

**THE GRAPSIDAE, GECARCINIDAE AND PALICIDAE
(CRUSTACEA: DECAPODA: BRACHYURA) OF THE RED SEA**

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ABSTRACT

An account is given of all the species of Grapsidae, Gecarcinidae and Palicidae known from the Red Sea proper, based on the material collected by the 1962 and 1965 Israel South Red Sea Expeditions in the Dahlak Archipelago (Ethiopia), on specimens in various museums and on published records. Eighteen species of Grapsidae, two species of Gecarcinidae and four species of Palicidae are dealt with. Several species are now reported for the first time from the Red Sea; one, *Palicus elaniticus*, is new to science. A neotype is selected for *Cancer messor* Forskål, 1775 (= *Metopograpsus messor*). *Grapsus thukuhar* Owen, 1839 is selected as the type species of the genus *Metopograpsus* H. Milne Edwards, 1853; *Grapsus penicilliger* Latreille, 1817 (= *Pseudograpsus setosus* (Fabricius, 1798)) is selected as the type species of the genus *Pseudograpsus* H. Milne Edwards, 1837. *Sesarma* (*Perisesarma*) *eumolpe* De Man, 1895 is chosen as the type species of the subgenus *Perisesarma* and *Grapsus* (*Pachysoma*) *haematocheir* De Haan, 1833, is chosen as the type species of the genus *Pachysoma* De Haan, 1833. *Perisesarma* is now to be used for *Chiromantes* auct.; *Chiromantes* Gistel, 1848 becomes the correct name for *Holometopus* auct.

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INTRODUCTION

The present paper is based on Red Sea collections of grapsid, gecarcinid and palicid crabs from the following sources:

1) Material obtained during the two Israel South Red Sea Expeditions (indicated in the lists of material as ISRSE 1962 and ISRSE 1965, respectively), which operated in Eritrean waters from 4.III.1962 to 24.IV.1963 and from 4 to 27.X.1965. In both expedi-

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tions most attention was devoted to the marine fauna and flora of the Dahlak Archipelago, while collections were also made on the coast of the adjacent mainland of Eritrea, Ethiopia.

2) Collections made along the coast of the Sinai Peninsula by the 1967-1972 Hebrew University – Smithsonian Institution Joint Program (indicated here with the letters SLR), and by the Zoology Departments of the Hebrew University of Jerusalem and the University of Tel Aviv (usually indicated with the letters E or NS).

3) Collections from various sources in the British Museum (Natural History), London (indicated with the letters BM) and the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH).

Species of the three families not represented in the above collections, but reported in the literature from the Red Sea, are also included in the present report, which is intended to provide a complete enumeration of the species known at present from the Red Sea. In this way it forms a sequel to the papers by Holthuis (1968), Lewinsohn (1969) and Griffin and Tranter (1975), which deal in the same way with other decapod groups from the Red Sea (Palinuridea, Anomura and Majidae, respectively).

The term "Red Sea" is understood here in its strict sense, i.e., the sea north of the Strait of Bab-el-Mandeb (from Perim to Suez and Elat). This excludes the Gulf of Aden. In many previous papers on decapod Crustacea, the Red Sea has, incorrectly, been considered to include the Gulf of Aden (Aden, Jibuti, Obock, etc.), e.g., in Nobili's (1906a) fundamental monograph of the Red Sea Decapoda and Stomatopoda. In that paper Nobili listed among the Grapsidae a species, *Cyclograpsus lophopus* Nobili, as belonging to the Red Sea fauna, while actually all of Nobili's material of this species (which he had described as new), originated from Jibuti. After 1906, the species has not been reported from the Red Sea either, and it is not represented in the collections I have studied. Therefore, it is not included in the present paper.

Of each species dealt with below the following information, if available, is provided:

- 1) All known references to Red Sea material.
- 2) A list of the material I have examined, arranged in four geographically (not zoogeographically) defined groups: (a) Sinai Peninsula, (b) east coast of the Red Sea from Elat to the Strait of Bab-el-Mandeb, (c) west coast of the Red Sea (except Ethiopia) from Suez to southern Sudan, (d) Ethiopia. In some cases these regions are further subdivided.

In the orthography of names of localities on the Sinai Peninsula the paper by Por, Steinitz, Ferber and Aron (1972) is followed. For the other geographical names within the Red Sea area that by Lewinsohn (1969) was consulted.

3) A description of the species or a reference to a published description. If pertinent, a special section on size or colour is added.

4) The general known geographical range of the species, and a detailed enumeration of the localities within the Red Sea from which it has been reported in the literature.

5) Remarks on the biology of the species (including habitat, behaviour, etc.), based on information pertaining to Red Sea material.

6) General remarks concerning systematics, nomenclature, etc.

The abbreviations CB and CL are used here for carapace breadth and carapace length, respectively.

In all, 18 species of Grapsidae (nine Grapsinae, three Varuninae, four Sesarminae and two Plagusiinae), two species of Gecarcinidae and four species of Palicidae are now known from the Red Sea. Nobili (1906a) reported 10 species of Grapsidae (excluding *Cyclograpsus lophopus* Nobili, see above) and one species of Palicidae from the Red Sea. Guinot (1967a) in her enumeration of the crabs of the western Indian Ocean and the Red Sea listed 16 grapsid species from the Red Sea, but four of these were either incorrectly identified or known from the Gulf of Aden only, so that only 12 Red Sea species of Grapsidae were actually known at that time. Of the Palicidae, Guinot mentioned only one species from the Red Sea.

SPECIES ACCOUNTS

GRAPSIDAE Macleay, 1838

GRAPSINAE Macleay, 1838

Grapsus Lamarck, 1801

Grapsus Lamarck, 1801, Syst. Anim. s. Vert.: 150. Type species, by tautonymy: *Cancer grapsus* Linnaeus, 1758, Syst. Nat., (ed. 10) 1: 630. Gender: masculine. This genus is represented in the Red Sea by three species.

Grapsus tenuicrustatus (Herbst, 1783)

Grapsus Pharaonis H. Milne Edwards, 1853:168; Heller, 1861a:18, 31; Heller, 1861b:362; Von Martens, 1866:381; Hilgendorf, 1869:88, 109.

Goniopsis picta— Heller, 1861:31.

Grapsus rudis— Paulson, 1875:68; Paulson, 1961:74.

Grapsus (s.s.) *pictus*— Hilgendorf, 1879:807.

Grapsus maculatus— De Man, 1883:159; De Man, 1891:49; Monod, 1938:150.

Grapsus grapsus— Doflein, 1900:142; Nobili, 1906a:319; Laurie, 1915:416; Balss, 1924:15.

Grapsus tenuicrustatus— Holthuis, 1958:48; Banerjee, 1960:134; figs. 1a, 2a, c-g; Guinot, 1962a: 1; Guinot, 1967a: 284; Guinot, 1967b: 380.

Grapsus tenuicristatus— Zarenkov, 1971:194.

*Material Examined**Sinai Peninsula*

Southern tip:

Ras Umm Sid, N of Sharm esh Sheikh; from vertical rocks above the waterline; 16.X.1972; Ch. Lewinsohn; 2 ♀. Marsa el 'At, S of Ras Nasrani; 4.VI.1969; SLR 2434; 3 ♂, 1 ♀.

Gulf of 'Aqaba:

Coast of Sinai Peninsula opposite Fara'un Island, northern Gulf of 'Aqaba; 30.I.1968; SLR 1327; 1 ♂, 1 ♀ (juveniles). Near Elat; 5.VI.1956; H. Steinitz, E 56/3; 1 ♀.

East coast of Red Sea (Saudi Arabia)

Sinafir Island, entrance to Gulf of 'Aqaba; 8.VII.1971; SLR 3210; 3 ♂, 2 ♀; 9.VII.1971; SLR 3224 and 3234; 1 ♂, 2 ♀. Jidda; 1880-1883; J.A. Kruyt; RMNH; 3 ♂, 3 ♀.

West coast of Red Sea (except Ethiopia)

Shadwan Island, Egypt; X-XI.1965; B. Lanza; RMNH; 2 ♂, 1 ♀. Red Sea (probably west coast); L.W. Ruysenaers; received 16.VII.1849; RMNH; 1 ♀.

Ethiopia

Dahlak Archipelago:

Harmil Island: 28.III.1962; ISRSE 62/1405; 2 ♂, 1 ♀.

Romia Island: 0-3 m deep, fish poison; 29.III.1962; ISRSE 62/1415; 1 ♀.

Description

This species, a good description of which was provided by Banerjee (1960), is distinctly less common on the Red Sea shores than *Grapsus albolineatus*. The two resemble each other in many respects, but one of the most convenient characters for separating them in the field is the fact that in *G. tenuicrustatus* the fingers lack the black hooves that are present in *G. albolineatus* and all other Indo-West Pacific species of the genus. In some specimens the fingertips are strongly broadened.

Distribution

Widely distributed throughout the Indo-West Pacific area. It has repeatedly been mentioned from the Red Sea. The previous Red Sea records in the literature are: Red Sea (H. Milne Edwards, 1853; Heller, 1861*a*, 1861*b*; Hilgendorf, 1869, 1879; Laurie, 1915; Banerjee, 1960; Guinot, 1967*a*, 1967*b*), Sinai Peninsula at Et Tur (= Tor) or Ras Muhammad (Paulson, 1875, 1961), Ras Muhammad, southern tip of Sinai Peninsula (Doflein, 1900; Balss, 1924), Sinafir Island, before entrance of Gulf of 'Aqaba (Monod, 1938), Elat, northern tip of Gulf of 'Aqaba (Holthuis, 1958), Bir al Mashiya, east coast of Gulf of 'Aqaba, 60 km S of 'Aqaba (Balss, 1924), Sherm Habban, Saudi Arabia (Balss, 1924), Jidda, Saudi Arabia, 21°29'N (De Man, 1883, 1891; Banerjee, 1960), Egypt (Hilgendorf, 1879), Shadwan Island near entrance of Gulf of Suez (Balss, 1924), Jubal Island, near entrance of Gulf of Suez (Monod, 1938), Marsa Abu Mokhadij (= Mersa Abou Makkadique), south of Hurgada, Egypt, 27°N (Guinot, 1962*b*), Quseir, Egypt, 26°06'N (Von Martens, 1866), The Brothers Islands, 26°19'N 34°51'E (Nobili, 1906*a*; Balss, 1924), Tella Tella Kebira Island, Suakin Archipelago near Suakin, Sudan (Zarenkov, 1971).

Remarks

Grapsus tenuicrustatus has often been confused with *Grapsus grapsus* (L.) from the tropical Atlantic and the west coast of America. Banerjee has clearly shown that the two are definitely distinct species. The nomenclature of the two species is rather simple. Linnaeus (1758:630), when describing *Cancer grapsus* referred to "Amoen. acad. 4t . . f." and to "Catesb. car. 2.r.36.f.1. Pagurus maculatus." The first item refers to J.C. Odhelius' thesis "Chinensia Lagerstroemiana" published in 1754 in

Linnaeus's *Amoenitates Academicae*, vol. 4 no. 61, pp. 1-36, 1 pl., where the species was described (as *Cancer retusus*) from Ascension Island in the southern Atlantic. The second reference is to Catesby's (1754: pl. 36 fig. 1) figure of *Grapsus* from the Bahama Islands. Odhelius's and Catesby's specimens are at present considered as belonging to the same species. I now select the specimen from the Bahama Islands, figured by Catesby (1754), as the lectotype of the species *Cancer grapsus* Linnaeus, 1758. Catesby visited the Bahamas in 1725 and went ashore on the islands New Providence, Eleuthera, Andros and Abaco.

