

REPORTS on the MARINE BIOLOGY of the SUDANESE RED SEA.—XXI. On the BRACHYURA. By R. DOUGLAS LAURIE, M.A. (Oxon.), Lecturer in Embryology and Senior Demonstrator in Zoology in the University of Liverpool. (Communicated by Prof. W. A. HERDMAN, F.R.S., F.L.S.)

(PLATES 42-45 and 5 Text-figures.)

[Read 18th June, 1914.]

THE collection comprises 65 species, of which 1, *Chlorodopsis arabica*, is new to science and 8 are new to the Red Sea. The latter are *Cryptodromia gilesii* (Alc.), *Notopus dorsipes* (Fabr.), two varieties of *Lambrus* (*Aulacolambrus*) *hoplonotus*, Ad. & Wh., *Chlorodopsis arabica*, Laurie, n. sp., *Actumnus setifer* (de Haan), var. *tomentosus*, Dana, *Litochaira integra* (Miers), *Macrophthalmus graeffei*, A. M.-Edw., and *Palicus whitei* (Miers). In addition, the very decided variety *cytherea* of *Chlorodiella niger* (Forsk.) is new to the Red Sea, and should perhaps be reinstated in the specific rank originally given to it by Dana.

Of the genera named above, 2 are new to the Red Sea fauna, namely, *Litochaira* and *Notopus*, and the latter is the first recorded Red Sea representative of the family Raninidae.

The material in the collection helps in the elucidation of the following, in addition to other points of interest:—

Thalamita chaptalii and *T. poissonii*, both of Audouin and Savigny, 1826, are easily separable species.

Lambrus (*Aulacolambrus*) *hoplonotus*, Ad. & Wh., will, I think, be found to comprise at least two species.

Macrophthalmus inermis, A. M.-Edw., is, I believe, incorrectly considered by Alcock to be a synonym of *M. convexus*, Stm. See note under *M. graeffei*, A. M.-Edw.

Ophthalmias curvirostris (A. M.-Edw.) is, I believe, quite a good species, easily distinguishable from *O. cervicornis* (Herbst). In addition to a series of other points of difference, I call attention to the figures which I give of the external maxillipedes in the two forms. There is in my mind a doubt as to the correctness of the single record of *O. cervicornis* from the Red Sea.

My specimens confirm Nobili's suggestion that *Dotilla affinis*, Alc., 1900, is a synonym of *D. sulcata* (Forsk., 1775). I find that the supposed distinction was in part based upon a sex-difference.

Chlorodopsis wood-masoni, Alc., 1898, is a doubtful synonym of *C. spinipes* (Hell., 1861).

The possible identity of *Actæa polyacantha* (Hell., 1861) with *A. peronii* (H. M.-Edw., 1834) is a point requiring investigation.

A study of certain growth-changes has been made in the 40 specimens of the common species *Chlorodiella niger* (Forsk.), as also in *Trapezia cymodoce* (Herbst), and less fully in *Phymodius sculptus* (A. M.-Edw.) and some others.

Lupa alcocki (Nob., 1905), *Herbstia corniculata*, Klunz., 1906, and *Macrophthalmus graeffei*, A. M.-Edw., 1873, have hitherto been known only by their type-specimens, and of each of the two latter species the present collection contains the first recorded male example.

Caphyra monticellii, Nob., and *Lupa alcocki* (Nob.), are here figured for the first time.

Other interesting forms in the collection include *Nucia pulchella* (A. M.-Edw.), *Cyphocarcinus minutus*, A. M.-Edw., and *Thalamita (Thalamatoïdes) tridens*, var. *spinigera* (Nob.).

Workers on Red Sea Brachyura will find two publications indispensable as a starting-point, namely, Alcock's 'Materials for a Carcinological Fauna of India' and Nobili's 'Faune Carcinologique de la Mer Rouge.' Nobili records all species known from the Red Sea at the time of his writing in 1906. Klunzinger the same year published his 'Spitz- und Spitzmundkrabben des Roten Meeres,' seen by Nobili when the latter had completed the body of his work, and reviewed briefly by him in an appendix. Klunzinger gives some useful descriptions and translations of some of Paulson's Russian descriptions. He considers *Acanthonyx consobrinus* of Paulson as a synonym of *A. elongatus*, Miers, so that *A. consobrinus*, A. M.-Edw., is to be deleted from Nobili's enumeration, and he adds the following 7 species to the Red Sea fauna, namely, *Simocarcinus camelus*, Klunz., *Herbstia corniculata*, Klunz., *Herbstia contiguicornis*, Klunz., *Heterocrypta petrosa*, Klunz., *Parthenope acuta* Klunz., *Eumedonus convictor*, Bouv. et Seu., and *Hyastenus brockii*, de Man, of which the first five were new to science. Including the 8 species added by the present paper, the revised list in Table I. shows a total of 260 species recorded from the Red Sea.

The Red Sea Brachyuran fauna forms an integral part of the Brachyuran fauna of the Indo-Pacific region. To emphasize this, I have associated with the following complete list of Red Sea species a table showing to what extent they have been recorded in certain representative districts within the region. It will be noted from the headings of the columns that the records are exhaustive for some districts, while for others they refer to a single important collection from the district named.

TABLE I.

	Red Sea. Complete list, 1914.	Seychelles. Rathbun, 1911 (Gardiner's 'Sealark' Miers, 1884 ('Alert' collection).	Persian Gulf. Nobili, 1907 (Bonnier et P. collection).	India. Alcock, 'Materials', 1895-1900. Complete list.	Maldives and Laccadives. Borradaile, 1901-1903 (3) (Gardiner's collection).	Ceylon. Laurie, 1906 (Herdman's collection).	Corres Straits. Calman, 1900 (Haddon's collection).	Hawaiian Islands. Rathbun, 1906. Complete list.	West Africa. Rathbun, 1900. Complete list.
Tribe BRACHYURA.									
Subtribe Dromiacea.									
Superfamily DROMIDEA.									
Family DROMIDÆ.									
<i>Dromia dromia</i> (Linn.) †.....	X	..	..	X	X	..	..	..	..
* <i>Dromidia unidentata</i> (Rüpp.).....	X	X	X	X	X	X	..	..	..
<i>Cryptodromia canaliculata</i> , Stimps.	X	X	..	X	..	..	..	..	..
— <i>pentagonalis</i> (Hilg.)	X	X	..	X	..	..	..	..	..
* — <i>hilgendorfi</i> , de Man	X	..	X	X	..	X	..	..	..
* — <i>gilesii</i> (Alc.).....	X	..	..	X	X	X	..	..	..
— <i>granulata</i> (Kossm.)	X	..	..	..	..	..	..	..	..
<i>Pseudodromia integrifrons</i> , Hend.....	X	..	..	X	..	..	..	..	..
Subtribe Oxystomata.									
Family CALAPPIDÆ.									
* <i>Calappa hepatica</i> (Linn.)	X	X	..	X	X	..	..	..	..
— <i>philargius</i> (Linn.)	X	..	..	X	X	..	..	..	..
— <i>gallus</i> (Herbst)	X	X	..	X	X	X	..	..	..
<i>Matuta banksii</i> , Leach.....	X	..	..	X	X	..	..	..	..
— <i>lunaris</i> (Forsk.) †	X	..	..	X	..	..	..	..	..
Family LEUCOSIDÆ.									
<i>Oreophorus horridus</i> , Rüpp.	X	..	..	..	..	..	..	..	..
{ <i>Nursia jousseauinei</i> , Nob.	X	..	..	..	..	..	..	..	..
— —, var. <i>cornigera</i> , Nob.	X	..	..	..	..	..	..	..	..
— <i>rubifera</i> , Müll.	X	..	..	X	..	..	..	..	..
<i>Ebalia granulata</i> (Rüpp.)	X	X	..	..	..	..	..	..	..
— <i>abdominalis</i> , Nob.	X	..	..	..	..	..	..	..	..
— <i>lacertosa</i> , Nob.	X	..	..	..	..	..	..	..	..
— <i>orientalis</i> , Kossm.	X	..	..	..	..	..	..	..	..
<i>Nucia tuberculosa</i> , A. M.-Edw.	X	..	..	..	..	..	..	..	..
— <i>pfefferi</i> (de Man)	X	..	..	X	..	..	..	..	..
* — <i>pulchella</i> (A. M.-Edw.)	X	..	..	..	..	..	..	..	..
* <i>Persephona fugax</i> (Fabr.)	X	X	..	X	..	X	X	..	..
— <i>affinis</i> (Bell)	X	..	X	..	..	X	..	..	..
— <i>kesslerii</i> (Pauls.)	X	..	..	..	..	..	..	..	..
* <i>Leucosia signata</i> , Pauls.	X	..	..	..	..	..	..	..	..
— <i>corallicola</i> , Alc.	X	..	..	X	..	..	..	..	..
— <i>etata</i> , A. M.-Edw.	X	..	..	X	..	..	..	..	..
— <i>hilaris</i> , Nob.	X	..	X	..	..	..	..	..	..

* Included in present collection.

† = *D. rumphii*, Fabr.; see Rathbun, 1902, p. 32, and Ihle, 1913, p. 22.

‡ = *M. victor* (Fabr.); see Stebbing, 1905 (1) p. 54.

TABLE I. (con.).

	Red Sea. Complete list, 1914.	Seychelles. Rathbun, 1911 (Gardiner's 'Sealark' Miers, 1884 ('Alert' collection).	Persian Gulf. Nobili, 1907 (Bonnier et P. collection).	India. Alcock, Materials, 1895-1900. Complete list.	Maldives and Laccadives. Borradaile, 1901-1903 (3) (Gardiner's collection).	Ceylon. Laurie, 1906 (Herdman's collection).	Torres Straits. Calman, 1900 (Haddon's collection).	Hawaiian Islands. Rathbun, 1906. Complete list.	West Africa. Rathbun, 1900. Complete list.
Family LEUCOSIIDÆ (con.).									
<i>Philyra scabrituscula</i> (Fabr.)	X	..	..	X	..	..	..	..	..
— <i>variegata</i> (Rüpp.)	X	..	..	..	..	..	..	..	..
— <i>rectangularis</i> , Miers	X	X	..	..	..	..	..	..	..
<i>Iphiculus spongiosus</i> , Ad. & Wh.	X	..	..	X	..	..	..	..	..
<i>Arcania septemspinosa</i> (Fabr.)	X	..	..	X	..	..	..	..	..
<i>Ixa inermis</i> , Leach	X	..	..	..	..	..	..	..	..
Family DORIPPIDÆ.									
* <i>Dorippe dorsipes</i> (Linn.)	X	X	X	X	X	X	..	..	..
Family RANINIDÆ.									
* <i>Notopus dorsipes</i> (Fabr.)	X	..	..	X	..	..	..	..	..
Subtribe Brachygnatha.									
Superfamily OXYRHYNCHA.									
Family MAMAIDÆ.									
* <i>Camposcia retusa</i> , Latr.	X	..	..	X	..	X	..	..	..
* <i>Acanthonyx elongatus</i> , Miers	X	..	..	..	..	..	..	..	..
<i>Huenia proteus</i> (de Haan)	X	X	..	X	X	X	X	X	..
{ <i>Simocarcinus simplex</i> (Dana)	X	X	..	X	..	X	..	X	..
—, var. <i>pyramidatus</i> (Hell.)	X	..	..	X	..	X	..	..	..
— <i>helleri</i> (Pauls.)	X	..	..	..	..	..	..	..	..
— <i>camelus</i> , Klunz.	X	..	..	..	..	..	..	..	..
<i>Menanthius monoceros</i> (Latr.)	X	X	..	X	X	X	X	X	..
<i>Hyastenus</i> † <i>spinosis</i> , A. M.-Edw.	X	..	..	X	..	X	X	..	..
— <i>tenuicornis</i> , Pocock	X	X	..	X	X	X	X	X	..
— <i>brockii</i> , de Man	X	..	..	?	..	X	X	..	..
<i>Perinea tumida</i> , Dana †	X	..	..	..	..	..	..	X	..
<i>Tylocarcinus styx</i> (Herbst)	X	X	..	X	X	X	X	..	..
* <i>Herbstia corniculata</i> , Klunz.	X	..	..	..	..	..	..	..	..
— <i>contiguicornis</i> , Klunz.	X	..	..	..	..	..	..	..	..
<i>Schizophrys aspera</i> (H. M.-Edw.)	X	X	X	X	X	X	X	..	..
<i>Cyclax suborbicularis</i> (Stimps.)	X	X	..	X	X	X	X	..	..
* <i>Stilbognathus erythraeus</i> , v. Mart.	X	..	..	..	..	..	..	..	..
* <i>Ophthalmias curvirostris</i> (A. M.-Edw.) ..	X	..	X	..	..	..	..	..	..
<i>Pseudomicippa nodosa</i> , Hell.	X	..	..	..	..	X	..	..	..
* <i>Cyphocarcinus minutus</i> , A. M.-Edw.	X	X	X	X	X	X	X	..	..
{ <i>Micippa philyra</i> (Herbst)	X	..	..	..	X	X	X	X	..
—, var. <i>mascarenica</i> Kossm. ....	..	..	X	..	..	..	..	..	..
— <i>thalia</i> (Herbst)	X	..	..	X	..	X	..	..	..
—, var. <i>haanii</i> , Stimps. ....	..	X	..	..	..	..	..	..	..

† No evidence that this genus = *Halimus*, Latr.; see Calman, 1913, p. 313.

‡ = *Parathoë rotundata*, Miers; see Calman, 1909, p. 713.

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Family PARTHENOPIDÆ.									
* <i>Parthenope horrida</i> (Linn.)	×	×	..	×	×	..
— <i>acuta</i> , Klunz.	×	×
<i>Lambrus</i> (<i>Thyrolambrus</i>) <i>leprosus</i> , Nob.	×
— (<i>Platylambrus</i>) <i>carinatus</i> , H. M.-Edw.	×	×	..	×
— (<i>Aulacolambrus</i>) <i>pisoides</i> , Ad. & Wh.	×
* — <i>hoplonotus</i> , Ad. & Wh.	×	×	..	×	..	×	×	×	..
* — (<i>Rhinolambrus</i>) <i>pelagicus</i> , Rüpp.	×	×	×	×	..	×	..
— <i>montiger</i> , Nob.	×	×
— (<i>Pseudolambrus</i>) <i>calappoides</i> (Ad. & Wh.)	×	×	×	×	×	×	×	×	..
<i>Heterocrypta petrosa</i> , Klunz.	×	×
<i>Eumedonius convictor</i> , Bouv. et Seu.	×
Superfamily BRACHYRHYNCHA.									
Family PORTUNIDÆ.									
<i>Carcinides</i> † <i>mænus</i> (Linn.)	×	×	×	..
<i>Portunus</i> ‡ <i>subcorrugatus</i> (A. M.-Edw.)	×
<i>Lissocarcinus orbicularis</i> , Dana	×	×	..	×	×	×	×	×	..
* <i>Caphyra monticellii</i> , Nob.	×
— <i>polita</i> (Hell.)	×
<i>Carupa læviuscula</i> , Hell.	×	×	..	×
<i>Scylla serrata</i> (Forsk.)	×	×
<i>Lapa pelagica</i> (Linn.)	×	×	..	×	×	×	..
— <i>sanguinolenta</i> (Herbst)	×	..	×	×	..	×	×	×	..
— <i>longispinosa</i> (Dana)	×	×	..	×	×	×	×	×	..
{ — —, var. <i>bidens</i> (Lau.)	×	×	×	×	..
— <i>arabica</i> (Nob.)	×	..	×
* — <i>alcocki</i> (Nob.)	×
— <i>granulata</i> (H. M.-Edw.)	×	×	..	×	×	×	×	×	..
— <i>orbitosina</i> (Rath.)	×	×
— <i>convexa</i> (de Haan)	×	×	×	×	..
* <i>Charybdis erythrodactyla</i> (Lam.)	×	×	..	×	..	×	×	×	..
— <i>orientalis</i> (Dana)	×	×	..	×	×	×	..
— <i>hellerii</i> (A. M.-Edw.)	×	×	..	×	×	×	..
— <i>merquiensis</i> (de Man)	×	×	..	×	×	×	..
— <i>sexdentata</i> (Herbst)	×	×	..	×	×	×	..

† *Carcinides*, Rathbun, 1897 = *Carcinus*, Leach, 1814, et auct.; see Rathbun, 1897, p. 164.
 ‡ Fabr., 1798. For lodadaptation of *Liocarcinus*, Rath., see Steb. 1902, p. 11, and 1908, p. 11.
 § May be *L. orbitosina* (Rath., 1911); see Rathbun, 1911, p. 205.
 ¶ I have re-examined an adult ♂ from off Mutwall Is. and 3 adult ♂ and 1 ♀ ovig. from Gulf of Mannar recorded as *granulata* and find that they come under *orbitosina*.

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Family XANTHIDÆ (con.).									
<i>Liomera themisto</i> (de Man).....	X								
— <i>granosimana</i> , A. M.-Edw.....	X	X							
<i>Lioxantho punctatus</i> (H. M.-Edw.) ...	X								
— <i>tumidus</i> , Alc.	X								
— <i>asperatus</i> , Alc.	X								
* <i>Atergatis roseus</i> (Rüpp.).....	X								
— <i>ocyroë</i> (Herbst) †	X								
— <i>granulatus</i> , de Man	X								
<i>Platypodia cristata</i> (A. M.-Edw.).....	X	X							
— <i>granulosa</i> (Rüpp.).....	X								
— <i>semigranosa</i> (Hell.).....	X	X							
* — <i>anaglypta</i> (Hell.)	X	X							
<i>Atergatopsis frauenfeldi</i> (Hell.).....	X								
— <i>granulatus</i> , A. M.-Edw.....	X	X							
* <i>Zosimus æneus</i> (Linn.).....	X	X							
<i>Zozymodes carinipes</i> , Hell.	X								
<i>Lophozozymus pulchellus</i> , A. M.-Edw..	X	X							
<i>Euxanthus sculptilis</i> , Dana	X								
<i>Hypocolpus diverticulatus</i> (Strahl) † ...	X	X							
* <i>Xantho distinguendus</i> , de Haan	X								
— <i>hirtipes</i> , H. M.-Edw.	X								
* — <i>hydrophilus</i> (Herbst)	X	X							
<i>Leptodius gracilis</i> (Dana)	X	X							
— <i>sanguineus</i> (H. M.-Edw.) ..	X	X							
— <i>euglyptus</i> (Alc.)	X								
— <i>cavipes</i> (Dana)	X								
<i>Cycloxanthops lineatus</i> (A. M.-Edw.)....	X								
* <i>Etisus lævimanus</i> , Rand.....	X	X							
<i>Etisodes anaglyptus</i> (H. M.-Edw.).....	X								
— <i>electra</i> (Herbst)	X	X							
<i>Actæa (Banareia) kraussi</i> , Hell.....	X								
— <i>bella</i> (Dana)	X								
* — <i>tomentosa</i> (H. M.-Edw.).....	X	X							
* — <i>hirsutissima</i> (Rüpp.)	X	X							
— <i>rufopunctata</i> (H. M.-Edw.)	X	X							
* — <i>garretti</i> , Rath.	X	X							
— <i>speciosa</i> (Dana)	X	X							
— <i>sabæa</i> , Nob.	X								
— <i>hellerii</i> , A. M.-Edw.	X	X							
— <i>nodulosa</i> , Wh.	X	X							
* — <i>polyacantha</i> (Hell.).....	X	X							
— <i>pistigera</i> , Nob.	X								

† = *Atergatis floridus* (Linn.); *vide* Rathbun, 1906, p. 845.

‡ = *Cancer sculptus*, H. M.-Edw., 1834; *not* Herbst, 1794. *Fide* Rathbun, 1911, p. 215.

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Family XANTHIDÆ (con.).									
{ * <i>Actæa granulata</i> (Aud. et Sav.)	X	X	X	X	X	X			
— — —, var. <i>carcharias</i> (Wh.)			
— — — <i>calculosa</i> (H. M.-Edw.)	X	X	X	X	X		
* — — — <i>fossulata</i> (Gir.)	X	..	X	X	X	X			
{ * <i>Chlorodiella niger</i> (Forsk.) †	X	X	X	X	X	X	X	X	
— — —, var. <i>cytherea</i> (Dana)	X
— — — <i>bidentatus</i> (Nob.)	X
— — — <i>leppus</i> (Nob.)	X
* <i>Phymodius ungulatus</i> (H. M.-Edw.)	X	X	X	X	X	X	X	X	
* — — — <i>sculptus</i> (A. M.-Edw.)	X	X	..	X	X	X	X	X	
— — — <i>granulatus</i> (Targ.-Tozz.)	X
<i>Pilodius pugil</i> , Dana	?	X
— — — <i>armiger</i> , Nob.	X
— — — <i>martensi</i> (Krauss)	X
<i>Chlorodopsis areolata</i> (H. M.-Edw.)	X	X	..	X	..	X	..	X	..
* — — — <i>arabica</i> , Laurie	X
* — — — <i>spinipes</i> (Hell.)	X	X	..	X	..	X	X
— — — <i>frontalis</i> (Dana) ‡	X	X
— — — (<i>Cyclodius ornata</i>) (Dana)	X	?
{ * <i>Cymo andreossi</i> (Aud. et Sav.)	X	X	X	X	X	X	X	X	
— — —, var. <i>melanodactylus</i> , de Haan	X	X	X	X	X	X	X	X	
— — — <i>quadrilobatus</i> , Miers	X	X	..	X	X	X
<i>Menippe rumphii</i> (Fabr.)	X	X
<i>Pseudozius caystrus</i> (Ad. & Wh.)	X	X	..	X	X	X	..	X	..
— — — <i>sinensis</i> , A. M.-Edw.	X
<i>Ozius rugulosus</i> , Stimps.	X
<i>Epixanthus frontalis</i> (H. M.-Edw.) ..	X	X	X	X	..	X
— — — <i>corrosus</i> , A. M.-Edw.	X	X
<i>Lydia</i> § <i>tenax</i> (Rüpp.)	X	X	..	X
<i>Heteropilumnus fimbriatus</i> (H. M.- Edw.)	X
{ <i>Pilumnus trichophorooides</i> , de Man	X
— — —, var.	X
— — — <i>vespertilio</i> (Fabr.)	X	X	X	X	X	
— — — <i>forskälvi</i> , H. M.-Edw.	X
— — — <i>savignyi</i> , Hell.	X
* — — — <i>propinquus</i> , Nob.	X	..	X
— — — <i>hirsutus</i> , Stimps.	X	X	..	?	X
— — — <i>quadridentatus</i> , de Man	X
— — — <i>levimanus</i> , Dana	X
— — — <i>eudæmoneus</i> , Nob.	X
— — — <i>spongiosus</i> , N. b.	X
— — — <i>brachytrichus</i> , Kossm.	X
— — — <i>schrenkii</i> , Pauls.	X
— — — <i>asper</i> (Rüpp.)	X
<i>Actumnus globulus</i> , Hell.	X	X

† It is doubtful how far authors have distinguished in their records between *C. niger* and var. *cytherea*.

