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Further Notes on Crustacea Decapoda in the Indian Museum.
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By

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FURTHER NOTES ON CRUSTACEA DECAPODA IN THE INDIAN MUSEUM.

III.—On the Decapod Crustacea collected by the Bengal Pilot Service off the Mouth of the River Hughli. Dromiacea and Oxystomata.

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For many years past the members of the Bengal Pilot Service have been enriching the collections of the Indian Museum with large numbers of, sometimes very interesting, zoological specimens, collected by them at the Sandheads, off the mouth of the Hughli River. The association between the Pilot Service and the Museum is a very old one, and there are numerous specimens in the Museum collection registered as having been presented by the Commissioners of Pilot Brigs as long ago as the seventies of the last century, or perhaps even earlier than that. This valuable association was continued even after the replacement of the Pilot Brigs by modern steamships, and has resulted in larger collections since the present Pilot vessels *S.S.* "Fraser" and *S.S.* "Lady Fraser" were equipped a few years ago with beam or otter trawls for such marine investigations as the exigencies of their service permit them. The result of this has been the accumulation of large collections from this interesting region, a considerable part of which consists of Decapod Crustacea. Though several interesting forms of Decapoda, Stomatopoda and other groups of Crustacea from this area have been described by Wood-Mason, Alcock, Kemp and others, and records of other forms from this locality have been included in a number of papers in the accounts of various species, no systematic attempt has up to the present time been made to give a collective account of the fauna of this region. I propose describing the Decapod Crustacea of this area in the present series of papers.

Like most deltaic regions, the Delta of the Ganges is a very interesting area from a zoological point of view. As pointed out by Kemp [1] in his "Notes on the Fauna of the Matlah River in the Gangetic Delta" the conditions governing life in this region are very peculiar, and have resulted in the evolution or preservation of a very specialized type of fauna. As in other deltaic regions, not only is there a rapid and extensive mingling of fresh and salt waters, resulting in a wide range of salinity that varies according to the conditions of the tides, and the amount of fresh water brought down by the river at different times of the year, but the amount of silt that the water of the Ganges brings down with it from the rich alluvial plains through which it flows, plays a very important part in regulating the conditions of life in the Delta. A very large amount of mud held in suspension in the form of minute particles must

[1] Kemp, *Rec. Ind. Mus.*, XIII, pp. 233-241 (1917).

necessarily diminish the amount of light that penetrates to the deeper layers of water, and its slow sedimentation forms a bed of a soft ooze-like mud, which from its very nature is somewhat unsuitable for a certain type of fauna. This result is no doubt also contributed to by the tidal currents and wave action, which must be constantly stirring up the superficial layers of mud at the bottom.

These conditions, though found by Kemp to exist in the Matlah River, are no doubt more or less characteristic of the entire Delta. The physical conditions prevailing at the Sandheads have not yet been adequately studied, but conditions somewhat similar to those in the Matlah River, though perhaps in a lesser degree, must obviously be existing here also. This area, which lies roughly in 21°N. and 88°E., is considerably lower and nearer the open sea than the region investigated by Kemp. The large amount of fresh water brought down either by the Hughli or the neighbouring branches of the Ganges no doubt changes the salinity, especially that of the superficial layers, to a considerable extent. Recently Commander Bacon of the Bengal Pilot Service has very kindly brought us a series of water samples from the Sandheads, covering a period of 24 hours. On titration it is found that the salinity of the surface water at the Sandheads on 18th, 19th October, 1932, varied between 16·175 and 20·990, and that it showed a tendency to rise and fall with the tides. More detailed observations on the salinity etc. of the waters at the Sandheads will be published later. I am very grateful to Col. Sewell for the very valuable help he has given me in studying these water samples.

The silt, that comes down with the river water, makes the water of this area markedly turbid. The bottom, again, for the most part consists of soft mud, though in some places there are patches of mud mixed with sand. The large quantities of mud particles held in suspension must cut off a large proportion of day-light and thus make the lower strata darker than at corresponding depths in the open sea. The depth is nowhere great and most of the collection appears to have been made at or under 20 fathoms.

From his study of the animals living in the Matlah River, Kemp came to some very interesting conclusions regarding the similarity of the Matlah fauna and that of the deep sea. At the present moment I am unable to make any general observations about the fauna of the Sandheads; it may be possible at a later stage to express some definite views on this matter.

The present paper deals with the crabs of the tribes Dromiacea and Oxystomata. Without going into the merits of the different systems of classification of the Oxystomes, so ably discussed by Ihle, I have followed in the present paper the classification adopted by Alcock in his famous "Materials for a Carcinological Fauna of India". For synonymies also the reader is referred to Alcock's work; for later references Ihle's excellent account of the Oxystomes in the Siboga Expedition Reports has been cited.

The Dromiacea are represented in the Sandheads collection by one species only, while there are 20 species and one variety of the Oxystomata. In the Calappidae, *Calappa pustulosa* Alcock, a rather rare species, is

represented by a number of good examples. In the Leucosiinae a new species of *Leucosia* has been described, while Bell's rare *Myra elegans* has also been met with. The Iliinae have six representatives living in this locality; of these *Arcania erinaceus* (Fabr.), a somewhat uncommon species, has been met with at the Sandheads. and both the known species of *Ixa* are also represented. Of these *I. inermis* Leach appears to be a rare form. The Dorippidae are represented by two species and a variety, and the Raninidae by a single species.

I give below a list of the species met with at the Sandheads; those recorded from this area for the first time are marked with an asterisk.

Dromiacea.
- Dromiidae.
  - *Conchoecetes artificiosus* (Fabr.).

Oxystomata.
- Calappidae.
  - Calappinae.
    - *Calappa lophos* (Herbst).
    - **Calappa pustulosa* Alcock.
  - Matutinae.
    - *Matuta lunaris* (Forskäl).
    - *Matuta planipes* Fabr.
- Leucosiidae.
  - Leucosiinae.
    - *Leucosia rhomboidalis* de Haan.
    - *Leucosia craniolaris* (Herbst).
    - **Leucosia rotundifrons*, sp. nov.
    - *Philyra globosa*[1] (Fabr.).
    - *Philyra globulosa* M.-Edwards.
    - *Myra fugax* (Fabr.).
    - **Myra elegans* Bell.
  - Iliinae.
    - **Iphiculus spongiosus* Adam and White.
    - **Pariphiculus mariannae* (Herklots).
    - *Arcania septemspinosa* (Fabr.).
    - *Arcania erinaceus* (Fabr.).
    - **Ixa cylindrus* (Fabr.).
    - **Ixa inermis* Leach.
- Dorippidae.
  - Dorippinae.
    - *Dorippe dorsipes* (Linn.).
    - *Dorippe facchino* (Herbst).
    - *Dorippe facchino*, var. *alcocki* Nobili.
- Raninidae.
  - **Raninoides personatus* Henderson.

My best thanks are due to Dr. Baini Prashad for making several valuable suggestions in the course of this work. and to Col. R. B. Seymour Sewell for going through the manuscript with me.

[1] No mention of this species has been made in the following pages on account of the bottle containing examples of it having been mislaid. Only three male specimens were collected at the Sandheads.

Tribe DROMIACEA.

Sub-tribe DROMIIDEA.

Family DROMIIDAE.

Conchoecetes artificiosus (Fabr.).

1901. *Conchoecetes artificiosus*, Alcock, *Cat. Ind. Decapod Crust.*, Part I, pp. 41, 42.

Seventeen specimens of both sexes and of different sizes, that agree closely with named examples of this species in the collections of the Indian Museum, have been brought back by the Pilot Steamships "Fraser" and "Lady Fraser" at different times between the years 1923 and 1928. The species is very easily recognised, among other characters, by the front having three teeth, by the presence of two teeth on the lateral borders of the carapace, and by the third pair of walking legs being short and ending in strong claws. The fourth pair of legs are very much reduced, and have tiny claw-like dactyli. The chelipeds are massive, especially in the males. The two teeth on the lateral border of the carapace are generally worn away in larger examples.

C. artificiosus has a wide range of distribution in the Indo-Pacific region. There are specimens in the Indian Museum from the Delta of the Indus to as far east as Hongkong. It has also been recorded, among other places, from the east coast of South Africa (Stebbing),[1] Ceylon (Laurie),[2] Gulf of Siam (Rathbun),[3] Japan (Balss)[4] and Queensland in Australia (Haswell).[5] It generally lives in shallow waters, but the examples from the Indus Delta in the Museum collection were dredged at a depth of 62 fathoms.

The species is known to cover itself with the shell of a bivalve mollusc, which it holds over its back by the strong claws of the third legs. One example from the Sandheads, collected by Capt. C. Park on board the "Lady Fraser" in 1927, has the shell of a Gastropod, *Xenophora* (*Onustus*) *solaris* (Linn.)[6] over its carapace.

The largest specimen in the Indian Museum collection has its carapace about 30 mm. long.

Tribe OXYSTOMATA.

Family CALAPPIDAE.

Sub-family CALAPPINAE.

Calappa lophos (Herbst).