Herbst (1783:113, pl. 3 figs. 33, 34), when describing "Die Dünnschale *Cancer tenuicrustatus*", referred to his own material, to Seba's (1759 pl. 18 figs. 5, 6) figures of "Cancer marinus, laevis, sulcatus, Indicus orientalis, rarissimus", and to Gronovius's (1764:224, no. 966) "Cancer thorace inermi retuso, postice arcuato, latiore: manibus aequalibus, brevioribus quam pedes cursorii." Gronovius in his turn referred to the above-mentioned authors Odhelius, Catesby and Seba, and to Petiver's "Cancer Carolinianus rugosus elegans" (1702-1709, *Gazophylacium*, pl. 75 fig. 11). Herbst's *Cancer tenuicrustatus* thus is a composite species: Herbst's own and Seba's specimens evidently are the present species, those of Gronovius and the authors cited by Gronovius (with the exception of Seba) were *Grapsus grapsus* (L.). Although Herbst did not mention the origin of his specimens, his figures show a greater resemblance to the Indo-West Pacific than to the Atlantic species. The Indo-West Pacific origin of *Cancer tenuicrustatus* is confirmed by Von Martens (1872:107), who remarked: "Herbst's *Cancer tenuicrustatus*. Bd. I S.113 Taf.3 fig. 33, 34 ist nach den Originalen im Berliner zoologischen Museum (Nro. 555 und 557) nicht diese westindische Art, sondern eine nahe verwandte ostindische, *G. rudis* M. Edw.; in der That kommt eines seiner Exemplare nach der Etikette im Museum auch von Tranquebar." In order to settle the identity of *Cancer tenuicrustatus* Herbst definitely, I now select as its lectotype the specimen from Tranquebar mentioned by Von Martens (1872).

Grapsus albolineatus Lamarck, 1818

Grapsus strigosus-. H. Milne Edwards, 1837:87; Hilgendorf, 1869:87, 109; Paulson, 1875:69; Kossmann, 1877:60, pl. 3 fig. 13; Miers, 1878:410; Miers, 1884:544; Cano, 1889a: 105; Cano, 1889b: 236; Ortmann, 1894:705; Nobili, 1906a:320; Laurie, 1915:416; Balss, 1924:15; Maccagno, 1936:178; Ramadan, 1936:38; Monod, 1938:150 (p.p. not specimen from "Abou Ramlah" = *G. granulatus*); Stella, 1955:67; Gohar and Al-Kholy, 1957:170, pls. 13, 14; Paulson, 1961:75.

Goniopsis strigosa-. Heller, 1861a:31.

Grapsus (Goniopsis) strigosus-. Herklots, 1861:130 (p.p.).

Grapsus albolineatus-. Holthuis, 1958:48, fig. 4b; Banerjee, 1960:147, figs. 1c, 2o, p, 3a, f (not the specimens from 'Aqaba = *G. granulatus*); Guinot, 1962:13; Magnus, 1965:544, 551; Guinot, 1967a:284; Lewinsohn and Fishelson, 1968:65; Fishelson, 1971:116, 123, 126, fig. 4.

Material Examined

Sinai Peninsula

Gulf of Suez:

Gulf of Suez; R. MacAndrew; BM; 1 ♂, 1 ovigerous ♀. Et Tur; 20.IX.1967; E. Cohen; NS 7200; 1 ♀.

Southern tip of Sinai Peninsula:

Ras Muhammad; 17.IX.1967; SLR 692; 2 ♀. Marsa el 'At, N of Ras Muhammad; 4.VI.1969; SLR 2434; 1 ♂. Na'ama, N of Sharm esh Sheikh; among rocks; collected at night; 24.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 2♂, 1 ♀, 1 juvenile.

Gulf of 'Aqaba:

Shurat el Manqata, N of Nabq; intertidal zone among rocks; 25.IV.1976; Ch. Lewinsohn and L. B. Holthuis; RMNH; 1 ♀, 1 carapace. El Hamira, northern part of Gulf, 14.XII.1967; SLR 1001; 1 ♀. Marsa Murach, 20 km S of Elat; 22.VIII.1967; L. Fishelson; NS 2436; 1 ovigerous ♀. Coast opposite Fara'un Island; 30.I.1968; SLR 1327; 1 juvenile. Elat; 20.XII.1949; A. Ben Tuvia; 1 ♂, 1 ♀.

West coast of Red Sea (expect Ethiopia)

Egypt; 1 ♂ (BM). Shadwan Island, near entrance of Gulf of Suez; X.-XI.1965; B. Lanza; RMNH; 1 ♂, 1 ♀. Hurghada (= Ghardaqa), Egypt; X.1962; D.B.E. Magnus; RMNH; 3 specimens. Red Sea, probably Egyptian coast; received 16.VII.1849; L.W. Ruysenaers; RMNH; 1 ♂, 1 ♀.

Ethiopia

Dahlak Archipelago:

Harmil Island: 28.III.1962; ISRSE 62/1405; 1 ♂. ISRSE 62/1409; 1 specimen.

Cundabilu Island: on rocks above waterline; 20.III.1962; ISRSE 62/1365; 1 ♀.

Entedebir Island: Landing Bay, on rocks above waterline; 12.III.1962; ISRSE 62/108; 1 ♂; on rocks near waterline, 24.III.1962, ISRSE 62/1385; 1 ♂; 4.IV.1962; ISRSE 62/3934; 1 ovigerous ♀. Abiad Bay, on rocks above waterline; 16.III.1962; ISRSE 62/1403; 1 ♂.

Shumma Island: rocks above waterline; 21.X.1965; ISRSE 65/1290; 1 ♂.

Museri Island: Camping Bay, among rocks; 9.X.1965; ISRSE 65/0236; 2 ♀ (1 ovigerous). Scopus Ridge, on rock, 1 m above waterline; 16.X.1965; ISRSE 65/1096; 1 ♀. Braathen Bay, rocky cliff above waterline; 18.X.1965; ISRSE 65/1260, 1 ♀; rocks above waterline; 23.X.1965; ISRSE 65/1453; 1 ♀. W of Mangrove Bay; 25.X.1965; ISRSE 65/2007; 1 ♀.

Ethiopian mainland:

Assab; on rocks in intertidal zone; 18.VII.1965; B. de Wilde-Duyfjes; RMNH; 1 ♂; rocks near waterline; 14.I.1966; B. de Wilde-Duyfjes; RMNH; 1 ♀.

Description

The differences between this species and *G. granulatus* have been discussed by Holthuis (1958). Crosnier (1965: figs. 8, 11) gave excellent figures of the male gonopods of this species. Banerjee (1960:147, figs. 1c, 2o, p, 3a, f) gave a description and illustrations of the species and discussed its synonymy.

Distribution

Like *Grapsus tenuicrustatus*, *G. albolineatus* has a wide range throughout the Indo-

West Pacific region, i.e., from the Red Sea and the western Indian Ocean to Japan and Polynesia. Its type locality is "les mers de l'Île-de-France" (=Mauritius). Crosnier (1965) expressed the opinion that *G. albolineatus* probably does not occur in Madagascar, nor on the east coast of Africa. It is, however, one of the most common and most conspicuous of the Red Sea Grapsidae, and has been reported by many authors from this area. There is a possibility that in some cases it has been confused with *Grapsus granulatus*, since some previous authors did not distinguish between the two.

The records in the literature from the Red Sea are as follows: Red Sea (H. Milne Edwards, 1837; Heller, 1861a; Herklots, 1861; Hilgendorf, 1869; Kossmann, 1877; Ortmann, 1894; Nobili, 1906a; Laurie, 1915; Gohar and Al-Kholy, 1957; Banerjee, 1960; Guinot, 1962a, 1967a; Fishelson, 1971), Gulf of Suez (Miers, 1884; Banerjee, 1960; Guinot, 1967a), Et Tur or Ras Muhammad, Sinai Peninsula (Paulson, 1875, 1961), Et Tur (= Tor), Gulf of Suez (Balss, 1924), Ras Muhammad, south point of Sinai Peninsula (Balss, 1924), Sharm esh Sheikh, southeast coast of Sinai Peninsula (Balss, 1924; Holthuis, 1958), Gulf of 'Aqaba (Miers, 1878; Nobili, 1906a), Dahab, east coast of Sinai Peninsula (Balss, 1924), Elat, Israel (Holthuis, 1958), Bir al Mashiya, east coast of Gulf of 'Aqaba (Balss, 1924), Sinafir Island, entrance to Gulf of 'Aqaba (Balss, 1924; Monod, 1938), Na'aman Islands (= Nomaninsel), Saudi Arabia (Balss, 1924), Habban, Saudi Arabia, 26° 44'N (Balss, 1924), Egypt (Miers, 1884), Ras Gharib, west coast of Gulf of Suez (Balss, 1924), Umm el Kyaman, west coast of Gulf of Suez, 27° 50'N (Monod, 1938), Shadwan Island, entrance of Gulf of Suez (Balss, 1924), Hurghada (= Ghardaqa), Egypt (Ramadan, 1936), Gaftun Seghir Island, near Hurghada (Magnus, 1965), Ras Shakal (= Ras Shekub), Gulf of Aqiq, Sudan (Guinot, 1962a), Dahlak Archipelago, Ethiopia (Guinot, 1962a; Lewinsohn and Fishelson, 1968), Dahlak Kebir Island (= Isola Grande Dahlak), Dahlak Archipelago (Stella, 1955), Assab, Ethiopia (Cano, 1889a, 1889b; Nobili, 1906a; Maccagno, 1936). As indicated by Crosnier (1965:17), the specimen from Abu Ramlah mentioned by Monod (1938) as belonging to *Grapsus strigosus* proves to actually belong to *G. granulatus*.

Biology

Like most other *Grapsus* species it is an inhabitant of rocks at or above the water line, and it spends much of its time out of the water. The species is extremely agile, and is very difficult to catch: at the least alarm it disappears in rock crevices.

Remarks

The specific epithet *strigosus* Herbst, 1799, which for a long time has been used for the present species proved to be invalid. *Cancer strigosus* Herbst, 1799, namely, is preoccupied by *Cancer strigosus* Linnaeus, 1761, for the galatheid known at present as *Galathea strigosa* (L.). The oldest available name for the present species proves to be *Grapsus albolineatus* Lamarck, 1818. Lamarck's description is insufficient for the recognition of his species, but H. Milne Edwards (1837:87), who must have seen Lamarck's types, which were in the Paris Museum, placed the species in the synonymy of *Grapsus strigosus* (Herbst), an action with which all subsequent authors concurred.

Grapsus granulosus H. Milne Edwards, 1853

- Grapsus granulosus* H. Milne Edwards, 1853:169; Heller, 1861a:18, 31; Hilgendorf, 1869:87, 109; A. Milne Edwards, 1873:287; Holthuis, 1958:48, fig. 4a; Crosnier, 1965:15, 17, figs. 9, 12; Guinot, 1967a:284; Fishelson, 1971:116, 126, 128, fig. 4.
- Grapsus intermedius*— Ramadan, 1936:38; Banerjee, 1960:155 (p.p., specimens from "Aqaba" only); Guinot, 1967a:284 (p.p.).
- Grapsus longitarsis*— Monod, 1938:151, fig. 28; Guinot, 1967a:284 (p.p.).
- Grapsus strigosus*— Monod, 1938:150 (p.p., specimen from "Abou Ramlah"); Banerjee, 1960:150 (p.p., specimens from "Aqaba").