‡ = *Etisodes frontalis*, Dana; see Borradaile, 1902 (2), p. 261.

§ = *Eurippellia*, Miers; see Rathbun, 1906, p. 862.

TABLE I. (con.).

	Red Sea. Complete list, 1914.	Seychelles. Rathbun, 1911 (Gardiner's 'Sealark' Miers, 1894 ('Alert' collection).	Persian Gulf. Nobili, 1907 (Bonnier et P. collection).	India. Alcock, 'Materials', 1895-1900. Complete list.	Maldives and Laccadives. Borradaile, 1901-1903 (3) (Gardiner's collection).	Ceylon. Laurie, 1906 (Herdman's collection).	Torres Straits. Calman, 1900 (Haddon's collection).	Hawaiian Islands. Rathbun, 1906. Complete list.	West Africa. Rathbun, 1900. Complete list.
Family XANTHIDÆ (con.).									
<i>Actumnus setifer</i> (de Haan)
—, var.	×
—, var. <i>setifer</i> (de Haan)
* —, var. <i>tomentosus</i> , Dana	×	..	×	×	×	×
—, var. <i>amirantensis</i> , Rath.	×
* — <i>bonnierii</i> , Nob.	×	×	×
— <i>obesus</i> , Dana	×	×	×	..
* <i>Heteropanope vaugelini</i> (Aud. et Sav.) ..	×
— <i>pharaonica</i> , Nob.	×
<i>Eurycarcinus natalensis</i> (Krauss)	×
— <i>orientalis</i> , A. M.-Edw.	×
— <i>integrifrons</i> , de Man	×
{ <i>Eriphia sebana</i> (Shaw) †	×	×	..	×	×	×	..
—, var. <i>smithii</i> , Macl.	×	×	×	×	×
— <i>scabricula</i> , Dana	×	×	×	×	×
{ * <i>Trapezia cymodoce</i> (Herbst)	×	×	×	×	×	×	×
—, var. <i>ferruginea</i> , Latr.	×	×	×	×	×	×	×
—, var. <i>areolata</i> , Dana	×	×	×	×	×
—, var. <i>guttata</i> , Rüpp.	×	×	×	×	×
* —, var. <i>maculata</i> (Macl.)	×	×	..	×	×	×	×	×	..
— <i>digitalis</i> (Latr.)	×	×	..	×	×	×	×	×	..
* <i>Tetralia glaberrima</i> (Herbst)	×	×	×	×	×	×	×
{ <i>Quadrella coronata</i> , Dana	×	×	×	×	×	×	×
—, var.	×	..	×
—, var. <i>granulosa</i> , Borr.	×	×
—, var. <i>maculosa</i> , Alc.	×
<i>Lybia denticulata</i> , Nob.	×
Family GONEPLACIDÆ.									
{ <i>Eucrate crenata</i> , de Haan	×	×	×	×
—, var. <i>dentata</i> (Stimps.), Alc.	×	×
* <i>Libystes nitidus</i> , A. M.-Edw.	×	×	×
* <i>Litochœira integra</i> (Miers)	×	×	..	×	×	×	..
<i>Paranotonyx curtipes</i> , Nob.	×
<i>Xenophthalmodes moebii</i> , Richt.	×	×
Family PINNOTHERIDÆ.									
<i>Ostracotheres tridacnæ</i> , Rüpp.	×
— <i>affinis</i> , H. M.-Edw.	×
* — <i>cynthia</i> , Nob.	×
<i>Pinnotheres pectinicola</i> , Bürg.	×
— <i>purpureus</i> , Alc.	×	×	×
— <i>pernicola</i> , Bürg.	×
— <i>lutescens</i> , Nob.	×
— <i>coutieri</i> , Nob.	×
— <i>borradailei</i> , Nob.	×
— <i>maindroni</i> , Nob.	×
* — <i>pilumnoides</i> , Nob.	×
<i>Durckheimia carinipes</i> , de Man	×

† = *Eriphia larimana*, Latr.; *vide* Rathbun, 1906, p. 865.

TABLE I. (con.).

	Red Sea. Complete list, 1914.	Seychelles. Rathbun, 1911 (Gardiner's 'Sealark' Miers, 1884 ('Alert' collection).	Persian Gulf. Nobili, 1907 (Bonnier et P. collection).	India. Alcock, 'Materials, 1895-1900. Complete list.	Maldives and Laccadives. Borradaile, 1901-1903 (3) (Gardiner's collection).	Ceylon. Laurie, 1906 (Herdman's collection).	Torres Straits Calmán, 1900 (Hadton's collection).	Hawaiian Islands. Rathbun, 1906. Complete list.	West Africa. Rathbun, 1900. Complete list.
Family OCYPODIDÆ.									
<i>Ocyrope cordimana</i> , Desm.....	X	X	..	X	X	..	..	..	..
— <i>ceratophthalma</i> (Pall.)	X	X	..	X	X	..	..	..	..
— <i>jousseau mei</i> , Nob.	X	..	..	..	..	X	..	..	..
* — <i>egyptiaca</i> , Gerst.	X	..	..	..	..	..	..	..	..
<i>Uca</i> † <i>annulipes</i> (Latr.)	X	X	X	X	X	X	..	..	..
{ — <i>inversa</i> (Hoffm.).....	X	..	X	X	..	..	..	..	..
—, var. <i>sindensis</i> (Alc.).....	X	..	..	X	..	..	..	..	..
— <i>tetragonon</i> (Herbst)	X	..	X	X	..	..	X	X	..
{ — <i>marionis</i> (Desm.)	X	..	..	X	..	..	..	..	..
—, var. <i>nitida</i> , Dana	X	..	..	X	..	..	..	..	..
* <i>Dotilla sulcata</i> (Forsk.)	X	..	..	X	..	..	..	..	..
* <i>Paracristostoma leachii</i> (And. et Sav.) ..	X	..	..	..	..	..	..	..	..
* <i>Macrophthalmus verreauxi</i> H. M.-Edw.	X	..	..	X	X	..	..	..	..
— <i>brevis</i> (Herbst)	X	..	..	..	..	..	..	..	..
* — <i>graeffei</i> , A. M.-Edw.	X	..	..	..	..	..	..	..	..
* — <i>depressus</i> , Rüpp.	X	..	X	X	..	..	..	..	..
<i>Euplax</i> (<i>Chænostoma</i>) <i>bosci</i> (Aud. et Sav.)	X	..	..	..	..	..	..	..	..
Family HYMENOSOMIDÆ.									
<i>Elamena mathæi</i> (Desm.)	X	..	..	..	..	..	..	..	..
Family GRAPSIDÆ.									
{ <i>Grapsus grapsus</i> (Linn.)	X	..	X	X	..	..	..	..	X
— <i>tenuicrustatus</i> (Herbst) .....	..	..	..	..	..	..	..	..	..
— <i>strigosus</i> (Herbst)	X	..	..	X	..	..	..	..	..
<i>Geograpsus grayi</i> (H. M.-Edw.)	X	X	..	..	X	..	..	X	..
* <i>Metopograpsus messor</i> (Forsk.)	X	X	X	X	..	X	X	X	X
<i>Brachynotus harpax</i> , Hilg.	X	..	..	..	..	..	..	..	..
<i>Planes minutus</i> (Linn.)	X	..	..	..	X	..	..	X	X
<i>Pseudograpsus erythræus</i> , Kossm.	X	..	..	..	..	..	..	..	..
<i>Cyclograpsus lophopus</i> , Nob.	X	..	..	..	..	..	..	..	..
<i>Sesarma</i> (<i>Sesarma</i>) <i>jousseau mei</i> , Nob. .	X	..	..	..	..	..	..	..	..
{ <i>Plagusia depressa</i> (Herbst).....	..	..	..	..	..	..	..	..	X
—, var. <i>tuberculata</i> , Lam.† .....	..	X	..	..	X	..	..	X	X
<i>Percnon</i> § <i>planissimum</i> (Herbst)	X	X	..	X	X	X	..	X	X
Family PALICIDÆ.									
<i>Palicus jukesii</i> (Wh.)	X	X	..	X	X	X	X	..	..
* — <i>whitei</i> (Miers)	X	X	..	X	..	..	X	..	..
Family HAPALOCARCINIDÆ.									
<i>Cryptochirus coralliodytes</i> , Hell.	X	..	..	..	X	..	..	..	..

† *Gelasimus*, Latr., 1817 = *Uca*, Leach, 1814; see Rathbun, 1897, p. 154, and Steb., 1905 (1) p. 39.‡ For use of *tuberculata*, Lam., in preference to *squamosa*, Hbst., see Rathbun, 1906, p. 841.§ *Leiolophus*, Miers, 1876 = *Percnon* Gistel, 1848; see Rathbun, 1900, p. 281.

The following is a summary of Table I. :—

TABLE II.

	Red Sea. Complete list, 1914.	Seychelles. Rathbun, 1911 (Gardiner's 'Sealark', Miers, 1894 ('Alert' collection). [collection].	Persian Gulf. Nobili, 1907 (Bonnier et P. collection).	India. Alcock, 'Materials,' 1895-1900. Complete list.	Maldives and Laccadives. Borradale, 1901-1903 (3) (Gardiner's collection).	Ceylon. Laurie, 1906 (Herdman's collection).	Torres Straits. Calman, 1900 (Haddon's collection).	Hawaiian Islands. Rathbun, 1906. Complete list.	West Africa. Rathbun, 1900. Complete list.
Tribe BRACHYURA.									
Subtribe Oxystomata	30	21 (6)	7 (3)	113 (17)	21 (4)	38 (5)	9 (2)	16 (2)	13 (1)
Family Calappidae	5	6 (2)	...	15 (5)	6 (3)	7 (2)	1 (1)	6 (2)	5 (1)
Leucosiidae	23	14 (3)	6 (2)	82 (10)	14 (0)	28 (2)	8 (1)	8 (0)	5 (0)
Dorippidae	1	1 (1)	1 (1)	11 (1)	1 (1)	2 (1)	...	2 (0)	2 (0)
Raninidae	1	...	...	5 (1)	...	1 (0)	...	...	1 (0)
Subtribe Dromiacea	8	11 (2)	3 (2)	29 (6)	7 (2)	10 (4)	...	...	3 (0)
Superfamily Dromiidea	8	10 (2)	3 (2)	21 (6)	7 (2)	10 (4)	...	...	3 (0)
Family Homolodromiidae ..	...	...	...	1 (0)	...	...	...	...	...
Dromiidae	8	6 (2)	3 (2)	18 (6)	7 (2)	10 (4)	...	...	3 (0)
Dynomenidae .....	...	4 (0)	...	2 (0)	...	...	...	...	...
Superfamily Homolidea .....	...	1 (0)	...	8 (0)	...	...	...	...	...
Family Homolidae .....	...	...	...	6 (0)	...	...	...	...	...
Latreillidae .....	...	1 (0)	...	2 (0)	...	...	...	...	...
Subtribe Brachygnatha	222	238 (85)	58 (41)	459 (117)	162 (67)	147 (56)	74 (40)	187 (59)	78 (6)
Superfamily Oxyrhyncha	34	57 (12)	10 (5)	112 (18)	29 (9)	50 (17)	24 (10)	28 (9)	11 (0)
Family Hymenosomidae	1	1 (0)	...	5 (0)	1 (0)	1 (0)	...	...	...
Mamaiidae	22	44 (9)	7 (4)	76 (13)	22 (7)	34 (12)	21 (8)	20 (6)	7 (0)
Parthenopidae	11	12 (3)	3 (1)	31 (5)	6 (2)	15 (5)	3 (2)	8 (3)	4 (0)
Superfamily Brachyrhyncha.	188	181 (73)	48 (36)	347 (99)	133 (58)	97 (39)	50 (30)	159 (50)	67 (6)
Family Corystidae .....	...	...	...	1 (0)	...	1 (0)	...	...	...
Portunidae	35	34 (11)	9 (7)	63 (22)	19 (7)	33 (13)	8 (7)	27 (13)	12 (1)
Potamonidae .....	...	...	...	...	...	...	...	1 (0)	16 (0)
Atelecyclidae .....	...	2 (0)	...	4 (0)	2 (0)	1 (0)	1 (0)	4 (0)	1 (0)
Trichiidae .....	...	...	...	...	...	...	...	...	...
Canceridae .....	...	...	...	...	...	...	...	...	...
Xanthidae	107	120 (51)	25 (21)	147 (56)	86 (39)	46 (21)	33 (18)	89 (28)	13 (0)
Goneplacidae	5	6 (2)	3 (1)	29 (3)	5 (1)	3 (0)	...	3 (1)	...
Pinnotheridae	12	...	2 (0)	11 (1)	2 (1)	1 (0)	...	...	1 (0)
Ptanoplacidae .....	...	...	...	1 (0)	...	...	...	...	...
Palicidae	2	3 (2)	...	5 (2)	1 (1)	2 (1)	3 (2)	3 (0)	...
Grapsidae	11	10 (4)	2 (2)	48 (6)	10 (4)	5 (2)	2 (1)	23 (6)	16 (5)
Gecarcinidae .....	...	...	1 (0)	5 (0)	1 (0)	...	...	1 (0)	2 (0)
Ocypodidae	15	5 (3)	6 (5)	33 (9)	5 (4)	5 (2)	2 (2)	7 (2)	6 (0)
Hapalocarcinidae	1	1 (0)	...	...	2 (1)	...	1 (0)	1 (0)	...
Total species	260	270	68	601	190	195	83	203	94
Number of species known from Red Sea	260	93	46	140	73	65	42	61	7
Species known from Red Sea expressed as per- centage of total species . .	100%	34%	68%	23%	38%	33%	50%	30%	7%

The first number in each column of the Table on p. 417 gives the number of species recorded from the source in question, the number in brackets gives the number of these which are known to occur also in the Red Sea.

Table II. is based upon Borradaile's classification (Borradaile, 1907, p. 477 *et seq.*). Elsewhere in this paper I have arranged the material in Nobili's order, to facilitate comparison with his 'Faune Carcinologique de la Mer Rouge.'

It will be seen that the affinity of the Red Sea crabs is strongest with those of the Persian Gulf, 68 per cent. of the species recorded from the latter locality having also been recorded from the Red Sea.

The homogeneity of the Indo-Pacific region is illustrated by the fact that in places so far apart as Seychelles and the Hawaiian Islands the percentage of crabs common to the Red Sea is very similar, approximately 33 per cent. in each case, that this per cent. occurs at Ceylon and a fairly similar one at the Maldives and Laccadives. India is below and Torres Straits distinctly above this average figure. In estimating the significance of these per cents. one notes that the Red Sea, having been very fairly explored by a variety of collectors, is a good standard; but, on the other hand, one must bear in mind that other populations may have been sampled under different conditions, and it will be noted that the Torres Straits result, which appears somewhat anomalous, is associated with a comparatively short list. If allowance were made for these possible sources of error, the similarity might be even more striking. But taking the figures at face value, certain points stand out clearly: (1) the comparative similarity of the crabs over the whole Indo-Pacific area; (2) the almost entire lack of specific resemblance between the crabs of the Red Sea and those of West Africa; (3) omitting Persian Gulf as being in the immediate vicinity of the Red Sea, the Indo-Pacific figures suggest that one may prophesy with a probable error of ± 5 or 6 that 35 is the most likely percentage of species common to the Red Sea which will be found in a collection of say 200 species of crabs from any hitherto insufficiently investigated portion of the Indo-Pacific Region; the odds are about 20 to 1 against the error in such a prophecy being greater than ± 15 . One may also prophesy with a probable error of ± 2 or 3 that 35 is the most likely average percentage of species common to the Red Sea which will be found on examining six further samples of Indo-Pacific crabs of similar numbers to those which I have considered; the odds are about 20 to 1 against the probable error of such a prophecy being greater than ± 7 . The number of samples I have considered is of course small, and the attempt to give numerical precision to the degree of homogeneity of the Brachyuran fauna of the coral zone presents certain intricacies not considered here, but the figures I give are, I believe, not without some value and may form the basis of further investigation upon similar lines.

The West African forms recorded from the Red Sea comprise only

Calappa gallus (Herbst), *Grapsus grapsus* (Linn.), *Planes minutus* (Linn.), *Percnon planissimum* (Herbst), *Metopograpsus messor* (Forsk.), *Plagusia depressa* (Herbst), and *Thalamita integra*, Dana, of which the first four are of little or no account, owing to their exceptionally wide distribution, and the last two are varietally distinct.

To save frequent repetition, I give here a list of stations from which the present collection was made, the latitudes of which I have estimated approximately.

Crossland's maps, published in the present volume of this Journal, pages 6 and 15, and Plates 28, 29, and 30, should be consulted.

I. Suez. Lat. 28° N.

A. Suez mud-flats.

B. Suez flats and docks. Dec. 1904.

C. Suez mud-flats; washings of weed and sponge. The washings included an abundance of small and very large Amphipoda, some Isopoda, not many Brachyura, only two or three Macrura, and very few small Polychæta, also numerous Foraminifera.

D. Suez docks. From beneath a floating stage which had been in the docks for several years. 26 Dec., 1904.

E. Between Suez and Port Tewfik. Amongst stones of the embankment, bordering mud-flats, near high-tide level.

F. As E plus Decapoda washed out of sponge and weed.

G. Suez Bay. Trawled in 5 fathoms, from mud bottom.

H. Suez Bay. Trawled in 5 fathoms, from mud bottom, among sponges.

I. Suez Bay. From a red sponge taken from mud bottom in 10 fathoms.

J. Suez. From among coral.

K. Suez. Washed by fresh water from two coral colonies.

L. Etuleh coral shoals, Suez Bay. Large areas covered by *Chama* and an Ostreid. In 1-3 fathoms.

II. Mersa Wadi Lehama, Egyptian coast. Lat. 24° 45' N.

III. Cape Elba, the northern frontier of Sudan coast. Lat. 22° N.

IV. Mersa Abu Hamama. Lat. 21° 30' N.

V. Khor Dongonab. Lat. 21° 11' N. to lat. 20° 50' N.

A. Washed from nullipore and branched coral from the reef off Beacon Island. Lat. 20° 55' N. 26 April, 1905. There were many Polychæta and Decapoda, comparatively few Amphipoda, and some Echinodermata in the same washings.

B. Just west of Beacon Island. Lat. 20° 55' N. Washed from nullipore dredged in 3-5 fathoms, 26 April, 1905. In the same washings were many Decapoda and Polychæta, especially the

TABLE III.

	Station I. Lat. 28° N.	Station II. Mersa Wadi Lehama. Lat. 24° 45' N.	Station III. Cape Eiba. Lat. 22° N.	Station IV. Mersa Abu Hamama. Lat. 21° 30' N.	Station V. Khor Dongonab. Lat. 21° 11' N. to 20° 50' N.	Station VI. Mersa Ar-rakya. Lat. 20° 15' N.	Station VII. Suakin Harbour. Lat. 19° 8' N.	Station VIII. Shubuk. Lat. 18° 52' N. to 18° 43' N.	Station IX. Tella Tella Kebira. Lat. 18° 48' N.	Station X. Agig. Lat. 18° 13' N.	Locality indefinite. Lat. 28° N. to 18° 13' N.
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22.
23.
23a.
24.
25.
26.

- Dromidia unidentata* (Rüpp.)
- Cryptodromia bigendorfi*, de Man
- *gilesii* (Alc.)
- Calappa hepatica* (Linn.)
- Nucula pulchella* (A. M.-Edw.)
- Persephona fagar* (Fabr.)
- Leucostia signata*, Pauls.
- Dorippe dorsipes* (Linn.)
- Notopus dorsipes* (Fabr.)
- Camposcia retusa*, Latr.
- Acanthonyx elongatus*, Miers
- Herbertia corniculata*, Klunz.
- Stibognathus erythraeus*, Y. Mart.
- (*Thalalmia curvirostris* (A. M.-Edw.))
- Cyphocarcinus minutus*, A. M.-Edw.
- Parthenope horrida* (Linn.)
- Lambrus (Aulacolambrus) koplonotus*, Ad. & Wh.
- (*Rhinolambrus pelagicus*, Rüpp.)
- Cophyra monticellii*, Nob.
- Lapa alcocki* (Nob.)
- Charysbia erythroactyla* (Lam.)
- Thalamia poissonii* (Aud. et Sav.)
- *admete* (Herbst), var. *savignyi*, A. M.-Edw.
- , var. *intermedia*, Borr.
- integra*, Dana
- (*Thalmitoides tridens*, A. M.-Edw., var. *spinigera* (Nob.)
- Podophthalmus vigil* (Fabr.)

- latter, a few Amphipoda, a few Echinodermata, and some Foraminifera.
- C. Engineer Island. Lat. $20^{\circ} 50' N$. Washed from old coral and weed obtained from Reef Flat. The washings were composed mostly of Polychæta (Eunicidæ, Nereidæ, etc.) and Decapoda (mostly small Brachyura), only two or three Amphipoda, no mud.
- D. Engineer Island. Lat. $20^{\circ} 50' N$. Washed from a small bucketful of weed and coral dredged in 3 fathoms of water. The washings were very rich in everything.
- E. Khor Dongonab. Among coral on reef.
- F. Khor Dongonab.
- G. Islet group, Khor Dongonab. From mud and coarse sand in 11 fathoms of water. This islet group is probably the same as "Four Islet Shoal" of Crossland's map (*loc. cit.* p. 15), which would place it just north of lat. $21^{\circ} N$.
- VI. Mersa Ar-rakiya. Among coral in 1 fathom of water. Lat. $20^{\circ} 15' N$.
- VII. Suakin Harbour. Lat. $19^{\circ} 8' N$.
- A. Suakin Harbour.
- B. Suakin Harbour. 26 Jan., 1905.
- C. Suakin Harbour. Purchased from a fisherman.
- D. Suakin Harbour. From coral, 1905.
- E. Suakin Harbour, near Customs' landing. From muddy bottom, in 5 fathoms of water.
- VIII. Shubuk. Lat. $18^{\circ} 52' N$. to $18^{\circ} 43' N$.
- A. Mersa Makdah in Shab-ul-Shubuk. 16 Feb., 1905.
- B. Passage south of Mersa Makdah in Shab-ul-Shubuk. From a colony of coarse Campanularian Hydroids, overgrown with Algæ, brought up by a diver. In the washings there were also great quantities of Amphipoda, but very little else, a few Polychæta, and a Planarian; the mud, however, is rich in Foraminifera, the lighter mud contains very minute Amphipoda.
- C. We Shubuk, north-east corner. 16 Feb., 1905.
- D. We Shubuk, south-east corner. 16 Feb., 1905.
- E. "Dredge washings, 17 Feb., 1905." No locality is given, but records were made by Crossland on the previous day from north-east corner of We Shubuk, south-east corner of We Shubuk, and Mersa Makdah in Shab-ul-Shubuk.
- IX. Tella Tella Kebira, a small group of islands in the northern part of Suakin Archipelago. Lat. $18^{\circ} 48' N$.
- A. Tella Tella Kebira. Washed from the half-loose coral fragments and nullipore which compose the edge of the Southern Reef. The washings were rich generally, minute Brachyura and Polychæta very numerous. 3 March, 1905.