1896. *Calappa lophos*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 144, 145.
1918. *Calappa lophos*, Ihle, *Siboga Exped. Rep.* XXXIX b², pp. 182, 183.

I refer to this species 20 examples of both sexes and of varying sizes, collected at the Sandheads between 1923 and 1929. The specimens

[1] Stebbing, *South African Crust.* II, pp. 19, 20 (1902).
[2] Laurie, *Rep. Pearl Oyster Fish. Ceylon* V, p. 353 (1906).
[3] Rathbun, *Kong. Danske Vidensk. Selsk. Skrifter* (7) V, p. 367 (1910).
[4] Balss, *Arch. Naturgesch.* LXXXVIII, p. 110 (1922).
[5] Haswell, *Cat. Austral. Crust.*, pp. 141, 142 (1882).
[6] I am indebted to my colleague Dr. B. Prashad for the name of this Gastropod.

agree closely with named examples of this species in the Museum collection. There has been some doubt about the shape of the anterior end of the endostomial septum in this species, but in my examples this septum is, as described by Alcock, "deeply excised anteriorly".

This species occurs very commonly all along the eastern coast of India from the Delta of the Hughli to as far south as Pondicherry. There are also specimens in the Indian Museum collections from the Andamans, Ceylon, the Laccadive Islands, and the Persian Gulf.

C. lophos has a wide range of distribution in the Indo-Pacific region. Balss [1] gives the distribution of the species as: Dar-es-Salaam, Persian Gulf, Indian coasts, Ceylon, Siam, Japan, Celebes, Amboina and ? Port Jackson. Miss Rathbun's[2] record of the species from the Gulf of Siam is rather doubtful, as it is difficult to say whether her examples really belong to this species or not.

The species lives in shallow waters, and, judging from the examples in the Museum collection, does not appear to go below 20 or 22 fathoms.

Calappa pustulosa Alcock.

1896. *Calappa pustulosa*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 147, 148, pl. vi, fig. 1.

This species has hitherto been known from two immature male specimens only, collected by the R. I. M. S. "Investigator" off the Ganjam and Orissa coasts, at a depth of 25 fathoms. It is very easily recognised by the poor development of the clypeiform extensions of the carapace and by the presence of large rounded tubercles arranged on the carapace in seven longitudinal rows. The clypeiform extension consists of five short, broad teeth, the anteriormost of which has the appearance of a sharp tubercle rather than that of a tooth. The third tooth is the largest, and its tip is somewhat pointed and curved forwards. The last tooth is in advance of the posterior border of the carapace. The antero-lateral margins of the carapace are distinctly crenulated (or coarsely, but evenly, beaded) in their posterior half, while the anterior part is practically smooth in most of the examples that I have examined. In a few specimens this margin is faintly beaded, while in most, though the margin is more or less smooth, the low tubercles on the carapace a little on the inside of the margin, give this part of the margin a superficially beaded appearance, somewhat like that shown in Alcock's figure of the species. Both the type-specimens, on which Alcock based the description of this species, have the anterior part of the antero-lateral margin practically smooth, but the row of low tubercles a little on the inside of the margin is seen in his figure, the true margin being invisible. The front is sharply bilobed and its tip projects beyond the orbits. The posterior border is more or less straight, and has a fairly well-marked prominence on either side at its junction with the postero-lateral margin. The seven rows of bullous tubercles are arranged on the carapace as shown in Alcock's figure. The tubercles near the posterior margin of the carapace are very much lower and less developed than on the rest of the carapace, and some of these belonging to the median row tend to

[1] Balss, *Arch. Naturgesch.* LXXXVIII, p. 123 (1922).
[2] Rathbun, *Kong. Danske Vidensk. Selsk. Skrifter* (7) V, p. 315 (1910).

become short, low crests. This is especially noticeable in larger specimens. At the anterior end of the median row, there are four smaller tubercles arranged almost in the form of a square. The surface of the carapace between the tubercles is finely granular in the anterior part, but is smooth posteriorly.

The endostomial septum in younger examples is as described by Alcock. In its anterior part the septum is a low, and slightly concave ridge, but is somewhat higher posteriorly. This is the case in the type-specimens, and in the smaller examples in my collection. In larger specimens the anterior part of the septum is a high vertical ridge, becoming low posteriorly, in which part it is deeply concave. The ischium of the external maxilliped is, as appears to be usual, strongly toothed on its inner border.

The chelipeds, as is always the case in the genus, are very massive, and the crest at the distal end of the arm is four-lobed, the anterior-most lobe ending in a sharp tooth. The outer surface of the palm (and to a less extent, the upper surface of the wrist) is covered with bullous tubercles like those on the surface of the carapace. The lower borders of the palm are finely milled, and a little above this margin on the outer surface of the palm there is a band of small granules arranged more or less parallel to the margin. The inner surface of the palm is practically smooth, and the crest on its upper margin is as shown by Alcock.

The abdomen in females and small males consists of seven distinct somites, while in large male examples the 3rd, 4th and 5th somites are fused, thus leaving only five pieces. In some comparatively large males there are still traces of lines between the fusing somites.

Calappa pustulosa appears to be a common species at the mouth of the Hughli River, 18 specimens, as listed below, having been collected by members of the Pilot service at the Sandheads. The largest male example has a carapace length of 35 mm., while the largest female, which is ovigerous, is 39·5 mm. long. The type-specimens have a carapace length of about 20 mm. only.

C 1606/1	Sandheads, mouth of the River Hughli.	"Fraser," 4th Nov. 1922.	1 young.
C 1608/1	,, ,, ,,	"Fraser," 22nd Mar. 1923.	1 ♂.
C 1612/1	,, ,, ,,	"Lady Fraser," Capt. A. W. Michie, June 1923.	1 ♂, 2 ♀♀.
C 1607/1	,, ,, ,,	"Lady Fraser," Nov. 1923.	1 young.
C 1605/1	,, ,, ,,	"Fraser," 11th Jan. 1924.	5 ♂♂.
C 1614/1	,, ,, ,,	"Fraser," 29th Feb. 1924.	1 ♂, 1 ♀.
C 1609/1	,, ,, ,,	"Fraser," Jan. 1930 .	1 young.
C 1610/1	Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel. 10 miles N. and S. of Eastern Channel Light Vessel.	"Fraser," Nov. 1923 .	1 ♀.
C 1611/1	,, ,, ,,	"Fraser," 29th Feb. 1924.	1 ♀.
C 1613/1	,, ,, ,,	"Lady Fraser," Feb., Mar. 1928.	2 ♀♀.

Typical examples of the species are so far known from the eastern coast of India only, though Borradaile[1] has recorded a variety of this species from the Maldive Islands. The variety, which he called *clypeata*, is distinguished from the *forma typica* by having the clypeiform extensions of the carapace much better developed and the antero-lateral margins of the carapace toothed throughout. The endostomial septum is more or less like that described by Alcock, though it is perhaps somewhat better developed. In the Indian examples, including the types, these characters do not exist. The anterior part of the antero-lateral margins is, as mentioned above, faintly beaded in some specimens, but in none can it be called toothed throughout. There are, however, a number of low tubercles quite close to this part of the margin, which give it a superficial appearance of being toothed, but the margin itself is practically smooth. The clypeiform expansion is poorly developed in all examples, and is nothing like that of *C. depressus* Miers,[2] as mentioned by Borradaile for his variety.

C. pustulosa lives in shallow waters, all the specimens in the Museum having been collected at depths of 20-25 fathoms of water.

Sub-family MATUTINAE.

Genus **Matuta** Fabr.

1896. *Matuta*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 153-157.

There has been a great deal of confusion regarding the correct names applicable to the various species of *Matuta*. Alcock in the paper cited above gave a very careful revision of this genus, but several workers like Stebbing,[3] Miss Rathbun,[4] Ihle, Balss [5] and others did not accept his views with regard to the correct names of *M. lunaris* and *M. victor*. I do not propose going into this matter here, but it seems clear that Alcock was wrong in ascribing the name of *M. lunaris* to Herbst. This species should undoubtedly be called *M. lunaris* (Forskäl) and *M. victor* of Alcock and some other authors should be referred to this species. *M. lunaris* of Alcock would thus appear to be *M. planipes* of Fabricius. In adopting these names I am following the example of most of the present-day workers.

Mutata lunaris (Forskäl).

1896. *Matuta victor*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 160, 161.
1918. *Matuta lunaris*, Ihle, *Siboga Exped. Rep.* XXXIX b[1], pp. 185, 186.

I refer to this species one ovigerous female specimen, with a carapace length of about 30 mm., collected by "Lady Fraser" at Sandheads in 1927. The species has been very accurately described by Alcock, and my example agrees closely with his description, as also with named specimens of the species in the collections of the Indian Museum.

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[1] Borradaile, *Fauna Geog. Maldive and Laccadive Archipelago* II, p. 436 (1903).
[2] Miers, *Challenger Brachyura* (Zool. XVII), p. 287, pl. xxiii, fig. 2 (1886).
[3] Stebbing. *South African Crustacea* III, pp. 54-57 (1905).
[4] Rathbun, *Kong. Danske Vidensk. Selsk. Skrifter* (7) V, p. 315 (1910).
[5] Balss, *Arch. Naturgesch.* LXXXVIII, p. 125 (1922).

