 1878, p. 811: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 48 (*gastric teeth*): Richters, in Möbius Meeresf. Maurit. p. 157: Miers, P. Z. S. 1884, pp. 10, 13, and 'Challenger' Brachyura p. 313: [Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 253]: Müller, Verh. Ges. Basel, VIII. 1886, p. 472: Ortmann, Zool. Jahrbuch., Syst., &c., VI. 1892, p. 581: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 402. (Adult).

*Myra carinata*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 297, pl. xxxii. fig. 3, and Cat. Leucos. Brit. Mus. p. 13: Haswell, P. L. S., N. S. Wales, IV. 1879, p. 50, and Cat. Austral. Crust. p. 121: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 316, and Zoology H. M. S. 'Alert' pp. 184, 250: Sluiter, Tijds. Nederl. Ind. XL. 1881, p. 160: Müller, Verh. Ges. Basel, VIII. 1886, p. 472: A. O. Walker, Journ. Linn. Soc., Zool., XX. p. 111. (Non-adult).

*Myra coalita*, Hilgendorf, MB. Ak. Berl. 1878, p. 812, pl. i. figs. 6 and 7: [Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 253]. (Non-adult).

*Myra dubia*, Miers, P. Z. S. 1879, pp. 20, 42.

*Myra fugax*, var. *coalita*, Ortmann, Zool. Jahrbuch., Syst., &c., VI. 1892, p. 582.

Carapace, in the adult, ovoidal, with 3 sharp, usually recurved, spines—one at either extremity of the posterior margin, and one very long one in the middle line just above the posterior margin. On the surface of the carapace are (1) some scattered punctiform granules, almost invisible to the naked eye in the adult (except on the basal half of the median posterior spine where they are always large and numerous), and (2) a longitudinal median carina, almost or quite obsolete in the adult. The regions of the carapace are not well defined.

The front is broadly bidentate, and is prominently convex dorsally, but projects so little beyond the edge of the buccal cavern that the spiniform angles of the branchial channels and the tips of the external maxillipeds can be seen beyond it in a dorsal view: it and the neighbouring parts are usually somewhat pubescent.

Behind the tip of the front the antero-lateral boundary of the carapace is formed by the obliquely-facetted side-wall of the sub-hepatic region, the facet being bounded above and below by beaded lines on both of which, near their posterior end, is a tubercle or tooth: the surface of the facet is quite smooth.

Behind the hepatic facet, between it and the branchial region, is a very well defined notch corresponding with a depression on the pterygostomial face, this again being in continuity with a well-cut longitudinal groove (quite independent of the epimeral suture) that traverses

the side-wall of the carapace just above the somewhat thickened epimeral edge,—the whole foreshadowing the thoracic sinus of *Leucosia*.

Behind this notch the lateral border of the carapace is defined by a finely beaded line, the first few beads being sometimes, in non-adults, somewhat dentiform.

The external maxillipeds are granular and hairy distally, and in the female are hairy all along their apposed edges.

The chelipeds vary a good deal according to age and sex, but are always rather slender. In the adult male they are from  $2\frac{3}{4}$  to  $3\frac{1}{4}$  times the length of the carapace (without spine), in the adult female a little over twice. The cylindrical arm has the proximal half to three-quarters closely covered on all but its under surface with enlarged vesicular granules. The hand though slightly broadened at base, is of an elongate rather slender form: in the adult male it is about  $\frac{2}{3}$  the length of the carapace (without spine), in the adult female half or a little more than half. The fingers in the adult male are from  $\frac{5}{8}$  to  $\frac{1}{2}$ , in the adult female about  $\frac{2}{3}$ , the length of the hand: they are gently curved, a little bent inwards, and somewhat slender, and their opposed edges meet throughout and are finely denticulate, with larger denticles at regular rather distant intervals.

The legs are slender and not, or hardly, longer than the arm; their dactylus is narrowly lancolate and fringed with longish stiffish hairs, as is also the dorsal edge of the propodite.

On the long penultimate piece of the male abdomen is a terminal granule.

Colours in spirit: pinkish flesh-colour, the chelipeds and legs coppery, the front and branchial regions often with a bluish tinge.

The largest adult male in the Indian Museum collection has the carapace 28 millim. long (without spine) and 23 millim. broad.

Found on both coasts of the Peninsula, at the Andamans, and in the Persian Gulf.

In the Indian Museum there are 57 specimens, including numerous adults of both sexes.

[ *Myra pentacantha*, n. sp. ?

Most probably the young of *M. fugax*.

Differs from *Myra fugax* Fabr. in the following characters:—

(1) the carapace is almost circular, and is somewhat depressed, except in the middle line where it is strongly carinated:

(2) the front is thickly pubescent, and the whole of the free edge of the buccal cavern is visible beyond it in a dorsal view:

(3) the intestinal region is well defined and rather tumid, and is

surmounted in the middle line by a raised cluster of granules, terminating, but discontinuous with, the carina of the carapace :

(4) in addition to the 3 spines on the posterior margin of the carapace there is a spine or spinule on either postero-lateral margin above the last pair of legs :

(5) on the antero-lateral margin, immediately behind the branchio-hepatic notch, are several denticles.

The chelipeds are not quite twice the length of the carapace : they are slender, and their constituent pieces have the same proportions as in the adult female of *M. fugax*.

The carapace of an average specimen is 8.5 millim. long and 8 millim. broad.

In the Indian Museum are 29 specimens from both coasts of the peninsula. Commonest at about 25 fathoms.

I regard these as the very young of *M. fugax* first because among 57 specimens of that species in the Indian Museum there is not a single very young one, and secondly because a fine large adult male of that species in our collection has the additional spine well developed on one side. Again it is suggestive that although *M. pentacantha* appears to be a common enough form, it is never found as an adult. ]

#### 42. *Myra affinis*, Bell.

*Myra affinis*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 296, pl. xxxii. fig. 2, and Cat. Leucos. Brit. Mus., p. 12 : Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 160 : Haswell, P. L. S. N. S. Wales, IV. 1879, p. 50, and Cat. Austral. Crust., p. 121 : Miers, Zool. H. M. S. 'Alert' pp. 184, 150, and 'Challenger' Brachyura, p. 315 : A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 111.

*Myra mamillaris*, Miers (*nec* Bell), Miers, Trans. Linn. Soc. (2) I. 1875-79 (1877) p. 239, pl. xxxviii. figs. 25-27, and 'Challenger' Brachyura, p. 315.