B. Tella Tella Kebira. From sand. The fauna includes the common shore hermit-crabs, which live above high-tide level, and the yellow land-crab, so abundant on the sand cays at Khor Dongonab and elsewhere, wherever there is sand for its burrows.

X. Agig. Lat. 18° 13' N. From among coral in 4½ fathoms of water. Agig is close to the southern frontier of the Sudan.

The distribution of the species in the present collection among the above Stations is set out in Table III. (pp. 420–421).

As regards literature, I have referred in every case to some good description—in Alcock's 'Materials,' whenever possible. I have included in the synonymies all references to Nöbili, 1906, and Klunzinger, 1906, the two most recent accounts of Red Sea Brachyura. Most references of earlier date will be found in the works just named, but I have added a few others. The more recent literature on Indo-Pacific Brachyura has been referred to as has appeared desirable. Useful lists of general carcinological literature are given in Alcock, 1901, Klunzinger, 1906, and Ihle, 1913. Important discussions on nomenclature will be found in Rathbun, 1897, and in Stebbing's 'South African Crustacea,' in which latter also are notes on classification and very useful synonymies. Borradaile 1902 (1) contains suggestive remarks on varieties.

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Subtribe DROMIACEA.

Family DROMIIDÆ.

Genus DROMIDIA, *Stimpson*, 1859, *emend. Borradaile*, 1903.

1. DROMIDIA UNIDENTATA (*Rüppell*, 1830). See *Alcock*, 1899 (2), p. 139.

Dromia unidentata, *Alcock*, *loc. cit.*

Dromidia unidentata, *Nobili*, 1906, p. 145.

Dromidia unidentata, *Ihle*, 1913, p. 31.

Locality. Station VI., 1 ♂ [1] *.

Remarks. C.l.† 22 mm., C.b. 22 mm., 1st W.L. 34 mm., 2nd W.L. 32 mm., 3rd W.L. 20.5 mm., 4th W.L. 25 mm.

The specimen is of the same order of size as those described by *Alcock*, but his statement regarding the relative lengths of the walking-legs is that “the fourth (last) pair of legs are not so very much shorter than either of the first two pairs and are very much longer than the third pair.”

Genus CRYPTODROMIA, *Stimpson*, 1859.

2. CRYPTODROMIA HILGENDORFI, *de Man*, 1887. See *Alcock*, 1899 (2), p. 145.

Dromia (Cryptodromia) Hilgendorfi, *Alcock*, *loc. cit.*

Cryptodromia Hilgendorfi, *Nobili*, 1906, p. 146.

Cryptodromia hilgendorfi, *Ihle*, 1913, p. 45.

Locality. Station X., 1 ♀ ovig. [2].

Remarks. C.l. 12.5 mm., C.b. 12.5 mm. *Alcock* describes the carapace as being longer than broad in two specimens—a male and a female—from the Persian Gulf. In the present specimen this is not the case, nor is it so in an example from Ceylon (*Laurie*, 1906, p. 352), where C.b. ÷ C.l. = 1.03. The two lateral teeth of the front are less prominent in the present example than in the one from Ceylon just named.

My specimens agree with those of *Nobili* in having the outer orbital angle more prominent and sharper than represented in *de Man*'s figure; *Alcock* says that this region is not dentiform, it is in the present specimen at least sub-dentiform.

* The collection is housed in the Museum of the Dept. of Zoology, University of Liverpool.

† Abbreviations are those used by *Laurie*, 1906, p. 350.

3. CRYPTODROMIA GILESII (*Alcock*, 1899). See *Alcock*, 1899 (2), p. 146.

Dromia (*Cryptodromia*) *Gilesii*, *Alcock*, *loc. cit.*

Cryptodromia Gilesii, *Alcock*, 1901, p. 54, pl. 3. fig. 13.

? Nec *Cryptodromia granulata*, *Nobili*, 1906, p. 147, pl. 9. fig. 5.

Locality. Station II., 1 ♂ apparently adult [3].

Remarks. The specimen agrees with *Alcock's* description. C.l., including frontal teeth, 9.5 mm., C.b. 10 mm.

The species is new to the Red Sea, it has hitherto been recorded only from the Malabar coast in 29 fathoms by *Alcock*.

It has in many of its characters a suspicious resemblance to *Cryptodromia granulata*, the *Epidromia granulata* of *Kossmann* (*Kossmann*, 1880, p. 69; and *Nobili*, *loc. cit.*). The two species are evidently, as pointed out by *Nobili*, very closely related, but, though it is possible that they may come later to be regarded as one, the published evidence yet available does not in my view warrant one in uniting them. It may be that there is little difference beyond the form of the front, but this is markedly different. In *Alcock's* species the lateral frontal teeth are much longer and the supraorbital border more oblique. I have not had the opportunity of examining the type-specimens.

Subtribe OXYSTOMATA.

Family CALAPPIDÆ.

Genus CALAPPA, *Fabricius*, 1798.

4. CALAPPA HEPATICA (*Linnaeus*, 1764). See *Alcock*, 1896, p. 142.

Calappa hepatica, *Nobili*, 1906, p. 148.

Calappa hepatica, *Klunzinger*, 1906, p. 60.

Calappa tuberculata, *Stimpson*, 1907, p. 165.

Localities. Station VII. E, 2 ♂ [4, 5]; Station VIII. A, 2 ♀ [6, 7]; Station VIII. C, 1 ♂ [8], 1 ♀ [9].

Remarks.

	♀ 6 juv.	♀ 9.	♀ 7 ovig.	♂ 8 juv.	♂ 4.	♂ 5.
C.l.	10.5	15.0	15.0	11.5	21.5	22.0 mm.
C.b. ₁	11.0	16.0	16.0	12.2	24.0	25.0 mm.
C.b. ₂	15.0	21.0	20.5	16.5	32.5	34.0 mm.
C.b. ₁ ÷ C.l. ....	.95	.94	.94	.94	.89	.88
C.b. ₂ ÷ C.l. ....	.70	.71	.73	.70	.66	.65

C.b.₁ is measured immediately in front of the clypeiform expansions; C.b.₂ is measured across the clypeiform expansions, from tip to tip of the fourth pair of teeth.

The specimens agree very well with *Alcock's* description. The emargination of the front is in all the specimens but slightly evident. The measurements given above indicate growth-change in the ♂ in regard to the ratio C.b. ÷ C.l.

Family LEUCOSIIDÆ.

Genus NUCIA, *Dana*, 1852.

5. NUCIA PULCHELLA (*A. Milne-Edwards*, 1873). See Nobili, 1906, p. 163.
Locality. Station V. A, 1 ♂ [10].

Remarks. C.l. 3 mm., C.b. 3.5 mm., frontal b. 1.1 mm. Only two other examples of the species have been recorded. The present specimen is of the same size as that of Nobili from the Red Sea; *A. Milne-Edwards's* type-specimen from the Fiji Islands has C.l. 5.5 mm. and C.b. 6 mm.

Genus PERSEPHONA, *Leach*, 1817.

Includes *Myra*, *Leach*, 1817; *teste* Rathbun.

6. PERSEPHONA FUGAX (*Fabricius*, 1798). See Alcock, 1896, pp. 202 and 204.

Myra fugax, Alcock, *loc. cit.* p. 202.

Myra pentacantha, n. sp.?, Alcock, *loc. cit.* p. 204.

Myra fugax, Nobili, 1906, p. 164.

Myra fugax, Klunzinger, 1906, p. 73.

Myra fugax, Laurie, 1906, p. 360.

Myra fugax, Stimpson, 1907, p. 152.

Persephona fugax, Rathbun, 1911, p. 201.

Locality. Station VIII. A, 1 ♀ juv. [11].

Remarks. C.l. including posterior spine, 11 mm.; Ch.l. 19.4 mm.; C.l. ÷ Ch.l. = 1.73. The specimen appears to be a late *pentacantha* stage, the spine on either postero-lateral margin above the last pair of legs is slightly indicated.

I agree with Nobili in believing that *Persephona pentacantha*, very doubtfully created by Alcock, is in reality the young stage of *Persephona fugax*.

Genus LEUCOSIA, *Fabricius*, 1798.

The adoption of *Leucosides*, Rathbun, 1897, as a name for this genus depends upon one's acceptance, with Rathbun, of Latreille's examples of genera in 1810 as specifications of type (Rathbun, 1897, p. 160). I agree with Stebbing (Stebbing, 1902, p. 11, and 1908, p. 11) in not so accepting them.

7. LEUCOSIA SIGNATA, *Paulson*, 1875. See Klunzinger, 1906, p. 69.

Leucosia signata, Nobili, 1906, pp. 163 and 344.

Leucosia fuscomaculata, Klunzinger, *loc. cit.*

Localities. Station II., 1 ♂ [12]; Station VIII. A, 8 ♀ [13-20], 10 ♂ [21-30]; Station VIII. D, 1 ♀ [31].

Remarks. The specimens comprise 5 ♂ juv., 6 ♂ adult, 6 ♀ juv., and 3 ♀ adult, non-ovig.

The adult females have a rounded posterior border; in all the adult males the angles of the posterior border, though rounded, are a little prominent; in all the young of both sexes the posterior border is straight with somewhat prominent angles.

The measurements given below show that the size of the adult specimen is of the same order as given by Nobili:—

	♀ adult.	♀ adult.	♂ adult.	♂ adult.
C.l.	19.0	22.5	19.5	21.0 mm.
C.b.	16.0	19.0	16.5	17.5 mm.
C.l. ÷ C.b. ....	.84	.84	.84	.83

In adult ♂ 30 (C.l. 19 mm.), the granules on the postero-lateral border of the carapace are not continued further back than the first pair of walking legs, above which they fade away. The specimen has the M well marked on the carapace and is clearly for all other reasons also to be placed in this species.

Family DORIPPIDÆ.

Genus DORIPPE, *Fabricius*, 1798.

8. DORIPPE DORSIPES (*Linnaeus*, 1764). See Alcock, 1896, p. 277.

Dorippe dorsipes, Nobili, 1906, p. 172.

Dorippe dorsipes, Nobili, 1907, p. 95.

Dorippe dorsipes, Laurie, 1906, p. 367.

Dorippe quadridens, Stimpson, 1907, p. 167.

Locality. Station I. H, 1 ♀ immature [32].

Remarks. C.l. 8.25 mm.

The spine at the outer angle of the orbit reaches distinctly less far forward than the frontal teeth; the large spine at the inner canthus projects the same distance forwards as the frontal teeth. The condition of the spine at the outer angle of the orbit appears to be characteristic of the earlier growth stages (Laurie, *loc. cit.*).

Family RANINIDÆ.

Genus NOTOPUS, *de Haan*, 1841.

9. NOTOPUS DORSIPES (*Fabricius*, 1793). See Alcock, 1896, p. 290.

Locality. Station V. G, 2 ♀ [33, 34].

Remarks. ♀ 34, C.l. 19 mm., C.b. across base of antero-external spines 13 mm., fronto-orbital border 8.5 mm.; ♀ 33, C.l. 13 mm., C.b. 9 mm., fronto-orbital border 6 mm.

Alcock's description reads obscurely as regards the spines of the anterior border of the carapace; there are five spines on the fronto-orbital border, as he describes, but the spine forming the antero-external angle of the carapace on either side is not the outermost of the above series but an additional one, making a series of seven spines in all along the anterior border of the carapace. This is seen quite clearly in de Haan's figure (1841, pl. xxxv. fig. 5). It is presumably also not the ischium but the merus of the chelipeds which Alcock intends to describe as trigonal, somewhat swollen, and having its outer surface tattooed with linear dents with hairy edges.

This is the first record of any member of the family Raninidæ from the Red Sea.

Subtribe **BRACHYGNATHA.**

Superfamily OXYRHYNCHA.

Family MAMAIDÆ.

= *Maiide*, see Stebbing, 1905 (1) p. 22, and 1910, p. 290. I use the word, however, in its wider sense, not as = Alcock's *Mainæ*.

Genus CAMPOSCIA, *Latreille*, 1829.

10. CAMPOSCIA RETUSA, *Latreille*, 1829. See Alcock, 1895, p. 184.

Camposcia retusa, Nobili, 1906, p. 172.

Camposcia retusa, Klunzinger, 1906, p. 15, pl. 1. fig. 1.

Camposcia retusa, Laurie, 1906, p. 371.

Camposcia retusa, Stimpson, 1907, p. 19.

Locality. Station V. E, 1 ♀ ovig. [35].

Remarks. C.l. 34 mm. It is encrusted, as is usual in this species, with a very considerable quantity of sponges, etc.

Genus ACANTHONYX, *Latreille*, 1829.

11. ACANTHONYX ELONGATUS, *Miers*, 1877. See Miers, 1877, p. 673, pl. 69. fig. 1.

Acanthonyx elongatus, Nobili, 1906, p. 172.

Acanthonyx elongatus, Klunzinger, 1906, p. 22.

Acanthonyx consobrinus, Paulson, 1875, p. 7, pl. 3. fig. 1 (nec *A. consobrinus*, A. M.-Edw., 1863); *vide* Klunzinger, *loc. cit.*

Locality. Station IX. B, 1 ♂ probably immature [36].

Remarks. C.l. including rostrum 22.5 mm.

It differs from Miers's description and figure in (a) the tubercles of the carapace, there being three on the gastric region, one on the cardiac region, a small one on either side of the cardiac region and a trace of one on the intestinal (post-cardiac) region; (b) the small middle tooth of the lateral border of the carapace is more distinct than in Miers's figure and so also are

the curves in front of and behind this. The specimen falls, however, under Klunzinger's description.

Klunzinger gives some notes on the synonymy of the species. He considers that the specimens which Paulson put under *A. consobrinus* in 1875 really belong to the present species, but that *A. consobrinus* of A. Milne-Edwards, 1863, is distinct. From this it would follow that the latter species has not been recorded from the Red Sea and should therefore be deleted from Nobili's list.

A. elongatus has not been recorded outside the Red Sea.

Genus HERBSTIA, *H. Milne-Edwards*, 1834.

12. HERBSTIA CORNICULATA, *Klunzinger*, 1906. (Plate 44. fig. 2.) See Klunzinger, 1906, p. 27, pl. 1. figs. 4 a-b.

Locality. Station V. A, 1 ♂ probably adult [37].

Remarks. C.l. including rostrum 7.5 mm., C.b. 8 mm. The fingers gape proximally as shown in the figure. Lower border of propus 3.5 mm.

Klunzinger's specimens are ♀. The present specimen is the only other recorded example of the species and the first ♂ recorded. The species has thus not been found outside the Red Sea.

Genus STILBOGNATHUS, *von Martens*, 1866.

13. STILBOGNATHUS ERYTHRÆUS, *von Martens*, 1866. See Klunzinger, 1906, p. 25.

Stylbognathus erythræus, Nobili, 1906, p. 176.

Locality. Station V. E, 1 ♂ [38], 1 ♀ ovig. [39].

Remarks. ♂, C.l. excluding the rostral horns but including the posterior triangle 22 mm., rostral horn 7 mm. Cheliped of the enlarged "breeding" type, the fingers gaping a good deal proximally: H.l. 6 mm., lower border of propus 11 mm., propus height 5.5 mm.; ♀ 39, C.l. 21 mm., rostral horn 5 mm.

Kossmann (1877, p. 15, pl. 1. fig. 1) gives a useful photograph of a dorsal view of the animal.

The species has not been recorded outside the Red Sea.

Genus OPHTHALMIAS, *Rathbun*, 1897.

= *Stenocionops*, Latr., 1825, *et auct.*, not Leach, 1823, which latter replaces *Pericera*, Latr., 1825; see Rathbun, 1897, p. 157.

14. OPHTHALMIAS CURVIROSTRIS (*A. M.-Edw.*, 1865). (Plate 45. fig. 4.) See Klunzinger, 1906, p. 24.

Stenocionops curvirostris, Nobili, 1906, p. 177.

Stenocionops curvirostris, Nobili, 1907, p. 108.

Stenocionops curvirostris, Klunzinger, 1906, *loc. cit.*

? *Stenocionops cervicornis*, von Martens, 1866, p. 379; *nec* Herbst, 1803.

Locality. Station VII. E, 2 ♀ (No. 41 ovig.) [40, 41].

Remarks. ♀ 41 ovig. : C.l. excluding rostral horns 23 mm., rostral horn l. 7 mm., eye-stalk l. measured from inner orbital angle 6.5 mm., and supra-ocular spine l. measured also from inner orbital angle 7 mm., R.l. ÷ C.l. = .30; ♀ 40 has C.l. 9 mm., R.l. 3.5 mm., and R.l. ÷ C.l. = .39.

The following distinctions hold between the present specimens of *O. curvirostris* and specimens of *O. cervicornis*, Herbst, from Ceylon, examined by me (Laurie, 1906, p. 383) :—

1. The rostral horns are distinctly upturned at the tips in *curvirostris*, not in *cervicornis*. See Rathbun, however, as below.

2. The rostral horns are closely apposed in *curvirostris*, but in *cervicornis*, though the rostral horns are somewhat bowed outwards, their tips are well apart (*e. g.* 8 mm. in a specimen with C.l. 45 mm.).

3. The triangular projection of the posterior border of the carapace is more broadly triangular and less elongate in *curvirostris*.

4. The form of the external maxillipedes presents two points of difference, both in regard to the ischium :—

(a) the ischium of *curvirostris* has a deep longitudinal groove on the exposed surface, there is in *cervicornis* only the merest trace of such a groove.

(b) in *cervicornis* the proximal portion of the inner margin of the ischium, just before the angle is reached, is strongly notched, so that a rounded window is formed when the two ischia are opposed, this window is open posteriorly as the proximal angles do not meet in the middle line, though each such angle bears a claviform seta and these meet across the middle line giving an appearance of completeness to posterior border of the window (Pl. 45. fig. 5); in *curvirostris* the proximal angle of the inner border of the ischium is cut away and only very obscurely marked, so that the regions in question slope obliquely backwards away from each other and the window does not appear, the club-shaped setæ are present but are far from meeting in the middle line (Pl. 45. fig. 4).

5. The eye-stalks and the supra-ocular spines are subequal in *curvirostris*, whereas in *cervicornis* the eye-stalks are quite distinctly the shorter of the two.

Of the above points of difference the first is of doubtful value, Rathbun (Rathbun, 1911, p. 254) saying that the rostral horns have their tips recurved upward (but not that they are apposed) in a ♂ *cervicornis* from Amirante and a young ♀ from Seychelles which she describes. The condition of the ischia of the external maxillipedes may prove, however, to be a distinction of considerable importance.

I do not share Nobili's doubt as to the distinctness of the two species from one another.

The only record of *O. cervicornis* from the Red Sea is that of von Martens, and, on the other hand, *O. curvirostris* has not been recorded outside the Red Sea and Persian Gulf. As pointed out by Nobili, von Martens made his identification when probably unaware of Milne-Edwards's description of *O. curvirostris*, published only the previous year. It would be of interest to re-examine von Martens's examples.

Genus CYPHOCARCINUS, A. Milne-Edwards, 1868.

15. CYPHOCARCINUS MINUTUS, A. M.-Edw., 1868. (Plate 44. fig. 3.) See Alcock, 1895, p. 254.

Cyphocarcinus minutus, A. Milne-Edwards, 1868, p. 73, pl. 19. figs. 7-12.

Cyphocarcinus minutus, Nobili, 1906, p. 177.

Cyphocarcinus minutus, Nobili, 1907, p. 109.

Ixion capreolus, Klunzinger, 1906, p. 44.

Cyphocarcinus minutus, Rathbun, 1911, p. 255.

Locality. Station VIII. B, 1 ♀, [42].

Remarks. C.l. to base of rostral horns 7.5 mm., and to tip of rostral horns 9.25 mm., rostral horn l. 2 mm.

The figures which best represent the present specimen are those of Paulson (1875, pl. 2. fig. 1) of a young ♂, size not stated, given under the name of *Ixion capreolus*. In Paulson's figure, however, the gastric hump is less marked and the rostral horns are longer than in my ♀ specimen. Klunzinger translates Paulson's description.

Nobili (1907, *loc. cit.*) gives a useful account of the species.

The present specimen differs strikingly, in three respects more particularly, from A. Milne-Edwards's account of *C. minutus*: (a) it will be seen from my figure that in the present specimen the pre-gastric region slopes a little forward so that it is not hidden in a dorsal view of the animal, as described by Milne-Edwards, and affords a considerable contrast from his fig. 10, which is referred to by Nobili as well representing his own specimens; (b) the rostral horns are not pressed against each other in their basal portion as described by Milne-Edwards, but stand well apart, contrasting strongly with his figure 8; (c) the basal joint of the first antenna and the joint following, though of the same general type, are less shortened in the present example than in Milne-Edwards's figure, so that a distinctly different appearance results from a ventral view.

In regard to (a) above my specimen appears to be similar to Rathbun's 'Sealark' specimens from Amirante and Coetivy (*loc. cit.*), and in regard to (b) Rathbun's specimens appear in some degree intermediate between mine and that of Milne-Edwards.

The type-specimen of *Xenocarcinus tuberculatus* of White, in the British Museum, has the appearance of having had a similar arrangement, the 4th pair of walking-legs is present and, though the 3rd pair is lost, the basipodites which remain suggest that the legs pointed more backward than in Miers's figure (Miers, 1874, pl. 2. fig. 1).

In the British Museum I find two unnamed males labelled "85.14. Aden, at low water. Presented by Major G. W. Yerbury." In these the rostral horns are longer than in the present example, being more as in Paulson's figure. Rathbun (*loc. cit.*) also finds the rostral horns longer in her ♂ than in her ♀ specimen. The two British Museum specimens are of the same size, C.l. 11 mm.; the chelipeds are enlarged in both, being apparently of the type appropriate to breeding males.

Family PARTHENOPIDÆ.

Genus PARTHENOPE, *Fabricius*, 1798.

For non-recognition of Weber, 1795, and consequent non-acceptance of *Daldorfia*, Rath., 1904, see Stebbing, 1905 (2), p. 332.

16. PARTHENOPE HORRIDA (*Linnaeus*, 1758). See Alcock, 1895, p. 279.

Parthenope horrida, Alcock, *loc. cit.*

Parthenope horrida, Nobili, 1906, p. 179.