M. lunaris occurs very commonly along the Indian shores. It is very widely distributed in the Indo-Pacific region, having been recorded from the Cape region and the Red Sea on the west to Polynesia on the east. Balss [1] gives the distribution of this species as: Zanzibar, Dar-es-Salaam, Madagaskar, Mauritius, Seychelles, Red Sea, Indian coasts, Ceylon, Amboina, Java, Celebes, Philippines, China Sea, Japan, Samoa, Nicobars, Tabiti, British New Guinea and Australia.

Matuta planipes [2] Fabr.

1896. *Matuta lunaris*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 161, 162.

This species, though closely resembling *M. lunaris* (=*M. victor* Alcock), can be, as pointed out by Alcock, easily distinguished from it. There is no spine at the angle where the hand comes in contact with the external border of the arm, the spine of the foregoing species being replaced by a tubercle, and the fourth lobe of the median longitudinal ridge on the outer surface of the hand is not raised into a spine in either sex. The colour in freshly preserved specimens is also different. I have examined a large number of specimens, that are preserved in the Indian Museum, of the two species of different ages and of both sexes, and I find that these differences are constant.

M. planipes appears to be a common species at the mouth of the Hughli, 12 specimens having been collected there between 1923 and 1927. In the Indian Museum there are specimens from Mergui, Andaman Islands, Burma and from several localities along both the coasts of Peninsular India. The species is widely distributed in the Indo-Pacific region; Balss [1] gives its distribution as Cape of Good Hope, Coasts of India, Singapore, Siam, China, Bonin Island, Japan, Java, Celebes and N. W. Australia.

Family LEUCOSIIDAE.

Sub-family LEUCOSIINAE.

Leucosia rhomboidalis de Haan.

1896. *Leucosia rhomboidalis*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 234, 235.

1918. *Leucosia rhomboidalis*, Ihle, *Siboga Exped. Rep.* XXXIX b[1], p. 282.

Leucosia rhomboidalis belongs to the group of species in which *L. craniolaris* (Herbst), *L. vittata* Stimpson and *L. pubescens* Miers are also placed. *L. truncata* Alcock also resembles these species in a number of important characters, but the shape of its front is so distinct that it can be readily distinguished from all other species of the genus. From the two first named species in this group *L. rhomboidalis* can be distinguished by having the two sides of its front more or less sub-parallel, so that a somewhat abrupt junction is formed between the front and the antero-lateral borders of the carapace; and by having the edge of

[1] Balss, *Arch. Naturgesch.* LXXXVIII, p. 125 (1922).

[2] As mentioned on p. 31, Alcock's name of *M. lunaris* is not applicable to this species, and Fabricius' old name *planipes* should take its place.

the pterygostomian region, which forms the anterior boundary of the thoracic sinus, smooth, there being no milling or granulation. From *L. pubescens* it can be recognised by its smaller size and by the fact that the surface of the carapace below the posterior margin of the dorsum is distinctly granular, while this surface is smooth in *L. pubescens*. Further the inner surface of the hand in the present species has two prominent rows of granules; in *L. pubescens* this surface is generally smooth, or there is a single row of obsolescent granules. The external orbital angles are also inconspicuous, and the two outer teeth of the front are minute and deflexed, giving the front a superficial appearance of ending in a single sharp point.

I refer to this species two male specimens collected at the Sandheads by the Pilot vessel "Lady Fraser" in November 1923. The larger example is about 14 mm. long. The specimens agree very closely with Alcock's description of the species, as also with named examples in the Museum collection. The colour is somewhat faded, but the crescents of dark red spots, mentioned by Alcock, can be distinctly made out.

There are specimens of this species in the Indian Museum collection from the Andamans, the Delta of the Irrawady River, the Sandheads and the Coromandel coast, besides some examples from Hongkong. According to Ihle the species is distributed from Ceylon to Japan; Balss [1] mentions its having been found at Vladivostock also.

Leucosia craniolaris (Herbst).

1896. *Leucosia craniolaris*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 231, 232.

1914. *Leucosia craniolaris*, Parisi, *Atti. Soc. Ital. Sci. Nat. Milano* LIII, pp. 293, 294.

The present species very closely resembles *L. vittata* Stimpson, from which it is somewhat difficult to distinguish it satisfactorily. The character on which Stimpson [2] separates his species from *L. craniolaris*, namely the presence of pubescense on the basal part of the arm, holds good for both species. Alcock mentions a number of characters by which the two species may be distinguished; the most important of these is afforded by the thoracic sinus. In *L. vittata* the outer limb of the sinus encroaches on the antero-lateral border of the carapace, where it causes a marked emargination, visible in a dorsal view; in *L. craniolaris* the outer limb of the sinus does not invade the antero-lateral margin of the carapace. This character, though quite constant in *L. vittata*, appears to be somewhat variable in the other species, for in some examples of *L. craniolaris* that I have examined a slight emargination of the antero-lateral border is formed. According to Alcock, the hand in *L. vittata* is "very appreciably longer than broad, and the fingers are every bit as long as the hand"; and in *L. craniolaris* the hand is nearly as broad as long and the fingers are also nearly as long as the hand. In all the specimens of both the species that I have examined the hand is longer than broad in the same way as the fingers are longer than the hand. In the former species, however, the fingers appear to be proportionately

[1] Balss, *Arch. Naturgesch.* LXXXVIII, pp. 127, 128 (1922).

[2] Stimpson, *Smithsonian Misc. Coll.* XLIX, pp. 149, 150, pl. xviii, figs. 3, 3a (1907).

somewhat longer than those in the other form. The third point mentioned by Alcock is the difference in the colouration of the two species. This difference appears to be constant, and in freshly preserved examples at least is no doubt useful in distinguishing the two forms. It thus appears that, apart from colouration, which in the case of old specimens cannot be relied upon to any great extent, the only point on which the two species can be satisfactorily separated is afforded by the thoracic sinus. Another character which might be of help in recognising these species is the slight difference in the shape of the front. In *L. craniolaris* the antero-lateral borders are practically straight, and meet the converging sides of the front in a more or less continuous sweep, so that there is hardly any angle formed by the two. In *L. vittata* the antero-lateral borders, which have a distinct emargination a little above the bases of the chelipeds, are somewhat arched, and meet the sides of the front in a distinct, though very broad, angle, giving the snout an appearance of being pinched off from the rest of the body. The junction is not as prominent as it is *L. rhomboidalis* or *L. pubescens*, but it is distinctly more so than in *L. craniolaris*. I have found this difference quite constant in all the examples of the two species in the Indian Museum collection.

The carapace in *L. craniolaris* appears to be a little less arched than in *L. vittata*.

There are nineteen specimens in the collection from the Sandheads that I refer to this species. Of these 13 are males, and 6 females, the latter including an ovigerous example. The largest specimen has a carapace length of 23 mm. There are already in the Museum collection specimens from the mouth of the Hughli River. In Indian waters Henderson[1] mentions its having been recorded from Rameswaram, Mutuwartu, Ceylon, Gulf of Martaban and Madras.

L. craniolaris is widely distributed in the Indo-Pacific region. In addition to Henderson's records Parisi has mentioned, in the paper cited above, a number of localities from which the species has been recorded. Ihle[2] gives its distribution as Gulf of Manaar, Indian Archipelago, Torres Strait and East Asia.

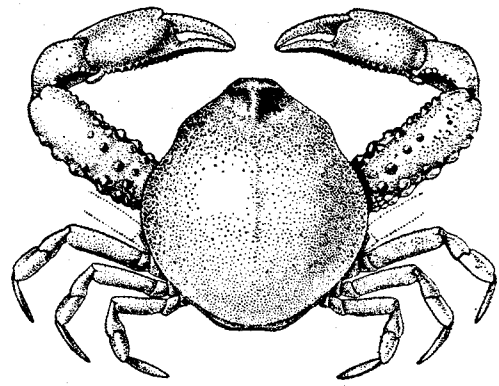
Besides the specimens mentioned above there is a young male example in the collection. As mentioned by Alcock[3] in the case of *L. vittata*, the posterior margin of the carapace is practically straight, and the outer angles are dentiform.

Leucosia rotundifrons, sp. nov.