*Myra subgranulata*, Kossmann, Reise roth. Meer. Crust., p. 65, pl. i. fig. 7, and Archiv. für Naturg. XLIV. 1878, p. 256.

? *Myra australis*, Haswell, Proc. Linn. Soc. N. S. Wales, IV. 1879, pp. 50 and 404, pl. v. fig. 3, and Cat. Austral. Crust., p. 122 : Miers, Zool. H. M. S. 'Alert' pp. 184, 251, and 'Challenger' Brachyura, p. 315 : A. O. Walker, Journ. Linn. Soc. Zool., XX. 1890, p. 111 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 402.

*Myra punctata*, de Man, Journ. Linn. Soc., Zool., XXII. 1878, p. 205 (*nec synon*).

Differs from *Myra fugax*, adult males being compared, in the following characters :—

(1) the carapace, including the surface of the sub-hepatic facet, is covered with crisp granules, all very plainly visible to the naked eye ; its longitudinal median carina is persistent and granular ; its posterior marginal spines are shorter and blunter, the middle one being sharp and recurved, the lateral ones dentiform :

(2) the chelipeds are stouter and shorter, being a little less than twice the length of the carapace (without spine); the hand especially is stouter and shorter, being hardly half the length of the carapace; the fingers are about  $\frac{2}{3}$  the length of the hand:

(3) the long penultimate piece of the male abdomen carries a strong terminal tooth.

Colours in spirit: some reddish or orange markings on the carapace, and some broad orange-reddish cross-bands on the chelipeds.

The largest adult male in the Indian Museum collection has the carapace 17 millim. long and 15 millim. broad.

In the young the intestinal region is distinctly delimited, rather tumid, and is surmounted by a raised cluster of granules terminating, but discontinuous with, the median carina of the carapace.

In the Indian Museum collection are 16 specimens from Arakan, Mergui, Andamans, Ganjam coast, and the Persian Gulf.

The specimens here included comprise (1) adult forms that answer to Bell's descriptions and figures of *M. affinis* and are readily distinguishable from *M. fugax* (a) by the relative stoutness and shortness of the chelipeds and hands and (b) by the shortness and coarseness of the spines, and (2) half-grown forms that correspond with Haswell's figure of *M. australis*, and Miers' figures of *M. mamillaris* (*loc. cit.*) which Miers in his work on the 'Challenger' Brachyura refers to *M. australis*. Although Haswell's figure and description hardly correspond—*e.g.*, the fingers are described as being about half the length of the hand, but are figured as nearly equal to the hand in length—I cannot but think that his species represents the immature form of *M. affinis*.

In very young specimens there is a denticle or enlarged granule on either postero-lateral margin above the last pair of legs.

#### 43. *Myra brevimana*, n. sp.

Differs from *M. fugax*, a large series of fully adult males and ovigerous females being compared, in the following characters:—

(1) the carapace is much more convex, being ovoid in the male, subglobular in the female; its surface, including the surface of the subhepatic facet, is crisply granular and its longitudinal median carina is persistent and granular, as in *M. affinis*; the posterior marginal spines are as in *M. affinis*, the middle one being short stout acute and recurved, the lateral ones being dentiform:

(2) the front is much more deeply and acutely bidentate, and otherwise is shaped much as in *Leucosia*, being strongly convex, being delimited from the hepatic regions on either side by a hollow, being well recurved upwards, and projecting so far that no part whatever of



the buccal frame or of the external maxillipeds can be seen in a dorsal view even in the deep incision between the frontal teeth :

(3) the tooth on the posterior part of the upper of the two lines that defines the hepatic facet is almost as large and prominent as that on the lower :

(4) the chelipeds are quite similar in both sexes, and are stout, especially the hand ; they are just under twice the length of the carapace (without spine). The hand is hardly two-fifths the length of the carapace (without spine), is more than half as broad as long, and is somewhat inflated ; the fingers are as long as the hand, the dactylus being plainly longer than the outer border of the hand :

(5) on the long penultimate piece of the male abdomen is a strong terminal tooth.

Colours in spirit : regions of carapace defined by broad orange-red markings, some broad orange-red cross-bands on chelipeds, one of which occupies the basal half or three-fourths of the fingers.

Carapace in the adult male 16 millim. long and 14 millim. broad, in the adult female 20 millim. long and 18 millim. broad.

In the Indian Museum are 34 specimens from Arakan, Mergui, Ganjam, and Ceylon, usually at depths of about 30 fathoms.

In the young the intestinal region is well defined and tumid, and is surmounted by a raised cluster of granules in a line with the median longitudinal carina.

The prominent front, the stout chelipeds, and the short inflated hands are characters by which this species is easily recognized.

#### 44. *Myra darnleyensis*, Haswell.

*Myra darnleyensis*, Haswell, Proc. Linn. Soc., N. S. Wales, IV. 1879, p. 52, pl. v. fig. 4, and Cat. Austral. Crust. p. 122 : Miers, ' Challenger ' Brachyura, p. 316.

Carapace sub-piriform, globous dorsally, the lateral margins full and inflated and not defined by any beaded line ; the surface very finely and closely granular (under the lens) ; the intestinal region fairly well defined, as are also the branchial regions posteriorly.

The three processes on the posterior margin are not spines, but broadly-laminar petaloid lobes.

The front is prominent, but the dentiform ends of the walls of the branchial canals can be seen beyond it in a dorsal view : it is deeply channelled in the middle line, dorsally, and has a fluted appearance : the outer wall of the orbit has the same elegantly fluted appearance, owing to the depth of the sutures and the convexity of the surfaces between the sutures.

Behind the front the side-wall of the hepatic regions is full and

convex, not flattened and distinctly faceted as it is in other species: it bears, however, a strong mammillary tubercle. As in the other species, there is a well-defined notch in the antero-lateral margin between the hepatic and branchial regions—the notch as usual being in continuity with a crease in the pterygostomial face, and this with a groove in the lateral wall of the carapace.

The external maxillipeds are granular and hairy distally, being alike in both sexes.

The chelipeds are alike in both sexes and are about twice the length of the carapace: all the surfaces of the arm in the greater part of its extent are vesicular-granular, but the granules are only just visible to the naked eye. The hand is short, about one-third the length of the carapace (without spine), and is somewhat inflated. The fingers are markedly longer than the hand, the dactylus being about half again as long as the outer border of the hand.