Parthenope horrida, Klunzinger, 1906, p. 54.

Parthenope horrida, Stebbing, 1905 (1), p. 27.

Daldorfia horrida, Rathbun, 1906, p. 886, pl. 14. fig. 5.

Daldorfia horrida, Rathbun, 1911, p. 259.

Locality. Station VIII. E, 1 ♀ small [43].

Remarks. C.l. 14 mm., C.b. 19.25 mm., $C.l. \div C.b. = .73$, larger (right) Ch.l. 25.5 mm., smaller (left) Ch.l. 23.5 mm., the right and left chelipeds are thus respectively 1.82 and 1.68 the length of the carapace.

The teeth on the upper margins of the meri of the walking-legs are triangular.

Fig. 1.



Parthenope horrida, ♀ 43. Sternal hollow, 3 mm. across.

The shape of the sternal hollow is shown in the accompanying text-figure.

Genus LAMBRUS, *Leach*, 1815.

For non-acceptance of *Parthenope*, *Weber*, 1795, see *Stebbing*, 1905 (2), p. 332.

17. LAMBRUS (AULACOLAMBRUS) HOPLONOTUS, *Adams & White*, 1848. See *Alcock*, 1895, p. 273.

Lambrus (Aulacolambrus) hoplonotus, *Alcock, loc. cit.*

Lambrus (Aulacolambrus) hoplonotus, *Laurie*, 1906, p. 389.

Parthenope (Aulacolambrus) hoplonotus, *Rathbun*, 1906, p. 885.

Localities. Station II., 1 ♂ juv. [44]; Station VIII. A, 1 ♀ non-ovig., but probably adult [45]; Station VIII. C, 1 ♂ juv. [46].

Remarks.

	♀ 45.	♂ 46.	♂ 44.
C.l.	15.0	7.5	7.5
C.b. ₁	17.0	..	7.75
C.b. ₂	26.5	..	10.75
Lat. Epi. spine (post. bord.)	7.25	..	2.5
Ch.l.	38.0	19.5	19.5
C.b. ₁ ÷ C.l.	1.13	..	1.03
C.b. ₂ ÷ C.l.	1.77	..	1.43
Ch.l. ÷ C.l.	2.53	2.60	2.60
Lat. Epi. spine ÷ C.l. ....	.48	..	.33

C.b.₁ is measured across anterior bases and C.b.₂ across tips of lateral epibranchial spines.

♂ 44 is well separated from the other two specimens. (a) All three specimens have the carapace set with rounded tubercles, but while in ♀ 45 and ♂ 46 these are strongly developed and well granulated they are in ♂ 44 less pronounced, and their granulation is inconspicuous; it follows that the latter specimen is much less rough in general appearance than either of the other two.

(b) The orbits have a very different appearance; in ♀ 45 and ♂ 46 the orbital margin bears a series of longitudinally elongated granulated tubercles which have somewhat the appearance of claws curving over the orbit, reminding one of the metal claws by which a jeweller sets a stone in a ring; in ♂ 44 there are simply a few granules which do not obscure the large triangular emargination of the dorsal margin of the orbit. Running back from the apex of this emargination the fissure is well seen in ♂ 44.

(c) The spines of the cheliped are smooth in ♂ 44; in ♀ 45 and ♂ 46 they are, in dorsal view, considerably granulated. The detail of the granulation is as follows: each spine of the inner border of the hand is quite covered with granules dorsally, the spines of the outer margin of the hand form a series in which there is a gradual transition from the distal one, which is granular to its base, to the proximal one, which is granular only at its tip;

on the wrist only the tips of the spines are granular, more particularly in the longer ones; and on the arm there is a transition as in the hand, but in the reverse direction, *i. e.*, a trace at the tip of the two distal ones, in the next one there are in addition one to three granules about the middle of its length, in the next the outer half or more is granular, and in the most proximal member of the series the granules extend almost to the base.

(d) In ♂ 44 the lateral epibranchial spine appears to curve a little forwards, owing to the convexity of its posterior border, while in ♀ 45 and ♂ 46 it points in a straight line obliquely backward.

(e) In ♂ 44 the lateral epibranchial spines are relatively shorter than in ♀ 45. (In ♂ 46 they are damaged.)

(f) In ♂ 44 the lateral epibranchial spine is simple, while in ♀ 45 and ♂ 46 it bears on each side near its base a well-marked secondary spine (not to be confused with the quite separate spine to its inner side).

(g) The number of large spines on the outer margin of the hand differs, in ♂ 44 there are six while in ♀ 45 and ♂ 46 there are eight.

Miers (1879, pp. 22-4) describes several varieties of this species. Specimens 45 and 46 appear to come close to White's type-specimen from "Eastern Seas," described by Miers, while specimen 44 closely resembles Ceylon examples examined by me (*loc. cit.*) and comes close to var. *planifrons* (Ceylon) and var. *granulosus* (Phillipine Islands and Corregidor), both of Miers.

Although in my Ceylon examples the resemblance is to specimen 44 of the present collection, the tubercles of the carapace are sharper than in it, and the orbital border is more as in specimens 45 and 46.

Perhaps the most important of the contrasted characters in the above forms are the number of spines on the outer border of the hand and the condition of the lateral epibranchial spines.

L. hoplonotus has not hitherto been recorded from the Red Sea.

18. LAMBRUS (RHINOLAMBRUS) PELAGICUS, Rüppell, 1830. See Alcock, 1895, p. 267.

Lambrus (Rhinolambrus) pelagicus, Alcock, *loc. cit.*

Lambrus (Rhinolambrus) pelagicus, Nobili, 1906, p. 184.

Lambrus (Rhinolambrus) pelagicus, Klunzinger, 1906, p. 47

Lambrus (Rhinolambrus) pelagicus, Laurie, 1906, p. 389.

Locality. Station II., 1 ♂, small [47].

Remarks. C.l. 7.5 mm., C.b. 7.5 mm., Ch.l. 19.5 mm., Ch.l. ÷ C.l. = 2.6. The cheliped length of this young ♂ agrees with that of a young ♀ of similar size from Ceylon (Laurie, *loc. cit.*).

Superfamily BRACHYRHYNCHA.

Family PORTUNIDÆ.

Genus CAPHYRA, *Guérin*, 1832.

19. CAPHYRA MONTICELLII, *Nobili*, 1901. (Plate 45. figs. 1, 1 a.) See *Nobili*, 1901, p. 10.

Caphyra Monticellii, *Nobili*, *loc. cit.*

Caphyra Monticellii, *Nobili*, 1906, p. 188.

Locality. Station VIII. E, 1 (? ♂) [48].

Remarks. Probably ♂, the abdomen is missing. C.l. 5 mm., C.b. 5.75 mm., C.b. ÷ C.l. = 1.15. The left hand is much more massive than the right: in the left cheliped H.l. (upper bord.) 4 mm., F.l. (upper bord.) 2.5 mm., lower border propus 6 mm. and H. height 2.75 mm.; in the smaller cheliped the same measurements are 2.6, 2.6, 5, and 2 mm. respectively.

There are small blunt tubercles on the upper inner border of the ischium of the cheliped instead of spinules. There are only two spines on the lower inner border of the ischium of the smaller (right) cheliped, there are two tubercles in this position on the larger (left) cheliped. The four spines on the lower anterior border of the merus of the left cheliped are equal in size and of the same type as on the merus of the right cheliped. The tubercle on the outer surface of the palm at the region of the carpo-propal articulation is blunt, not spiniform. The upper border of the palm is as described by *Nobili*, but neither the well-developed crest nor the traces of a second one are present on the outer surface of the palm.

Thus this specimen differs from *Nobili's* specimen essentially (*a*) in the size and relations of the chelipeds, the left being much the more massive and its fingers much shorter in proportion to the palm; and (*b*) in having the armature of the hands less sharp.

The abdomen of the present specimen is missing. If my identification is correct and if the specimen is, as I take it to be, a male, then the above points of difference of the chelipeds from *Nobili's* description, which was of a female, may be in some part sex-differences; they may also be in part related to size. *Nobili's* type-specimen had C.l. 4 mm. and C.b. 5 mm.; it was taken 25 miles north of Massowah in 1893.

The front is asymmetrical in the present specimen, the outer tooth of the right frontal lobe being very inconspicuous, while that of the left lobe is distinct, though small.

Genus LUPA, *Leach*, 1813.

= *Neptunus*, de Haan, 1833. See Stebbing, 1902, p. 11, and 1908, p. 11.

20. LUPA ALCOCKI (*Nobili*, 1905). (Plate 44. figs. 1-1 c.) See *Nobili*, 1906, p. 191.

Neptunus (Hellenus) Alcocki, *Nobili*, loc. cit.

Locality. Station I. B, 1 ♂ [49].

Remarks. C.l. 8 mm.; C.b. from tip to tip of the large 9th antero-lateral spines 16.25 mm., across the line of the angles between 8th and 9th antero-lateral teeth 12 mm.; Ch.l. 16 mm.; propus l. (inner lower bord.) 8.75 mm.

Of the three teeth on the outer surface of the wrist one is distal and spiniform and two are proximal and blunt.

A point not referred to by *Nobili* is that there is a break in the salient crest of the large lateral spine where it curves back on the carapace towards the cardiac region.

The chelipeds are of approximately equal length, but the right chela is the more massive.

The only other example of this species recorded is the male with C.l. 6.75 mm., which formed *Nobili's* type-specimen and was taken at Djibouti.

Genus CHARYBDIS, *de Haan*, 1833.

= *Goniosoma*, A. M.-Edw., 1860; see Rathbun, 1897, p. 161.

21. CHARYBDIS ERYTHRODACTYLA (*Lam.*, 1818). See *Nobili*, 1907, p. 118, fig. 3.

Charybdis (Goniosoma) erythroductyla, *Nobili*, 1906, p. 194.

Thalamita pulchra, *Randall*, 1840, p. 117, pl. 4; see Rathbun, loc. cit.

Charybdis erythroductyla, *Rathbun*, 1906, p. 872, pl. 4 (coloured).

Locality. Station VII. B, 1 ♀ immature [50].

Remarks. C.l. 16.25 mm., C.b. (across the region of the last antero-lateral spines) 25 mm.

Though the chelipeds are missing, and important characters are thus undeterminable, the specimen appears evidently to belong to *C. erythroductyla*, agreeing with the group of small specimens described by *Nobili* (1906, p. 195).

There is granulation on the basal antennal joint both proximal and distal to the blunt laminar tubercle.

Genus THALAMITA, *Latreille*, 1829.

22. THALAMITA POISSONII (*Audouin et Savigny*, 1826). See *Alcock*, 1899 (1), p. 81.

Thalamita Poissonii, *Alcock*, loc. cit.

Thalamita Poissonii, *Nobili*, 1906, p. 205.

Thalamita Poissonii, *Nobili*, 1907, p. 120.

Thalamita poissonii, *Laurie*, 1906, p. 419.

Localities. Station I. B, 4 ♂ [51-54], 5 ♀ [55-59]; Station I. E, 1 ♂ probably adult [60]; Station I. G, 1 ♂ [61], 1 ♀ [62].

Remarks. The length of the carapace varies in the males from 11 to 16 mm. and from 11 to 17.5 mm. in the females.

In both sexes it is sometimes the right and sometimes the left cheliped which is the larger, thus it is the right in four of the males and three of the females, and the left in the remainder of the specimens.

I do not share Alcock's doubt as to the distinctness of this species from *T. chaptalii*. Points of difference are as follows:—

1. As pointed out by Alcock, the teeth of the antero-lateral border are in *T. poissonii* acute, and the last tooth is more spiniform and more prominent than the others.

2. As pointed out by Nobili, the fourth tooth of the antero-lateral border is in *T. poissonii* much smaller than the others.

3. Alcock notes that the teeth of the anterior border of the arm are in *T. poissonii* acute; this is so in the present specimens, in which they are three or four in number. So also are the other teeth of the cheliped acute, and this is conveniently seen in the case of the tooth on the upper surface of the propus, in front of the carpo-propal articulation. Borradaile (1902 (1), p. 201) records, however, a male from Suvadiva which "has the spines on the fore edge of the meropodite of the cheliped blunt," as in *T. chaptalii*.

4. In place of the somewhat granular eminence on each antero-lateral portion of the gastric region in *T. chaptalii* there is in *T. poissonii* a short transverse granular ridge.

5. The present specimens contrast with those from the Gulf of Manaar placed by me (Laurie, *loc. cit.*) under *T. chaptalii* in the shape of the front; its outer limit is well marked and rounded in the present specimens instead of gently sloping, so that the anterior frontal margin is fairly straight transversely.

6. The hinder edge of the propodite of the last leg bears in *T. poissonii* several spinules, of which there is no trace in *T. chaptalii*. This difference is emphasized by Borradaile.

7. The setæ of the dorsal surface of the carapace are longer in the present specimens of *T. poissonii* than in the Gulf of Manaar examples of *T. chaptalii* mentioned above; the difference, though not great, is constant.

8. An additional point is the red coloration (spirit-specimens) of the upper mero-carpal point of articulation; this concerns both the articular process of the carpus and the margin of the articular cavity of the merus, and appears as a conspicuous red dot in a dorsal view of the animal as it lies in a position of rest. Colour in spirit is no doubt elusive, but in the present instance the red spot is clearly seen in all the specimens, but not to be made out at all in a series of 22 specimens of *T. chaptalii* from Gulf of Manaar which I have

before me, though these latter show traces of colour on the fingers just as clearly as do the present specimens.

23. *Thalamita admete* (Herbst, 1803), var. *savignyi*, A. M.-Edw., 1861. See Alc. 1899 (1), p. 84; Nob. 1906, p. 206; Borr. 1902 (1), p. 202.

Thalamita admeta, var. *savignyi*, Alcock, *loc. cit.*

Thalamita admeta, var. *Savignyi*, Nobili, *loc. cit.*

? *Thalamita admete*, Rathbun, 1906, p. 874.

Locality. Station V. E, 1 ♀ [63]; Station X., 1 ♀ [64].

Remarks. Specimen 64 is immature, C.l. 11.5 mm., C.b. 19 mm.; it has lost its left cheliped. Specimen 63 is non-ovigerous, but appears to be mature, C.l. 14 mm., C.b. 22.75 mm.; its front is damaged.

The present examples have very strong resemblance also to var. *admete*, Herbst, 1803, but they fall within the limits of variation of specimens referred by Nobili to var. *savignyi*. One may note (a) the transverse ridges of the carapace are in sharp relief; (b) the division between the two frontal lobes is not broad and deep (in specimen 63 this region is injured); (c) certain particulars in regard to the hands in specimen 63 (the left cheliped is lost in specimen 64), namely: the inner surface of each hand bears a median longitudinal granular ridge and the narrower (left) hand has, in addition, a second row of small granules below this, and the lower portion of its inner surface is also granular; the lower margin of the larger hand is smooth save for a few obsolescent markings, that of the smaller is granular, the granulation being continuous with the granular portion of the lower part of the inner surface; except for a few obsolescent granules the space between the two lower crests of the outer surface of the hand is smooth, a point of difference from Borradaile's Key (Borradaile, 1902 (1), p. 202); (d) each finger has a well-marked groove along its inner surface and the dactylus has the suggestion of a second groove above the other proximally; (e) in the larger specimen the 4th antero-lateral tooth of each side, though far from obsolescent, is smaller than the others, being about one-half the size of the third; in the smaller specimen it is rudimentary. From cases cited by Nobili it appears that the size of this tooth may be subject to considerable growth-change, assuming an increased relative size with the growth of the animal.

Rathbun (*loc. cit.*) describes three forms from the Hawaiian Islands, *edwardsi*, Borradaile, *admete*, Herbst, and *auauensis*, Rathbun, sp. nov., which come within the *admete* group, and to each she gives specific rank. She does not agree with the application of Herbst's name *admete* made by Alcock and by Borradaile, but believes it essential that forms included under it shall have a well-developed fourth side-tooth. One would like to know the sizes of the specimens which she discusses, and whether differences of the condition

of the fourth side-tooth hold as between large specimens or to what extent such differences may be due to growth-change. Rathbun remarks regarding the examples she puts under *T. admete* that "the description of *T. savignyi*, A. Milne-Edwards, applies very well to these specimens, except that the inner surface of the hand is not granular."

23 a. THALAMITA ADMETE (*Herbst*, 1803), var. INTERMEDIA, *Borr.*, 1902. See *Borr.* 1902 (1), p. 203; *Nob.* 1906, p. 208.

Thalamita admeta, var. *intermedia*, *Borradaile*, *loc. cit.*

Thalamita admeta, var. *intermedia*, *Nobili*, *loc. cit.*

Locality. Station X., 2 ♂ [65, 66].

Remarks. Specimen 65 has C.l. 11.5 mm. Specimen 66 has C.l. 12.5 mm.

In specimen 66 the crest on the basal joint of the right antenna has four spinules, and that of the left antenna five spinules; specimen 65 is typical with three spinules on each side.

24. THALAMITA INTEGRATA, *Dana*, 1852. See *Alcock*, 1899 (1), p. 85.

Thalamita integra, *Nobili*, 1906, p. 209.

Thalamita integra, *Stimpson*, 1907, p. 83.

Locality. Station VII. E, 1 ♀ ovig. [67].

Remarks. C.l. 7 mm., C.b. 11 mm.

The ridge which *Alcock* refers to as running along the distal two-thirds of the outer surface of the larger hand is present in this specimen and is continued along the fixed finger; on the narrower chela a similar ridge is present, and in addition one above it which runs to the gape of the two fingers.

It is the right chela which in the present specimen is the larger.

Subgenus THALAMITOÏDES, *A. Milne-Edwards*, 1869.

Thalamitoïdes has come to be treated as a genus, perhaps by accident rather than by design. I use the name in its original meaning. See *A. Milne-Edwards*, 1869, p. 146.

25. THALAMITA (THALAMITOÏDES) TRIDENS, *A. M.-Edw.*, 1869, var. SPINIGERA (*Nob.*, 1905). See *Nobili*, 1906, p. 213.

For the species, see *A. Milne-Edwards*, 1869, p. 149, pl. 6. figs. 1-7.

Locality. No locality given, 1 ♀ juv. [68].

Remarks. C.l. 4 mm.

The specimen shows the characters of var. *spinigera*, the basal joint of the second antenna bearing spines between the outer frontal lobe and the orbit,

and the hands bearing seven spines on the upper border. Of the antennal spines above named there are three on the right antenna, of which the middle one is very small, and four on the left antenna, of which the two at the orbital end are small, particularly the inner of the two.

The line uniting the posterior teeth of the lateral border of the carapace is well marked, and the posterior gastric line is somewhat curved, with the convexity backwards, so that the general appearance of the lines on the carapace is as in A. Milne-Edwards's figure of *T. quadridens* (A. Milne-Edwards, 1869, pl. 6. fig. 8).

The part of the carapace anterior to the posterior gastric line is seen by the aid of a lens to be closely covered with small low granules.

This appears to be essentially a Red Sea variety, and may perhaps come to be given specific rank.

Genus *PODOPHTHALMUS*, Lamarck, 1801.

(Original orthography *Podophtalmus*, not *Podophthalmus*.)

26. *PODOPHTHALMUS VIGIL* (*Fabricius*, 1798). See H. Milne-Edwards, 1834, p. 467.

Podophthalmus vigil, Nobili, 1906, p. 213.

Locality. Station IV., 1 ♂ juv. [69].

Remarks. C.l. 7 mm., C.b. including spines 14.5, frontal b. 2.5, lateral epibranchial spine 5, length of post. bord. C. 5, eye-stalk including eye 6.75 mm. The specimen is thus very small, H. Milne-Edwards's specimens were 2 to 4 inches in length.

Both chelipeds are lost, but it appears clear that the specimen comes under the present species, agreeing in other points with H. Milne-Edwards's description (*loc. cit.*) and figure (H. Milne-Edwards, *Cuv.*, pl. 9. fig. 1), except that the two pairs of antennæ are of equal length, instead of the second being much shorter than the first pair.

Family XANTHIDÆ.

Genus *CARPILIUS*, Desmarest, 1825.

27. *CARPILIUS CONVEXUS* (*Forskål*, 1775). See Alcock, 1893, p. 80.

Carpilius convexus, Nobili, 1906, p. 214.

Carpilius convexus, Stimpson, 1907, p. 37.

Locality. Station VII. A, 1 ♀ [70].

Remarks. C.l. 50 mm.

The pitting of the carapace extends over the whole of the dorsal surface; it is coarse inside the frontal and antero-lateral borders, less so in the middle region, and faint on the posterior slope.

Genus CARPILODES, *Dana*, 1851.

28. CARPILODES LÆVIS, *A. Milne-Edwards*, 1873. See *Nobili*, 1906, p. 215.

Locality. No locality given, 1 ♀ [71].

Remarks. C.l. 5·25 mm.

Areolæ 1 **M** are not separated from the inner parts of the protogastric areolæ (2 **M**); *Nobili* calls attention to the variability which occurs in this respect in the species.

29. CARPILODES RUGATUS (*H. Milne-Edwards*, 1834). See *Alcock*, 1898, p. 84.

Carpilodes rugatus, *Nobili*, 1906, p. 219.

Localities. Station VII. B, 1 ♂ small [72]; Station IX. B, 1 ♀ ovig. [73].

Remarks. ♀ 73, C.l. 6 mm., C.b. 11 mm.; ♂ 72, C.l. 4·4 mm., C.b. 8 mm.

The specimens agree very closely with the figures of *A. Milne-Edwards* (*A. Milne-Edwards*, 1865, pl. 12. figs. 3-3*b*).

Genus ATERGATIS, *de Haan*, 1833.

30. ATERGATIS ROSEUS (*Rüppell*, 1830). See *Alcock*, 1898, p. 97.

Atergatis roseus, *Nobili*, 1906, p. 229.

Localities. Station V. E, 1 ♂ [74]; no locality given, 1 ♀ [75].

Remarks. ♂ 74, C.l. 16 mm.; ♀ 75, C.l. 13 mm.

In the following points the present examples approach *A. integerrimus* (*Lamarek*): (a) the cardiac region is partly indicated by a pair of short faint curved longitudinal creases placed with convexities facing each other; (b) the dorsal surface of the carapace is irregularly and rather distantly pitted, especially near the frontal and antero-lateral borders; (c) the upper edge of the hand is bluntly and not very conspicuously crested.

The essential reason for placing the specimens under the present species is the absence of any ridge or tooth from the lateral epibranchial angle.

Genus PLATYPODIA, *Bell*, 1835.

= *Lophactæa*, *A. M.-Edw.*, 1865; see *Rathbun*, 1897, p. 159.

31. PLATYPODIA ANAGLYPTA (*Heller*, 1861). See *Alcock*, 1898, p. 102.

Lophactæa anaglypta, *Alcock*, *loc. cit.*

Lophactæa anaglypta, *Nobili*, 1906, p. 233.