The carapace is bluntly hexagonal, and is slightly longer than broad, the greatest breadth being about nine-tenths of the length. The surface is devoid of hair, and is quite smooth in the posterior and median regions. The hepatic, the gastric and the sides of the branchial regions are, however, minutely, but distinctly punctate, the punctations in fully grown examples being visible even to the naked eye. The antero-lateral

[1] Henderson, *Trans. Linn. Soc. London* (2) Zool. V, p. 397 (1893).
[2] Ihle, *Siboga Exped. Rep.* XXXIX b², p. 315 (1918).
[3] Alcock, *Journ. As. Soc. Bengal* LXV, p. 233 (1896).

borders are markedly sinuous, and are concave, except for a broad notch a little above the base of the chelipeds; they are beaded through-



TEXT-FIG. 1.—*Leucosia rotundifrons*, sp. nov.
Dorsal view of a male specimen: ×1·5.

out, though the beading in the anterior part is faint. The postero-lateral margins, which are broadly arched, are crenulate, the crenulation becoming sparser posteriorly, and extending up to the base of the last pair of legs. The posterior margin is faintly milled, and is regularly rounded in the female. In the male this margin is very gently curved, or is more or less straight with a concavity in the middle. It is continuous on either side with the thickened and milled epimeral margin, which, for the most part, is not visible in a dorsal view. As is usual the epimeral margin ends in a tooth. The deflexed surface below the posterior margin is quite smooth, though its lower border is beaded.

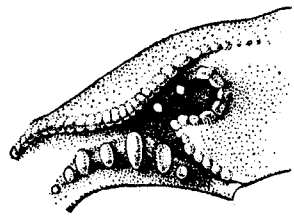
The front is prominent and is conspicuously broader than long. It is dorsally concave, and has a faint long groove on either side a little on the outside of the eye. Its front edge is deflexed and is broadly and regularly rounded. There are distinct concavities on the carapace, one on either side of the middle line at the base of the front.

The ventral surface of the ischium of the external maxilliped in the female is raised into a carina, which, in one specimen, is quite sharp and ends in a blunt tooth. The distal part of the exognath and the merus of the maxilliped, is covered with small pearly granules in both sexes.

The thoracic sinus is like that of *L. obtusifrons* de Haan, as described by Alcock [1] and figured by Parisi.[2] It is a long narrow loop between the base of the cheliped, and the strongly pronounced lateral angle or the eave of the carapace. The granules on the dorsal end of the loop are small in size, and are for the most part hidden under the eave of the

[1] Alcock, *Journ. As. Soc. Bengal* LXV, pp. 216, 217 (1896).
[2] Parisi, *Atti. Soc. Ital. Sci. Nat. Milano* LIII, pp. 291, 292, pl. xiii, fig. 4 (1914).

carapace; those on the lower limb are large and pearl-shaped. The granules of the anterior concavity of the loop are only partly welded



TEXT-FIG. 2.—*Leucosia rotundifrons*, sp. nov.
Thoracic sinus, lateral view: × 4.

together, are cut off from those of the lower limb and form a somewhat isolated incomplete ring. The pterygostomian plate in front of the loop has a small depression, and its lower edge in continuation with the loop is markedly granular.

In the adult male the chelipeds are considerably more than half again as long as the carapace. The inner and outer borders of the arm are covered with large pearly tubercles, and in addition to these the upper surface of the arm has two divergent longitudinal rows of similar tubercles, arising from a number of smaller coalescent tubercles at the base of the arm, and running for about half its length. The inner surface of the arm is completely covered with pearly tubercles, which become smaller in size near the distal end. The under surface has a large number of small tubercles in the basal portion, and similar tubercles along the sides arranged so as to leave a large smooth area of a triangular shape in the middle. The wrist is short and globular, and is smooth, except for two rows of small granules on the inner surface, one along the upper border and the other along the lower. The hand is about one and a half times as long as high, and its outer border is very faintly carinated. The inner surface of the hand has a number of rows of granules on it; the rows on the dorsal and ventral borders consist of larger granules, and are continued on to the fixed finger. The fingers are somewhat shorter than the hand, and leave an appreciable gap at the base when they are closed. They bear short teeth on their entire edges, and their tips are somewhat sharply pointed.

The legs have subcylindrical meropodites, with four longitudinal rows of small indistinct granules; the carpopodities are short and inflated, the propodites have sharp, dorsal carinae and the dactyli are broadly lanceolate.

The abdomen consists of four pieces in both the sexes; the third piece in the male has a strong tooth in the middle line. The second piece in the male is almost as long as the third and has its surface raised in three prominent convexities. In the female the second piece is very small.

The largest specimen, a male, has a carapace length of 28·8 mm. and breadth of 26·5 mm.; the largest female is 26 mm. long and 24·7 mm. broad.

The colour in spirit specimens is slate-grey, with the pearly tubercles on the arm white. There are generally no characteristic markings on the carapace, but in one female example from the Madras coast a pair of small white spots on either side of the gastric region is faintly visible, as in *L. obtusifrons*. In the specimen from the Sandheads the carapace and the lower surface of the body are mostly black, only the anterior part of the former being whitish. The chelipeds and the tubercles on it are also black, except for parts of the hand and the fingers, which are pale orange. The meropodites of the legs are black, while the remaining parts are light orange. The colouration of this example does not agree with that of any other specimen in the collection. There are tufts of Polyzoan colonies growing on the arms in this example.

The type-specimen is registered under 2855/10 in the registers of the Zoological Survey of India.

Locality.—The species appears to have quite a wide range of distribution in the Indian Ocean, there being specimens in the Museum collection both from the Arabian Sea and the Bay of Bengal. The type-specimen is from the Laccadive Sea (Marine Survey Station 246).

2855/10	Laccadive Sea, 11° 14′ 30″ N., 74° 57′ 15″ E., 68-148 fathoms.	Marine Survey, 15th Oct. 1898.	2 examples including TYPE.
2856/10	,, ,, ,,	,,	1 young.
C1643/1	Madras Coast. ,,	,,	1 ♀.
C1644/1	Near Muscat, Persian Gulf.	T. H. Townsend.	1 young ♂ with a Bopyrid.
C1645/1	Sandheads, mouth of the River Hughli.	"Fraser," 29th Feb. 1924.	1 ♀.

The present species very closely resembles *L. unidentata* de Haan and *L. obtusifrons* de Haan, notably in the shape and proportions of the carapace, the general shape of the front, the granulation of the arm, the form of the legs, and the general shape of the thoracic sinus. It can, however, be easily distinguished from both these species, among other characters, by the punctations of the carapace, the shorter and anteriorly rounded front, and the carina on the ischium of the maxilliped of the female. As is seen from the accompanying table *L. rotundifrons* shows a greater resemblance with *L. obtusifrons* than with de Haan's other species. The resemblance between the three species is so close, that some examples of the new species had been mixed up with specimens of the other two species in the Museum collection. The type-specimen along with another younger example had been included with examples of *L. unidentata*, while the female from Madras coast had been determined as *L. obtusifrons*. Another specimen from Muscat in the Persian Gulf had also been called *L. unidentata*.

L. unidentata.	*L. obtusifrons.*	*L. rotundifrons.*
1. Carapace smooth.	1. Carapace smooth.	1. Carapace distinctly punctate on hepatic, gastric and sides of the branchial regions.
2. Front somewhat broader than long, truncate triangular, its anterior edge faintly trilobed and slightly deflexed.	2. Front more or less as in *L. unidentata.*	2. Front very much broader than long, its anterior edge deflexed and regularly and broadly rounded.
3. Ventral surface of ischium of external maxilliped in the female smooth	3. As in *L. unidentata.*	3. Ventral surface of ischium of external maxilliped in the female carinate.
4. Distal part of merus and exognath of external maxilliped in both sexes smooth.	4. As in *L. unidentata.*	4. Distal part of merus and exognath of external maxilliped having pearly granules in both sexes.
5. Thoracic sinus loop-shaped, with equal sized pearly granules on both limbs. Pterygostomian plate in front of the loop deeply indented transversely.	5. Thoracic sinus loop-shaped, with the anterior end of the loop cut off in an isolated ring of coalesced granules, and with granules of the dorsal limb minute. Pterygostomian plate in front of the loop flat.	5. Thoracic sinus more or less as in *L. obtusifrons.* Pterygostomian plate in front of the loop somewhat depressed, with its lower edge prominently granular.
6. Divergent rows of granules on the upper surface of arm extending for about three-fourths of the basal part of the arm.	6. Divergent rows of granules extending for about half the length of the arm.	6. Divergent rows of granules extending far about half the length of the arm.
7. Outer border of hand rounded.	7. Outer border of hand rounded.	7. Outer border of hand faintly carinate.
8. Fingers as long as the hand.	8. Fingers shorter than the hand.	8. Fingers shorter than the hand.
9. Chelipeds more than 1½ times the length of the carapace.	9. Chelipeds less than 1½ times the length of the carapace.	9. Chelipeds more than 1½ times the length of the carapace.

The species appears to be uncommon at the Sandheads, only one example, as shown in the list of localities given above, having been collected there by the Pilot Steamship " Fraser " in 1924.

Philyra globulosa M.-Edwards.

1896. *Philyra globulosa,* Alcock, *Journ. As. Soc. Bengal* LXV, pp. 245-247.
1918. *Philyra globulosa,* Ihle, *Siboga Exped. Rep.* XXXIX b², pp. 274, 275.

I refer to this species 21 specimens from the Sandheads, collected between 1922 and 1927. There are 12 males and 9 females, the former varying beween 14 mm. and 20 mm. in length, and the latter between 14 and 16 mm. According to Alcock the adult female is 22-24 mm. long, but in my collection some females, having a carapace length of about 14 mm. only, are ovigerous.