The long penultimate piece of the abdomen of the male carries a stout terminal denticle.

Colours in spirit much as in *M. brevimana*, the regions of the carapace being defined by broadish orange-red markings, and the chelipeds having some broad cross-bands of the same colour, but these never involve the fingers, which are white.

In the male the carapace is 13 millim. long (without spine) and 11 millim. broad, in the female 15 millim. long and 13 millim. broad.

In the Indian Museum are 52 specimens, including adult males and ovigerous females, from the Andamans, Maldives, Palk Straits, and from off Ceylon 34 fms.

In many adult females, as in most young, there is in the middle of the carapace a cruciform constellation of 5 enlarged bead-like granules or denticles. In the young also the side wall of the hepatic region is not so much inflated and even shows traces of flattening, while the tumid intestinal region is surmounted by an enlarged granule, and on either postero-lateral margin (in the very young), just above the last pair of legs, is a denticle or enlarged granule.

#### 45. *Myra elegans*, Bell.

*Myra elegans*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 297, pl. xxxii. fig. 4, and Cat. Leucos. Brit. Mus. p. 13.

Carapace elongate-oval tapering to a long acute spine at the posterior margin, half again as long as broad without the spine, nearly twice as long as broad with the spine. On either side of the spine is a spinule situated at either extreme of the short posterior margin, and a little in advance of these, on either postero-lateral margin, just above the last pair of legs, is sometimes a sharp denticle.

The carapace is traversed longitudinally, from the middle of the gastric region, by a broadish granular carina, and there is an elongate patch of granules along the middle of either branchial region and a patch round and on the big posterior spine; otherwise the carapace is smooth.

The front is broadly bilobulate, each semi-circular lobule having a knife-edge, and although it projects beyond the margin of all parts of the buccal cavern, yet the hairy tips of the external maxillipeds can be seen beyond it in a dorsal view.

Behind the front the side wall of either sub-hepatic region forms a not very well marked hairy facet, behind which there is no well marked marginal notch as there is in the other species. The lateral margins of the carapace are well defined and beaded throughout.

The chelipeds are nearly similar in both sexes, being slender and short—only about  $1\frac{1}{3}$  times the length of the carapace (without spine): the upper surfaces of the cylindrical arm are covered with enlarged vesicular granules in the greater part of their extent, and the under surface at base only: the hand is short, hardly a quarter the length of the carapace (without spine): the fingers are almost one-fourth longer than the hand.

The legs are compressed, especially the carpopodites and propodites, the latter and the dactyli having hairy edges.

The long penultimate piece of the abdomen of the male has a terminal denticle.

The largest male in the Indian Museum has the carapace 12 millim. long and 8 millim. broad: in an apparently adult female the carapace is 15.5 millim. long and 10.5 millim. broad.

A young and two apparently adult males and an adult female from a muddy bottom, in 12 fms., off the Madras coast, and a young male from off the Arakan coast 13 fms., are in the Indian Museum. In the last mentioned the wrist and hand are elegantly fluted with lines of raised granules.

Although our female is not laden with eggs, I conclude that it is adult because it has the wide deep brood-chamber with the broad convex abdominal lid so familiarly found in the adult females of the *Leucosidæ*. Moreover the carapace is stained and worn as if it had not been renewed for a long time. *Myra elegans* is certainly not the young of any other Indian species.

#### LEUCOSIA, Fabr.

*Leucosia*, Fabricius, Ent. Syst. Suppl., p. 349.

*Leucosia*, Milne Edwards, Hist. Nat. Crust. II. 121.

*Leucosia*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 281, and Cat. Leucos. Brit. Mus., p. 5.

*Leucosia*, A. Milne Edwards, Nouv. Archiv. du Mus. X. 1874, p. 39.

*Leucosia*, Miers, 'Challenger' Brachyura, p. 322.

The whole exo-skeleton is of the consistence and appearance of glazed porcelain.

Carapace extremely convex, sub-circular or subrhomboidal to hexagonal in outline, perfectly smooth, with none of the regions—except sometimes the hepatic—defined: in front of the hepatic regions it is produced to form a sort of upturned snout, underneath the tip of which are found the minute eyes sunk in deep round complete orbits, the obliquely-folding antennules, and the minute antennæ lying below the antennules.

The lateral epibranchial angles of the carapace form on either side a distinct lobe, which is bent downwards towards the base of the chelipeds to form the eave of a deep sinuous depression in the side-wall of the carapace, known as the thoracic sinus.

The true postero-lateral margin of the carapace is ill-defined posteriorly, and the epimeral edge of the carapace—which practically takes the place of most of the postero-lateral margin—is greatly thickened and elegantly milled. These epimeral edges on either side are continuous with a finely-beaded crest that forms the posterior margin of the dorsum of the carapace; and below this posterior margin the carapace ends in a deflexed posterior wall.

The buccal cavern is elongate-triangular, and the front part of its side walls are coincident with the sides of the snout-like front of the carapace: the acutely-triangular merus of the external maxillipeds is about as long as the ischium, and the outer margin of the exognath is almost straight.

The chelipeds are symmetrical and, relatively to the legs, very massive; they are a little longer in the male than in the female, but are very rarely more than half again as long as the carapace: the margins and certain parts of the surfaces of the arms are ornamented with large polished pearly tubercles: the hands are usually short and broad and little longer than the fingers. The true legs are small.

The abdomen of the male consists usually of 4 pieces, but the two large middle pieces (which are formed of 5 terga) are sometimes fused, into one: the abdomen of the female also consists of 4 pieces usually, but the large oval third piece (which is formed of 4 terga) is sometimes fused with the second piece.

The so-called thoracic sinus of *Leucosia* is simply an invagination of the after part of the pterygostomian region and of the side-wall of the carapace, as may be seen by comparing cleaned carapaces with those of other Leucosines.

The invagination seems to be chiefly due to the pushing up of the epimeral margin against the resistance of the vault of the carapace — a pushing up which may be inferred from the position of what remains of the “epimeral suture.”

The origin of the thoracic sinus from such a simple invagination is very apparent in the isolated carapace of *Leucosia unidentata*. Here, viewed from the inside of the carapace, the thoracic sinus is seen as the convexity of a pocket; and, viewed from the outside, the mouth of the sinus shows as a ring of large granules or puckers resulting from invagination.