Localities. Station V. B, 1 ♀ small [76]; Station V. E, 1 ♂ [77], 3 ♀ [78-80].

Remarks. ♀ 76, C.l. 6 mm., C.b. 9·5 mm.; ♂ 77, C.l. 9·5 mm.; ♀ 78, C.l. 11 mm.; ♀ 79, C.l. 17 mm.; ♀ 80, C.l. 19 mm. and C.b. 28·5 mm.

The carapace proportions apparently remain much the same during growth. Thus C.b. ÷ C.l. is about 1.5 in both ♀ 76 (C.l. 6 mm.) and ♀ 80 (C.l. 19 mm.).

The front does not present a fissure in any of the specimens.

Genus ZOSIMUS, *Leach*, 1818.

(Original orthography *Zosimus*, not *Zozymus*.)

32. ZOSIMUS ÆNEUS (*Linnaeus*, 1764). See Alcock, 1898, p. 104.

Zozymus æneus, Nobili, 1906, p. 235.

Zozymus æneus, Stimpson, 1907, p. 42.

Locality. Station VII. C, 1 ♂ [81].

Remarks. C.l. 28 mm.

Genus XANTHO, *Leach*, 1815.

33. XANTHO DISTINGUENDUS, *de Haan*, 1835. See Alcock, 1898, p. 113.

Xantho distinguendus, Nobili, 1906, p. 239.

Xantho distinguendus, Laurie, 1906, p. 401.

Localities. Station I. E, 1 ♂ [82], 2 ♀ [83, 85 ovig.]; a bottle labelled "Trials 1" 1 ♀ ovig. [84].

Remarks. ♂ 82, C.l. 11.75 mm.; ♀ 83, C.l. 7 mm.; ♀ 84, C.l. 7.5 mm.; ♀ 85, C.l. 10 mm.

In specimens 82, 84, and 85 the right, and in specimen 83 the left, chela is the larger.

34. XANTHO HYDROPHILUS (*Herbst*, 1790). (Plate 43. fig. 1.) See Alcock, 1898, p. 118.

Xantho (Leptodius) exaratus, Alcock, *loc. cit.*

Leptodius exaratus, Nobili, 1906, p. 240.

Leptodius exaratus, Nobili, 1907, p. 121.

Xantho (Leptodius) exaratus, Laurie, 1906, p. 402.

Chlorodius exaratus, Stimpson, 1907, p. 52.

Leptodius exaratus, var., Rathbun, 1911, p. 215.

Xantho hydrophilus, Stebbing, 1910, p. 297.

Localities. Station V. D, 2 ♀ [86, 87 ovig.]; Station VII. E, 1 ♂ [88].

Remarks. ♂ 88, C.l. 7 mm.; ♀ 87 ovig., C.l. 5 mm.; ♀ 86, C.l. 5 mm.

Under a lens the carapace, chelipeds, and walking-legs are seen in all three specimens to be covered with granules which are obsolescent in some places but well developed in others: thus they are obsolescent on the posterior portions of the dorsal surface of the carapace, but well seen on the anterior and antero-lateral portions, the transverse edges of the areolæ standing out conspicuously; they form a beaded row along the margin of

the front, and a less clear row of beads along the upper margin of the orbit; along the lobes of the antero-lateral borders of the carapace they tend to be dentiform in the two smaller specimens and absent in the larger one; on the rugulæ of the upper part of the outer surface of the hand they are also clearly seen, but they are very obscure on the inner surface of the palm; on the upper margin of the meropodites, carpopodites, and propodites of the walking-legs they are crisp, two rows on the upper border of the dactylopodites being more or less spiniform; there are a few minute spinules on the lower margin of the propodites and dactylopodites; on the lower margin of the dactylopodites, at the base of the terminal light brown horny claw and at right angles to it, is a strongly developed tooth, about a quarter to a third as large as the claw itself. The dactylopodites have thus for *X. hydrophilus* a well-armed aspect (Pl. 43. fig. 1). The antero-lateral teeth of the carapace are well developed and procurved.

Stimpson gives an interesting list of varieties of this highly variable species, but the present specimens do not fall under any variety described by him. They have somewhat the granulation of his var. *i*, *granulosus* (*loc. cit.* p. 56, pl. 6. fig. 3), though the spiniform tendency of the granulation of the dactylopodites of the walking-legs is not mentioned by Stimpson, while the granules of the outer surface of its hand appear in his variety to be larger and more conspicuous than in my specimens. The antero-lateral teeth have much the appearance that they have in Stimpson's figure of his var. *h*, *latus* (*loc. cit.* pl. 6. fig. 9), *i. e.* less triangular than in *granulosus*, and the last two in particular are more tooth-like in form, but their margins do not bear large granules.

The denticulate armature of the walking-legs, and of the dactylopodites in particular, is noteworthy; this and the general tendency to granulation all over the animal are differences from Alcock's description.

Genus ETISUS, *H. Milne-Edwards*, 1834.

35. ETISUS LÆVIMANUS, *Randall*, 1840*. See Alcock, 1898. p. 131.

Etisus lævimanus, *Nobili*, 1906, p. 244.

Etisus lævimanus, *Rathbun*, 1906, p. 851.

Etisus convexus, *Stimpson*, 1907, p. 36, pl. 5. fig. 2.

Locality. No locality given, 1 ♂ [89], 1 ♀ ovig. [90].

Remarks. ♀ ovig. 90, C.l. 17.5 mm., C.b. 25.25 mm., Ch.l. 30 mm.; ♂ 89, C.l. 16 mm., C.b. 23.75 mm., Ch.l. 31 mm., fronto-orbital b. 14.75 mm., frontal b. 7 mm.

It will be noticed that the chelipeds of the ♂ have by no means yet attained their enlarged condition, though the ♀, which is only a little larger, is ovigerous.

In the ♀ specimen the right, and in the ♂ the left, chela is the more massive.

* For date see p. 425.

Genus *ACTÆA*, de Haan, 1833.

- 36.
- ACTÆA TOMENTOSA*
- (
- H. Milne-Edwards*
- , 1834). See Alcock, 1898, p. 140.

Actæa tomentosa, Nobili, 1906, p. 252.*Acteodes tomentosus*, Stimpson, 1907, p. 44.*Locality.* Station VII. C, 1 ♀ non-ovig., but apparently adult [91].*Remarks.* C.l. 16 mm., C.b. 24.75 mm., C.l.÷C.b.=.65.

- 37.
- ACTÆA HIRSUTISSIMA*
- (
- Rüppell*
- , 1830). See Alcock, 1898, p. 141.

Actæa hirsutissima, Nobili, 1906, p. 252.*Localities.* Station V. A, 8 small [92-99]; Station V. B, 1 ♂ [100], 1 ♀ small [101]; Station V. C, 1 ♀ small [102]; Station V. E, 2 ♂ [103-104]; no locality given, 1 ♂ [105].*Remarks.* The largest ♂ has C.l. 15 mm. and C.b. 23.5 mm., so that C.l.÷C.b.=.64; C.l. of smallest specimen 3 mm.

- 38.
- ACTÆA GARRETTI*
- ,
- Rathbun*
- , 1906. See Rathbun, 1906, p. 852, pl. 9. fig. 8.

Actæa garretti, Rathbun, 1911, p. 218.*Actæa rufopunctata*, var. *retusa*, Nobili, 1906, p. 253.*Locality.* Station IX. A, 1 ♂ [106], 1 ♀ [107].*Remarks.* ♂ 106, C.l. 8 mm., C.b. 11.5 mm., C.l.÷C.b.=.69; ♀ 107, C.l. 7 mm., C.b. 10.75 mm., C.l.÷C.b.=.66.

- 39.
- ACTÆA POLYACANTHA*
- (
- Heller*
- , 1861). See Heller, 1861, p. 339, pl. 3. fig. 21.

Chlorodius polyacanthus, Heller, *loc. cit.**Actæa polyacantha*, Nobili, 1906, p. 259.*Actæa polyacantha*, Rathbun, 1911, p. 222.*Localities.* Station V. A, 1 ♀ [108]; Station VII. D, 1 ♀ non-ovig., but apparently adult [109].*Remarks.* ♀ 109, C.l. 7 mm., C.b. 10 mm., C.l.÷C.b.=.7; ♀ 108, C.l. 3.75 mm., C.b. 5.25 mm., C.l.÷C.b.=.68.

This species is evidently allied very closely indeed to the Australian species *peronii* of H. Milne-Edwards (Alcock, 1898, p. 150) and its Indian variety *squamosa* of Henderson (Henderson, 1893, p. 357, and Laurie, 1906, p. 404). Alcock suggests with a query that the two species may be synonymous. I have not sufficient new material before me to warrant in my opinion their union as yet. Rathbun keeps them apart and calls attention to the intermediate position occupied by *A. polyacantha* between *peronii*, H. M.-Edw., and *spinosissima*, Borradaile.

40. *ACTÆA GRANULATA* (*Audouin et Savigny*, 1826). See Alcock, 1898, p. 151.

Actæa granulata, Nobili, 1906, p. 261.

Actæa granulata, Nobili, 1907, p. 127.

Actæa pura, Stimpson, 1907, p. 44, pl. 5. fig. 7.

Actæa granulata, Stebbing, 1905 (1), p. 30.

Localities. Station I. B, 2 ♂ [110, 111]; Station I. E, 1 ♂ small [112], 1 ♀ small [113]; Station I. J, 1 ♂ [114] 1 ♀ [115]; Station I. L, 1 ♂ [116]; no locality given, 1 ♂ [117], 4 ♀ [118, 119, 120, 121 ovig.].

Remarks. ♂ juv. 113, C.l. 6.2 mm.; ♂ 110, C.l. 21 mm.; ♀ juv. 112, C.l. 4 mm.; ♀ ovig. 121, C.l. 15.5 mm.

41. *ACTÆA FOSSULATA* (*Girard*, 1859). See Alcock, 1898, p. 148.

Actæa fossulata, Nobili, 1906, p. 262.

Actæa fossulata, Nobili, 1907, p. 126.

Localities. Station V. C, 1 ♂ [122]; Station VII. B, 1 ♂ [123]; Station VII. D, 1 ♂ [124], 1 ♀ [125]; Station VII. E, 1 ♂ [126].

Remarks.

	125 ♀.	123 ♂.	122 ♂.	124 ♂.	126 ♂.
C.l.	3.5	3.1	3.25	6.0	7.75 mm.
C.b.	5.25	4.75	5.0	9.0	12.0 mm.
C.l. ÷ C.b. ....	.66	.65	.65	.66	.65

No growth-change in the ratio is indicated by the above measurements.

Genus *CHLORODIELLA*, *Rathbun*, 1897.

= *Chlorodius*, H. M.-Edw., 1884, not Leach, 1823, which latter = *Atelecyclus*, Leach, 1814; see Rathbun, 1897, p. 157.

42. *CHLORODIELLA NIGER* (*Forskål*, 1775). See Alcock, 1898, p. 160.

Chlorodius niger, Alcock, *loc. cit.*

Chlorodius niger, Nobili, 1906, p. 262.

Chlorodius niger, Nobili, 1907, p. 128.

Chlorodius niger, Stimpson, 1907, p. 50.

Chlorodiella [= *Chlorodius*] *niger*, Laurie, 1906, p. 405.

Chlorodiella niger, Rathbun, 1906, p. 857 (synonymy).

Localities. Station I. J, 2 ♀ [154, 166]; Station V. A, 3 ♂ [132, 133, 142], 2 ♀ [129, 130]; Station V. E, 6 ♂ [147, 153, 160-163], 2 ♀ [143, 146]; Station VII. D, 7 ♂ [134, 138, 144, 148, 156, 157, 164], 10 ♀ [127, 128, 135, 139, 140, 141, 145, 150, 151, 152]; no locality given, 3 ♂ [131, 158, 165], 5 ♀ [136, 137, 149, 155, 159].

Remarks. The above include 40 specimens, and as their range of size is considerable, I take the opportunity which so large a series affords of making a study of growth-change in regard to certain variable characters. Three characters are selected and their conditions set forth in the following table, which includes also the size and sex and a statement as to which is the larger cheliped:—

No. of specimen.	Sex.	C.l.	Number of lobes of ant.-lat. bord. C. which end in procurved spine-like points.	Condition of tubercle or spine on anterior margin of arm.	Armature of posterior margin of arm.	Larger chela.
127.		3.5 mm.	3	Spine.	Spiniform.	Left.
128.		3.7 mm.	3	"	"	Right.
129.		3.7 mm.	3	"	"	Left.
130.		4.0 mm.	3	"	"	Right.
131.		4.0 mm.	3	"	"	Right.
132.		4.5 mm.	3	"	"	Right.
133.		4.5 mm.	3	"	"	Left.
134.		5.0 mm.	3	"	"	Right.
135.		5.0 mm.	3	"	"	Left.
136.		5.0 mm.	3	"	"	Left.
137.		6.0 mm.	3	"	"	Right.
138.		6.0 mm.	3	"	"	Right.
139.		6.0 mm.	3	"	"	Left.
140.		6.0 mm.	3	"	Granular.	Right.
141.		6.0 mm.	2	"	"	Right.
142.		6.5 mm.	3	"	Spiniform.	Left.
143.		6.5 mm.	3	"	Granular.	Right.
144.		6.5 mm.	2	"	"	Left.
145.		6.7 mm.	3	"	"	Right.
146.		7.0 mm.	3	"	"	Left.
147.		7.2 mm.	2	"	"	Left.
148.		7.5 mm.	3	"	"	Left.
149.		7.5 mm.	2	"	"	Left.
150.		7.7 mm.	2	"	"	Right.
151.		8.0 mm.	3	"	"	Left.
152.		8.0 mm.	2	"	"	Left.
153.		8.0 mm.	2	"	"	Right.
154.		8.0 mm.	2	"	"	Left.
155.		8.0 mm.	2	"	"	Left.
156.		9.0 mm.	2	"	"	Right.
157.		9.0 mm.	2	Small tubercle.	"	Left.
158.		9.0 mm.	3	Spine.	"	Right.
159.		9.0 mm.	1	Tubercle.	"	Left.
160.		9.5 mm.	2	Pointed tubercle.	"	Right.
161.		9.5 mm.	0	Small tubercle.	"	Right.
162.		10.0 mm.	1	Tubercle.	"	Right.
163.		11.0 mm.	0	Small tubercle.	"	Right.
164.		11.0 mm.	1	Small tubercle.	"	Left.
165.		11.5 mm.	0	Tubercle.	"	Left.
166.		12.0 mm.	0	Tubercle.	"	Left.

It will be noticed that, as a rule, crabs with C.l. from 3.5 to 6.5 mm. have the last three of the antero-lateral lobes spiniform, those with C.l. 7 to 9 mm. have the last two lobes spiniform, those with C.l. 9.5 to 11 mm. tend to have only the last lobe spiniform, and that in those with C.l. above 11 mm. there is an absence of the spiniform condition in all the lobes.

It will be further noted that the above is only an average relation and that variability is not the same in crabs of all sizes. Thus, where C.l. is 3.5 to

6 mm., variability is practically nil, whereas variability is high in crabs with C.l. from 9 to 11 mm.

The spiniform character of the tooth on the anterior edge of the arm gives place to the tubercular condition in crabs whose C.l. has reached about 9 mm.

The spiniform armature of the posterior edge of the arm becomes granular when the C.l. reaches about 6 mm.

Another point to be noted is that ovigerous females occur with C.l. of only 6 mm. and that the different conditions of the characters above described are thus related with size rather than with sexual maturity ; this is quite usual among crabs. On the other hand, the same ovigerous specimens have the broadened form of abdomen, an example of a character associated with sexual maturity rather than with size.

The number of individuals in which the right or left hand respectively is the larger is approximately equal, thus the right is larger in 19 and left in 21 individuals.

Some notes on the high variability of this species are given by A. Milne-Edwards (1873 (1), p. 214).

42 a. CHLORODIELLA NIGER, var. CYTHEREA (Dana, 1852). See Dana, 1852, p. 213, pl. 12. figs. 2 a-c.

Chlorodius cytherea, Dana, loc. cit.

Chlorodius cytherea, Stimpson, 1907, p. 50.

Localities. Station V. G, 1 ♂ juv. [167], 5 ♀ juv. [168-172]; Station IX. A, 4 ♂ [173-176], 2 ♀ ovig. [177, 178].

Remarks. C. l. ranges in the ♀ specimens from 2 to 4.5 mm. and in the ♂ from 3 to 5.25 mm. In the largest ♂ (176) C.b. is 8.25 mm. and C.b. ÷ C.l. = 1.57.

The length of the larger cheliped is related to the carapace length as follows :—

	177 ♀ ovig.	178 ♀ ovig.	173 ♂.	174 ♂.	175 ♂.	176 ♂.
C.l.	4.0	4.5	4.0	4.75	5.0	5.25 mm.
Ch.l.	7.75	8.75	8.0	9.75	12.0	11.25 mm.
Ch.l. ÷ C.l.	1.94	1.94	2.00	2.05	2.40	2.10
Larger Ch.	Right	Right	Left	Left	Right	Left

C. cytherea (Dana) is included by Alcock (Alcock, 1898, p. 160) as a synonym of *C. niger*. It appears possible that it may come to be re-elevated to specific rank, but I have not sufficient data to warrant my taking this step.

Var. *cytherea* has not hitherto been recorded from the Red Sea.

Genus PHYMODIUS, *A. Milne-Edwards*, 1863.

43. PHYMODIUS UNGULATUS (*H. Milne-Edwards*, 1834). See Alcock, 1898, p. 162.

Phymodius ungulatus, Nobili, 1906, p. 264.

Phymodius ungulatus, Nobili, 1907, p. 129.

Phymodius ungulatus, Rathbun, 1906, p. 857.

Phymodius ungulatus, Borradaile, 1902 (2), p. 259.

Phymodius monticulosus, Alcock, 1898, p. 163.

Phymodius monticulosus, Nobili, 1906, p. 264.

Phymodius obscurus, Rathbun, 1906, p. 858.

Locality. Station VII. D, 10 ♂ [179–188], 6 ♀ (1 ovig.) [189–194].

Remarks. ♂ C.l. varies from 4.25 to 6.5 mm.; ♀ ovig. C.l. 5 mm.

In five of the males the right, and in five the left, chela is the larger.

The specimens fall under Alcock's description of *P. ungulatus*.

Regarding the inclusion of *P. obscurus* (Lucas) (= *P. monticulosus* (Dana)) under *P. ungulatus*, see Borradaile, *loc. cit.*, but also Nobili, 1906, *loc. cit.*

44. PHYMODIUS SCULPTUS (*A. Milne-Edwards*, 1873). See Alcock, 1898, p. 164.

Phymodius sculptus, Nobili, 1906, p. 265.

Localities. Station VII. B, 1 ♂ [195]; Station IX. A, 2 ♂ [196, 197], 5 ♀ [198–202].

Remarks. The specimens show growth-change in regard to the condition of the antero-lateral lobes. In the two smallest specimens, ♀ 198 (C.l. 3.9 mm.) and ♀ 199 (C.l. 4.3 mm.), all four lobes are produced into procurved spines; in ♀ 200 (C.l. 4.7 mm.) the three most posterior lobes are produced into procurved spines; and in all the remaining five specimens with C.l. ranging from 7 to 9.25 mm. the last two only of the lobes are so produced. C.l. of these last five specimens is as follows:—♀ 7 mm.; ♀ 7.5 mm.; ♂ 8.25 mm.; ♂ 9 mm.; ♂ 195, 9.25 mm.

In ♂ 195 the right, and in the other two ♂ specimens the left, chela is the larger.

Genus CHLORODOPSIS, *A. Milne-Edwards*, 1873.

45. CHLORODOPSIS ARABICA, n. sp. (Plate 42. figs. 1–1 b; Pl. 43. figs. 2, 4 a–4 d.)

Localities. Station V. E, 3 ♂ [203–205]; Station VI. 1 ♂ [212]; Station X. 1 ♂ [206], 4 ♀ [207–210]; no locality given, Crossland's label reads "A part of the fauna of two dead valves of *M. margaritifera* which were covered by sponges etc. and supported a regular microcosmos of life," 1 ♀ adult non-ovig. [211].

Description of ♂ 203.—The entire carapace is cut into distinct areolæ, isolated by broad fairly deep channels. All the areolæ are granulated: those

of the posterior half are closely covered with small rounded granules (smaller and more numerous than in *C. areolata* (H. M.-Edw.)). The areolæ of the anterior half of the carapace have a more lumpy surface, they are more prominent and end more abruptly in their anterior portions, but slope off gradually posteriorly, and the granules covering them have also their more prominent part directed anteriorly and the dorsal surface planed off, as it were, posteriorly, so as to slope gradually backwards; the granules also are more irregular in size on the anterior part of the carapace, larger ones tending to cluster at the anterior margins of the areolæ, as may be well seen, for example, in 2 F, where an appearance is produced which contrasts markedly with the rounded character of the same areolæ in *C. areolata*. The dividing channels are naked; they are smooth in front of the cervical groove, but tend to be obscurely granular behind this. There is no hair on the dorsal surface of the carapace, except a bristle or two here and there.

The front is distinctly and broadly cut by a U-shaped notch into two lobes, the outer angle of each of which forms a separate lobule. The free margin of the large inner frontal lobes bears a neat row of bead-like granules.

The three fissures of the granular orbital margin are well marked, giving a lobed appearance.

The antero-lateral border is divided into four rounded-triangular lobes, in addition to the outer orbital angle, of which the third is the most prominent. The greatest breadth of the carapace is therefore across this region.

All the areolæ of Dana's scheme are clearly visible and some of them are further subdivided: 2 M is divided by a longitudinal groove into a smaller inner and a larger outer portion, 6 L is subdivided into two, the tooth S is distinct from the areola 1 R, 2 R is divided into two; the narrow median anterior process of 3 M runs forward between the posterior portions of the inner borders of 2 M, 1 P is shaped as in *C. areolata*, having a median notch anteriorly, corresponding with the median posterior projection.

The epistome is smooth, the sub-hepatic and sub-branchial regions are granulated, as also the sternum between the chelæ; granulation becomes obscure and pitting mingles with it on the sterna between the walking-legs. All these regions are naked or practically so.

There is an inconspicuous granulated sub-hepatic tubercle.

The outer distal angle of the basal antennal joint is drawn out into the large orbital hiatus, so as to lie against the inner angle of the lower orbital margin, but it falls very far short of filling the hiatus; the inner distal angle falls short of the hiatus and slopes obliquely where it comes in contact with the turned-down outer frontal lobe. The antennal flagellum arises from the basal joint where the latter makes an angle with the outer frontal lobe, and so lies in the hiatus.