P. globulosa somewhat closely resembles *P. globosa* (Fabr.), but, as shown by Alcock, the two can be distinguished without much difficulty. Ihle in the paper cited above has also given a number of useful characters, which facilitate the recognition of the two species.

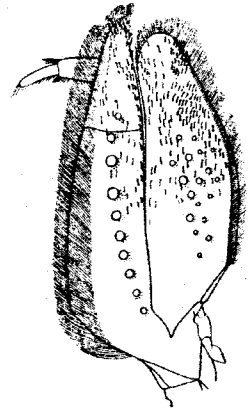
The species appears to be quite common in the Indian Ocean, there being specimens in the Museum collection, as remarked by Alcock, from " all along the East coast, from the mouth of the Hooghly to Point Calimere, and on the coasts of Travancore, the Andamans, and the Persian Gulf ". The specimens from the last mentioned locality differ from others in having the upper surface of the arm, and the pterygo stomian region less granular than is usually the case.

Ihle gives the distribution of the species as the Indian Ocean from the Persian Gulf to the Gulf of Siam, and the Moluccas.

Myra fugax (Fabr.).

1918. *Myra fugax*, Ihle, *Siboga Exped. Rep.* XXXIX b[a], pp. 256, 257.

Myra fugax occurs very commonly all round the coasts of India. In the Indian Museum collections there are specimens from, among other localities, the Mergui Archipelago, the Andamans, the Irrawady Delta, the Delta of the Ganges, both the coasts of the Indian Peninsula (up to Karachi on the Bombay coast) and from the Persian Gulf. There are also examples from Singapore and Hongkong. In addition to these there are numerous specimens registered under the name of *M. pentacantha* Alcock,[1] which appears to be only a young form of *M. fugax*, from both the coasts of India.



TEXT-FIG. 3.—*Myra fugax* (Fabr.).
External maxilliped of female: × 8.

The species has been very fully described by Alcock[2] and several other writers. In the female the ventral surface of the ischium of the external maxillipeds is distinctly raised in a median longitudinal ridge composed of fairly large pearly granules. This character is very poorly developed in the male, but is present in all females, and even in young specimens of that sex.

As Ihle has pointed out *M. fugax* is rather a variable species. The proportions of the carapace, the size of the terminal spines, the relative length of the chelipeds, and the granulation of the carapace—to mention only a few of the important characters—all vary a great deal with age, and to a certain extent with sex also.

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[1] Alcock, *Journ. As. Soc. Bengal* LXV, pp. 204, 205 (1896).
[2] Alcock, *op. cit.*, pp. 202—204.

I refer to this species 13 examples collected at the Sandheads at different times between the years 1922 and 1928. There are 10 males and 3 females; the largest male has a carapace length (excluding the terminal spine) of 27 mm., while the largest female, which is ovigerous, is about a millimetre longer.

M. fugax has a very wide range of distribution in the Indo-Pacific region. Balss[1] gives the distribution as East Africa, Madagascar, Red Sea, Indian Coasts, Ceylon, Gulf of Siam, Japan, Arafura Sea on the north of Australia and New Caledonia.

Alcock, in the paper cited, pointed out with good reasons that his *M. pentacantha* is probably only a young form of *M. fugax*, and Ihle, agreeing with this view, has included Alcock's species in the synonymy of *M. fugax*. This course he has followed even in spite of the fact that Miss Rathbun[2] considered the two species distinct, chiefly on the ground that in *M. pentacantha* the ischium of the external maxilliped in the female has no fringe of setae along the inner part of apposed edge. Ihle in the young examples of *M. fugax* in his collection—which he considers to be nothing else but *M. pentacantha* of Alcock—found this fringe present. I have examined a number of female examples of *M. pentacantha* on which Alcock based his new species, and in all of these I have found a row of sparsely placed hairs on the inner edge of the ischium of the external maxilliped. This row of hairs is present in *M. fugax* also, but in addition to this there is a thick fringe of closely developed hairs, a little on the outside of the apposed edge. This fringe is altogether absent in all the examples of *pentacantha* that I have examined. Though this fringe is well developed in large females of *M. fugax*, I have failed to find it in younger examples of this sex. It seems probable, therefore, that this fringe grows with age, and as all the examples of *M. pentacantha* are very young, this fringe is naturally absent in these. The row of tubercles on the ventral surface of the ischium mentioned in the case of *M. fugax*, is present in a similar position in examples of *M. pentacantha* also. These tubercles are poorly developed in very small examples of the latter species, but in comparatively bigger specimens these are very clearly seen. The other characters of *M. pentacantha*, mentioned by Alcock, are for the most part those that one would expect to find in the young of *M. fugax*, and I have, therefore, no hesitation in agreeing with Alcock and Ihle that it is only a young form of the latter.

Myra elegans Bell.

1896. *Myra elegans*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 208, 209.
1918. *Myra elegans*, Ihle, *Siboga Exped. Rep.* XXXIX b², p. 261.

This species can be very easily recognised by the elongate-oval form of its carapace, having a flat median carina and terminating posteriorly in a long spine with two short spinules, one on each side. The branchial regions have a longish patch of tubercles on the middle of their surface; the carina and the region round the posterior spine are also granular. The prominent marginal notch behind the hepatic region that is generally

[1] Balss, *Arch. Naturgesch.* LXXXVIII, p. 127 (1922)
[2] Rathbun, *Kong. Danske Vidensk. Selsk. Skrifter* (7) V, p. 308 (1910).

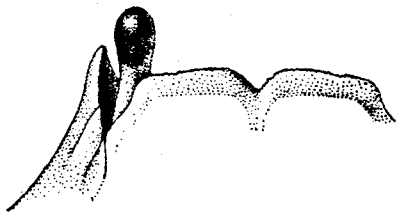
present in other species of the genus is wanting. The chelipeds are slender and rather short, and those of the two sides differ only slightly from one another.

Myra elegans appears to be rather a rare species. The incomplete female specimen on which Bell [1] based the description of the species was collected in the "Mari orientalis". There are five specimens in the Indian Museum collection; of these four are from the Madras Coast and the fifth was collected from East of the Terribles, off the Arakan Coast in Burma. Miss Rathbun [2] has recorded the species from the Gulf of Siam, and the Siboga Expedition obtained a young example in the Madura Strait, north of Java. The species lives in shallow waters, and is not known to go deeper than about 20 fathoms.

I refer to this species three specimens, one male and two females, collected at the Sandheads.

C1581/1	Sandheads, mouth of the River Hughli.	"Fraser," Capt. R. Smyth, 26th August 1922.	1 ♀.
C1580/1	,, ,, ,,	"Lady Fraser," Capt. A. W. Michie, June 1923.	1 ♀.
C1579/1	,, ,, ,,	"Lady Fraser," Nov. 1923.	1 ♂.

The larger of the two females has a carapace length (excluding the terminal spine) of 17·5 mm., and is about 12·5 mm. broad; the single male is 15 mm. long, and has a breadth of about 10·5 mm.



TEXT-FIG. 4.—*Myra elegans* Bell.
Dorsal view of anterior end of carapace: × 17.

The species has been very well described by Alcock, and besides the illustrations given by Bell, Miss Rathbun has published a photograph of a large male specimen. The deep triangular fissure on the border of the orbit mentioned by Ihle is clearly seen in all the examples that I have examined. It is broad anteriorly, but becomes deeper and narrower posteriorly. The outer orbital angle is also acutely pointed. At the lower anterior angle of the hepatic facet there is a large cylindrical spine projecting considerably beyond the outer orbital angle. This spine, as mentioned by Ihle, is a prolongation of the anterior border of the pterygostomian region. The spine is strongly developed in the

[1] Bell, *Trans. Linn. Soc. London* XXI, pp. 297, 298, pl. xxxii, fig. 4 (1855).
[2] Rathbun, *Kong. Danske Vidensk. Selsk. Skrifter* (7) V, p. 309, pl. i, fig. 12 (1910).

male; in the female, though it is considerably reduced, it can still be made out by the side of the outer orbital angle, beyond which it does not project very much. The upper border of the hepatic facet posterior to the spine is distinctly beaded. The other differences observed by Ihle in his specimen are probably due to its being very young.

M. elegans does not appear to grow to a large size, the largest specimen in the Indian Museum collection is the female from the Sandheads referred to above, in which the length of the carapace, including the terminal spine, is 21·4 mm.

Sub-family ILIINAE.

Iphiculus spongiosus Adam and White.

1896. *Iphiculus spongiosus*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 256, 257.
1918. *Iphiculus spongiosus*, Ihle, *Siboga Exped. Rep.* XXXIX b², p. 252.

I refer to this species a single female example collected by the Pilot S. S. "Lady Fraser" at the Sandheads in November, 1923. It agrees closely with the published descriptions and figures of the species, as also with Alcock's named examples of it in the collections of the Indian Museum.