*Material Examined**Sinai Peninsula*

Gulf of 'Aqaba:

Shurat el Manqata, N of Nabq; 25.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 1 ♂. Dahab; shore, among rocks; 3.II.1949; "Manihine"; BM; 2 ♂, 3 ♀ (2 ovigerous). Near Coral Beach, S of Elat; among rocks near the waterline; 15.V.1962; L.B. Holthuis no. 3011; RMNH; 4 specimens; 26.IV.1976; L.B. Holthuis; RMNH; 1 ♂, 2 ♀ (1 ovigerous). S of Wadi Masri, S of Elat; 15.VI.1959; H. Steinitz, E 59/29; 1 ♂. Near Beth Williams, Elat; 9-23.IX.1952; Ch. Lewinsohn and L. Fishelson, NS 7316, 6 ♂, 7 ♀ (2 ovigerous). Elat, Israel; 13.XII.1949; A. Ben-Tuvia; 6 ♂, 2 ♀ (1 ovigerous); 20.XII.1949; 1 ♀; 0-1 m deep; fish poisoning; 5.IX.1960; E. Clark, E 60/62.20; 5 ♀ (2 ovigerous); 4.VII.1963; A. Ben-Tuvia; NS 5462; 1 ♂; 15.IV.1969; A. Kocatas; RMNH; 1 ♂; 14.X.-14.XI.1975; D.H. Spaargaren. RMNH; 1 ♂.

East coast of Red Sea (Arabia)

Sinafir Island, entrance to Gulf of 'Aqaba; 8.VII.1971; SLR 3184; 1 ♂, 1 ♀.

West coast of Red Sea (except Ethiopia)

Hurghada (= Ghardaqa), Egypt; among rocks in intertidal zone; X.1962; D.B.E. Magnus; RMNH; 3 specimens.

Ethiopia

Dahlak Archipelago:

Cundabilu Island: on rocks above waterline; 25.III.1962; ISRSE 62/1394; 1 ♂, 3 ♀ (1 ovigerous); on rocks above waterline; 4.IV.1962; ISRSE 62/1442; 1 ovigerous ♀.

Entedebir Island: Landing Bay; 12.III.1962; ISRSE 62/107; 1 ♂.

Ethiopian mainland:

Assab; among rocks in intertidal zone; 18.VII.1965; B. de Wilde-Duyfjes; RMNH; 1 ♂.

Description

Crosnier (1965) provided excellent figures of the male gonopod of all three small species of *Grapsus*: *G. granulosus*, *G. intermedius* and *G. fourmanoiri*, as well as of *G. tenuicrustatus* and *G. albolineatus*. These illustrations prove to be most helpful in the identification of the species, as are also his remarks on these taxa.

Colour

The following colour description was made from living material collected near Coral Beach, S of Elat, on 26.IV.1976. The upper part of the carapace and the legs are very pale greenish grey, mottled with some darker grey spots and overlaid by a pattern of numerous very dark, practically black, short lines and dots. These dark lines often follow the ridges and grooves. In the frontal area of the carapace some of the black lines have a whitish dot behind them. In the posterior part of the carapace the dark grey colour is arranged in such a way that it encloses numerous pale circular spot-like areas. On the legs some more-or-less distinct transverse dark bands can be seen: two on the propodus, two on the carpus, and three or four on the merus. The general impression of the upper surface of the animal is that it is a rather drab dark greenish grey mottled crab. The under surface of the body and legs are pale grey or whitish, and unmottled.

The chelae have the proximal part of the outside of the palm and the upper part of the fixed finger greenish grey, mottled with very dark grey. The middle third of the chela is pale violet on the outer surface. The distal part of the fixed finger, and the lower part of the dactylus are whitish. The tips of the fingers are black. The inner surface of the chela is whitish or very pale grey; the upper part of the dactylus and the proximal part of the palm are mottled with black. The upper surface of the carpus and merus of the cheliped is like the upper surface of the carapace, the lower surface is whitish.

Distribution

Grapsus granulatus is one of the smaller species of the genus which have often puzzled and confused zoologists studying this group. Although the large species, *Grapsus tenuicrustatus* and *G. albolineatus*, are widely distributed in the Indo-West Pacific region, the smaller species give the impression of having more restricted ranges. *Grapsus granulatus* is so far not known outside the Red Sea, *G. fourmanoiri* Crosnier has only been found in Madagascar and on the East African coast, while *G. intermedius* De Man seems to be restricted to the Malay Archipelago (the records of this species from the Red Sea and Madagascar prove, in fact, to be based on material of *G. granulatus* and *G. fourmanoiri*, respectively). *Grapsus granulatus* has not, so far, been found in the Persian Gulf nor on the East African coast. During a short stay at Bamburi Beach, north of Mombasa, Kenya (November, 1969) I collected *Grapsus tenuicrustatus* and *G. fourmanoiri*, but neither *G. albolineatus* nor *G. granulatus*. It would be interesting to find out whether the ranges of *G. granulatus* and *G. fourmanoiri* meet somewhere between Assab and Mombasa.

The published records of *Grapsus granulatus* are as follows: Red Sea (H. Milne Edwards, 1853; Heller, 1861a; Hilgendorf, 1869; A. Milne Edwards, 1873; Holthuis, 1958; Crosnier, 1965; Guinot, 1967a; Fishelson, 1971), Sharm esh Sheikh, south-eastern Sinai Peninsula (Holthuis, 1958), Shurat el Manqata, 28°12'N, southeastern Sinai Peninsula (Holthuis, 1958), Dahab, Sinai Peninsula, Gulf of 'Aqaba, 28°30'N (Banerjee, 1960; Banerjee indicated this locality as "Aquaba, Trans Jordan"), Abu Ramlah, Sinai Peninsula, Gulf of 'Aqaba, about 29°10'N (Monod, 1938; Crosnier,

1965), Elat, Israel, northern tip of Gulf of 'Aqaba (Holthuis, 1958), Sinafir Island, entrance of Gulf of 'Aqaba (Monod, 1938), Hurghada (= Ghardaqa), Egypt (Ramadan, 1936). The present material extends the known range of the species as far south as Assab.

Biology

This species, like most other *Grapsus*, lives among rocks just above and at the water line. It runs very fast and is even more agile and alert than *G. albolineatus*, which may be the reason that it is rarer in collections.

Remarks

Grapsus granulosus was identified with *G. albolineatus* by several authors, e.g., Hilgendorf, 1869 and A. Milne Edwards, 1873. Therefore several of the Red Sea records of *Grapsus albolineatus* (or its better-known synonym *G. strigosus*) may eventually prove to pertain to *G. granulosus*. Thus Crosnier (1965:17) pointed out that Monod's (1938:150) specimen from Abu Ramlah identified as "*Grapsus strigosus*" actually belongs to the present species. This is also true for the specimens from "Aquaba" reported by Banerjee (1960:150) as *G. albolineatus*, which I re-examined in the British Museum.

The specimen identified by Monod (1938) as *Grapsus longitarsis*, as shown by the figure, clearly belongs to *G. granulosus*. Banerjee's (1960:155) Red Sea material of "*Grapsus intermedius*" proved to belong to *G. granulosus*, and this is also highly likely of the material that Ramadan (1936) brought to the same species. Guinot's (1967a) records of *Grapsus intermedius* and *G. longitarsis* from the Red Sea are evidently based on those of Ramadan (1936), Monod (1938) and Banerjee (1960) and thus they too pertain to *G. granulosus*.

Geograpsus Stimpson, 1858

Geograpsus Stimpson, 1858, Proc. Acad. Nat. Sci. Philadelphia, 10:101. Type species, selected by Rathbun (1918, Bull. U.S. Nat. Mus., 97:231): *Grapsus lividus* H. Milne Edwards, 1837, Hist. Nat. Crust., 2:85. Gender: masculine.

So far only a single species of this genus is known from the Red Sea.

Geograpsus crinipes (Dana, 1851)

Grapsus (*Geograpsus*) *rubidus*-. Hilgendorf, 1869:87, 109, pl. 5.

Geograpsus grayi-. Miers, 1884:545 (p.p.); Laurie, 1915:416 (p.p.); Guinot, 1967a:284 (p.p.).

Geograpsus crinipes-. Ortmann, 1894:706; Guinot, 1967a:284; Fishelson, 1971:126.

Geograpsus Grayi-. Nobili, 1906a:320.

Material Examined

Sinai Peninsula

Southern point:

Ras Muhammad; 17.IX.1967; L. Fishelson; NS 1549; 1 ♀.

West coast of Red Sea

Egypt; Sir J.G. Wilkinson; BM; 1 ♂.

Description

A description of this species has been published by Banerjee (1960:163, figs. 1e, 3q, r, 4a-c).

Colour

Alcock's (1900:396) statement that the animals are "in life bright red", was fully confirmed by specimens which I observed at Bamburi Beach, N of Mombasa, Kenya, which showed a most spectacular bright red colour all over.

Distribution

Geograpsus crinipes has been reported from the larger part of the Indo-West Pacific area, from the Red Sea and East Africa to Japan and Polynesia. Of the genus *Geograpsus* only a single species, *G. crinipes*, is known from the Red Sea. The first Red Sea record of the species is the one by Hilgendorf, who described the species under the name *Grapsus (Geograpsus) rubidus* Stimpson, and gave an excellent figure of it. Hilgendorf reported upon material collected by C.C. von der Decken at Zanzibar, but also included in his description a specimen collected by Dr. G. Schweinfurth in the Red Sea.

The second record is by Miers (1884:545) who, when dealing with *Geograpsus grayi* (H. Milne Edwards) mentioned a specimen, which he assigned to that species, and which was collected in Egypt by Sir J.G. Wilkinson.

At present, *Geograpsus grayi* (H. Milne Edwards, 1853) is considered a species distinct from *G. crinipes*. At the same time, *Geograpsus rubidus* Stimpson, 1858, is synonymized with *Geograpsus grayi*. Hilgendorf's (1869) description and figure of *Grapsus (Geograpsus) rubidus* clearly show that his material belongs not to the true *G. rubidus*, but to *Geograpsus crinipes*; this has already been pointed out by previous authors such as Ortmann (1894:706), De Man (1895:83), and Alcock (1900:396). Examination of Mier's (1884) specimen of "*Geograpsus grayi*" from Egypt, showed it to belong to *G. crinipes*.

The remaining records of *Geograpsus grayi* from the Red Sea (Nobili, 1906a; Laurie, 1915; Guinot, 1967a) are not based on actual material, but evidently on the record by Miers and, later, that by Hilgendorf. Thus, all the published Red Sea records of *Geograpsus* pertain to *G. crinipes*, and so far *G. grayi* is not known from the area.

Fishelson's (1971) record of the present species is based on the above listed specimen from Ras Muhammad (southern tip of Sinai Peninsula), which is one of the only three specimens known from the Red Sea. The other two being (a) the specimen from "Egypt", also listed above, which is the specimen mentioned by Miers (1884), and (b) the specimen collected by G. Schweinfurth in the Red Sea ("aus dem Rothen Meere", without further locality indication) described by Hilgendorf (1869).