The exposed surface of the external maxillipedes is naked, but the inner margin of the ischium has a short fringe of delicate hairs, very different from

the stout fringe in *C. areolata*. The merus is granular; it has a prominent rounded, somewhat upturned antero-external angle; its anterior margin is notched, as also is its antero-internal angle, proximal to the latter notch is a smooth-floored depression. The ischium has a slight granulation anteriorly and slight pitting posteriorly; it has a longitudinal groove to the inner side of the middle line.

Chelipeds subequal in length, a little less than twice the length of the carapace, but one (left) chela is considerably the more massive. The whole surface of the chelipeds, including the larger rounded tubercles of the exposed surface of the wrist (2 tubercles mark the inner angle) and the tubercles of the upper border of the hand, is granulated. On the outer surface of the hand the tubercles become smaller, particularly on the lower part of the tuberculated area, and smooth, and tend to run in 4 longitudinal rows, of which the 3rd, counting from above, runs along the middle and is much the best defined, and the 4th runs on to the proximal portion of the fixed finger. The fingers are well arched, the apposed borders not meeting except at their cup-shaped tips, and each armed with three teeth. The arrangement of these teeth is the same in the two chelæ, but their relative proportions differ a good deal. In both chelæ those of the movable finger are equidistant, while the distal tooth of the fixed finger is well removed from the other two and faces the large gap distal to the third tooth of the dactylus. In the smaller chela these teeth are of approximately equal size and not particularly large, but in the larger chela the 1st and 3rd of the dactylus and the 2nd of the fixed finger are enlarged. Each dactylus has a few granules on its upper margin proximally, also a pitted groove on its upper margin, and both dactylus and fixed finger have two pitted grooves on the outer surface.

Chelipeds in ♀ (specimen 211) are little more than one-half as long again as the carapace. They are less massive than in the ♂, subequal and very similar. The fingers are less strongly arched than in the ♂, but, as in the ♂, they only meet at their hollowed tips. The teeth of the fingers are not enlarged except the middle one of the fixed finger, and this by no means to the same extent as in the ♂. The armature is sharper, the granules of the tubercles of the wrist and upper border of the hand are crisp, the two tubercles of the inner angle of the wrist are spiniform and curved, the smooth tubercles of the outer surface of the hand are conical and pointed; on the same surface of the hand the tubercles extend almost to the ventral margin. Some of the above differences may be due to the smaller size of the ♀ specimen described as compared with the described ♂; it has, however, though non-ovigerous, the well-fringed broad abdomen, which may be taken to indicate sexual maturity.

The dorsal margin of the walking-legs, the ventral margin of their last two joints, and to a less extent the posterior surface of their last three joints bear

fairly long scattered setæ, which do not, however, hide the armature beneath them. The lower and posterior surfaces of the meropodite are granular, the anterior surface is smooth, the upper border bears a row of about seven long sharp teeth. The carpopodite has a double row of teeth on its dorsal border and a third row on the upper part of the posterior surface. The anterior and posterior rows of teeth are continued along the propodite, the posterior one being brought up to a higher level; the middle row is continued halfway along the propodite in the 1st, not so far in the 2nd, a single tooth in the 3rd, and not at all in the 4th walking-leg. The teeth are continued along the upper edge of the dactylopodite. There are a few small teeth distally on the lower border of the meropodite, a single distally directed sharp tooth on the distal end of the lower border of the propodite, and two rows of small teeth on the lower border of the dactylopodite, terminating in a pair of larger ones at the base of the brown claw.

The abdominal terga are in both sexes smooth for the most part, with a few setæ along the lines of articulation of the segments. The margin of the abdomen is fringed inconspicuously with short setæ in the ♂, and in the ♀ with conspicuous long setæ. The abdomen is 7-segmented in the ♀ and 5-segmented in the ♂.

Colours in spirit whitish, with the anterior portion of the carapace and the meri and carpi of the chelipeds a faint orange-red, the same colour much deeper on the hands and also on the exposed surface of the external maxillipedes; fingers chocolate-brown with white tips, the colour of the fixed finger extends a short but quite evident distance along the lower border and both surfaces of the hands.

Remarks. The smaller specimens differ from the larger ones as follows:—

(1) The armature is sharper: thus the granulation of the carapace and chelipeds is crisp, and the tubercles of the chelipeds are dentiform, the two at the inner angle of the wrist in particular are stout curved spines.

(2) The areolæ are less distinct.

(3) The antero-lateral lobes tend to be spiniform and procurved (see Table, p. 454).

(4) In the young ♂ the chelæ show less differentiation from each other and from the ♀ type, and in the young ♀ the abdomen is fringed with short inconspicuous setæ only.

Apart from the above changes, associated with growth, there appears to be considerable variation in the distinctness of the granulation and areolation of the carapace, this being most pronounced in specimens 206 and 212.

The following table illustrates certain growth-changes, together with some characters of the genus *Chlorodopsis*, and also shows that either cheliped may be the larger in the present species:—

	♀ 210.	♀ 209.	♀ 207.	♀ 208.	♀ 211.	♂ 212.	♂ 205.	♂ 203.	♂ 206.	♂ 204.
C.l.	5.0	6.1	7.0	7.0	7.5	6.75	6.75	8.50	9.0	9.25
C.b.	6.9	8.5	9.75	10.0	10.75	9.75	10.0	12.75	14.0	13.75
Fronto-orbital b.	5.0	6.0	6.75	6.75	7.25	6.75	6.75	8.5	8.75	9.0
Frontal b.	2.5	3.0	3.4	3.4	3.75	3.25	3.25	4.25	4.25	4.5
Major diameter orbit ..	1.0	1.2	1.5	1.5	1.75	1.5	1.5	2.0	2.0	2.0
Ch.l. (larger)	7.5	9.75	10.75	10.75	11.5	11.4	..	17.0	..	17.75
Ch.l. (smaller)	7.5	9.75	10.75	10.75	11.5	11.0	..	16.25	..	..
Lower bord. propus } (larger)	4.0	5.1	5.75	5.75	6.5	6.1	..	9.5	..	10.0
Lower bord. propus } (smaller)	4.0	5.1	5.75	5.75	6.5	5.8	..	9.0	..	..
Propus h. (larger)	1.5	1.9	2.0	2.0	2.3	2.8	..	4.25	..	4.25
Propus h. (smaller)	1.5	1.9	2.0	2.0	2.3	2.25	..	3.25	..	..
Fronto-orb. b. ÷ C.b. ....	.72	.71	.69	.67	.67	.69	.67	.66	.62	.65
Frontal b. ÷ C.b. ....	.36	.35	.35	.34	.35	.33	.32	.33	.30	.33
Ch.l. (larger) ÷ C.b.	1.50	1.60	1.54	1.54	1.53	1.69	..	2.00	..	1.92
Number of side-lobes, counting from behind, which are spiniform .	3	3	3	4	1	1 on left	2	0	1	1
Condition of the two prominences on inner angle of wrist	Spines	Spines	Spines	Spines	Spines	Blunt tubercles	Teeth	Blunt tubercles	..	Blunt tubercles
Larger cheliped	Left	Right	Left	Left	Right	Left	Left	Left	..	Left

The new species has affinities with several other species of *Chlorodopsis*. From *C. areolata* it can be distinguished (*a*) by the type of granulation of the carapace and more particularly of the anterior half, for *C. areolata* has a regular covering of larger pearly granules which are rounded and of similar size in anterior and posterior regions alike; (*b*) by the absence of the coat of very short fur from dorsal and ventral surfaces of the carapace and from the exposed surface of the external maxillipedes, chelipeds, and walking-legs; (*c*) by the scattered arrangement of the less numerous long setæ fringing the walking-legs, not hiding the dorsal armature of the latter—this contrasts with the dense close fringe in *C. areolata*; (*d*) by a few differences in the areolation, thus the areolæ 2 F have a much more irregular appearance than in *C. areolata*, where they are rounded and evenly granular; the anterior narrow portion of 3 M extends forward between the posterior borders of the pair 2 F; 3 M has less tendency to be tripartite; (*e*) by the wider orbital hiatus and less extent to which it is filled by the basal joint of the antenna; (*f*) by the armature of the dorsal margin of the three distal joints of the walking-legs, which makes some approach to that of *C. spinipes*—that of *C. areolata* is hidden by the fringe of setæ, and when the latter is removed is found to be reduced to a granulation in carpopodite and propodite, and entirely absent from dorsal edge of dactylopodite.

The new species may be distinguished from *C. spinipes* and *C. wood-masoni* (*a*) by the continuation of the areolation over the posterior portion of the

carapace, though here the grooves between the areolæ are shallower than in the anterior part; (*b*) by the longitudinal division of areolæ 2 M; (*c*) by the less spiniform character of the armature on the antero-lateral regions of the carapace and the frontal margin; (*d*) the tubercles of the chelipeds are not spiniform as in *C. spinipes*, but are much as in Alcock's figure (Alcock, 1899 (3), Pl. 37. fig. 7) of *C. wood-masoni*, though less numerous on the larger hand; (*e*) the hands of the ♀ are subequal in *C. arabica* and the tubercles of their outer surfaces arranged in more definitely separated straight lines (see figs.); (*f*) the armature of the dorsal margin of the carpopodite and propodite of the walking-legs is less spiniform than in *C. spinipes* (Pl. 43. figs. 3 a-3 d), more as in Alcock's figure of *C. wood-masoni*. It will be noted that in (*d*) and (*f*) *C. wood-masoni* differs from *C. spinipes* in the direction of the new species. Characters in which the new species approaches *C. spinipes* and *C. wood-masoni* include the type of granulation of the anterior portion of the carapace, the arrangement of the setæ of the walking-legs, and the almost naked character of the carapace.

An interesting character in all species of *Chlorodopsis* is the form and relation of the basal antennal joint. In this, which has been described above, the new species differs a good deal from both *C. areolata* and *C. spinipes* (A. Milne-Edwards, 1873 (1), pl. 8. figs. 8 & 6 a), and has much the same appearance as in three specimens of *C. pilumnoides* from Ceylon which I have before me (recorded by Laurie, 1906, p. 406).

The new species falls under section I. of Alcock's key to the Indian species of *Chlorodopsis* (Alcock, 1898, p. 165), becoming thus associated with *C. areolata*, from which it is distinguished as above.

Type specimens are in the British Museum.

46. CHLORODOPSIS SPINIPES (Heller, 1861). (Plate 43. figs. 3 a-3 d.) See Alcock, 1898, p. 169.

Chlorodopsis spinipes, Nobili, 1906, p. 270.

? *Chlorodopsis wood-masoni*, Alcock, 1898, p. 170, and 1899 (3), pl. 37. fig. 7.

Localities. Station V. B, 2 ♂ [213, 214], 1 ♀ [215]; Station V. C, 1 ♂ [216], 2 ♀ [217, 218]; Station V. D, 5 ♂ [219-223], 1 ♀ [224]; Station V. E, 1 ♀ [225]; Station VII. D, 1 ♀ [226].

Remarks. Except as regards the denticulation of the frontal margin, all the specimens fall fairly well under Alcock's description of *C. spinipes*.

One may note in particular:—

(*a*) In all cases the first tooth of the antero-lateral border of the carapace is much reduced as compared with those following it. This is the case in *C. spinipes*.

(*b*) In one example, specimen 226, there is a minute spinule about half-way along the posterior border of the second antero-lateral spine of each side; this is absent in the other examples, where the condition is as in *C. spinipes*.

(c) The spines on the walking-legs are more pronounced than in Alcock's figure of *C. wood-masoni*.

(d) The armature of the wrist and hand is markedly acicular, giving an appearance very different from the tubercles figured by Alcock for *C. wood-masoni*; in the case, however, of the ovigerous female, specimen 218, the condition of the right cheliped makes a decided approach to Alcock's figure just named.

So far then the present specimens fall without doubt under *C. spinipes* in spite of (b) and (d) above, but they agree with *C. wood-masoni* in the denticulate character of the frontal margin. In this latter character they differ a good deal among themselves, but Alcock's figure of *C. wood-masoni* gives a very fair idea of the frontal condition in some of them. It appears doubtful whether Heller's figure of *C. spinipes* is intended to convey any different impression.

The following is the condition in each of the present specimens:—

No. of specimen.	Sex.	C.l.	Number of denticles on left inner lobe of front.	Number of denticles on right inner lobe of front.	Enlarged denticles of inner frontal lobes; the numbers are from inner end. (Outermost denticles excluded.)
219.	♂	mm. 3·25	23	23	{ 2nd, 3rd, 4th, and 5th on each lobe (1st is small on right and very small on left).
220.	♂	3·25	22	22	{ 2nd, 3rd, and 4th on right. 1st, 2nd, and 3rd on left.
224.	♀	3·75	4+?+5	6+?+5	{ 2nd and 3rd on each. (Denticles obsolescent on middle of each lobe.)
215.	♀ ovig.	4·25	17	17	1st, 2nd, and 3rd on each,
221.	♂	4·5	14	13	None enlarged.
217.	♀	5·0	16	16	{ 2nd and 3rd on right. 2nd, 3rd, and 4th on left.
218.	♀ ovig.	5·0	12	12	1st on each.
216.	♂	5·0	11	11	1st on each.
222.	♂	5·25	16	14	{ 2nd and 3rd on right. 2nd, 3rd, and 4th on left.
223.	♂	5·5	18	18	2nd and 3rd on each.
213.	♂	5·5	13	13	1st and 2nd on each.
225.	♀	6·25	8	10	{ 1st, 2nd, 5th, and 7th on right. All on left.
226.	♀	6·25	6	7	All.
214.	♂	7·0	8	11	All, particularly 1st on each.

The outermost tooth of the inner frontal lobe, and in some cases more than one tooth in this position, is also enlarged. There is a similarly enlarged tooth on the small outer frontal lobe to the inner side of the much larger terminal tooth.

It will be noted that the number of teeth is very variable. The larger teeth are of an order of size easily made out under a hand lens which magnifies 6 diameters.

To sum up :—The specimens fall under *C. spinipes*. *C. wood-masoni* has, however, a frontal condition difficult to distinguish from that of *C. spinipes*. The presence of the minute accessory spinule in specimen 226 and the character of the right chela in specimen 218 should be noted as some approach to *C. wood-masoni*. One could hardly perhaps unite the two species on the data supplied by the present specimens, but on the other hand Nobili's remark is to be kept in mind to the effect that examples examined by him throw grave doubt upon their specific distinction.

Genus CYMO, *de Haan*, 1833.

47. CYMO ANDREOSSYI (*Audouin et Savigny*, 1826). See Alcock, 1898, p. 173.

Cymo Andreossi, Nobili, 1906, p. 271.

Cymo Andreossi, Nobili, 1907, p. 129.

Cymo andreossi, Laurie, 1906, p. 406. (A single specimen, which belongs to var. *melanodactylus*.)

Cymo andreossi, Stimpson, 1907, p. 60.

Localities. Station I. J, 1 ♂ [227]; Station V. E, 1 ♂ [228], 3 ♀ [229–231]; Station VIII. D, 4 ♂ [232–235], 2 ♀ [236, 237].

Remarks. ♂ 227 is apparently adult, C.l. 18 mm., C.b. 19 mm.; all the others are small, C.l. from 3.25 to 6 mm.

The small ♀ specimens 229 and 236, with C.l. 6 and 5.5 mm. respectively, though not ovigerous, appear to be adult, whereas another specimen with C.l. only 4 mm. is immature.

The frontal breadth of the large specimens agrees with Alcock's description, " $\frac{2}{3}$ the greatest breadth of the carapace," if it be taken to include the inner supraorbital angles; but if the latter be excluded then the front is only $\cdot 33$ the greatest breadth of the carapace.

In all the specimens the granules lose their sharpish character on the lower part of the outer surface of the larger hand, becoming here more rounded and pearl-like.

In the large specimen 227 the granules on the upper part of the outer surface of the wrist and hand are sharpish conical; in the other and smaller specimens the granules in this position are sharper, and in some specimens some of them are almost spines.

The areolation of the carapace is less clearly seen in the small specimens.

The present examples do not include any having the brown fingers of var. *melanodactylus*, de Haan, which variety is, however, also recorded from the Red Sea. For the synonymy of var. *melanodactylus*, see Alcock, 1898, p. 174;

later records have been made by Nobili, 1906, p. 271, and Nobili, 1907, p. 129; see also *Cymo melanodactylus*, Stimpson, 1907, p. 59. I take this opportunity of pointing out that the specimen recorded from Ceylon by Laurie, 1906, p. 406, under the name of *Cymo andreossyi* also belongs to *var. melanodactylus*.

Nobili found transitional conditions of finger-coloration both in Red Sea specimens and in examples from the Persian Gulf.

Genus *PILUMNUS*, Leach, 1815.

48. *PILUMNUS PROPINQUUS*, Nobili, 1905. See Nobili, 1907, p. 140.

Pilumnus propinquus, Nobili, 1906, p. 277, pl. 9, fig. 7.

Localities. Station VII. B, 2 ♂ [238, 239], 2 ♀ [240, 241]; Station X., 1 ♂ [242], 2 ♀ [243, 244]; no locality given, 1 ♂ [245].

Remarks. ♂ C.l.s. are 5, 6, 6.75, and 8.75 mm. respectively; ♀ C.l.s. 4.5, 4.75, 5.25, and 6 mm. respectively. The largest ♂ (245) has C.b. 12 mm., so that $C.b. \div C.J. = 1.37$; frontal b. of same specimen 3.75 mm. without the inner orbital angles and 5 mm. if the latter be included; distance between outer orbital angles 8.75 mm. These measurements agree very well with those of the specimen described by Nobili.

In the present specimens the armature of the chelipeds and walking-legs is less emphasized than in Nobili's description of forms from the Persian Gulf: thus (a) they have in general on the meropodites of the walking-legs only the distal spine of the upper border and this is in a few instances replaced by a blunt tubercle; Nobili calls attention to the variation in the degree of spininess of the meropodites in his forms from the Persian Gulf and notes that the meropodites were without spines in his Red Sea (Djibouti) examples; (b) the tubercles of the wrist and upper part of the outer surface of the hand are as a whole conical and pointed; some of them, indeed, more particularly on the smaller hand, are elongated, but very few, and in some specimens none, could be called spiniform; (c) in all the subhepatic tooth is present, but it tends to be tubercular rather than spiniform; (d) none of the spines is blackish.

In all except the ♀ 241 it is the right hand which is the more massive.

Genus *ACTUMNUS*, Dana, 1851.

49. *ACTUMNUS SETIFER* (de Haan, 1835), var. *TOMENTOSUS*, Dana, 1852. See Alcock, 1898, p. 202.

Actumnus setifer, var. *tomentosus*, Laurie, 1906, p. 408.

Actumnus tomentosus, Alcock, loc. cit.

Actumnus tomentosus, Nobili, 1907, p. 132.

Localities. Station V. D, 1 ♂ [246], 4 ♀ [247-250]; Station VII. B, 1 ♀ [251]; Station X., 1 ♀ [252]; no locality given, labelled "Trials I.," 2 ♀

[253, 254]; no locality given, labelled "Sponge Inhabiters, 11 Jan., 1905," 1 ♀ [255].

Remarks. The only ♂ in the above series has C.l. 5.75 mm. Specimens 249, 251, and 252, though all ovigerous, are of very different size, C.l. 4, 6, and 11 mm. respectively. Specimens 255, 254, and 253 are not ovigerous, but apparently adult, C.l. respectively 7.5, 8, and 8.5 mm.

♀ 250 and ♀ 254 have each a parasitic *Sacculina* attached to the abdomen, C.l. 4.5 and 8 mm. respectively.

Regarding the position of *tomentosus* as a variety of *A. setifer*, see Miers, 1884, p. 225, and Laurie, *loc. cit.*

A. setifer has not been hitherto recorded from the Red Sea.

50. ACTUMNUS BONNIERI, *Nobili*, 1905. See *Nobili*, 1907, p. 132, pl. 6. fig. 32.

Actumnus Bonnierii, *Nobili, loc. cit.*

Actumnus Bonnierii, *Nobili*, 1906, p. 285.

Actumnus bonnierii, Laurie, 1906, p. 409.

Actumnus bonnierii, Rathbun, 1911, p. 232.

Localities. Station VIII. C, 1 ♂ [256]; Station X., 1 ♀ ovig. [257].

Remarks. ♀ ovig. 257 has C.l. 9.25 mm.; ♂ 256 has C.l. 7.5 mm.

Genus HETEROPANOPE, *Stimpson*, 1859.

51. HETEROPANOPE VAUQUELINI (*Audouin et Savigny*, 1826). See *Heller*, 1861, p. 344.

Pilumnus Vauquelini, *Heller, loc. cit.*

Heteropanope Vauquelini, *Nobili*, 1906, p. 285.

Localities. Station I. B, 7 ♂ [258-264], 5 ♀ [265-269]; Station I. C, 4 ♂ [270-273]; 9 ♀ [274-282]; Station I. D, 1 ♂ [283], 10 ♀ [284-293]; Station I. E, 3 ♂ [294-296], 10 ♀ [297-306]; Station I. H, 1 ♂ [307]; no locality given, labelled "Sponge Inhabiters, 11 Jan., 1905," 2 ♂ [308, 309], 3 ♀ [310-312]; no locality given, labelled "Trials I.," 1 ♂ [313], 3 ♀ [314-316].

Remarks. There are 59 specimens in all. C.l. ranges in ♀ from 2.75 to 7.25 mm. and in ♂ from 2.75 to 8.25 mm. None of the ♀ specimens are ovigerous, but all having C.l. 4 mm. or over, with the exception of two, have an adult appearance. The largest ♂ has C.l. 8.25 mm. and C.b. 11.5 mm., so that C.l. × C.b. = 72.

Of 50 specimens 35 (12 ♂ and 23 ♀) have the right hand, and 15 (7 ♂ and 8 ♀) the left hand, the more massive. *Heller* also found that in his examples it was generally the right hand which was the larger.

The specimens agree very fairly with *Heller's* description (*loc. cit.*) and *Savigny's* figure (*Savigny*, 1826, pl. 5. fig. 3). There is a good deal of variation in the distribution of hair on the carapace, a point noted also by

Nobili. The lower border of the orbit is granular or crenulated in all the specimens, which was the case in Nobili's examples.

The carapace of ♀ 284 is asymmetrical and abnormal in regard to its antero-lateral teeth; on its left side the second tooth is reduced to a slender spine and on its right side only two teeth are present.

Genus *TRAPEZIA*, *Latreille*, 1825.

52. *TRAPEZIA CYMODOCE* (*Herbst*, 1801). See *Alcock*, 1898, p. 219.

Trapezia cymodoce, Nobili, 1906, p. 292.

Trapezia cymodoce, Laurie, 1906, p. 410.

Grapsillus cymodoce, Rathbun, 1906, p. 865, pl. 11. fig. 6.