I. spongiosus has been recorded from several localities in the Indian waters. In the Museum collection there are several specimens from the Andamans, off the Irrawady Delta, the Ganjam and the Madras coasts, the Mekran coast and the Persian Gulf. The species lives for the most part in shallow waters, but some examples in the Museum collection from the Bay of Bengal are from a depth of 66 fathoms.

The species has quite a wide range of distribution in the Indo-Pacific region. Ihle mentions it as having been reported from the Red Sea, Mekran coast, Bay of Bengal, Andaman Islands, Singapore, Arafura Sea, Gulf of Siam, Philippine Islands and Hongkong.

Pariphiculus[1] **mariannae** (Herklots).

1896. *Pariphiculus rostratus*, Alcock, *Journ. As. Soc. Bengal* LXV, p. 259, pl. viii, fig. 2.
1918. *Pariphiculus mariannae*, Ihle, *Siboga Exped. Rep.* XXXIX b², pp. 249, 250.

As pointed out by Nobili[2], Alcock's *P. rostratus* is undoubtedly identical with the form described by Herklots[3] in 1852 under the name of *Ilia mariannae*. The description and the figure published by this author leave no doubt on this point.

The one male example that I refer to this species agrees very closely with the description and figure given by Alcock, as also with the named

[1] In his "Ostasiatische Decapoden. III" Balss [*Arch. Naturgesch.* LXXXVIII, p. 131 (1922)] says that there are four species in the genus *Pariphiculus*. So far as I am aware, the genus consists of only three species, namely, the genotype *P. cornutus* Alcock and Anderson, *P. mariannae* (Herklots) (=*P. rostratus* Alcock), and *P. agariciferus* Ihle. It is possible Balss considers Alcock's *P. rostratus* distinct from *P. mariannae*.
[2] Nobili, *Ann. Sci. Nat. Paris* (9) IV, p. 165, foot-note (1906).
[3] Herklots, *Bijdr. Dierkunde* I, pp. 35-37, pl. fig. 2 (1852).

examples of the species in the Museum collection. The abdomen of the male, as mentioned by Alcock, has segments 3-5 fused, but even in comparatively large specimens the sutures between these segments are still faintly visible. The third segment has two marked convexities, one on either side at the base, and a deep concavity between the two. There are some small granules on the convexities and, though these appear to vary with age, these are present in all male specimens. Besides this, in very young specimens, both male and female, almost the entire surface of the abdomen, and the ventral surface of the thoracic sternites are covered over with granules. These tend to disappear with age, but the 1st and the 2nd sternites, especially the latter, are always granular in both sexes. The ventral surface of the ischium of the external maxilliped has also a median longitudinal ridge of low granules in both sexes.

The species is represented in the Indian Museum collection by examples from the Burma, Coromandel and Malabar coasts, as also by two large females from Hongkong. Herklots described the species from China, while Ihle had a young male in the Siboga collection from the Malay Archipelago. I refer to it one example from the Sandheads.

C1641/1 Sandheads, mouth of the River Hughli. "Lady Fraser," Nov. 1923. 1 ♂

P. mariannae seems to live on a muddy bottom in comparatively shallow waters. The specimens in the Museum collection are mostly from a depths varying between 25 and 45 fathoms, though one specimen from the Gulf of Martaban was dredged at 61 fathoms.

The largest female in the collection (from Hongkong) is 32 mm. long, while the largest male (from the Sandheads) has a carapace length of about 22 mm.

Arcania septemspinosa (Fabr.).

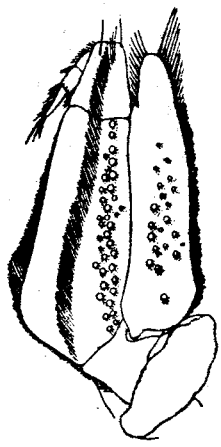
1896. *Arcania septemspinosa*, Alcock, *Journ. As. Soc. Bengal* LXV, p. 265.
1918. *Arcania septemspinosa*, Ihle, *Siboga Exped. Rep.* XXXIX b², pp. 265, 266.

This species appears to be rather common at the Sandheads, 30 specimens having been collected there on six different occasions between 1922 and 1932. Of these 17 are males and 13 females; the largest male has a carapace length of about 23 mm., while in the largest female, which is ovigerous, the carapace has also the same length.

The merus of the external maxilliped in the female has a thick fringe of long hairs running in a longitudinal direction about the middle of the surface, and external to the fringe and running parallel to it there are two or three rows of pearly tubercles placed close to one another. These tubercles are present in the male also, but the fringe of hairs is lacking in examples of this sex. The exognath in both sexes has a number of tubercles scattered on its surface. The palp arises on the underside near the antero-external angle.

In the Indian Museum collections there is a large number of specimens of this species from the Andamans, the Arakan coast, the Delta of the Ganges, all along the eastern coast and from the Persian Gulf.

A. septemspinosa has a wide range of distribution in the Indo-Pacific



TEXT-FIG. 5.—*Arcania septemspinosa* (Fabr.).
External maxilliped of female: × 8.

region. Balss[1] gives the distribution of the species as Cape of Good Hope, Red Sea, Indian Seas, Malay Archipelago and Hongkong.

Arcania erinaceus (Fabr.).

1896. *Arcania erinaceus*, Alcock, *Journ. As. Soc. Bengal* LXV, p. 268.

The present species can be very easily recognised by the fact that the carapace is longer than broad, the fingers are shorter than the hand and that the surface of the carapace is densely covered with spines, of which eleven arranged along the margins are more prominent than the others. Most of the marginal spines are covered with secondary spinules; the latter, however, appear to vary with age, and in smaller specimens are not as prominent as in well grown examples. The front is deeply bifid, and ends in two short teeth. The ventral surface of the body, including the external maxillipeds, is sharply granular. The meropodites of the chelipeds and the walking legs are spiny even in young specimens. The first walking legs are proportionately long.

I refer to this rather rare species five examples from the Sandheads.

C1570/1	Sandheads, mouth of the River Hughli.	"Lady Fraser," Nov. 1923.	2 ♂♂, 1 ♀.
C1571/1	,, ,, ,,	"Lady Fraser," Aug., Sept. 1927.	1 ♀.
C1572/1	Bay of Bengal, between Pilot Ridge Light Vessel and Eastern Channel Light Vessel. 10 miles N. and S. of Eastern Channel Light Vessel.	"Lady Fraser," Feb., Mar. 1928.	1 ♂

[1] Balss, *Arch. Naturgesch.* LXXXVIII, p. 132 (1922).

My examples agree very closely with the published descriptions of the species, as also with named examples of it in the Museum collection. There is, however, one small difference in my specimens. According to Alcock, all the joints of the walking legs, except the dactyli, and those of the chelipeds except the distal half of the hand and the fingers are sharply granular, and this character can be clearly seen in all the specimens that Alcock examined. In my examples, however, the granulation on the basal half of the hand, and on some of the distal joints of the legs is very obscure.

The anterior margin of the pterygostomian plate is prolonged into a sharp spine, as is clearly shown in Milne-Edwards' [1] figure of the species. In the female the ischium of the external maxilliped has a thick longitudinal fringe of hairs about the middle of its surface ; this is altogether wanting in the male.

Balss [2] has doubtfully included this species in his account of the Decapoda from Eastern Asia. He had before him only a young female specimen, having a carapace length of 8 mm. His specimen differs from the published account of the species, chiefly in having the front more drawn forwards and not deeply divided into two parts, and in the meropodites of the chelipeds and the walking legs not being armed with spines, but being only granular. The marginal spines also do not bear secondary "Dornen," but only "kleine Stacheln". In the Indian Museum collection also there is an immature female, with a carapace length of about 9 mm. In this example the front is, as in older specimens of the species, deeply bifid, with each part ending in a spine ; the meropodites of the chelipeds and the walking legs are distinctly spiny ; and the marginal spines have secondary spines on them, though the latter are not as prominent as in older specimens. It thus seems probable that the specimen examined by Balss is not referable to this species.

In Indian waters *A. erinaceus* is known to occur along the east coast of India, from the Delta of the Ganges to as far south as Pondicherry. Laurie [3] has recorded it from the Gulf of Manaar. The species is also known from Singapore (Lanchester [4]).

The largest specimen in the Museum collection, a female, has a carapace length (excluding the posterior spine) of 21 mm., while the largest male is about 16·5 mm. long.