Biology

In November 1969 I had the opportunity of collecting and observing live specimens of this species at Bamburi Beach, N of Mombasa, Kenya. The specimens were found at

night, far from water on overhanging coral cliffs, and moving into cracks when disturbed.

Metopograpsus H. Milne Edwards, 1853

Metopograpsus H. Milne Edwards, 1853, Ann. Sci. Nat. Zool., (3) 20:165. Type species, by present designation: *Grapsus thukuhar* Owen, 1839, Zool. Beechey's Voy.:80. Gender: masculine.

So far two species of this genus are known from the Red Sea.

Metopograpsus messor (Forskål, 1775)

Cancer messor Forskål, 1775:88; Herbst, 1782:86; Olivier, 1791:179; Heller, 1861a:30.

Grapsus Gaimardi— Audouin, 1826:82, pl. 2 fig. 3; Audouin, 1827:258, pl. 2 fig. 3; Heller, 1861a:31.

Grapsus messor— H. Milne Edwards, 1837:88 (p.p.); White, 1847:39 (p.p.); Heller, 1861a:31.

Metopograpsus messor— H. Milne Edwards, 1853:131 (p.p.); Heller, 1861a:18, 31; Heller, 1861b:362; Paulson, 1875:68; Kossmann, 1877:57; Neumann, 1878:27; Hilgendorf, 1879:808; De Man, 1880:183; De Man, 1881:94; Miers, 1884:245 (p.p.); Ortmann, 1894:701 (p.p.); Del Prato, 1896:184; Nobili, 1906a:320; Laurie, 1915:416, 421, 472; Balss, 1924:16; Calman, 1927:215; Munro Fox, 1927:218, 219; Pesta, 1927:72; Maccagno, 1936:178; Ramadan, 1936:38; Monod, 1938:151; Tweedie, 1949:469, fig. 1e; Stella, 1955:68; Holthuis, 1958:51; Banerjee, 1960:174, figs. 4h,i, 5c; Paulson, 1961:73; Guinot, 1962a:13; Guinot, 1967a:285; Fishelson, 1971:123.

Leptograpsus messor— Von Martens, 1866:381.

Grapsus Gaimeri— Neumann, 1878:27.

Grapsus (Metopograpsus) messor— Hilgendorf, 1869:109.

Metopograpsus messor— Lenz, 1912:4; Fishelson, 1971:116, 128, fig. 4.

Material Examined

Sinai Peninsula

Gulf of Suez:

Red Sea (Suez, Et Tur or Massawa); IX.1874-II.1875; R. Kossmann; RMNH; 1 ♂, 1 ♀. Suez, Egypt; VII.1936; G. Witenberg; no. E 61/7.2; 1 ♀. Ras el Misalla; 1.II.1969; SLR 2258; 1 ♀; 11.VIII.1970; SLR 2933, 2 ♂, 2 ♀ (1 ovigerous); 22.IX.1970; SLR 3035; 1 ♂. Ras Matarma; 31.I.1969; SLR 2205; 8 ♀; 12.VIII.1970; SLR 2988; 2 ♂, 6 ♀ (4 ovigerous); 24.IX.1970; SLR 3123; 2 ♂, 1 ♀. Ras Abu Rudeis; 13.VI.1968; SLR 1877; 1 ♀. El Bilaiyim; 13.I.1970; SLR 2637, 2644; 3 ♂, 1 ♀, 1 juv.; 3.V.1970; SLR 2872, 2875; 2 ♂, 1 ♀. Abu Durba; 11.VI.1968; SLR 1783; 1 ♀.

Southern tip of peninsula:

Ras Muhammad; 3.XII.1956; H. Steinitz; 2 specimens.

Gulf of 'Aqaba:

Gulf of 'Aqaba, coast of Sinai Peninsula; XII.1956; O.H. Oren and A. Ben-Tuvia; 1 juv. Nabq; 9.V.1968; SLR 1477, 1479, 1493; 11 ♂, 3 ovigerous ♀; 11.V.1968; SLR 1614, 1640; 2 ♂, 6 ♀ (1 ovigerous). Shurat Gharqana, N of Nabq; 2.VI.1969; SLR 2302; 2 ♂, 5 ♀; 3.VI.1969; SLR 2399, 4 ♂, 5 ♀; in mangroves; 24.IV.1976, Ch. Lewinsohn and L.B. Holthuis; RMNH; 2 specimens. Shurat Arwashie, in mangroves (*Avicennia marina* (Forskål)); 24.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 2 ♀ (1 ovigerous). N. of Shurat Arwashie, intertidal zone of open coast; 24.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 1 ♂, 2 ovigerous ♀. Shurat el Manqata, N of Nabq; among mangroves (*Avicennia marina*); 15.XI.1967; L. Fishelson; NS 1559, 1565; 4 ♂, 1 ♀, 2 juv; 15.X.1968; L. Fishelson; NS 4610; 1 ♂; 25.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 3 ♂, 1 ♀. Abu Zabab; 2.II.1957; H. Steinitz; E 57/66; 1 specimen.

East coast of Red Sea (Arabia)

Jidda, Saudi Arabia; received 1880; J.A. Kruyt; RMNH; 3 ♂, 1 ovigerous ♀.

West coast of Red Sea (Egypt, Sudan)

Hurghada (= El Ghardaqa), Egypt; X.1962; D. Magnus; RMNH; 2 ♂, 2 ♀.

Ethiopia

Dahlak Archipelago:

Entedebir Island: Landing Bay, 15.III.1962; ISRSE 62/304; 2 juv. Padina Bay, under rocks in the littoral zone of a rock flat covered with a thin layer of mud; 18.III.1962; ISRSE 62/1359; 1 ♂, 1 ♀. Goliath Bay, exposed mud flat of very fine coral silt; 19.III.1962; ISRSE 62/4422; 2 ♂; under rocks on a muddy and rocky shore, 0-1 m deep; 30.III.1962; ISRSE 62/1418; 4 ♂, 10 ♀ (6 ovigerous). Amphioxus Bay, among silt-covered rocks out of the water; 22.III.1962; ISRSE 62/1380; 1 ♂.

Nocra Island: Bay near prison in NE corner of island, sandy bottom and corals, 0-3 m; fish poison; 18.III.1962; ISRSE 62/1356; 2 juveniles; tidal zone, solid mud, among salt plants; 18.III.1962; ISRSE 62/1358; 2 ♂, 3 ♀; 21.III.1962; ISRSE 62/137; 3 ♂, 2 ♀.

Museri Island: Camping Bay, among rocks; 9.X.1965; ISRSE 65/0238; 1 ♀; among rocks, 0-0.2 m; 12.X.1965; ISRSE 65/0293; 1 ♂; rocky plateau, 0-0.1 m; 14.X.1965; ISRSE 65/1065; 1 juvenile ♀; rock plateau, among rocks at low tide; 14.X.1965; ISRSE 65/1031; 2 ♂; 15.X.1965; ISRSE 65/0760, 0761; 2 ♂, 4♀, 5 juv.; exposed rock plateau at low tide; 26.X.1965; ISRSE 65/2060, 1 ovigerous ♀. Braathen Bay, under rock at tide line; 13.X.1965; ISRSE 65/0295; 1♂, 1♀. North coast of the island; X.1965; 19 specimens.

Ethiopian mainland:

Gurgursum, N of Massawa; 4.II.1958; O.H. Oren; E 58/13; 3 ♂, 3 ♀. Massawa; rocky shore, among rocks near the water line, 0-2 m deep; 6-8.III.1962; ISRSE 62/1513; 5 ♂, 6 ♀. Island S of Massawa; among corals; 13.I.1968; I. Golser; 1 ♀. Massawa Channel; 1957; A. Ben-Tuvia; E 57/406; 1 ovigerous ♀. Zula Bay, S of Massawa; small saltwater pool; 20-23.III.1962; ISRSE 62/4421; 1 ♂, 1 ♀.

Description

Banerjee (1960:174, figs. 4h, i, 5c) and Tweedie (1949:469) gave good charac-

terizations of this species and provided a key to the species of the genus. The male pleopods, which are most characteristic for the species, have been figured by Stephensen (1945:195, figs. 59E, F), Tweedie (1949:467, fig. 1c), Forest and Guinot (1961:153, fig. 163) and Crosnier (1965:20, fig. 19). The similarly characteristic female openings were figured by Banerjee (1960:164, fig. 4i) and Forest and Guinot (1961:156, fig. 166).

Colour

Forskål's (1775) colour description cited below (see Remarks), characterizes the colour of the carapace of the present species quite well: "obscur-cinereus, nigro-nebulosus", which Herbst (1782) translated as "dunkel aschgrau mit schwarzen Wolken." Banerjee (1960:177) described the colour as "brownish yellow above, sometimes variegated with dark brown patches". These descriptions were based on preserved material. Crosnier's (1965:25) colour description "verte ou brune avec des points et des lignes irrégulières plus foncés" is possibly based on fresh material. I made the following colour description of living material collected on 14.X.1965 at Camping Bay, Museri Island, Dahlak Archipelago: "Carapace bright pale green with dark brownish purple, almost black, irregular spots. Walking legs pale brown with irregular whitish spots on the upper surface, lower surface pinkish to red. The chelipeds have the outside dark brownish red, inside they are paler; the carpus and merus of the chelipeds are marmorated. The sternum is greyish, the mouth parts darker. Small specimens are pale grey marbled." Kossmann (1877:58) commented on the variability of the dark marbling of the carapace: "die Färbung und Zeichnung variirt ausserordentlich von rötlich gelben Exemplaren fast ohne Zeichnung bis zu solchen, bei welchen die braune oder schwarze Marmorirung die Grundfarbe fast nirgends mehr erkennen lässt." We found the colour of the species also quite variable in the extent of the dark colour. The chelipeds have the chelae usually brownish red, often with a purplish tinge.

Distribution

Confusion existed within the genus *Metopograpsus* until in 1949 Tweedie defined the status of the various species and showed that several species incorrectly had been identified with *M. messor*. Therefore most of the old records, if not substantiated by descriptions, illustrations or material, cannot be trusted. So far the only reliable records of *Metopograpsus messor* pertain to material from the Red Sea, the Persian Gulf, the east coast of Africa and Madagascar; the ones from the rest of the Indo-West Pacific area (as far as Japan and Hawaii) that could be checked proved to be based on specimens of other species; a specimen said to originate from Gabon, W Africa (Monod, 1956:423), proved to be correctly identified, but was most likely incorrectly labelled as to the locality.