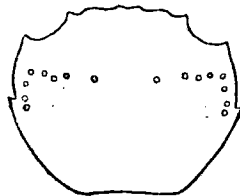
Trapezia cymodoce, Rathbun, 1911, p. 234.

Localities. Station I. D, 1 ♂ [317]; Station V. D, 1 ♀ juv. [318]; Station V. E, 1 ♂ [319], 2 ♀ [320-321]; Station VII. B, 3 ♂ [432-434]; Station VII. D, 16 ♂ [322-335, 359, 360], 15 ♀ [336-349, 361] (9 ovig.); Station IX. A, 1 ♂ [362]; no locality given, 3 ♂ [356-358], 9 ♀ [350-355, 363-365] (4 ovig.).

Remarks. In all 52 specimens, except only the large ♂ 360, the outer division of the frontal lobe of each side is seen to be crenulated when examined through a lens.

In most of the specimens a transverse line of rounded red spots is more or less evident on the carapace when carefully looked for. In no case is this

Fig. 2.



Trapezia cymodoce. Dorsal view to show position of line of spots.

line obvious to the naked eye at a casual glance, but on a more careful examination, especially with a hand-lens, it can be made out very completely in seventeen specimens (in ten of which, however, the colour appears to have faded, leaving the spots whitish), incompletely in seven, an inner pair of spots only in twelve, and not seen in sixteen. Of those specimens in which it is not seen twelve are quite small; other small specimens, however, have it present. It appears as if the presence of the complete line is normal in the living condition and that the other less complete conditions represent stages in fading of spirit-specimens. Even in some of those described above as not showing it, traces were discovered on careful examination under a Zeiss

binocular dissecting microscope. The line under consideration commences on either side just inside the lateral epibranchial spine and runs forwards to curve inward halfway between this and the outer orbital tooth, then running inward and slightly backward to terminate in a spot somewhat larger than the others well to the side of the middle line. Thus the whole line is divided into right and left halves, which are symmetrical. The spots are closer together on the branchial portions of the line.

The growth-changes in this species are considerable, as the following table will illustrate:—

No. of specimen.	Sex.	C.l.	C.b.	C.b. C.l.	Antero-lateral borders of carapace.	Condition of lateral epibranchial tooth.	Condition of teeth on anterior border of merus of cheliped.	Condition of teeth on anterior border of carpus of cheliped.
362.	♂	mm. 2·8	mm. ..	..	Anteriorly divergent.	Spiniform.	Spiniform, procurved.	Spiniform.
363.	♀	3·5	..	..	"	"	"	Acute.
364.	♀ ovig.	6·0	..	..	Approx. parallel.	"	Acute, procurved.	"
365.	♀	7·75	..	..	Anteriorly convergent.	"	"	"
359.	♂	10·75	12·5	1·16	"	Blunt.	Squarish, procurved.	Blunt.
360.	♂	13·0	15·5	1·19	"	Notch.	Blunt, a little procurved.	Absent.
361.	♀ ovig.	13·0	17·0	1·31	"	Obscure notch.	"	"

During growth the main changes are (1) from spiniform armature to an armature which is more blunt and less conspicuous; (2) from anteriorly divergent to anteriorly convergent antero-lateral borders of the carapace.

The large difference in size between the two ovigerous females should be noted. The smaller specimen has reached the egg-bearing stage, while still showing the general characters appropriate to a comparatively early growth-stage.

The different ratio between carapace length and breadth in the large males and the large female will be noted, due to the greater relative width of carapace in the female.

Out of seventeen ♂ specimens with C.l. ranging from 16 to 15 mm., eleven have the left and six the right hand the more massive.

Var. *edentula*.—I suggested this name for a specimen from Ceylon (*loc. cit.*), in which the lateral epibranchial tooth was absent and the hand naked. The former character appears of doubtful value, in view of the considerable

changes during growth indicated by the above table; but specimens 359-365 of the present collection have also a naked hand. (As the specimens happen to make a convenient series in regard to size I have used them for the table above).

52 a. *TRAPEZIA CYMODOCE*, var. *MACULATA* (*Macleay*, 1838). See Alcock, 1898, p. 221.

Trapezia maculata, Alcock, *loc. cit.*

Trapezia maculata, Nobili, 1906, p. 293.

Trapezia maculata, Laurie, 1906, p. 410.

Trapezia maculata, Stimpson, 1907, p. 73.

Grapsillus maculatus, Rathbun, 1906, p. 865.

Trapezia cymodoce maculata, Rathbun, 1911, p. 235.

Locality. Station VII. D, 1 ♂ [366], 1 ♀ ovig. [367].

Remarks. ♀ ovig. 367 has C.l. 14.5 mm., greatest C.b., a line joining points of union of antero-lateral and postero-lateral borders, 17.5 mm., Ch.l. 28 mm., merus l. measured from most proximal to most distal point of lower surface 9 mm.; C.b. across region of outer orbital teeth 15 mm., so that the antero-lateral borders, which are a little convex, slope inwards anteriorly. The outer angle of the orbit is pointed. The inner angle of the lower margin of the orbit bears a sharp tooth. The boundary between the antero-lateral and postero-lateral borders of the carapace is marked by a blunt tubercle. The inner angle of the wrist bears a blunt pointed tubercle in place of a spine. There are 118 red spots visible in a dorsal view of the carapace, a few of them tending to run together in pairs on the lateral portions of the gastric regions.

Specimen ♂ 366 is small, C.l. 5 mm., C.b. measured by a line joining points of union of antero-lateral and postero-lateral borders 6 mm.; a line uniting the outer orbital teeth 6.25 mm. It differs from the ♀ ovig. 367 in (a) the sharp spiniform character of the denticles marking the outer angle of the orbit, the inner angle of the lower margin of the orbit, the boundary between the antero-lateral and the postero-lateral borders of the carapace, the inner border of the arm and the inner border of the wrist; (b) the almost straight character of the frontal border, the teeth being very little marked; (c) the antero-lateral borders of the carapace slope a little outward anteriorly; (d) the number of red spots visible on the carapace in dorsal view is small, namely, twenty-eight.

The points mentioned above in regard to the small ♂ are probably marks of youth. The specimen bears a close resemblance to a ♀ of the same size and a rather larger ♂ (C.l. 7 mm.), both from Ceylon, which I have before me (Laurie, *loc. cit.*). The Ceylon ♂, however, is somewhat intermediate in the character of its front between the two present specimens and

has 48 red spots visible in a dorsal view of the carapace; the Ceylon ♀ has also 48 spots approximately, but it is difficult to count the number accurately, as they are in a very faded condition.

Genus TETRALIA, Dana, 1851.

53. TETRALIA GLABERRIMA (*Herbst*, 1790). See *Alcock*, 1898, p. 223.

Tetralia glaberrima, Nobili, 1906, p. 294.

Tetralia glaberrima, Nobili, 1907, p. 143.

Tetralia glaberrima, Stimpson, 1907, p. 74.

Localities. Station III., 1 ♀ ovig. [368]; Station V. E, 1 ♀ ovig. [369]; Station VII. B, 1 ♀ ovig. [370]; Station VII. D, 2 ♂ probably adult [371-372], 3 ♀ ovig. [374-376].

Remarks. An ovigerous ♀ has C.l. 9 mm. and C.b. 10.5 mm.

In two of the females the left cheliped, and in the other six specimens the right cheliped, is the larger.

Family GONEPLACIDÆ.

Genus LIBYSTES, A. Milne-Edwards., 1867.

54. LIBYSTES NITIDUS, A. M.-Edw., 1867. See A. M.-Edw. 1868, p. 83, pl. 20. figs. 5-7.

Lybystes nitidus, Nobili, 1906, p. 297.

Localities. Station VI. 1 ♂ [377]; Station VIII. A, 1 ♂ [378], 3 ♀ [379-381].

Remarks.

	♀ 379.	♀ 380.	♀ 381.	♂ 378.	♂ 377.
C.l.	5.75	7.25	7.75	4.0	7.75 mm.
C.b.	8.5	11.25	12.0	6.0	13.0 mm.
C.b. ÷ C.l.	1.48	1.55	1.55	1.50	1.68
Lower bord. propus right cheliped ..	7.25	9.75	10.25	5.0	12.0 mm.
Height propus right cheliped	2.5	4.0	3.5	1.75	3.75 mm.
Lower bord. propus left cheliped ..	7.0	9.0	9.5	5.0	12.0 mm.
Height propus left cheliped.....	2.0	2.5	2.5	1.25	3.75 mm.

All the specimens have a uniformly fine granulation on the antero-lateral margin of the carapace; there are no denticles on this margin such as Nobili describes for his small ♀ (C.l. 7.5 mm.) from Djibouti, and looked upon by him as a condition of youth.

In the larger ♂ specimen the hands are similar. In the smaller ♂ and in the ♀ specimens there is a good deal of difference between the hands, the right being in each case much more massive than the left, though not much longer. In specimens 380 and 381 the fixed finger of the less massive left hand bears on its distal half 3 spiniform teeth, of which the middle one is the largest, in the small ♀ 379 the proximal of the three teeth is absent. In

the small ♀ 379 the larger right hand makes an approach to Milne-Edwards's fig. 7, the lower border being slightly concave near the base of the fingers and the fingers not markedly hooked at tips; in the more slender left hand of the same specimen the ends of the fingers are strongly curved towards each other, which condition occurs also in both hands of all the other examples.

It will be noted, as pointed out above, that though in the smaller ♂ one hand is more massive than the other, yet in the larger ♂ the two hands are equally massive.

Genus *LITOCHEIRA*, *Kinahan*, 1856.

Original orthography *Litochœira*, not *Litochira*; see *Kinahan*, 1856, p. 116.

55. *LITOCHEIRA INTEGRATA* (*Miers*, 1884). (Plate 45. fig. 2.) See *Alcock*, 1900, p. 314.

Litochira integra, *Alcock*, *loc. cit.*

Carcinoplax integra, *Miers*, 1884, p. 543.

Localities. Station V. A, 1 ♂ [382], 1 ♀ ovig. [383]; Station V. B, 1 ♂ [384], 2 ♀ [385, 386].

Remarks. The specimens agree with *Alcock's* description of the genus and species. *Miers's* figure (1884, pl. 48. fig. C) would have given a good idea of the present examples if the fringing setæ, even of the front, had been made longer. Many of the very long fine setæ which fringe the front, the antero-lateral borders, the chelipeds, and the walking-legs are in the present specimens more than one-half as long as the carapace, and give a very beautiful appearance to the creatures.

I give an anterior view of the front with the setæ removed, which is "turned down and distinctly arched"—a character of the genus *Litochœira*, to which *Alcock* calls attention.

Miers gives dimensions of his ♀ specimen as C.l. 4 mm. and C.b. 5 mm., but this may be a slip, as his figure, drawn to scale, gives ratio as 4 to 6. *De Man* (1888, p. 93) cites a ♂ as having C.l. 7.75 and C.b. 10.25 mm. *Alcock* gives a ♀ as 6 × 9. The measurements in the present specimens are as follows:—

	♀ 385.	♀ ov. 386.	♀ ov. 383.	♂ 382.	♂ 384.
C.l.	2.5	4.0	4.2	2.75	3.75 mm.
C.b.	3.5	5.75	6.1	4.0	5.25 mm.
C.l. ÷ C.b. ....	.71	.70	.69	.69	.71

In the ovigerous female 383 the breadth of the frontal margin is 2 mm., and a line uniting the external angles of the orbits measures 4.25 mm.

Both genus and species are new to the Red Sea.

Family PINNOTHERIDÆ.

Genus OSTRACOTHERES, *H. Milne-Edwards*, 1853.Original orthography *Ostracotheres*, not *Ostracoteres*; see *H. Milne-Edwards*, 1853, p. 219.56. OSTRACOTHERES CYNTHIÆ, *Nobili*, 1905. (Pl. 45. figs. 3-3 b.) See *Nobili*, 1906, p. 301.*Ostracoteres cynthiæ*, *Nobili*, *loc. cit.**Locality.* No locality given, 1 ♂ [390].

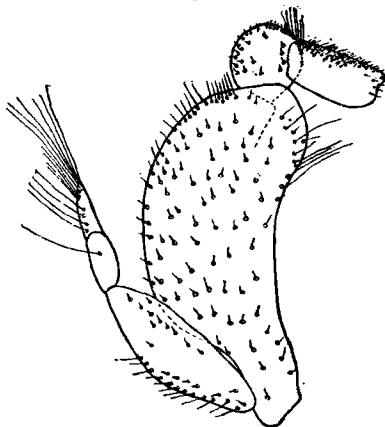
Remarks. After characterising the species from a ♀ example by pointing out that, among other things, its carapace is quadrangular rather than globular and that the dactylus of the last walking-leg is long, flattened, hairy, and has a sinuous margin, *Nobili* adds that in the ♂ the carapace is more rounded and the dactylus of the last walking-leg differs little from those of the others.

In the present specimen the carapace is almost, though not altogether, circular, with the posterior border convex. It is seen under a lens to be faintly pitted and to bear a few scattered very short inconspicuous setæ.

The deflexed anterior obtusely pointed tip of the front is only seen in an anterior view of the animal.

The distal end of the propodite of the third maxillipede differs from *Nobili's* description and figure, for, instead of being obliquely truncated, it is the same width distally as elsewhere and its distal margin is concave. The form of this appendage is important in species of *Ostracotheres*.

Fig. 3.

*Ostracotheres cynthiæ*. External maxillipede, ♂ 390.

Cheliped stout, half as long again as the carapace (1.58 C.l.), a little longer than walking-leg 1 (1.07 length of W.L. 1); wrist swollen; hand with lower outer border strongly marked posteriorly, producing a triangular

appearance ; the tip of the fixed finger is pointed and curved and lies against the outer side of the more strongly curved tip of the dactylus; dactylus about three-quarters as long again as the upper border of the propus (1·71 upper border propus), its tip very strongly curved—at the base of its apposed border is a large triangular tooth and a smaller one on the distal half of the same border corresponding to a similarly placed one on the fixed finger; the fingers meet only at their tips, which cross as above indicated, the considerable gape being occupied by fine downy hairs. The whole cheliped, more particularly the inner surface of the hand, is covered with fine down.

The first three walking-legs are of equal length and each is a little shorter than the cheliped and 1·48 C.l.; W.L. 4 is shorter (1·3 C.l.). The dactyli of W.L. 1, 2, and 3 are equal in length (0·23 C.l.), that of W.L. 4 is longer (0·28 C.l.), but of very similar form.

Some measurements of the specimen are as follows:—C.l. 6 mm.; C.b. 6 mm.; Ch.l. 9·5 mm.; lower bord. propus Ch. 1·75 mm.; F.l. 3·1 mm.; W.L. 1, 2, and 3 are each 8·9 mm.; W.L. 4 is 7·8 mm.; dactylus 1. of W.L. 4 is 1·7 mm.

It will be noted that in Nobili's key of *Ostracotheres* the place of *O. cynthiæ* is determined by characters of the ♀; the key is of doubtful value in identifying a ♂ example.

Nobili does not figure the species, save for a text-figure of part of the third maxillipede (sex not stated).

As Nobili's reference to the ♂ is not very precise, and his description and figure of the propodite of the external maxillipede do not agree with mine, it is just possible that the present specimen represents a new species; should this be so, the almost circular carapace and the form of the propodite of the external maxillipede are characters to be noted more especially.

Genus PINNOTHERES, *Bosc*, 1802.

Original orthography *Pinnotheres*, not *Pinnoterres*.

57. PINNOTHERES PILUMNOIDES, *Nobili*, 1905. See *Nobili*, 1906, p. 307, fig. 12.

Pinnoterres pilumnoides, *Nobili*, *loc. cit.*

Localities. No locality given, labelled "Trials I., mostly from sponge," 1 ♀ adult non-ovig. [387]; no locality given, labelled "From *Holothuria gallensis*," 2 ♀ ovig. [388, 389].

Remarks.

	♀ 387.	♀ ov. 388.	♀ ov. 389.
Cl.	10·0	10·0	12·25 mm.
C.b.	11·0	11·5	14·25 mm.
Post. bord. C.	4·0	5·0	6·0 mm.
C.l. ÷ C.b.	·91	·87	·86
Post. bord. C. ÷ C.b.	·36	·43	·42

It is difficult to give accurate measurements, owing to the slight degree of calcification of the carapace. Those of specimen 387 are the most reliable.

Specimen 389 carries 714 eggs, each having a diameter of about 0.75 mm.

Family OCYPODIDÆ.

Genus OCYPODE, *Fabricius*, 1798.

Original orthography *Ocypode*, not *Ocypoda*; see Miers, 1882, p. 376.

58. OCYPODE ÆGYPTIACA, *Gerstücker*, 1856. See Miers, 1882, p. 381, pl. 17. fig. 3.

Ocypoda ægyptiaca, Miers, *loc. cit.*

Ocypoda ægyptiaca, Nobili, 1906, p. 310.

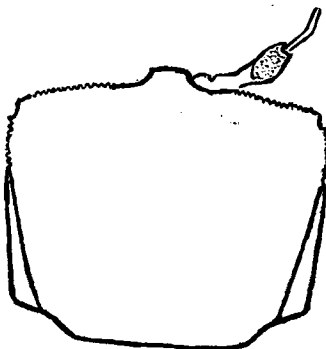
Ocypoda ægyptiaca, Nobili, 1907, p. 152.

Locality. Station IX. B, 1 ♂, probably adult [391].

Remarks. C.L. 36 mm. The stridulating organ is composed of 80 ridges in this example.

The outer orbital angles undergo considerable growth-change in this species (see Nobili, 1906, *loc. cit.*). The text-figure shows their condition in the present specimen, and also an eye-stalk with its characteristically curved terminal style.

Fig. 4.



Ocypode ægyptiaca. ♂, C. 136. mm.

Genus DOTILLA, *Stimpson*, 1859.

59. DOTILLA SULCATA (*Forskål*, 1775). See Alcock, 1900, p. 365.

Dotilla affinis, Alcock, *loc. cit.*; and 1902, pl. 63. fig. 1.

Dotilla sulcata, Nobili, 1906, p. 315.

Locality. Station I. B, 9 ♂ [392-400], 4 ♀ [401-404].

Remarks. The present specimens enable me to add further evidence in favour of Nobili's suggestion (Nobili, *loc. cit.*) that *Dotilla affinis*, formed in

1900 by Alcock for four specimens from Aden and the Baluchistan coast, is a synonym of this species.

The characters by which Alcock separates his species from *D. sulcata* are: (1) the absence of the spine from the under surface of the arm; (2) the presence of a tympanum on the dorsal surface of the merus of the last pair of walking-legs, and (3) the fact that the fingers are *shorter* than the palm. The condition of each of these characters in my specimens is shown in the following table:—

No. of specimen.	Sex.	C.I.	H.I. (upper bord.).	F.I.	H.I. F.I.	Meral spine.	Tympanum.
401.	♀	mm. 5.6	mm. 1.5	mm. 3.0	2.00	Absent.	[Leg lost.]
402.	♀	5.9	1.5	3.0	2.00	Absent.	Present.
403.	♀	6.0	1.5	3.0	2.00	Absent.	Present.
404.	♀	6.5	1.6	3.5	2.19	Absent.	[Leg lost.]
					Average in 4 ♀s = 2.05.	Absent in all.	Present in both.
392.	♂	5.0	2.0	3.0	1.50	Absent.	Present.
393.	♂	5.9	1.9	3.4	1.79	Absent.	Absent.
394.	♂	6.0	2.1	3.2	1.52	Absent.	Absent Rt. [Left lost.]
395.	♂	6.0	2.0	3.5	1.75	Absent.	Trace.
396.	♂	6.0	2.0	3.2	1.60	Absent.	Present.
397.	♂	6.0	2.5	3.7	1.48	Absent.	Present.
398.	♂	6.5	2.5	3.8	1.52	Absent.	Present.
399.	♂	7.0	2.8	3.9	1.39	Trace.	Present.
400.	♂	7.5	3.0	4.2	1.40	Present.	Present.
					Average in 9 ♂s = 1.55.	Absent 7. } Trace 1. } Present 1. }	Present 6. } Trace 1. } Absent 2. }

It will be noted from the above table that the most usual condition is for the spine to be absent and the tympanum present, this occurring in six instances (seven if 395 be included); but in one specimen (two if 399 be included) both spine and tympanum are present, and in two specimens both are absent. This agrees with Nobili's results.

The remaining point of difference, namely, the relative size of hand and

fingers, appears from the measurements given above to be clearly a sex-difference.

Summarising available data in regard to all these characters one finds:—

	Meral spine.	Tympanum.	Ratio of H.l. to F.l.
<i>D. sulcata</i> (Forskål)	Present.	Absent.	Fingers longer than hand.
<i>D. affinis</i> , Alcock, 1900, } 4 specimens, sex not } stated.	Absent.	Present.	Fingers shorter than hand.
Nobili's <i>D. sulcata</i> , 24 ♂ s } and 2 ♀ s. } {	Absent in 17. Present in 3.	Present in 14. Absent in 6.	Fingers longer than hand in 24. Fingers and palm subequal in 2.
Present specimens	Absent in 11. Trace in 1. Present in 1.	Present in 8. Trace in 1. Absent in 2.	H.l. (upper bord.) ÷ F.l. gives for 4 ♀ s an average of 2.05 and range of variation from 2 to 2.2 mm.; for 9 ♂ s an average of 1.55 and range of variation from 1.4 to 1.8 mm.

Alcock does not state the sex of his four specimens; I suggest that they were females. Nobili, though giving the sex of his, does not relate it to finger length, probably the two in which the fingers and hand were subequal were the two females of his collection.

N.B.—I have taken finger length as being the length of the dactylus; hand length might be measured in various ways, I have measured the well-defined upper border, the authors quoted above evidently estimated the less easily measurable "greatest length."

Genus PARACLISTOSTOMA, *de Man*, 1895.

60. PARACLISTOSTOMA LEACHII (*Audouin et Savigny*, 1826). See Audouin, 1826, p. 81; Savigny, 1826, pl. 2. fig. 1.

Macrophthalmus Leachii, Audouin, *loc. cit.*; Savigny, *loc. cit.*

Paraclistostoma Leachii, Nobili, 1906, p. 316.

Localities. Station I. A, 1 ♂ probably adult [405], 2 ♀ ovig. [406, 407]; Station I. E, 2 ♂ probably adult [408, 409], 1 ♀ ovig. [410].

Remarks. C.l. ♀ ovig. 8 mm.

In each ♀ the anterior surface of the propodite of W.L. 3 is hairless, whereas in each ♂ it is densely clothed with hair; this confirms Nobili's suggestion that such a hairy patch is a sex-distinction and not, as regarded by Paulson, a varietal one.