*Key to the Indian species of Leucosia.*

**A. NORMAL GENERA:** free edge of front projecting beyond the epistome: hands not foliaceous:—

I. Carapace conspicuously longer than broad, bluntly rhomboidal, quite devoid of definite pubescence, the thickened epimeral edge never visible in all its extent, dorsally, when the carapace is held, without any inclination, straight in front of the observer's eyes: front never ending in three sharp horizontal prongs: the thoracic sinus always defined in some part of its extent by large granules visible to the naked eye: no extensive growth of hair, or definite patches of spongy pubescence at the base of the upper surface of the arm: meropodites of legs subcylindrical: abdomen in both sexes consisting of 4 pieces:—

1. Outer edge of hand never carinate: front dorsally convex in all its extent: posterior margin of carapace, in the adult, usually gently convex, with its external angles not defined:—

i. True postero-lateral margin of carapace beaded as far as the level of the base of the last pair of legs: ventral surface of ischium of external maxillipeds of female almost flat—never broadly carinate:—

a. A loop of large granules between the base of the chelipeds and the margin of the carapace: two small red and white ocelli on either side of the gastric region ..... *L. unidentata.*

b. A single row of large granules between the base of the chelipeds and the margin of the carapace, and above it a second row of very small granules running into the puckered edge of an almost circular bight in the pterygostomian region: no ocelli ..... *L. obtusifrons.*

ii. True postero-lateral margin of carapace beaded only up to the level of the base of the first pair of true legs: a single row of large granules between the base of the chelipeds and the margin of the carapace:—

a. Carapace, excluding the whole front, broader than long, its posterior margin gently convex:—

aa. Thoracic sinus deep, the convex edge of the pterygostomian region, which defines the sinus

anteriorly, being finely granular: front ending in a triangular projecting beak: ventral surface of ischium of external maxillipeds of female broadly carinate up to a stout terminal tooth:—

- a. Hepatic regions each forming a strong mammary bulge, dorsally, quite independent of the general convexity of the carapace: meropodites of true ambulatory legs perfectly smooth ..... *L. longifrons.*
- β. Convexities of hepatic regions hardly distinguishable, dorsally, from the general convexity of the carapace: meropodites of true ambulatory legs with some longitudinal granulation:—
- a1. Meropodites of legs with 3 rows of granules: inner edge of hand with several rows of granules: size under 25 millim. .... *L. neocaledonia.*
- a2. Meropodites of legs with a single row of granules: inner edge of hand with a single row of granules: size over 35 millim. .... *L. urania.*
- bb. Thoracic sinus shallow, the convex edge of the pterygostomian region, which defines the sinus anteriorly, smooth and entire: edge of front sharply transverse, and sinuous: ventral surface of ischium of external maxillipeds of female non-carinate ..... *L. haswelli.*
- b. Carapace, excluding the front, as long as broad, its posterior margin almost straight ..... *L. marmorea.*
2. Outer edge of hand raised into a sharp carina: posterior margin of carapace, in the adult, straight, with its external angles pronounced:—
- i. Front dorsally concave in the middle line anteriorly:—
- a. Size medium (carapace over 20 millim. long): thoracic sinus defined ventrally by a row of granules of which 3 or 4 are pearl-like ..... *L. pallida.*
- b. Size small (carapace under 15 millim. long): thoracic sinus with at most three granules, two of which are very large and reniform or fungiform ... *L. whitmeei.*
- ii. Front convex dorsally in all its extent, produced beyond the orbits into a broadly triangular point as in *L. longifrons* ..... *L. corallicola.*
- II. Carapace conspicuously longer than broad, sharply hexagonal, devoid of definite pubescence outside of the thoracic sinus, the thickened epimeral edge visible, dorsally, in all its extent when the carapace is held without any inclination straight in front of the observer's eyes: front ending in three sharp horizontal prongs: the thoracic sinus is filled with hair, and is not defined in any part of

its extent by granules visible to the naked eye : a definite patch of encrusting spongy pubescence at the basal end of the upper surface of the arm : meropodites of legs compressed : abdomen of the male consisting of 3 pieces, of the female of 4 pieces :—

1. Front much broader than long, distinctly trigonal, its sides merging in the antero-lateral borders of the carapace without any very abrupt transition : thoracic sinus deep, the edge of the pterygostomial region, which forms the anterior boundary of the sinus, convex and granular or milled : surface below the posterior margin of the dorsum of the carapace sharply granular :—

i. Outer limb of the thoracic sinus not invading the antero-lateral margin of the carapace..... *L. craniolaris.*

ii. Outer limb of the thoracic sinus invading, and causing a marked emargination of, the antero-lateral border of the carapace ..... *L. vittata.*

2. Front about as long as broad, with the sides subparallel or, at any rate, forming an abrupt junction with the antero-lateral borders of the carapace : thoracic sinus shallow, the edge of the pterygostomial region, which forms the anterior boundary of the sinus, not strongly convex and not granular or milled :—

i. The edge of the pterygostomial region that bounds the thoracic sinus almost straight : surface of carapace below the posterior margin of dorsum granular : inner surface of hand with two prominent sharp-cut rows of granules : size about 14 millim. .... *L. rhomboidalis.*

ii. Edge of the pterygostomial region a little convex : surface of carapace below posterior margin smooth : inner surface of hand smooth, or with a single row of obsolescent granules : size about 18 millim. .... *L. pubescens.*

III. Carapace as broad as long, urn-shaped or broadly hexagonal, often with a strip of thick fur along the postero-lateral border, the thickened epimeral edge visible, dorsally, in all its extent when the carapace is held without any inclination straight in front of the observer's eyes : front obtuse : the thoracic sinus with or without granules : either a definite patch of spongy pubescence or a good deal of coarse hair at the basal end of the upper surface of the arm : meropodites of legs compressed : [abdomen of male consisting of 4 pieces, that of the female of 3, or if of 4, then the 3rd piece is again incompletely subdivided] : size very small, rarely 14 millim. :—

1. Lateral epibranchial angle and true postero-lateral border of the carapace with a sharply defined edging of thick fur :—