The records from the Red Sea are as follows: Red Sea (H. Milne Edwards, 1837, 1853; White, 1847; Heller, 1861a, 1861b; Hilgendorf, 1869, 1879; Kossmann, 1877; Neumann, 1878; Miers, 1884; Ortmann, 1894; Nobili, 1906a; Tweedie, 1949; Banerjee, 1960; Guinot, 1962a, 1967a; Fishelson, 1971), Egypt (Audouin, 1826, 1827; De Haan, 1835), Suez Canal near Kubri (km 149) and El Shatt (km 157), both

localities less than 10 km N of Suez (Calman, 1927; Munro Fox, 1927; Banerjee, 1960; Guinot, 1967a), Gulf of Suez (Miers, 1884; Calman, 1927; Munro Fox, 1927; Monod, 1938; Banerjee, 1960), Suez (Forskål, 1775; Herbst, 1782; Nobili, 1906a; Laurie, 1915; Balss, 1924; Banerjee, 1960), between Suez and Port Taufiq (Laurie, 1915; Banerjee, 1960), Port Taufiq (Calman, 1927; Munro Fox, 1927; Banerjee, 1960), coast of Sinai Peninsula (Balss, 1924), Et Tur, west coast of Sinai Peninsula (Lenz, 1912; Balss, 1924; Holthuis, 1958), Et Tur or Ras Muhammad (Paulson, 1875, 1961), Ras Millar, west coast of Sinai Peninsula (Balss, 1924), Ras Muhammad, southern point of Sinai Peninsula (Holthuis, 1958), Gulf of 'Aqaba (Nobili, 1906a), Shurat al Manqata just S of Abu Zabad (Holthuis, 1958), Abu Zabad, about 40 km south of Dahab (Holthuis, 1958), Dahab (as 'Aqaba, St. Dahab), east coast of Sinai Peninsula (Banerjee, 1960), Sinafir Island, entrance to Gulf of 'Aqaba (Balss, 1924), Na'aman Island (= Nomaninsel), off Saudi Arabia, S of Yanbu (Balss, 1924), Habban, Saudi Arabia, 26°44'N 36°32'E (Balss, 1924), Jidda, Saudi Arabia (De Man, 1880, 1881; Tweedie, 1949; Banerjee, 1960), Mersa Thlemel, west coast of Gulf of Suez, Egypt (Monod, 1938), Ras Gharib (Balss, 1924), Umm el Kyaman (Monod, 1938), Hurghada (= El Ghardaqa), Egypt (Ramadan, 1936), Ras Abu Soma (= Abu Somer), S of Hurghada (Balss, 1924), Marsa Luli (= Mersa Sheikh), Egypt, 24°35'N 35°5'E (Balss, 1924), Marsa Abu, Egypt, 21°N (Von Martens, 1866), Port Sudan, Sudan (Pesta, 1927), Aqiq, S of Suakin, Sudan (Balss, 1924), Massawa, Ethiopia (Del Prato, 1896; Nobili, 1906a; Guinot, 1962a), Dahlak (= Dahalak) Archipelago, Ethiopia (Balss, 1924), Dahlak Kebir Island (= Isola Grande Dahlak), Dahlak Archipelago (Stella, 1955), Isratu Island, Dahlak Archipelago (Guinot, 1962a), Assab, Ethiopia (Balss, 1924; Maccagno, 1936). *Metopograpsus messor* is one of the commoner, if not the commonest, grapsid of the Red Sea, but it seems to be absent from some areas. Thus in the northern Gulf of 'Aqaba, especially in the neighbourhood of Elat, the species has not yet been found, although this is perhaps the most intensely explored part of the Red Sea as far as the marine fauna is concerned; here *Grapsus granulatus* is commonly encountered.

Biology

The species lives in the littoral zone under and among stones, especially when those are covered with a thin film of mud. Forskål (1775) described the habitat as "frequens inter lapides", and remarked "Refluente aqua prodit; viride maris sedimentum saxis adhaerens chelis alternatim decerpit & edit." Laurie (1915) reported the species from "mud-flats", "flats and docks", and "amongst stones of the embankment, bordering mud-flats, near high-tide level." I have also found it in mangroves.

Remarks

Forskål's (1775:88) original description of *Cancer messor* runs as follows:

"*Cancer messor*; *brachyurus*, *thorace rectangulo*, *laevi*; *spinula utrinque pone oculum*; *manuum chelis sub-inefirmibus*, *carpis & femoribus introrsum serratis*.

Descr. *Color* obscure-cinereus, nigro-nebulosus. *Thorax* pollicaris, subrectangulus, pone paulo angustior, planiusculus, rugis acutis, obliquis. *Chelae* obscure-violaceae;

subtus oblique rugosae & introrsum vix tuberculosae. Pollex utroque margine tuberculosus. Femora omnia transverse rugosa."

In some respects this description fits *Grapsus granulatus* better, since the latter species does have "sharp oblique grooves" on the carapace, those of the present *Metopograpsus* being very faint. The oblique ridges on the lower half of the outer surface of the chelae of *G. granulatus* are distinct, while in the present *Metopograpsus* such ridges can only be discerned with a lens. Also the rugae on the femora of the walking legs are far more conspicuous in *Grapsus granulatus* than in the present species. Forskål's description of a spinule on each side behind the eye, could as well refer to the outer orbital angle in *Metopograpsus* as to the single anterolateral tooth in *Grapsus granulatus*. His colour description, however, removes any doubt. It fits *Metopograpsus messor* auct. perfectly and is totally different from that of *Grapsus granulatus* (see p. 149). Forskål's descriptions are more in the nature of field notes than of finished accounts of the species. They were evidently intended as additions to morphological descriptions. Forskål died during his 1761–1763 Red Sea expedition, and did not have the opportunity to study his material in detail and publish complete descriptions. His field notes were published posthumously by C. Niebuhr, the leader of the expedition, and they show Forskål's great talents as a zoologist, in that so many of these preliminary incomplete descriptions make the identity of the species studied perfectly clear. There is the possibility that Forskål's description of *Cancer messor* was based on material of two different species (*M. messor* and *G. granulatus*), although it seems unlikely that Forskål would not have distinguished between the two. The question cannot be decided by examination of the type specimen, as all type material of Forskål's Crustacea is lost, with the exception of *Phronima sedentaria* (Forskål) which is still preserved in the Zoological Museum at Copenhagen (the late K. Stephensen, in litt., 5.I.1942). In order to settle this problem and to make any further discussion about the real identity of *Cancer messor* superfluous, I now select the male specimen (CL 21 mm, CB 28 mm) from Ras el Misalla, Sinai Peninsula, about 13 km SE of Suez (11.VIII.1970; SLR 2933), as the neotype of *Cancer messor* Forskål, 1775. The specimen is preserved in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden under reg. no. Crust. D.30637, and agrees perfectly with Tweedie's (1949) and Banerjee's (1960) accounts of *Metopograpsus messor*.

H. Milne Edwards (1837:88) when dealing with *Grapsus messor* must have had a mixture of species in hand, as he stated that the lateral borders of the carapace are entire and "ne présentant tout au plus qu'une seule petite dent en arrière de l'angle orbitaire externe." In none of the specimens examined was such a tooth found, and none has been reported by other authors dealing with *M. messor*. In his 1853 paper, however, H. Milne Edwards indicated that in the present species there are no lateral teeth behind the orbital angle. His 1837 statement, therefore, is either a mistake, or his material at that time was not homogeneous. However, also in 1853 his *M. messor* material was composite, as among it he mentioned a specimen from the Malabar coast of India.

Subsequent authors reported *Metopograpsus messor* from all over the Indo-West

Pacific region, and synonymized several other species of *Metopograpsus* with it. The revision of the genus *Metopograpsus* by Tweedie (1949), in which much attention is given to the shape of the male gonopods, finally straightened out the situation, and the status of the various species of *Metopograpsus* was clarified. Tweedie's results were fully confirmed by Banerjee's (1960) work on the same genus. These authors showed that *Metopograpsus messor* is restricted to the Red Sea and the extreme NW part of the Indian Ocean.

According to Kossmann (1877:58), *Grapsus savignyi* De Haan (1835:59) is a synonym of *M. messor*. In the Crustacea volume of Fauna Japonica, De Haan mentioned his new *Grapsus savignyi* twice, both times in the 1835 Decas II of the work. The first mention was on p. 32 as *Grapsus (Grapsus) "savignyi Nob. Description de l'Egypte T.II.f.4"*, the second on p. 59 as *Grapsus "Savignyi, nob. (Description de l'Egypte, T. II.f.3.) plica transversa dentes posteriores conjungente, pollice medio fasciato distincta."* That on p. 59 "T.II.f.3" is a misprint for "T.II.f.4" is shown by the following: (1) on p. 32 De Haan not only used the specific epithet *savignyi* for Savigny's pl. 2 fig. 4, but also referred Savigny's pl. 2 fig. 3 correctly to *Grapsus gaimardi* Audouin, (2) the species figured by Savigny on pl. 2 fig. 4 shows a dark band over the fingers of the chela as described by De Haan on p. 59 for his *Grapsus savignyi*, while the specimen of pl. 2 fig. 3 lacks such a band. Thus *Grapsus savignyi* De Haan, 1835, is a junior synonym of *Pachygrapsus marmoratus* (Fabricius, 1787) and not of *Metopograpsus messor* (Forskål, 1775).

Metopograpsus thukuhar (Owen, 1839)

Metopograpsus thukuhar— Lewinsohn and Fishelson, 1968:65.

Metopograpsus thukuar— Fishelson, 1971:128.

Metopograpsus thukuhar— Fishelson, 1971:130.

Material Examined

Sinai Peninsula

Gulf of 'Aqaba:

Nabq; common among the mangroves; 14.X.-14.XI.1975; D.H. Spaargaren; RMNH; 1 ♂. Shurat Arwashie, N of Nabq; in mangroves (*Avicennia marina* (Forskål)); 24.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 1 ♂. Shurat el Manqata; among mangroves, *Avicennia marina*; 15.IX.1967; L. Fishelson; NS 1559; 6 ♂, 12 ♀; among mangroves; 5.X.1968; L. Fishelson; NS 4609; 1 ♀; 2.VI.1973; J. Dafni; NS 9139; 3 ♂, 3 ♀; 25.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 1 ovigerous ♀.

Ethiopia

Dahlak Archipelago:

Entedebir Island: Landing Bay, 11.III.1962; ISRSE 62/207; 1 ovigerous ♀.

Ethiopian mainland:

Melita Bay, Gulf of Zula, S of Massawa; on mangroves, *Avicennia marina* (Forskål); 12, 14.IV.1962; ISRSE 62/2615, 2617, 2953; 10 ♂, 3 ♀, 1 juv.

Description

A good account of the species has been given by Tweedie (1949:469, fig. 1f), Banerjee (1960:186, fig. 6f, g), Forest and Guinot (1961:155, fig. 162, 167) and Crosnier (1965:25, figs. 20-22, 27). The male gonopods were well illustrated by Tweedie (1949: fig. 1f), Forest and Guinot (1961: fig. 162) and Crosnier (1965: fig. 20). Figures of the female gonopores were provided by Banerjee (1960: fig. 6g) and Forest and Guinot (1961: fig. 167). My specimens agree very well with these various accounts.

Distribution

The species is known from the greater part of the Indo-West Pacific region, i.e., from the Red Sea and East Africa to the Ryukyu Islands, Hawaii and Polynesia. Tweedie's (1949) supposition "that the species has a predilection for oceanic islands" is not confirmed by later finds.

The discovery of this second species of *Metopograpsus* in the Red Sea came as a surprise; most authors had considered *M. messor* the only erythraean species of the genus. Our material shows that *M. thukuhar* is found throughout the Red Sea, from the Gulf of 'Aqaba to the Eritrean coast south of Massawa. The only previous records of this species from the Red Sea, those by Lewinsohn and Fishelson (1968) and Fishelson (1971), are based on part of the present material.