The demarcation of the regions of the carapace varies somewhat in distinctness; the slight difference in Savigny's excellent figures between ♂ and ♀ carapace markings is evidently not a sex-distinction, as in both males in the present collection the transverse line across the branchial region is faintly indicated.

Genus MACROPHthalmus, Latreille, 1829.

61. MACROPHthalmus VERREAUXI, H. Milne-Edwards, 1848. See Alcock, 1900, p. 377.

Macrophthalmus Verreauxi, Alcock, *loc. cit.*

Macrophthalmus Verreauxi, Nobili, 1906, p. 317.

Locality. Station VIII. C, 1 ♀ ovig. [411].

Remarks. C.l. 6 mm., C.b. 9.5 mm., frontal b. between eye-stalks 2 mm., eye-stalk l. including eye 7.75 mm.

62. MACROPHthalmus GRAEFFEI, A. Milne-Edwards, 1873. See A. Milne-Edwards, 1873 (2), p. 81, pl. 13. fig. 5.

Locality. Station VIII. A, 1 ♂ [412], 5 ♀ [413-417].

Remarks.

	♀ juv. 413.	♀ ov. 414.	♀ 415.	♀ ov. 416.	♀ 417.	♂ 412.
C.l.	7.25	12.0	12.0	12.75	12.75	11.0 mm.
C.b. across and including outer orbital angles	12.0	21.5	22.0	22.75	23.75	20.25 mm.
Frontal b. between eye-stalks.	1.5	2.0	2.1	2.25	2.25	2.0 mm.
Ch.l. ....	..	18.0	18.5	19.5	19.5	23.0 mm.
C.b. ÷ C.l.	1.65	1.79	1.83	1.78	1.86	1.84
Frontal b. ÷ C.b. ..	.12	.09	.10	.10	.09	.10

The only example hitherto recorded is A. Milne-Edwards's type-specimen from Upolu, one of the Samoan Islands. With his description and figures the present specimens agree except in (a) the proportion of length to breadth of the carapace, the measurements in Milne-Edwards's type-specimen, probably a young ♀, being C.l. 7 mm. and C.b. 14 mm.; (b) the granulation of the branchial regions, which is probably more distinct in my specimens; (c) the shape of the abdomen, which in my ♂ differs from Milne-Edwards's figure; as, however, the latter represents very well the abdomen of my young ♀ of C.l. 7.25 mm., it appears that Milne-Edwards's figure is wrongly labelled in regard to sex, and that no real difference is involved under this head.

In addition to the points given in Milne-Edwards's description, my specimens have (a) some hair distributed in various places, and (b) some granulation on the walking-legs. In detail, hair occurs (i.) on lateral borders of the carapace; (ii.) on upper border of the merus of 1st, 2nd, and 3rd pairs of walking-legs; (iii.) on both borders of the 4th pair of walking-legs, except that it is almost absent from the lower border of the carpus and distal half of the lower border of the merus; on this 4th pair, moreover, the hair is more strongly developed than on the meri of the first three pairs; (iv.) in all the females on the upper border of the cheliped and flanking the

margins of the apposed borders of the fingers. The granulation occurs on both borders of the meri, the upper borders of the carpi, and both borders of the propi of the walking-legs, also traces on outer surface of the 3rd and 4th pairs more particularly; the granulation of the lower borders of the meri of the 2nd and 3rd pairs of walking-legs is visible to the naked eye.

Perhaps an important point about *M. graeffei* (my specimens included) is that the eye-stalk extends just beyond the tip of the outer orbital tooth (for a distance approximately equal to the length of the tooth) ending in a blunt point or tubercle drawn out distal to the pigmented region. The spiniform outer orbital tooth reaches to about the middle of the pigmented region.

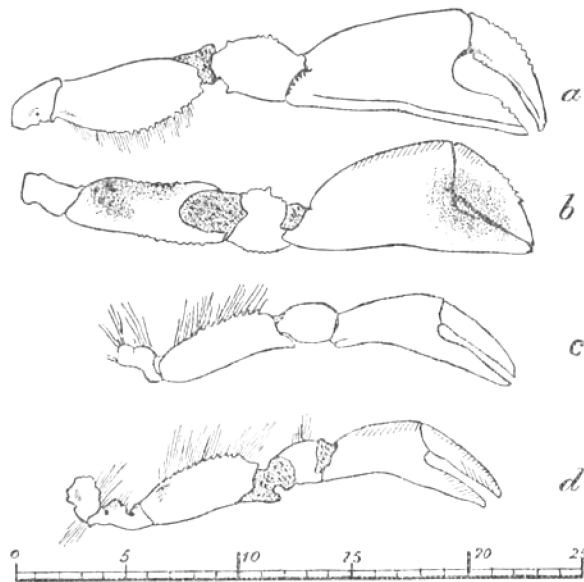
Macrophthalmus graeffei is evidently closely related to *M. convexus*, Stimpson, 1858 (Stimpson, 1907, p. 97, pl. 13. fig. 2 a-b), and *M. inermis*, A. Milne-Edwards, 1867 (A. Milne-Edwards, 1873 (1), p. 277, pl. 12. figs. 5, 5 a), but differs from both in (a) the relative length of the eye-stalks, which in both the latter do not extend beyond the orbit and so fall short of the tip of the outer orbital tooth; (b) the more spiniform and more transversely disposed character of the antero-lateral teeth of the carapace; this is particularly seen in the 1st, *i. e.* the outer orbital angle, since this is the largest, but is also well seen in the second one; (c) the merus of each of the first three pairs of walking-legs bears a subterminal tooth; in *M. convexus* the merus of the 4th pair also has such a tooth, though, in five specimens from the Andaman Islands described by Alcock, it was absent not only from the fourth pair, but also from the first pair; in *M. inermis* none of the meri of walking-legs bear such a tooth.

M. graeffei agrees with *M. inermis* and differs from *M. convexus* in the degree of pilosity of the inner surface of the chelæ. In all three the inner surface of the fingers is pilose, but while the inner surface of the hand is pilose also in *M. convexus* the pilosity is confined in *M. inermis* and in *M. graeffei* to the distal margin bordering the fingers (see Milne-Edwards's figure of both, *loc. cit.*). I give outlines from photographs of chelipeds of ♂ and ♀ specimens of *M. graeffei*.

Alcock's treatment of *M. inermis* as a synonym of *M. convexus* appears to me to be open to question. The two species agree in the length of the eye-stalks as well as in many other ways, but Milne-Edwards's text and figure both describe *M. inermis* as having only two antero-lateral teeth on the carapace; the difference in subterminal meral spines of walking-legs and in pilosity of the inner surface of the hand have been noted above, and a comparison of the figures of Milne-Edwards and Stimpson suggests various points of difference in carapace form.

I find also that Rathbun (1906, p. 834), in recording *M. inermis* from the Hawaiian Islands, states very definitely her view that it is quite another species from *M. convexus*,

Fig. 5.

*Macrophthalmus graeffei.*

- a. Right cheliped, ♂ 412: outer surface, setae removed from gape of fingers.
 b. Left cheliped, ♂ 412: inner surface.
 c. Right cheliped, ♀ ov. 414: outer surface.
 d. Left cheliped, ♀ ov. 414: inner surface.

(Each division of the enlarged scale represents 1 mm.)

63. *MACROPHTHALMUS DEPRESSUS*, Rüppell, 1830. See Alcock, 1900, p. 380.

Macrophthalmus depressus, Nobili, 1906, p. 318.

Macrophthalmus depressus, Nobili, 1907, p. 155.

Locality. Station I. B, 1 ♂ [418], 1 ♀ [419].

Remarks. The female is non-ovigerous, but probably adult, C.l. 10 mm.; the male also is probably adult, C.l. 11 mm.

Family GRAPSIDÆ.

Genus *METOPOGRAPSUS*, H. Milne-Edwards, 1853.

64. *METOPOGRAPSUS MESSOR* (Forskål, 1775). See Alcock, 1900, p. 397.

Metopograpsus messor, Nobili, 1906, p. 320.

Metopograpsus thukuhar, Stimpson *, 1907, p. 114, and synonymy.

Metopograpsus messor, var. *frontalis*, Miers, 1880, p. 311.

* Stimpson includes a reference to "*Metopograpsus thukuhar* Milne Edwards, *Mélanges Carcinologiques*, p. 131." I do not know the latter publication under the title given, but internal evidence shows that the reference is equivalent to H. Milne-Edwards, 1853, p. 165,

Localities. Station I. A, 1 ♂ [420], 2 ♀ [421, 422]; Station I. B, 1 ♂ [423], 3 ♀ [424-426]; Station I. E, 3 ♂ [427-429], 1 ♀ [430].

Remarks. Miers observed "some variation in the width of the front in this species," and one of the characters of his var. *frontalis* is its wide front, this being "almost three and a half times the length of the upper orbital margin." I give, therefore, the following measurements and ratios:—

	424♀.	425♀.	426♀.	421♀.	430♀.	422♀.	427♂.	423♂.	428♂.	429♂.	420♂.
C.l.	11.75	16.75	17.0	18.5	20.25	21.0	10.0	16.5	21.0	23.0	27.0 mm.
C.b.	16.0	22.0	23.0	24.5	26.25	28.0	14.0	21.25	26.75	29.25	35.0 mm.
Frontal b.....	10.0	14.25	15.0	16.0	17.0	17.5	8.8	13.5	17.5	19.25	22.0 mm.
Major diameter orbit ...	3.5	4.5	4.5	4.75	5.25	5.5	3.0	4.5	5.75	5.5	6.5 mm.
Diam. orb. ÷ frontal b. ..	.35	.31	.30	.30	.31	.31	.34	.33	.33	.28	.30

It will be noted that the ratio greatest diameter of orbit ÷ frontal breadth is less in the larger forms. In specimen 429 the ratio is as in var. *frontalis*, but the margin of the front has the characteristically sinuous form and not the straight character of var. *frontalis*.

Family PALICIDÆ.

Genus PALICUS, *Philippi*, 1838.

65. PALICUS WHITEI (*Miers*, 1884). See *Alcock*, 1900, p. 453.

Palicus Whitei, *Alcock*, *loc. cit.*

Palicus whitei, *Rathbun*, 1911, p. 240.

Locality. Station II., 1 ♀ ovig. [431].

Remarks. C.l. 14 mm. Although this species is easily separated from the allied *jukesii* of White by the character of the walking-legs and by other characters also, it should not be overlooked that there is indeed a crest or carina on the upper border of the carpopodites and propodites of the first three pairs of walking-legs, though, of course, of very slight dimensions as compared with that in *P. jukesii*; *Alcock* appears rather to overlook this point.

Miers's figure (*Miers*, 1884, pl. 49, fig. C) gives an excellent idea of the present specimen.

A good account and drawings of *P. whitei* are given by *Calman* (*Calman*, 1900, p. 31, pl. 2, figs. 14-19).

EXPLANATION OF THE PLATES.

PLATE 42.

- Fig. 1. *Chlorodopsis arabica*, n. sp. ♂ specimen (♂ 204). × 5. Text, p. 450.
 1 a. Do. do. Ventral view of anterior region of same specimen. × 5.
 1 b. Do. do. Abdomen of same specimen. × 6.

PLATE 43.

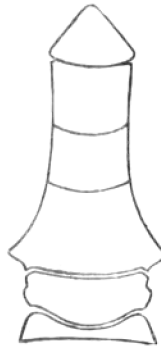
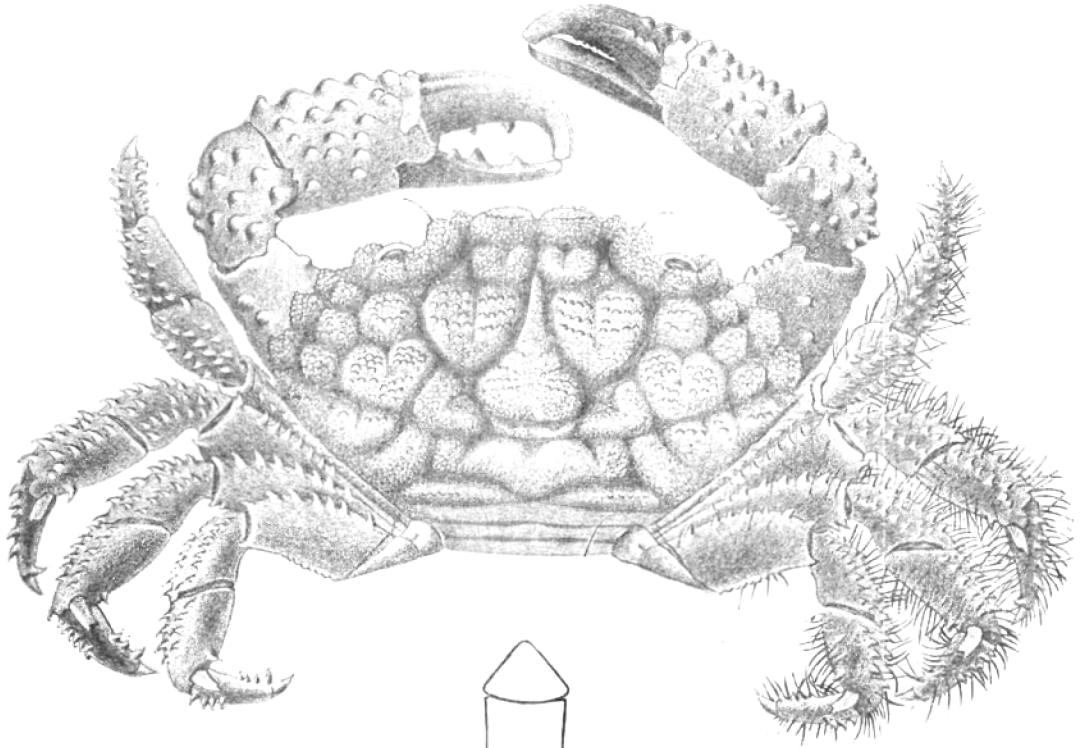
- Fig. 1. *Xantho hydrophilus* (Herbst, 1790). Walking-leg, enlarged. Text, p. 444.
 2. *Chlorodopsis arabica*, n. sp. First pair of abdominal appendages of ♂ specimen (♂ 204). × 6½. Text, p. 450.
 3 a. *Chlorodopsis spinipes* (Heller, 1861). Left chela ♂ (♂ 222, C.l. 5.25 mm.), outer surface. × 6½ (actual length lower border 5.5 mm.). Text, p. 455.
 3 b. Do. do. Right chela of same specimen, outer surface. × 6½ (actual length lower border 5.75 mm.).
 3 c. Do. do. Left chela ♀ (♀ ovig. 218, C.l. 5 mm.), outer surface. × 6½ (actual length lower border 5 mm.).
 3 d. *Chlorodopsis spinipes* (Heller, 1861). Right chela of same specimen, outer surface. × 6½ (actual length lower border 5.5 mm.).
 4 a. *Chlorodopsis arabica*, n. sp. Left chela ♂ (♂ 203, C.l. 8.5 mm.), outer surface. × 6½ (actual length lower border 9.5 mm.). Text, p. 450.
 4 b. Do. do. Right chela of same specimen, outer surface. × 6½ (actual length lower border 9 mm.).
 4 c. Do. do. Left chela of ♀ specimen (♀ 211, C.l. 7.5 mm.), outer surface. × 7 (actual length lower border 6.5 mm.).
 4 d. Do. do. Right chela of same specimen, outer surface. × 7 (actual length lower border 6.5 mm.).

PLATE 44

- Fig. 1. *Lupa alcocki* (Nob., 1905). ♂. × 3½. Text, p. 438.
 1 a. Do. do. Ventral view of anterior region of same specimen. × 10.
 1 b. Do. do. Anterior view of antero-ventral region of same specimen. × 10.
 1 c. Do. do. Abdomen of same specimen. × 4.
 2. *Herbstia corniculata*, Klunz., 1906. Left hand ♂. × 10. Text, p. 431.
 3. *Cyphocarcinus minutus*, A. M.-Edw., 1868. ♀ 42, side view. × 11½. Text, p. 433.

PLATE 45.

- Fig. 1. *Caphyra monticellii*, Nob., 1901. Specimen 48. $\times 5$. Text, p. 437.
- 1 a. Do. do. Ventral view of anterior region of same specimen. $\times 11$.
2. *Lithocheira integra* (Miers, 1884). Ovig. ♀ 383 showing sharply turned down front etc. $\times 12$. Text, p. 464.
3. *Ostracotheres cynthiae*, Nob., 1905. ♂ 390. $\times 5\frac{1}{2}$. Text, p. 465.
- 3 a. Do. do. Ventral view of anterior region of same specimen. $\times 8$.
- 3 b. Do. do. Abdomen of same specimen. $\times 5\frac{1}{2}$.
4. *Ophthalmias curvirostris* (A. M.-Edw., 1865). External maxillipedes (♀ ovig. 41, C.l. excluding rostral horns 23 mm.). $\times 5\frac{1}{2}$. Text, p. 431.
5. *Ophthalmias cervicornis* (Herbst, 1803). External maxillipedes (♀ orig. from Cheval Paar, Gulf of Manaar, C.l. excluding rostral horns 39 mm.). $\times 3\frac{3}{4}$. Text, p. 432.



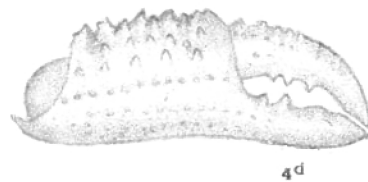
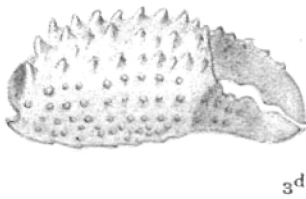
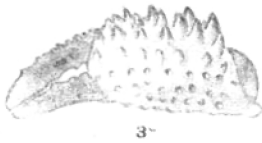
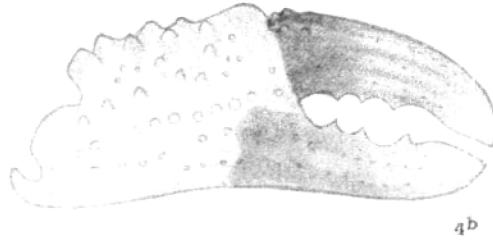
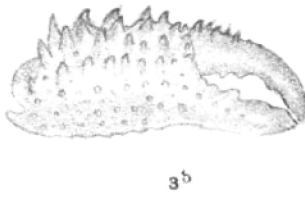
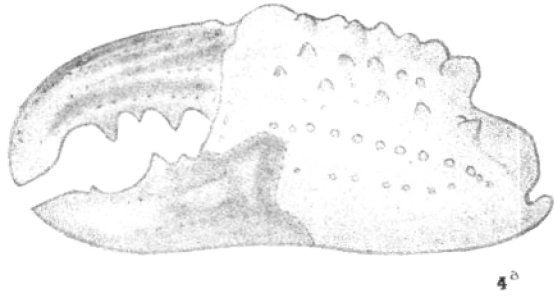
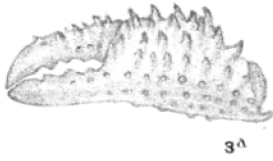
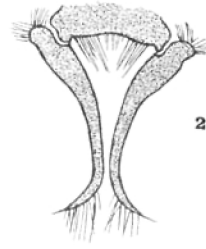
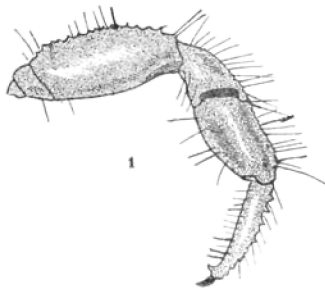
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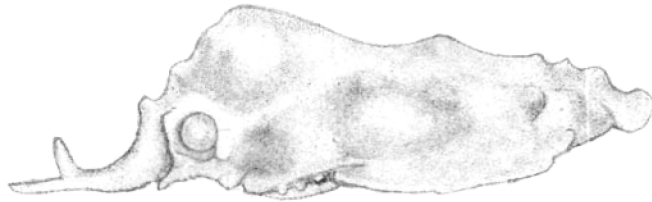
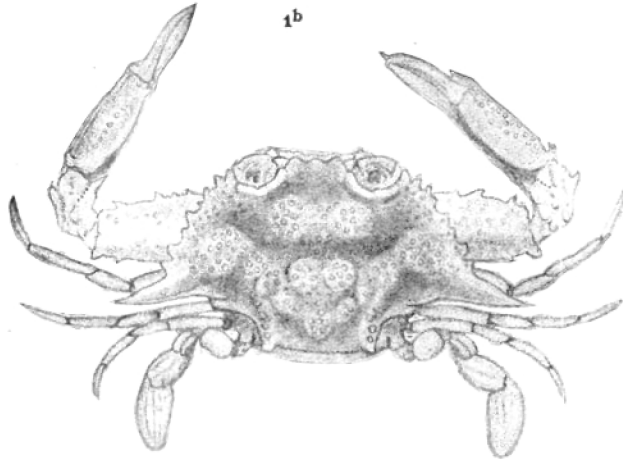
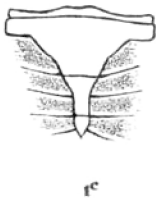
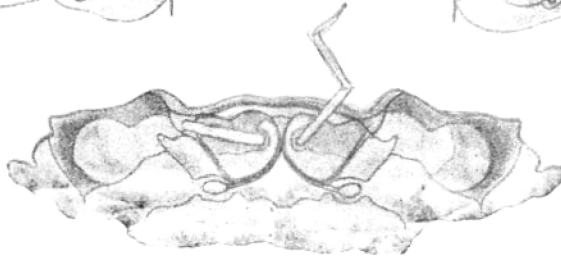
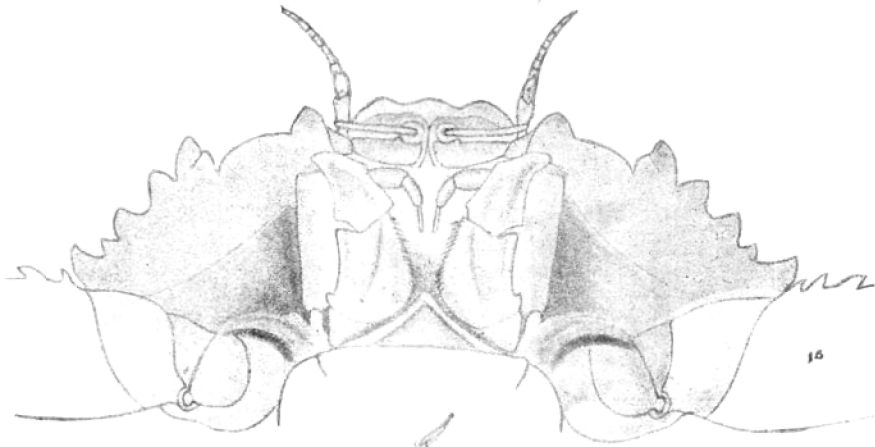
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