- i. Outer edge of hand, if sharp, never distinctly carinate: front with the dorsal surface uniformly convex:—
- a. Thoracic sinus defined ventrally by relatively large granules: hepatic region culminating, dorsally, in a granular eminence: arms covered with tubercles: hands subglobular: abdomen of female of 4 pieces, the large third piece incompletely subdivided into three ..... *L. whitei*.
- b. Thoracic sinus not defined by granules: hepatic regions smooth and ill-defined: surfaces of arms not everywhere invested with tubercles, a definite patch of spongy pubescence at the basal end of the upper surface: hands of the ordinary form: abdomen of female formed of 3 pieces:—
- aa. Four rows of tubercles—including those on the inner and outer margins—along the upper surface of the arm: fur and pubescence on carapace and chelipeds black (in spirit): carapace (in spirit) reticulated with bright brown ..... *L. margaritata*.
- bb. Upper surface of arm with only a few tubercles besides those on the margins: fur and pubescence yellowish white: carapace covered with crimson spots ..... *L. hæmatosticta*.
- ii. Outer edge of hand strongly carinate: front with the dorsal surface concave in the middle line giving a bilobed appearance ..... *L. elata*.
2. Lateral epibranchial angle and true postero-lateral border of the carapace devoid of fur:—
- i. Front prominent beyond the hepatic regions: posterior border of the carapace not equal in length to half the greatest breadth of the carapace: thoracic sinus deep and sharply defined in front: hand hardly longer than the fingers ..... *L. cumingii*.
- ii. Front hardly prominent beyond the unusually strong convexity of the hepatic borders: length of the posterior border of the carapace more than half the greatest breadth of the carapace: hand about twice as long as the fingers ..... *L. sima*.
- B. PECULIAR GENERA:—**
- I. Free edge of front not projecting beyond the level of the epistome. Otherwise belonging to the *craniolaris* group ..... *L. truncata*.
- II. Hands foliaceous: chelipeds shorter than the carapace: thoracic sinus ill defined. Otherwise belonging to the *longifrons* and *marmorea* group ..... *L. phyllochira*.



46. *Leucosia unidentata*, De Haan.

*Leucosia unidentata*, DeHaan, Faun. Japon., Crust., p. 133, pl. xxxiii, fig. 3: Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 284, and Cat. Leucos. Brit. Mus. p. 6: Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 44, and Cat. Austral. Crust. p. 118.

*Leucosia obtusifrons* var. *unidentata*, Ortmann, Zool. Jahrbucher, Syst. etc., VI. 1892, p. 535.

Carapace bluntly hexagonal or subcircular, about nine-tenths as long as broad: its surface perfectly smooth and devoid of hair: its antero-lateral borders sinuous, convex, faintly beaded anteriorly, strongly beaded posteriorly: its *true* postero-lateral border distinctly beaded or crenulate up to the level of the base of the *last* pair of legs: its thickened milled epimeral edge, which is continuous with the posterior margin and ends at a sharp tooth just behind the base of the chelipeds, is not visible, dorsally, when the carapace is held, without any inclination, straight in front of the observer's eyes: its posterior margin short, gently curved, finely beaded, with the deflexed surface below it quite smooth.

The puckered mouth of the pterygostomian invagination—the thoracic sinus of Bell and subsequent authors—shows as a roughly 9-shaped loop of equal-sized large pearly granules situated between the base of the chelipeds and the strongly-pronounced lateral angle, or eave, of the carapace: the pterygostomian plate is deeply indented, transversely, in front of this loop of granules.

The convexities of the hepatic regions are an almost indistinguishable part of the general convexity of the carapace.

The front is prominent, dorsally convex, and truncate-triangular; its length is less than its breadth; its front edge is strongly deflexed and very faintly trilobed, the middle lobe being mucronate.

The ventral surface of the ischium of the external maxillipeds in the female, as in the male, is flat and smooth.

The chelipeds in the adult male are considerably more than half again as long as the carapace. The upper surface of the arm has two divergent longitudinal rows of pearly tubercles in addition to those that bound its inner and outer borders: these two rows start from a basal emiuece formed of 7 or 8 smaller coalescent tubercles, and end near the distal quarter of the arm. The inner surface of the arm is completely covered with pearly tubercles of unequal size: the under surface is smooth except in its basal third, or half. The wrist is smooth except for two lines of bead-like granules bounding its inner surface,—one line dorsal in position, the other ventral. The hand and fingers together are as long as the arm. The hand is half again as long as broad, its narrow inner surface bears several rows of small bead-like granules the upper and lower of which are sharply deflexed and converge

elegantly to the immobile finger, along which they are usually continued for some distance. The fingers are as long as the hand, and have their opposed edges crenulate throughout their extent.

The legs have stout subcylindrical meropodites (the trigonal origin of which, however, is shown by three longitudinal rows of fine granulation), inflated carpopodites, stout dorsally-sharp-edged propodites, and broadly lanceolate, or palmulate, dactyli.

The abdomen in both sexes consists of 4 distinct pieces, the third piece in the male bearing a strong tooth in the middle line.

Colours in spirit: carapace slate-grey with four small ocelli—two on either side of the gastric region: the ocelli have broad red circumferences and small white centres: the pearly tubercles of the upper surface of the arm have the base orange-red and the apex white: the fingers have a yellowish red base, and the legs are indefinitely banded with yellowish red.

The carapace of an adult of average size, of either sex, is about 30 millim. long and 27 millim. broad.

In India this species has been found only off the Malabar Coast at 45 fathoms. In the Museum collection are an adult male and female, and three half-grown females from the Malabar Coast, (and four adult females from Hongkong.)

#### 47. *Leucosia obtusifrons*, De Haan.

*Leucosia obtusifrons*, De Haan, Faun. Japon. Crust. p. 133, pl. xxxiii. fig. 2: Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 284, and Cat. Leucos. Brit. Mus. p. 6: A. Ortmann, Zool. Jahrbucher, Syst. etc. VI. 1892, p. 585.

Differs from *L. unidentata*, De Haan, *only* in the following characters, adults of both sexes being compared:—

1. The puckered mouth of the pterygostomial invagination—or thoracic sinus—is still visible in all its extent as a long loop of granules lying between the base of the chelipeds and the cave of the carapace; but the granules of the dorsal limb of the loop are so small as to be only visible with a lens; those of the front convexity of the loop have—by a further infolding of the pterygostomial region—become partly welded together and cut off to form an almost isolated ring; while only those that form the ventral limb of the loop remain as large separate granules.