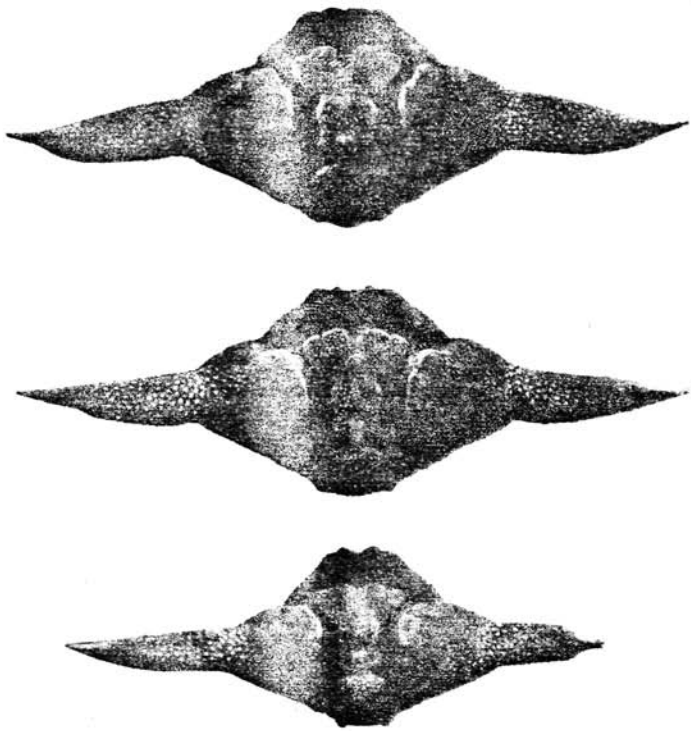
Ixa cylindrus (Fabr.).

1896. *Ixa cylindrus*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 271, 272.

Ixa cylindrus is characterised by the possession of deep and well-defined channels, with the floor covered with pubescence, on the carapace, the general surface of which is granular, leaving smooth, polished patches in places ; by the presence of huge lateral processes, which have generally the same diameter at their distal ends as near the base, and are abruptly

[1] Milne-Edward, in Cuvier's *Regne Animal*, pl. xxiv, fig. 2 (1838–1849).
[2] Balss, *Arch. Naturgesch.* LXXXVIII, p. 133 (1922).
[3] Laurie, *Rep. Pearl Oyster Fish. Ceylon* V, p. 366 (1906).
[4] Lanchester, *Proc. Zool. Soc. London* for 1900, p. 766 (1900).

surmounted by a spine; and by having the buccal cavern somewhat triangular in shape. The exognath of the external maxilliped has a concave and smooth surface along its inner edge, and the ischium has a narrow band of granules along its outer border. The posterior border of the carapace is not dentiform at the edges. All these characters appear to be very constant in this species, except the shape of the lateral processes. As already pointed out by Bell [1] the form and size of these processes show a great deal of variation in this genus, so much so that on an examination of about a dozen examples referred to the three then-known species of the genus (including Leach's specimens) this eminent carcinologist was led to the conclusion that the genus is mono-



Text-fig. 6.—*Ixa cylindrus* (Fabr.).

Photographs of three specimens showing the variation in the lateral processes.

typic and that the so called different species represent nothing but individual variations. Though I am unable to agree with Bell in consi-

[1] Bell, *Trans. Linn. Soc. London* XXI, pp. 311, 312 (1855).

dering *I. cylindrus* to be the only valid species of this genus, I fully support his statement regarding the variation in the lateral processes. The three specimens from the Sandheads that are in my collection show this variation very clearly. In one female, with a carapace length of about 20 mm., the processes are conical, more or less gradually tapering from a broad base to a finely pointed tip. They are practically straight, with the distal end of one process slightly bent forwards. In the second, slightly larger, female the processes have in a general way the shape described for the first specimen, but they are bent backwards at the base, and the tips very distinctly point forwards. In the third example, a male about 17 mm. long, the condition is still different. The process on the left side of the carapace is like that of the other two examples: conical, gradually tapering from a broad base to a sharply pointed tip, which is directed forwards; the other process is distinctly shorter and is like that of a typical *I. cylindrus* as described by Alcock and other authors. It is cylindrical in shape, almost as broad distally as at the base and the rounded distal end is surmounted by a short, sharp spine. Judging by the somewhat broken tip, it is likely that at least a part of this process has been regenerated. The distal parts of all the processes are smooth, while the rest of the surface is granular. In all other characters, enumerated above, these specimens agree so closely with typical examples of the species that to my mind there cannot be any doubt of their specific identity.

The lateral processes in my example resemble those of *I. edwardsi* Lucas[1], as figured by M.-Edwards,[2] or to a certain extent even those of *I. inermis* Leach (Alcock). But these two forms (which are probably identical) differ from *I. cylindrus* in a number of important and constant characters, notably the channeling on the carapace and the form of the posterior margin.

It is thus clear that the shape and size of the lateral processes do not afford distinguishing characters between the species of the genus *Ixa*. There are, however, other characters, such as the channels on the carapace, the form of the posterior border, the shape of the buccal cavern, etc., on the basis of which the species can easily be separated.

I refer to this species three examples, 1 male and 2 females, collected at the Sandheads between 1924 and 1927. Two of these were obtained by "Lady Fraser," while the single male was collected by "Fraser".

Besides these three, *I. cylindrus* is represented in the Indian Museum collection by specimens from Port Blair in the Andamans, Madras coast and from the Palk Straits between India and Ceylon. Laurie [3] has also recorded the species from near the latter locality and Miss Rathbun [4] obtained examples in the Gulf of Siam. Ihle [5] gives the distribution of the species as Kilwas (coast of British East Africa), India, Singapore and Thursday Island.

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[1] Lucas, *Ann. Soc. Ent. France* (3) VI, pp. 184-186, pl. iv, fig. 3 (1858).
[2] Milne-Edwards, *Ann. Soc. Ent. France* (4) V, pp. 156-158, pl. vi, fig. 1 (1865).
[3] Laurie, *Rep. Pearl Oyster Fish. Ceylon* V, p. 366 (1906).
[4] Rathbun, *Kong. Danske Vidensk. Selsk. Skrift.* (7) V, p. 314 (1910).
[5] Ihle, *Siboga Exped. Rep.* XXXIX b², p. 314 (1918).

Ixa inermis Leach, Alcock.

1896. *Ixa inermis*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 272, 273.
1906. *Ixa inermis*, Nobili, *Ann. Sci. Nat. Paris* (9) IV, pp. 171, 172.
1918. *Ixa* sp., Ihle, *Siboga Exped. Rep.* XXXIX b², pp. 267, 268.

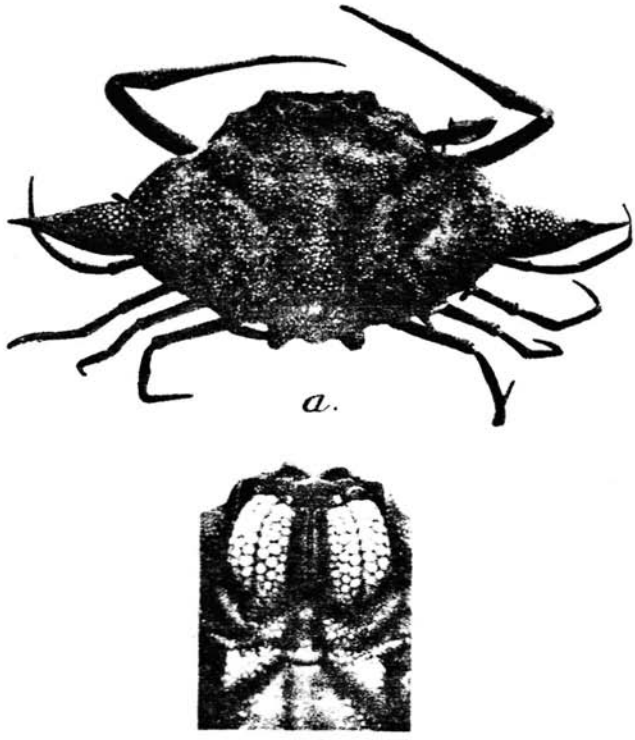
Ixa inermis can be easily distinguished from the foregoing species by the fact that the channels on the carapace of the latter species are represented in the present form by shallow, impressed grooves without any definite margins; the posterior border of the carapace has on each end a petaloid process directed backwards and outwards; the buccal cavern is distinctly quadrate owing to the eversion of the outer lip of the afferent branchial channel; the ischium of the external maxilliped is covered over with pearly tubercles and is strongly convex, except for a small part along the inner border, where it is grooved; and the exognath is also strongly convex, except for a small distal portion, where it is hairy and markedly depressed. The lateral processes are proportionately short, are thick at the base and taper distally to a fine point; the distal part of the process is smooth, while the rest of the surface is densely granular. The surface of the carapace and the ventral surface of the body is granular, more densley so in some parts than in others. The gastric region has three prominent convexities, dotted over with granules, and the tumid intestinal region is surmounted by a blunt, somewhat elongated tubercle. The front is distinctly bilobed, each lobe ending in a blunt tooth-like projection. The sternum of the first thoracic somite (at the base of the cheliped) is raised into a large and prominent area, covered with pearly granules. A similar area is present in the female of *I. cylindrus* also, but is not so much raised or prominent as in the present species.

The large female specimen in the Siboga collection described by Ihle is undoubtedly referrable to *I. inermis* of Leach, as defined by Alcock. All the characters mentioned by Ihle agree with Alcock's description of the species. It is difficult definitely to assign the other smaller example in the Siboga collection to any species, as Ihle has not mentioned any characters by which it can be recognised.