Biology

Metopograpsus thukuhar, at least in the Red Sea, seems to be a mangrove crab. In Melita Bay it was observed climbing around in the *Avicennia* trees and over dead logs on the ground. In the mangroves of the Gulf of 'Aqaba it was found among the aerial roots of *Avicennia* in shallow water, where it was observed together with *Metopograpsus messor*. *M. messor* is also found under and among rocks in the tidal zone, but *M. thukuhar* has not, at least in the Red Sea, been observed anywhere but among the mangroves. The record of *M. thukuhar* from Entedebir Island, where no mangroves occur, is somewhat dubious.

Pachygrapsus Randall, 1840

Pachygrapsus Randall, 1840, J. Acad. Nat. Sci. Philadelphia, 8:126. Type species, by designation by Kingsley, 1880 (Proc. Acad. Nat. Sci. Philadelphia, 1880:198): *Pachygrapsus crassipes* Randall, 1840, J. Acad. Nat. Sci. Philadelphia, 5:272. Gender: masculine.

Only a single species of this genus is known from the Red Sea.

Pachygrapsus minutus A. Milne Edwards, 1873

?*Nautilograpsus eriantus* Klunzinger, 1870:391.

?*Nautilograpsus minutus*-. Klunzinger, 1878a: 389; Klunzinger, 1878b: 357 (not *Cancer minutus* L., 1758).

Pachygrapsus minutus-. Balss, 1924:16; Ramadan, 1936:38; Guinot, 1967a:285; Fishelson, 1971:122, 126.

*Material Examined**Sinai Peninsula*

Gulf of 'Aqaba:

Nabq, near Straits of Tiran; 10.V.1968; SLR 1565; 1 ovigerous ♀. Shurat Gharqana, N of Nabq; on large rocks on reef flat in tidal zone; 24.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 9 specimens (1 ovigerous female). Bay N of Shurat Arwashie, N of Nabq; rocks in tidal zone; 25.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 1 specimen. Ras el Burqa' (= White Cape), 40 km S of Elat; 5.X.1968; L. Fishelson; NS 4030; 2 ♂, 1 ♀. Wasset (= Wasit), between Dahab and Nawibi (= Nuweiba); under stones; 7.X.1968; L. Fishelson; NS 3744; 2 ♂; fish poisoning; 8.X.1968; L. Fishelson; NS 4258; 2 ♀. Coral Beach, Elat; outside new pier; 1.III.1970; H. Schuhmacher; RMNH; 1 ♀.

Description

The specimens agree well with Crosnier's (1965:26, figs. 23, 29, 30) excellent description and figures of the species.

Like *Pachygrapsus transversus* (Gibbes), the present species shows a long and dense whitish pubescence on the anterior surface of the propodus of the first walking leg.

Colour

The posterior half of the carapace bears four submedian dark spots; two of these are placed just behind the central part of the cervical groove, the other two are situated slightly wider apart, just before the posterior margin of the carapace. In some specimens these spots are connected by more chromatophores so that two more-or-less distinct longitudinal submedian bands are formed. The pereopods have dark spots on the anterior margin: two on the propodus, one on the carpus, and three on the merus.

Distribution

The species has a wide distribution throughout the Indo-West Pacific region. It is known from the Red Sea and East Africa to Japan, Hawaii and Polynesia. The previous records from the Red Sea are as follows: Red Sea (Guinot, 1967*a*; Fishelson, 1971), Shadwan Island near the entrance of the Gulf of Suez (Bass, 1924), Hurghada (= Ghardaqa), Egypt (Ramadan, 1936), ?Quseir, Egypt (Klunzinger, 1870, 1878*a, b*; see below under Remarks). The published Red Sea records of this species are all from the northern part of the Red Sea and the Gulf of Suez; the present material shows that it is quite common in the Gulf of Aqaba, but so far it has not been found in the central and the southern part of the Red Sea.

Biology

At Shurat el Gharqana the species was found in the tidal zone on large rocks lying on the reef flat. The species occurred there in considerable numbers, hiding in little cracks, and scurrying away rapidly when alarmed. Klunzinger (1870, 1878 *a, b*) reported his *Nautilograpsus* from a very similar habitat.

Remarks

As shown below under *Planes minutus*, Klunzinger's (1870, 1878*a, b*) reports of

Nautilograpsus minutus (once spelled incorrectly *N. eriantus*) do not pertain to *Planes minutus* (L.), but in all probability to the present species.

Planes Bowdich, 1825

Planes Bowdich, 1825, Excursions Madeira, Porto Santo: xi, 15 (footnote), pl. 14 figs. 2a, b. Type species, by monotypy: *Planes clypeatus* Bowdich, 1825, Excursions Madeira, Porto Santo: 15 (footnote), pl. 14 figs. 2a, 2b [a subjective synonym of *Cancer minutus* L., 1758]. Gender: masculine.

Planes minutus (Linnaeus, 1758)

not *Nautilograpsus eriantus* Klunzinger, 1870:391.

not *Nautilograpsus minutus*-. Klunzinger, 1878a: 349; Klunzinger, 1878b: 357.

Planes minutus-. Nobili, 1906a: 321; Laurie, 1915:416; Makkaveeva, 1965:91.

Nautilograpsus minutus-. Makkaveeva, 1965:91.

Description

Chace (1951) gave an excellent revision of the genus with descriptions and figures of both species.

Distribution

Planes minutus is known with certainty only from the Atlantic Ocean, where it is one of the characteristic inhabitants of floating gulf weed (*Sargassum*).

Although during the 1965 Israel South Red Sea Expedition floating *Sargassum* weed was collected in great quantities near Museri Island, Dahlak Archipelago, and was thoroughly searched, no material of *Planes* was found in it.

The records of *Planes minutus* in the literature concerning the Red Sea are either erroneous or doubtful. Klunzinger (1870:390-391) when describing the life in a rock pool in the Red Sea (presumably near Quseir, where he was stationed for a long time) remarked: "Ein Felsblock liegt in einer Vertiefung. An seiner vorragenden nackten Oberfläche sitzen kleine Schnecken und es klettert der kleine *Nautilograpsus eriantus* herum, der in dieser Zone so häufig ist." This same rock is later described by Klunzinger in his book on Egypt (in the 1878 English translation, pp. 356-358); it is said to rest in a slight depression of the reef, "Its upper surface, only occasionally washed by the waves at high water, rises naked, gray, and [p. 357:] dry above the surface. On this surface needle-shells, shore-shells (*Eulima*, *Rissoa*), and tiny hermit-crabs sun themselves, and the small but active rock-crab (*Nautilograpsus minutus*) clambers about. The last occurs in the greatest abundance over the whole of this zone where it is laid dry, popping out of one hole and into another; it is the representative here of the larger Grapsus of the shore." The specific epithet *eriantus* has, so far as I know, never been used for this species or, for that matter, for any other species of crab; it might just be a lapsus for *minutus*: the *m* of unclear handwriting might have been taken for *er*, and the *nu* for *an*. This seems the more likely as Klunzinger later used the name *Nautilograpsus minutus* for the same animals. Klunzinger's description of the habitat and the habits of his specimens makes it very likely that his identifica-

tion is incorrect. *Planes minutus* is a species found among floating algae and on floating objects and certainly is not a species that "clanders about" "in the greatest abundance" over rocks that become exposed at low tide. It seems more likely that what Klunzinger observed was not "*Nautilograpsus minutus* (L.)," but *Pachygrapsus minutus* A. Milne Edwards, a species which in the Red Sea is commonly found in a habitat that exactly matches the one described by Klunzinger for his specimens. Without actual material, however, the identity of Klunzinger's material remains difficult to prove, although we may be confident that it is not *Planes minutus*.

Laurie's (1915) record of *Planes minutus* from the Red Sea is evidently based on Nobili's (1906a: 321) mention of it in his "Faune carcinologique de la Mer Rouge," Nobili's material, however, does not originate from the Red Sea proper, but from Jibuti in the Gulf of Aden. In Chace's (1951:80, 83, fig. 8) revision of the genus *Planes*, correctly no records of the genus from the Red Sea are given.

More recently another dubious record of the species from the Red Sea was published. Makkaveeva (1965), in a Russian paper dealing with the *Sargassum* fauna of the Red Sea, reported on a specimen of *Planes minutus* (table 8, p. 91) which in the text on the same page is referred to as *Nautilograpsus minutus*. Although Makkaveeva mentioned only one specimen, two dates of capture are given, almost a year apart. Furthermore, Makkaveeva's specimen is only 2 mm long, much smaller than the smallest specimen recorded by Chace (1951). This small size of Makkaveeva's specimen makes her identification rather dubious, as in such a small specimen the differences from juveniles of related species are almost impossible to observe. *Planes minutus* is only known with certainty from the Atlantic Ocean, and Makkaveeva's specimen, if a *Planes* at all, would more likely be the Indo-West Pacific *Planes cyaneus* Dana, 1852. Also, the fact that in her paper Makkaveeva (1965:86, 90, 91, 92) reported "*Latreutes ensiferus* Stimp." (= *Latreutes fucorum* (Fabricius)) and "*Neptunus sayi* Gibb." (= *Portunus sayi* (Gibbes)) from the Red Sea, makes the reliability of her identifications even more dubious: *Latreutes fucorum* is only known from the North Atlantic and *Portunus sayi* is "reliably reported only from the Atlantic" (Chace, 1951:79). Another unfortunate fact is that Makkaveeva did not indicate the station(s) at which her little crab was taken, although in the introduction to her paper it is stated that the expedition of the "Akademik Kovalevskii" in 1961-1963 operated in the Red Sea and the Gulf of Aden. Therefore, there is the possibility that the specimen originates from outside the Red Sea.

***Iliograpsus* Barnard, 1955**

Iliograpsus Barnard, 1955, Ann. S. Afr. Mus., 43:25. Type species, by original designation and monotypy: *Iliograpsus rhizophorae* Barnard, 1955, Ann. S. Afr. Mus., 43:26 (a junior subjective synonym of *Camptandrium paludicola* Rathbun, 1909). Gender: masculine.

***Iliograpsus paludicola* (Rathbun, 1909)**

Iliograpsus paludicola Fishelson, 1971:128.

Material Examined

Sinai Peninsula

Gulf of Suez:

Ras Matarma: lagoon; 31.I.1969; SLR 2205; 1 ♂.

Gulf of 'Aqaba:

El Gharqana, N of Nabq, near entrance of Gulf of 'Aqaba; 11.V.1968; SLR 1614; 13 ♂, 5 ovigerous ♀.

Ethiopia

Melita Bay, Gulf of Zula, S of Massawa; mangrove swamp with *Avicennia marina* (Forskål), 0 to 0.5 m deep at low tide; 14.IV.1962; ISRSE 1962/2996; 5 ♂, 1 ♀.

Description

The carapace breadth of the males varies from 5.7 to 8 mm, the carapace length from 4.5 to 6.5 mm. In the ovigerous females the carapace breadth varies from 6 to 8 mm, the carapace length from 4 to 6 mm.

The species has been well described by Crosnier (1965:31, figs. 36, 37, 38a, b, 39, 59), and the present specimens agree well with this account. The dactylus of the cheliped of the male has a strong tooth in the middle of the cutting edge. Behind this tooth the edge is crenulate or provided with one or two smaller teeth; the distal part of the edge bears some widely spaced granules. The cutting edge of the fixed finger is evenly crenulate. In the female the chela is much smaller and slenderer than in the male, the cutting edges are without teeth and the fingers end in spoon-shaped tips. These spoon-shaped tips are also present in the males, but are less conspicuous. In the females the inner surface of the chelae do not show the long and soft pubescence described by Crosnier, but this is very distinct in the male specimens I examined.