2. The two rows of tubercles on the upper surface of the arm are shorter, ending within the proximal half of the arm.

3. The chelipeds, in the adult male, are less than half again as long as the carapace.

4. The dactyli of the legs are narrowly lanceolate, not palmulate.

5. On either side of the gastric region are two white spots, instead of two red and white ocelli.

6. The body is somewhat smaller, the carapace in the average adult male measuring 25 by 23 millim., and in the average adult female 26 by 24 millim.

In the Museum Collection are 2 adult males, 4 egg-laden females, 2 young males, and a young female, from the Coromandel Coast.

The structural and colour differences hold good irrespective of age or sex, and I therefore think that De Haan's separation of this species from the preceding is justified.

#### 48. *Leucosia longifrons*, De Haan.

? *Cancellus anatum secundus*, Rumph, Amboin. Rariteitkamer, I. 27, pl. x. fig. B.

? *Araneus marinus*, Seba, Thesaurus, III. 46, pl. xix. figs. 4, 5.

*Leucosia longifrons*, De Haan, Faun. Japon. Crust. p. 132, pl. xxxiii, fig. 4: Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 284, and Cat. Leucos. Brit. Mus. p. 6: A. Ortman, Zool. Jahrbüch., Syst. etc., VI. 1892, p. 585.

? *Leucosia urania*, Guérin, Icon. R. A. Crust., pl. vi. fig. 4 (*nec* Herbst).

*Leucosia polita*, Hess, Archiv für Naturges. XXXI. i. 1865, pp. 155 and 172, pl. vi. fig. 14; (and ? Haswell, Cat. Austral Crust. p. 120); *vide* de Man, Zool. Jahrbüch. Syst. etc., II. 1892, p. 585.

*Leucosia ornata*, Miers, Trans. Linn. Soc., Zool., (2) I. 1875-79, p. 236, pl. xxxviii. figs. 7-9.

*Leucosia urania*, de Man, Journ. Linn. Soc., Zool., Vol. XXII. 1888, p. 197 (*nec* Herbst).

Carapace bluntly rhomboidal, about nine-tenths as long as broad: its surface perfectly smooth and devoid of hair: its antero-lateral borders finely beaded, and strongly sinuous, owing to the prominence of the edge of the well-defined hepatic region: its *true* postero-lateral border beaded only as far as the level of the first pair of legs (2nd pereopods): its thickened milled epimeral border is visible, dorsally, only in its posterior third when the carapace is held, without any inclination, straight in front of the observer's eyes: its posterior margin short, gently curved, and finely beaded, with the deflexed surface below it quite smooth.

The thoracic sinus is no longer recognizable as the puckered mouth of a simple pterygostomian invagination: it is now a roughly Y-shaped cavity, the tail of the Y being defined by a line of 6 or 7 large pearly granules continuous with the milled epimeral edge of the carapace, the concavity of the fork of the Y being defined by the convex crenulated edge of the pterygostomian region, and the outer limb of the Y being a good deal longer than the inner.

The hepatic regions are strongly convex dorsally, their convexities being quite independent of the general convexity of the carapace.

The front is prominent, triangular, and dorsally convex; its length is at least equal to its breadth, and it ends in a projecting laminar triangular tip.

The ventral surface of the ischium of the external maxillipeds of the female is strongly convex up to a stout terminal tooth.

The chelipeds, in the adult male, are less than one-third longer than the carapace. The upper surface of the arm has both its anterior and posterior borders defined by a distally-incomplete row of tubercles, and, besides the basal eminence formed of 6 to 8 coalescent granules, has four—rarely five or more—large tubercles disposed in an irregular square just beyond the basal eminence: the inner surface of the arm has a few tubercles in its proximal half, as has also the under surface in its proximal fourth. The wrist is quite smooth. The hand is very little longer than broad, its inner edge bears a single row of granules which are often indistinct. The fingers are not much shorter than the hand, and their opposed edges are crenulate—and that but indistinctly—only in their distal two-thirds.

The legs have stout, subcylindrical, perfectly smooth meropodites, inflated carpopodites, propodites with a sharpish dorsal edge, and, in the case of the last pair, with the ventral edge sharp also, and narrowly lanceolate dactyli which are more than half again as long as their propodites.

The abdomen in both sexes consists of 4 distinct pieces, the third piece, in the male, having a denticle in the middle line.

Colours in spirit: carapace light yellowish-brown, with a horseshoe of six impressed white spots in the gastric region, and with a narrowly defined red ring in either branchial region posteriorly; legs broadly banded with yellowish red; fingers with reddish base and white tip; tubercles on upper surface of arm with red base, sharply defined, and white apex.

The carapace of an average adult male is 22 millim. long and 18 millim. broad, of an adult female 25 millim. long and 22 millim. broad.

Over 80 specimens of all ages, from the Andamans, Mergui, Ceylon, and the Persian Gulf.

48a. *Leucosia longifrons*, var. *neocaledonica*, A. Milne Edwards.

*Leucosia neocaledonica*, A. Milne Edwards, Nouv. Archiv. du Mus. X. 1874, p. 40, pl. ii. fig. 1; and? Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 46; and? de Man, Notes Leyden Mus. III. 1881, p. 123.

? *Leucosia urania*, de Man, Notes Leyden Mus. III. 1881, p. 256.

This is certainly a well-marked variety, and perhaps a distinct

species. It differs from *L. longifrons*, De Haan, only in the following characters, adults of both sexes being compared :—

1. The carapace is closely punctate.
2. The antero-lateral border is *sharply* crenulate.
3. The hepatic regions although equally convex in the antero-lateral margins, have their dorsal convexity hardly distinguishable from the general convexity of the carapace.
4. The terminal tooth on the ventral surface of the ischium of the external maxillipeds of the female is extremely acute and prominent.
5. Along the inner edge of the band, below the upper row of granules, which are very distinct, are several indefinite rows of granules.
6. Along the inner edge of the upper surface of the wrist is a line of 3 or 4 granules.
7. The meropodites of the ambulatory legs have three distinct longitudinal lines of granules,—one dorsal, two ventral.
8. The propodites of the ambulatory legs have their dorsal edges not merely sharp, but highly carinate, and have also their ventral edges carinate.
9. The colours, when good fresh spirit specimens are compared, are very different. On the gastric region is a pair of large ocelli with small white centres and very broad red outer rings. In faded specimens the colours are much those of *L. longifrons*, but even then, instead of two round spots or rings in the posterior half of the carapace, there are from 4 to 6 large spots round the posterior half of the circumference of the carapace.

Its average size is a little less than that of *L. longifrons*.