Leach's [1] figure of *I. inermis* does not agree with Alcock's description of the species, chiefly as regards the shape of the lateral processes. In Alcock's *I. inermis* the process is thick at the base, and gradually tapers to a point, where it is surmounted by a sharp smooth spine, somewhat similar to the spine of *I. cylindrus*. In Leach's figure this process is seen to taper distally only slightly, is somewhat rounded at the tip, and has no sharp spine at the end. Miers,[2] who evidently examined Leach's type-specimen, also described the processes as "somewhat narrowed distally" and "without terminal spinules." The other characters of the species that can be judged from the figure and the scanty characterisation of Leach agree with Alcock's description. The shallow grooves on the carapace and the petaloid tubercles on the posterior margin are very characteristic of this species. The lateral processes in this genus, as has already been remarked, appear to be very variable

[1] Leach, *Zool. Misc.* III, p. 26, pl. cxxix, fig. 2 (1817).
[2] Miers, *Challenger Brachyura* (Zool. XVII), p. 301, foot-note (1886).

in shape and size. Until a more detailed description of Leach's type-specimen, especially with reference to its buccal cavern and the external



TEXT-FIG. 7.—*Iza inermis* Leach.

a. Dorsal view of a female specimen.

b. Ventral view of the anterior part of the body, enlarged.

maxillipeds, is given, the doubts regarding this species cannot be definitely cleared up. I am, however, of the opinion that Alcock's *I. inermis* is identical with the form described by Leach under that name. I give here a figure of *I. inermis*, as understood by Alcock. The specimen on which the figure is based is from the Sandheads, and agrees in every detail with Alcock's examples of the species.

I. edwardsi was originally described by Lucas [1] from a fossil, but the description was amplified by Milne-Edwards [2] from a living example from Zanzibar. From the nature of the grooves and the presence of

[1] Lucas, *Ann. Soc. Ent. France* (3) VI, pp. 184-186, pl. iv, fig. 3 (1858).

[2] Milne-Edwards, *Ann. Soc. Ent. France* (4) V, pp. 156-158, pl. vi, fig. 1 (1865).

petaloid tubercles on the posterior margin of the carapace this species, as remarked by Miers,[1] Nobili and others, appears to be identical with *I. inermis* Leach. The shape of the lateral processes is somewhat different in the two, but as already pointed out, these structures appear to be very variable in the genus *Ixa*.

I refer to this species one large ovigerous female from the Sandheads. The carapace is 25 mm. long, and the breadth, including the lateral processes, is 58 mm., while excluding these the carapace is 35 mm. broad. There are a few barnacles attached to the carapace.

C1642/1	Sandheads, mouth of the River Hughli.	"Lady Fraser," Sept. 1925.	1 ♀ ovigerous.

I. inermis appears to be a rather rare species. Besides the Sandheads example, there is in the Indian Museum collection a large female from off the Ganjam coast, and another young specimen from the Persian Gulf. The species has so far been recorded from the Red Sea (Nobili), Persian Gulf, Ganjam coast (Alcock), Indian Archipelago (Ihle) and North Australia (Haswell).[2] Milne-Edward's example of *I. edwardsi* (=*I. inermis*) was collected at Zanzibar.

Family DORIPPIDAE.

Sub-family DORIPPINAE.

Dorippe dorsipes (Linn.).

1896. *Dorippe dorsipes*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 277, 278
1916. *Dorippe dorsipes*, Ihle, *Siboga Exped, Rep.* XXXIX b[1], pp. 148, 149.

I refer to this common Indo-Pacific species two examples collected by the Pilot vessel "Lady Fraser" at the Sandheads in May, 1927. Both the specimens are males, and the larger of the two has a carapace length of 30 mm.

My specimens agree closely with Alcock's description of the species, except for the fact that the carapace is slightly broader than long, as was observed by Miss Rathbun in her examples from the Gulf of Siam, and by Ihle in the Siboga material. In the smaller example from the Sandheads (with a carapace length of 24 mm.) the 4th tergum of the abdomen has, in addition to the large median tubercle, a small acute tubercle on each side.

D. dorsipes has a wide range of distribution in the Indo-Pacific region, having been recorded from the east coast of Africa and the Red Sea to Japan and west coast of Australia.

Dorippe facchino (Herbst).

1896. *Dorippe facchino*, Alcock, *Journ. As. Soc. Bengal* LXV, pp. 278, 279.

I refer to this species 13 examples from the Sandheads. Of these, 7 are males, the largest having a carapace length of 28 mm., and 6 are

[1] Miers, *Challenger Brachyura* (Zool. XVII), p. 301, foot note (1886).
[2] Haswell, *Cat. Australian Crust.*, p. 132 (1882).

females ; some of the latter are ovigerous. Most of the specimens agree with the typical examples of the species, and not with the specimens that Alcock doubtfully referred to as ? *D. granulata* de Haan. The latter, as Nobili[1] pointed out, are different from de Haan's species, and as Alcock himself had suggested, represent a new variety of *D. facchino*. Nobili designated this variety as *alcocki*.

The variety *alcocki* does not differ very markedly from the *forma typica*, but, as pointed out by Alcock and Nobili, can be distinguished from it on account of the carapace and the walking legs of the last two pairs being less hairy and more granular, the first two pairs of walking legs being devoid of hair in both the sexes, and by the chelipeds of the male being more or less symmetrical. Also the sternites of the abdomen of the male in the *forma typica* [2] are entirely unarmed, while in the variety there are low tubercles on some of the sternites.

Besides the scanty pubescence on the carapace and the last two pairs of legs, the most constant distinguishing character in the variety is the absence of hairs on the first two walking legs in the male. In some specimens of the *forma typica* also the legs are more scantily clad than is usually the case, and sometimes the third legs are totally devoid of hair. The pubescence on the carapace also appears to vary in the species ; in some specimens the carapace is more or less densely hairy, while in others the pubescence is scanty. The asymmetry between the two chelipeds of the male is less marked in the variety than in the typical form, but in some examples of the former it can be clearly seen. All the male specimens of the variety that Alcock had examined are rather small, and this may perhaps account for the apparent symmetry between the chelipeds.

Out of the thirteen specimens that I have referred to this species, only two male examples are referrable to the variety *alcocki*. The larger of the two has a carapace length of 11 mm., and both shows all the features that characterise the variety. The two chelae are only slightly asymmetrical.

D. facchino is represented in the Indian Museum collection by a large number of examples collected along the east coast of India, and from the Andaman Islands. The variety (registered in the collections under Alcock's name of *D. granulata*) has also been collected from several localities in the Bay of Bengal. Both the species and the variety appear to be fairly common in the Indo-Pacific region. The species is known from the east coast of India, the Indian Archipelago and Hongkong; while the variety, according to Ihle,[3] is recorded from the Bay of Bengal and Singapore. The two male examples recorded by Laurie[4] from the Gulf of Manaar appear to be referrable to Nobili's variety *alcocki*, in so far as the carapace is less hairy and the first two pairs of walking legs are devoid of hairs.

Most of the Sandheads specimens carry bivalve shells on their backs.

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[1] Nobili, *Boll. Mus. Zool. Torino* XVIII, No. 455, pp. 25, 26 (1903).

[2] In very young males of the *forma typica* also low tubercles are present on some of the abdominal sternites.

[3] Ihle, *Siboga Exped. Rep.* XXXIX b[1], p. 156 (1916).

[4] Laurie, *Rep. Pearl Oyster Fish. Ceylon* V, p. 367 (1906).

Family RANINIDAE.

Raninoides personatus Henderson.

1896. *Raninoides personatus*, Alcock, *Journ. As. Soc. Bengal* LXV, p. 293.

R. personatus is a common species in the Bay of Bengal. I refer to it 5 examples collected at the Sandheads between the years 1923 and 1927. Four of these are females, three being ovigerous and the largest having a carapace length of 27 mm., while one is a male, the carapace of which is a little over 23 mm. The specimens agree closely with Henderson's [1] and Alcock's descriptions of the species, except for the fact that the number of teeth on the inner border of the hand is not constant. According to the authors mentioned above there are three teeth on the inner border of the hand, and Henderson's figure also shows three such teeth. In my specimens, however, only one female has three teeth on the inner border of both the hands; in one there are four on each side; in two examples there are four teeth on the right hand and three on the left; while in the fifth there are three teeth on the right hand and four on the left. I have also examined ten examples of this species from the older collection in the Museum, and find the same difference in these. Only one specimen has three teeth on each hand; four have four teeth on the right hand and three on the left; two have three teeth on the right hand and four on the left; two have four teeth on each hand; while one example differs from all the rest in having four teeth on one hand and five on the other. In some specimens the tooth on the proximal end of the hand is rather small, while in others all the teeth are well developed. It thus appears that in this species there are generally 3-4 teeth, but rarely five, on the inner border of the hand.

R. personatus is represented in the Museum collection by specimens collected mostly off the eastern coast of India, and by two examples off the Burma coast. Henderson's examples were collected off Amboina Island in the Moluccas. The species lives for the most part in shallow waters, but a specimen in the collection from off the Burma coast has been dredged at a depth of 90 fathoms.

[1] Henderson, *Challenger Anomura* (Zool. XXVII), p. 27, pl. ii, fig. 5 (1888).