Colour

Reddish bands are present on the legs: one in the distal part and one in the middle of the propodus, one in the distal and one in the proximal part of the carpus and four on the merus. This colour pattern is very similar to that shown by Rathbun (1910:326, fig. 9) for the female type specimen of the species.

Distribution

So far the species is known from East Africa, Madagascar and Thailand. The only previous record from the Red Sea is the one by Fishelson (1971), which is based on the present material from Melita Bay.

Biology

All previous records mention the species from mangroves, a habitat where the present material also was found.

VARUNINAE Alcock, 1900

Pseudograpsus H. Milne Edwards, 1837

Pseudograpsus H. Milne Edwards, 1837, Hist. Nat. Crust., 2:81. Type species, by present selection: *Grapsus penicilliger* Latreille, 1817, Nouv. Dict. Hist. Nat., (ed. 2)

13:431 (a subjective junior synonym of *Cancer setosus* Fabricius, 1798. Suppl. Entomol. Syst.: 339). Gender: masculine.

Only one species of this genus is known at present from the Red Sea.

***Pseudograpsus elongatus* (A. Milne Edwards, 1873)**

Pseudograpsus erythraeus Kossmann, 1877:61, pl. 1 fig. 5, pl. 3 figs. 14, 15; Kossmann, 1878:255; Neumann, 1878:26; Laurie, 1915:416; Balss, 1924:16; Holthuis, 1958:51.

Pseudograpsus erytraeus— Nobili, 1906a:321.

Pseudograpsus elongatus— Guinot, 1967a:286.

Pseudograpsus erythreus— Fishelson, 1971:128.

Material examined

Sinai Peninsula

Gulf of 'Aqaba:

Shurat Gharqana, N of Nabq; in sand under stones in tidal zone; 24.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 16 specimens. Shurat el Manqata, N of Nabq; 15.IX.1967; NS 2455; 1 ♀; under stones in tidal zone; 25.IV.1976; Ch. Lewinsohn and L.B. Holthuis; RMNH; 1 specimen. Marsa Murach, northern Gulf of 'Aqaba, about 20 km S of Elat; 22.VIII.1967; NS 2426; 1 ♂; 22.VIII.1968; N. Gunderman; NS 5469; 1 ♂ 1 ♀. Coast opposite Fara'un Island; 18.XII.1967; SLR 1115; 1 ♀. Elat; X.1949; 1 ♀; 12.VI.1966; Ch. Lewinsohn; NS 1074; 1 ovigerous ♀; date unknown; U. Safriel; NS 1077; 1 ovigerous ♀.

Ethiopia

Dahlak Archipelago

Entedebir Island: Padina Bay, under rocks in litoral zone; 18.III.1962; ISRSE 1962/1359; 1 ♂. Abiad Bay, fine sand beach exposed at low tide; 0-0.2 m deep in sand; 12.III.1962; ISRSE 1962/1474; 1 ♀; 0-1 m deep; collected with fish poison; 29.III.1962; ISRSE 1962/3427; 2 ♂, 2 ♀.

Museri Island: Camping Bay; 27.X.1965; ISRSE 1965/2451; 2 ♀.

Description

An excellent description of this species is provided by Crosnier (1965:39, figs. 47, 49-51, 58).

Colour

The specimens from Abiad Bay, which were found in fine pure white sand, were whitish when alive, having the colour of the sand in which they were found. The specimens from Shurat Gharqana were very variable in colour and less so in colour pattern: the carapace was whitish, greyish or reddish brown, or brownish red, often marbled or spotted with dark grey. The walking legs were light, usually with narrow dark bands. These bands are usually placed in the proximal part of the dactylus and of the propodus, in the proximal and distal part of the carpus, while three bands are present on the merus. These bands are not always distinct. The chelipeds are spotted with grey.

A. Milne Edwards (1873:318) gave the colour as "un brun violacé; ces teintes se disposent parfois par marbrures"; it is likely that his animals came from a dark substratum. Crosnier (1965:42) indicated the colour of the species as "uniforme, jaune clair", which agrees reasonably well with what we found in our specimens from Abiad Bay.

Distribution

Pseudograpsus elongatus is known from the Red Sea, SE and E Africa, Madagascar, the Seychelles and New Caledonia. The record from Gabon (West Africa), based on a specimen in the Paris museum, is almost certainly incorrect and caused by faulty labelling; this is the more likely as the collection in the Paris Museum also contains a specimen of *Metopograpsus messor* with the same locality data. The records from the Red Sea are as follows: Red Sea (Kossmann, 1877, 1878; Neumann, 1878; Nobili, 1906a; Laurie, 1915; Guinot, 1967a; Fishelson, 1971), Abu Zabad, about 40 km S of Dahab, east coast of Sinai Peninsula (Holthuis, 1958), Dahab, Gulf of 'Aqaba, Sinai Peninsula (Balss, 1924), Sinafir Island near the entrance of the Gulf of 'Aqaba (Balss, 1924), Shadwan Island, near entrance of Gulf of Suez (Balss, 1924), Ras Abu Soma (= Abu Somer), S of Hurghada, Egypt (Balss, 1924), Halaib (= Haleib), north of Dungunab, Sudan (Balss, 1924).

Biology

At Abiad Bay, Entedebir Island, the species was found dug in, in the upper layers of a fine white sandy beach, not more than 30 cm deep, while in Padina Bay it was found under rocks in the litoral zone. At Shurat Gharqana and Shurat el Manqata we found the specimens in the intertidal zone by turning stones over; the specimens were observed on the rather coarse sand under the stones and, upon being disturbed, they tried to dig themselves in. The colour of the animals is clearly adapted to the substrate in which they are living. So far no ecological or biological data on the species have been published.

Remarks

The present species was usually indicated by authors as *Pseudograpsus erythraeus* Kossmann, although Tesch (1918:97) had already indicated that the identity of *P. erythraeus* with *P. elongatus* seemed very likely to him. The first to definitely identify the two species was Monod (1965:423, figs. 578-582), who published figures of the male pleopods of both "species". Crosnier (1965:39) confirmed Monod's conclusion. I have been able to compare a male syntype of *Heterograpsus elongatus* A. Milne Edwards from New Caledonia (now in the collection of the Leiden Museum), with Red Sea material of the present species. Neither in the male pleopods nor in the male abdomen could I find any differences. The syntype was also examined by Tesch (1918:101) who already commented upon its imperfect condition. At first it seemed to have the anterolateral teeth less pronounced than in the Red Sea specimens, but a study of all the Red Sea material showed this character to be variable, several of the specimens in the present material in this respect matching the syntype quite well.

Utica White, 1847

Utica White, 1847, Proc. zool. Soc. London, 15:85. Type species, by monotypy:
Utica gracilipes White, 1847, Proc. zool. Soc. London, 15:86. Gender: feminine.

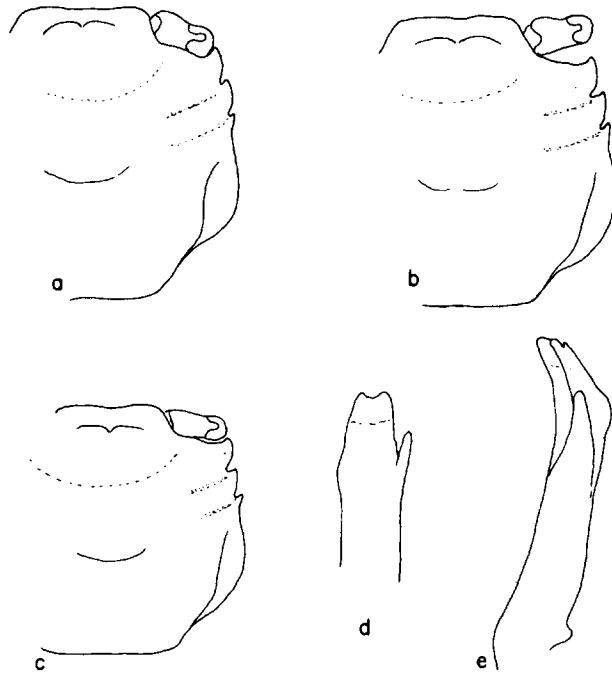


Fig. 1. *Utica barbimana* A. Milne Edwards, from the Red Sea. a-c. Right half of carapace in dorsal view (a & b, ♂; c, ♀). d & e. Male pleopod. a-c, x 6; d & e, x 25.

***Utica barbimana* A. Milne Edwards, 1873**

Fig. 1

Material Examined***Sinai Peninsula*****Gulf of 'Aqaba:**

El Gharqana, N of Nabq, 40 km N of Sharm esh Sheikh; 11.V.1958; SLR 1614; 2 ♂, 1 ♀.

Description of male

The carapace is roughly quadrangular, being slightly wider in the posterior third than at the frontorbital margin. The anterior margin of the front is slightly less than half the frontorbital width; it is weakly convex, with a slight emargination in the middle. The front has the anterolateral angles widely rounded and it broadens posteriorly. At its base the front is about 1/3 wider than the anterior margin. The

posterior margin of the orbit slopes somewhat backwards laterally. The lateral margin of the carapace is directed almost straight backwards in its anterior half, then it bulges outwards somewhat, narrows rather abruptly posteriorly, and merges with a curve with the posterior margin, which is slightly more than half the carapace width. Of the three anterolateral teeth the first, the outer orbital tooth, is largest, bluntly triangular, with the outer margin distinctly convex, and it reaches forward beyond the posterior orbital margin. The second tooth is of about the same size, less protruding and with the outer margin less convex. The third tooth is small, somewhat triangular and usually reaches the furthest sideways of the three teeth (Fig. 1a, b), although sometimes less far (Fig. 1c). The anterior half of the carapace is widest at the level of the third tooth. On the carapace there are two distinct sharp submedian postfrontal ridges; these are slightly convex anteriorly, meet under a wide angle and are separated by a distinct median incision. Behind these postfrontal ridges there is a low rounded, rather faint ridge which forms a curve between the two orbits, the convex side pointing posteriorly. From both the second and the third anterolateral tooth a similar faint curved ridge goes inward. There is a clear median transverse cervical groove, which is curved slightly forward at both ends and continues laterally as a very faint depression, reaching the lateral margin behind the anterolateral teeth. A sharp lateral ridge starts at some distance obliquely behind the last anterolateral tooth and is directed to the outer end of the posterior margin of the carapace, bypassing the lateral bulge. The entire dorsal surface of the carapace is covered with short, stiff, often slightly curved, dark brown hairs. These hairs are longest in the area along the anterior and anterolateral margins, smallest and least conspicuous in the central and posterior part. On the postfrontal carina and lateral ridges the hairs are placed closest together, thereby making the ridges more conspicuous.

The eyes are as long as the orbits. Their base is somewhat swollen and distinctly wider than the cornea, it bears some short dark brown hairs in the anterodorsal part. The antennulae are placed obliquely, almost transversely. The antennae do enter the orbit. The lower orbital angle is formed by a smooth ridge. A ridge is visible on the lower surface of the outer orbital angle.