In the Museum collection are 35 adult males and females from Palk Straits, from Karáchi, and from the Persian Gulf.

48b. *Leucosia longifrons*, var. *pulcherrima*, Miers.

? *Cancellus anatum primus*, Rumph, Amboin. Rareitkamer, I. 27, pl. x. fig. A.

*Leucosia pulcherrima*, Miers, Trans. Linn. Soc., Zool., (2) I. 1875-79, (1877) p. 236, pl. xxxviii. figs. 4-6: Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 46, and Cat. Austral. Crust. p. 119.

*Leucosia splendida*, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 47, pl. v. fig. 1, and Cat. Austral. Crust. p. 119.

This is certainly only a variety of *L. longifrons*, De Haan, from which it differs chiefly in the colouration, which is altogether richer and more brilliant. Adult females compared, the only apparent differences from *L. longifrons* are as follows :—

1. The surface of the carapace is slightly punctate.
2. The propodites of the ambulatory legs are highly carinate dorsally, and have also their ventral edges carinate, as in var. *neocaledonica*.

3. The two red rings on the posterior half of the carapace are often, but not always, much larger, and the six white spots on the anterior part of the carapace are enclosed in six red circles, which often partly coalesce to form a double trefoil pattern.

In the Museum collection are an adult female, two half-grown females, and a half-grown male, all from the Persian Gulf; and the characteristic trefoil pattern occurs only in the adult female.

#### 49. *Leucosia urania*, Herbst.

*Leucosia urania*, Herbst, Krabben, III. ii. 17, pl. liii. fig. 3: Leach, Zool. Miscell. III. p. 21: Desmarest, Consid. Gen. Crust., p. 167: Milne Edwards, Cuv. Règne An., Crust. pl. xxv. fig. 1, and ? Hist. Nat. Crust. II. 122: Bell, Trans. Linn. Soc. XXI. 1855, p. 283, and Cat. Leucos. Brit. Mus. p. 6: Hilgendorf, MB. Ak. Berl. 1878, p. 811.

This species, although closely resembling *L. longifrons*, and especially the variety (or species) *neocaledonica*, is at once distinguished from these, and from all other species, by its comparatively great size. It is a giant in the genus *Leucosia*, the carapace of an adult female in the Indian Museum collection being 38 millim. long and 34 millim. broad, dimensions almost equalled by Herbst's figure.

It differs from *L. longifrons* only in the following particulars, adult females being compared:—

1. It is very much larger.
2. The antero-lateral border is but slightly sinuous, owing to the slight prominence of the hepatic regions, of which also the dorsal convexities are an almost indistinguishable part of the general convexity of the carapace.
3. The hand is as broad as long, and the fingers have their opposed edges crenulate throughout.
4. The meropodites of the legs are traversed ventrally by a line of granules.
5. The propodites of the legs are foliaceous.
6. The dactyli are broadly lanceolate, and are only equal in length to their propodites.
7. Colours (of a thoroughly well-preserved specimen that has been eight years in spirit) olive green, with a broad white median band, forked posteriorly, extending from the tip of the front to the after end of the gastric region; four dusky red blotches round the posterior half of the circumference of the carapace: legs yellow, banded with red; basal half of fingers red.

*Loc.* Andamans.

The single female specimen in the Indian Museum collection is the exact counterpart of Herbst's figure.

50. *Leucosia marmorea*, Bell.

*Leucosia marmorea*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 286, pl. xxx. fig. 4: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 49 (*gastric teeth*): A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 111.

Carapace highly polished, piriform, *longer than broad by the whole extent of the front*: its antero-lateral borders finely beaded, *slightly sinuous*, and *gradually convergent*: its true postero-lateral border beaded only as far as the level of the first pair of legs (2nd pereopods): its epimeral edge not visible in a dorsal view: its finely-beaded posterior margin *almost straight*, with the surface below it quite smooth.

The thoracic sinus is a roughly Y-shaped cavity, the tail of the Y being defined by a line of 5 or 6 small pearly granules continuous with the milled epimeral edge, the concavity of the Y being defined by the convex, *very finely crenulated* edge of the pterygostomial region, and both limbs of the Y being very short.

The hepatic regions are hardly defined posteriorly by a faint crease.

The front is prominent, dorsally convex, and truncate-triangular, ending in three minute teeth, of which the middle one is the largest.

The ventral surface of the ischium of the external maxillipeds of the female is smooth, *and not strongly convex*.

Chelipeds little longer than the carapace. The arm has its three borders tuberculate; its upper surface with 5 to 7 pearly tubercles, in two short rows, in its basal half, just beyond a basal eminence formed of 6 to 8 coalescent granules; its inner surface granular or tubercular in rather more than its basal half, and its under surface in rather more than its basal third. The wrist and hand both have a row of sharp-cut granules along their inner edge. The fingers, which meet only at their tips, have the opposed edges distantly crenulate.

The legs are slender: their meropodites are subcylindrical with longitudinal rows of microscopic granulation, dorsally and ventrally: their propodites have sharpish edges, but are not dilated: their dactyli, which are somewhat longer than the propodites, are very narrowly lanceolate.

Colours in spirit: rich warm yellowish-brown with two pale round spots on either side of the gastric region.

Length of carapace of an adult female 23 millim., breadth 18.5 millim.

A young and four adult females from the Andamans.

Among Indian species of the *L. longifrons* group, this is at once recognized by its elongate piriform carapace, by its truncate front, by its nearly straight posterior margin, by its slender legs, and by its warm cinnamon brown colour.

51. *Leucosia haswelli*, Miers.

*Leucosia haswelli*, Miers, 'Challenger' Brachyura, p. 324, pl. xxvii. fig. 2.

Carapace with the antero-lateral margins slightly sinuous, owing to the slight convexity of the hepatic regions, which also are defined posteriorly, on the dorsum of the carapace, only by a faint crease. In other respects the carapace almost exactly resembles that of *L. longifrons*, but is a little more convex.

The front ends abruptly in a projecting, sharply transverse, sinuous edge, the edge under a lens being seen to be faintly bilobed with each lobule again faintly emarginate.

The thoracic sinus is a roughly Y-shaped cavity of no great depth, the tail of the Y being defined by four large pearl-like granules situated above the base of the chelipeds, the concavity of the fork of the Y being defined by the convex perfectly smooth edge of the pterygostomian region, and the limbs of the Y being both equally short.

The ventral surface of the ischium of the external maxillipeds of the female is moderately convex without a terminal tooth.

The chelipeds are almost exactly like those of *L. longifrons*; but on the upper surface of the arm there are always at least six pearly tubercles, in two short lines, running forwards from the basal eminence formed of coalescent granules, and these tubercles, like some of those on the inner edge of the arm, are of an uniform transparent blood-red colour; the wrist has a row of tiny blood-red granules along its inner edge; and the hand has not only a row of granules along its inner edge, but also, below this, a row of punctuations which become granules on the immobile finger: finally, the fingers are crenulate along the whole extent of their opposed edges.

Except that their propodites are sharply carinate, the legs exactly resemble those of *L. longifrons*.

Colours in spirit: light greenish yellow, mottled with darker, and with a dark greenish brown blotch on the posterior part of either branchial region and two white spots on either side of the gastric region.

Size of carapace of an adult male 21 millim. long and 18 millim. broad, of an adult female 22.5 by 20 millim.

37 specimens, young and adult, of both sexes, from the Andamans, are in the Indian Museum collection. In the smallest young the carapace is more elongate and its posterior border is almost straight, its whole shape being very much like that of *L. marmorea*, Bell.

52. *Leucosia pallida*, Bell.

*Leucosia pallida*, Bell, Trans. Linn. Soc. Vol. XXI. 1885, p. 285. pl. xxx. fig. 2, and Cat. Leucos. Brit. Mus. p. 7: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 48. (gastric teeth).



*Leucosia obscura*, Bell, Trans. Linn. Soc. Vol. XXI. 1855, p. 285, pl. xxx. fig. 3, and Cat. Lencos. Brit. Mus. p. 7.

*Leucosia pallida*, var. *obscura*, Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 316.

? *Leucosia parvimana*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 159.

? *Leucosia moresbiensis*, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 49.

? *Leucosia perlata*, de Man, Notes Leyden Mus. III. 1881, p. 124; Ortmann, Zool. Jahrbüch Syst. etc., VI. 1892, p. 584.

Carapace more nearly circular than in any other species of the genus, owing to the convexity of the antero-lateral margins; its surface perfectly smooth; its antero-lateral margins crenulate: its *true* postero-lateral margins beaded almost up to the level of the 2nd pair of legs (3rd pereopods); its epimeral edge not visible in a dorsal view; its posterior margin in the adult, as well as in the young, nearly *straight, salient, and having the outer angles dentiform*, the deflexed surface below being quite smooth.

The thoracic sinus is a Y-shaped cavity of no great depth; the tail of the Y being defined by a row of 6 or 7 granules, *three or four of which are large and pearl-like*; the concavity of the fork of the Y being defined by the convex smooth edge of the pterygostomian region; and both limbs of the Y being equally short.

The front is much broader than long *and is distinctly concave in the mid-dorsal line, anteriorly*: it ends in three denticles, the middle one of which is the most prominent.

The ventral surface of the ischium of the external maxillipeds of the female is strongly convex up to a stout terminal tooth.

The upper surface of the arm is traversed, in its proximal half, by 7 to 9 pearly tubercles arranged in two rows running forwards from the basal eminence formed by the usual mass of coalescent granules: the inner edge of the upper surface of the wrist bears a few tiny tubercles: *the hand, which is more than three-fourths as broad as long, has its outer edge strongly carinate*, and its inner edge granular: the fingers meet only at their tips, where alone they are faintly denticulate, their length is four-fifths that of the hand.

Except that they are more slender, and have sharply carinated propodites, and slender very narrow dactyli, the legs are as in *L. longifrons*.

Colours in spirit: delicate lavender grey marbled with darker; a pair of brown spots in the posterior part of the carapace, and two pairs of pale spots in the gastric region.

The carapace of an adult female is 21 millim. long and 18 millim. broad.

In the Indian Museum collection are 3 adult females (one with eggs) from the Andamans, and a young male from the Persian Gulf.

53. *Leucosia corallicola*, n. sp. Plate VI. fig. 4.

Carapace somewhat piriform, longer than broad almost by the whole length of the front: the antero-lateral borders gradually converging, and coarsely crenulate up to the smooth sharp lateral borders of the front: the true postero-lateral border, which is also crenulate, ceases abruptly at the level of the first pair of true legs: the posterior margin is quite straight with the outer angles pronounced: the epimeral edge is only visible dorsally in its posterior part.

The thoracic sinus is deep and distinct, but short and in places ill defined: its longitudinal limb is bounded by 3 or 4 small (small because the species is small) granules above the base of the chelipeds: the edge of the pterygostomian region, which defines it in front, is convex and irregularly wrinkled but not granular.

The front is almost as in *L. longifrons*: it is long, strongly convex dorsally, and ends in a broad triangular somewhat deflexed tip which projects beyond the orbits.

The ventral surface of the ischium of the external maxillipeds is not abnormally convex.

The chelipeds are as in *L. pallida*, as are the legs.

Colours in spirit: light yellow marbled with brownish. The carapace of not quite adult females, and of the males, is 10 millim. long and 8 millim. broad.

*Loc.* Off Malabar Coast, 29 fathoms on a bottom of "hard flat coral slabs" (Alfred Carpenter).

This species may possibly be Bell's *L. affinis* (Trans. Linn. Soc. Vol. XXI. 1855, p. 287, pl. xxx. fig. 6), but the front and the thoracic sinus are quite different from the figures of that species. It is certainly not the immature form of *L. longifrons*, *L. kaswelli*, *L. pallida*, or *L. whitmeei*, to which group it belongs. Among Indian forms its closest relative is *L. pallida* Bell.

54. *Leucosia whitmeei*, Miers.

*Leucosia whitmeei*, Miers, Ann. Mag. Nat. Hist. (4) XVI. 1875, p. 342, and Trans. Linn. Soc., Zool., (2) I. 1875-79, p. 238, pl. xxxviii. figs. 16-18: J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 397.

Carapace piriform, longer than broad by the whole length of the front; the antero-lateral borders hardly sinuous, gradually converging, and finely milled; the true postero-lateral border, which is also finely milled, ceases abruptly at the level of the interval between the chelipeds and the first pair of legs; the posterior margin, in the adult, no less than in the young, almost straight, with the external angles somewhat pronounced, the deflexed surface below being quite smooth; the epimeral edge visible to dorsal view only in its posterior part.