The palp of the third maxilliped articulates in the middle of the front margin of the merus. The merus itself is wider than long, with the antero-external angle somewhat produced and rounded, being slightly auriculate. The ischium is longer than the merus and about twice as wide as the peduncle of the exopod. This peduncle narrows distally and carries a well developed flagellum.

The first pereopods in the male are equal and rather small, being shorter than the following pair of legs. The fingers are distinctly longer than the palm ($5/3$ times the length of the upper margin of the palm). The tips each bear a horn-coloured hoof, i.e., a curved ridge which on the outside merges with the cutting edge. The hoof of the dactylus shows a tooth, flanked at the outside with a concavity in which a similar tooth of the fixed finger fits. The cutting edges of both fingers bear several small sharp teeth behind the horny ridges. A distinct longitudinal carina extends over the outer surface of the chela from the tip of the fixed finger back and over the full length of the lower half of the palm. On the outer surface of the dactylus a much less distinct

low carina is visible, with a shallow, hair-filled groove just above it. The outside of the palm and fingers bears scattered short hairs, those on the ridge of the palm are dark and very conspicuous. A rather longish and soft pubescence is present on either side of the basal part of the cutting edges and the neighbouring area of the palm and fingers. This tuft stands out at either side of the chela. The inner surface of the chela is smooth. The carpus and the merus have about the same short pubescence as the chela and the carapace. The inner and upper angles of the anterior margin of the carpus are broadly rounded. The merus has a blunt tooth at the anterior lower angle of the outer surface; no other teeth or spines are present.

The following pereopods have the posterior and lower surfaces with the same kind of short hairs as has the carapace. These hairs are most distinct and most dense near the margins; the central part of the posterior surfaces of the merus, propodus and dactylus, but not that of the carpus, are almost or entirely without hairs; this is also true of the central part of the lower surface of the segments. Long hairs are implanted on the upper and lower margin of all the segments, being most conspicuous in the distal segments. The dactylus is longer than the propodus, this is most conspicuous in the first three walking legs, the ratio there varying from 1.2 to 1.4. In the last walking leg the dactylus is as long as or only slightly longer than the propodus. The dactyli of the first three walking legs are about six times as long as wide and have the upper margin slightly convex; in the last leg the dactylus is slightly less slender (about five times as long as wide), and has the upper margin straight or with the tip even curved slightly up. The dactylus of the second walking leg (P3) is the longest being slightly longer than that of P4 and distinctly longer than those of P2 and P5, the last mentioned being the shortest. The meri of P2 to P4 inclusive have a distinct subterminal dorsal tooth, which is absent in P5. The merus of P3 is about three times as long as wide; that of P5 is slightly more slender.

The telson is about 0.6 times as wide as the sixth abdominal somite; it has a rounded top and is 0.8 times as long as wide at the base. The last three abdominal somites (4, 5 and 6) similar to one another, both in length and width. The abdomen widens slightly towards the base.

The male first pleopod is rather short and somewhat curved outward at the top. The corneous top ends in two lobes which are separated by a U-shaped gap. The posterior lobe is thinner than the anterior which carries on its medial surface a carina ending in a tooth. A small slender lobe is placed in the distal part of the anterior margin of the pleopod.

In the female the chelipeds are smaller than in the males and lack the tuft of soft hairs at the base of the fingers.

Size

The carapace length of both males is 6.5 mm and the carapace breadth 6.8 mm. In the female these measurements are 5.5 and 6 mm, respectively.

Remarks

The specimens agree with A. Milne Edwards's (1873) short description and figure of *Utica barbimana*. The few differences found may be due to inaccuracies in A. Milne

Edwards's account. Thus, he stated that the chelipeds are smooth; no mention is made of the crista over the base of the palm which, however, is very clear in his pl. 14 fig. 4b. In A. Milne Edwards's fig. 4 the merus of P5 is shown as carrying a subdistal tooth, absent in the present material. Furthermore, the right cheliped is shown larger than the left, while in my specimens they are equal; A. Milne Edwards's text, however, stated that these legs are "égales". A. Milne Edwards's (1873) figure (pl. 14 fig. 4a) of the lower surface of the anterior part of the carapace is quite good, only the ridges on the lower surface of the external orbital tooth are shown as forming an entity, in my specimens they are separated. A. Milne Edwards's specimen is slightly larger than mine: the carapace is 10 mm long and wide. Finally, the habitat is different. A. Milne Edwards's specimens originate from fresh water in New Caledonia, while the Red Sea material is positively marine.

A Milne Edwards's *Utica glabra* also shows much resemblance to the present species. However, the carapace is said to be without postfrontal ridges: "sans indication des lobes protogastriques"; such ridges are present in all my specimens, but are also shown in A. Milne Edwards's pl. 14 fig. 3 of *U. glabra*. The carapace and legs of *U. glabra* are said to be naked, while in my specimens both the carapace and the legs bear hairs. The figure, apart from the absence of hairs, shows a species very similar to my material. The presence in the figures of *U. glabra* of a subdistal tooth on the merus of the last pereopods may be an error by the artist. The type specimen of *U. glabra* is said to be a male, but the chelipeds bear no hairs at the base of the fingers. The specimen has the carapace 13 mm long and wide and thus is considerably larger than the present specimens. The fact that *U. glabra* and *U. barbimana* were found together in fresh water of New Caledonia is rather peculiar and it would be worth while to look into the question of the distinctness of the two "species". For the time being, however, I think it best to treat *U. glabra* as a species different from the present form.

Haswell (1882:101, pl. 2 fig. 2) described *Utica setosipes* from Port Denison, Queensland. His description and figure agree entirely with the present form, and without examination of the type material no good differences between the two forms can be mentioned. Haswell's specimen had the carapace 7/16 in. (= 11 mm) long and 1/2 in. (= 12.5 mm) wide. The colour was dark brown.

De Man (1895:118; 1898, pl. 28 fig. 25) gave an excellent description and figure of a new species *Utica borneensis*. The description and figure are very detailed and accurate, and leave no doubt that this species is the same as that to which the present Red Sea specimens belong. The only difference that I could find is that in De Man's fig. 25 the dactyli of the last pair of legs are distinctly smaller than in my female; as nothing is said about this character in De Man's description, it may be an inaccuracy of the drawing, or the latter may show the dactylus foreshortened. De Man (1895:119) and Tesch (1918:95) indicated the shape of the anterolateral teeth of the carapace as a character distinguishing *U. barbimana* from *U. borneensis*. However, this is based mainly on A. Milne Edwards's illustration which is rather unsatisfactory in this respect while in A. Milne Edwards's text nothing is said about the arrangement of the teeth otherwise than that the third tooth is the smallest. The present material shows that the shape of the teeth, especially that of the third, is rather variable. De Man's single

female specimen (CL 13.5 mm, CB 14.5 mm) was collected at Pontianak, west coast of Borneo (now Kalimantan, Indonesia), but he did not indicate whether or not the specimen was taken at the coast or in freshwater. Tesch's (1918:96, footnote) remark "*U. borneensis* most likely lives in freshwater" does not seem to be well founded: other species reported by De Man from Pontianak are all marine, like *G. tenuicrustatus* and *G. albolineatus*. Tweedie (1940:110, fig. 12) under *Utica borneensis* gave additional details of specimens from Malaya (Prai near Butterworth) and Singapore and later (Tweedie, 1950a:356) reported the species from North Borneo (Labuan). The data given by Tweedie agree well with the present material. His Singapore specimens came from a mangrove swamp.

De Man (1895) himself had already remarked on the close resemblance of *Utica borneensis*, *U. barbimana* and *U. setosipes*. Tesch (1918) also emphasized this point, although in his key he kept *U. barbimana* and *U. borneensis* separate. Although only a re-examination of the types of *U. barbimana* and *U. setosipes* will make a definite judgment possible, it seems most likely that the three names are synonyms for a single species, which then would be known from the northern Red Sea (present material), Malaya, Singapore and SW and N Borneo (*Utica borneensis*), Queensland (*U. setosipes*) and New Caledonia (*U. barbimana*). As far as I know *U. setosipes* and *U. barbimana* are only known from the type specimens.

Thalassograpsus Tweedie, 1950

Thalassograpsus Tweedie, 1950, Bull. Raffles Mus. Singapore, 22:133. Type species, by original designation and monotypy: *Brachynotus harpax* Hilgendorf, 1892, S.B. Ges. Naturf. Freunde Berlin, 1892:38. Gender: masculine.

Thalassograpsus harpax (Hilgendorf, 1892)

Brachynotus harpax-. Nobili, 1906a: 320; Laurie, 1915:416, Guinot, 1967a: 286.

Distribution

No material of this species was collected by the Israel Red Sea Expeditions, and I have seen no Red Sea specimens of it. The type locality (Hilgendorf, 1892:38) is Aden, thus just outside the Red Sea. Nobili (1906a:320) reported it from various localities within the Gulf of Aden (Aden, Jibuti), from Perim Island in the entrance to the Red Sea and from "mer Rouge" without any more accurate locality indication. Laurie (1915) and Guinot (1967a) evidently based their inclusion of the species in the Red Sea fauna on Nobili's records.

The species has also been reported from Japan, the Malay Archipelago, the Cocos-Keeling Islands and Polynesia.

Remarks

Most authors assigned the species to the genus *Brachynotus*, but Tweedie (1950) showed it to be sufficiently different to deserve a genus of its own.

The genus *Brachynotus* thus does not occur in the Red Sea, but the Mediterranean species *Brachynotus sexdentatus* (Risso), the type of the genus *Brachynotus*, was

reported by Calman (1927:215) from the northern end of the Suez Canal (Port Said Lake Menzaleh, Lake Timsah). There are no indications so far that that species ever reached the Red Sea.

SESARMINAE Dana, 1852

Sesarma Say, 1818

Sesarma Say, 1817, J. Acad. Nat. Sci. Philadelphia, 1 (1):76. Type species by monotypy: *Ocypode reticulatus* Say, 1817, J. Acad. Nat. Sci. Philadelphia, 1 (1):73. Gender: neuter.

Serène and Soh (1970) divided the genus *Sesarma*, as until then understood by most authors, into several genera and subgenera, the typical genus *Sesarma* in their opinion being absent from the Indo-West Pacific area. As Serène and Soh's paper is only a preliminary one and still contains several inconsistencies and inaccuracies, I treat, for the time being at least, the genus *Sesarma*, s.l., as most previous authors did even though I do recognize the need for further splitting it up.

Subgenus *Perisesarma* De Man, 1895

Perisesarma De Man, 1895, Zool. Jb. Syst., 9:208. Type species by present selection: *Sesarma (Perisesarma) eumolpe* De Man, 1895, Zool. Jb. Syst., 9:208. Gender: neuter.

Most authors use the name *Chiromantes* for this subgenus, but incorrectly so. *Chiromantes* Gistel (1848: x) is a replacement name for *Pachysoma* De Haan (1833:5 circ. pl. 2, pl. 7 fig. 4, pl. 8 fig. 3), type species by present selection *Grapsus (Pachysoma) haematocheir* De Haan (1833: pl. 7 fig. 4). *Pachysoma* De Haan, 1833, is preoccupied by *Pachysoma* Macleay, 1821 (Coleoptera) and *Pachysoma* Geoffroy 1828 (Mammalia). In the original publication of *Pachysoma* De Haan only two species are mentioned by name: *Grapsus (Pachysoma) haematocheir* De Haan (on pl. 7 fig. 4) and *Grapsus (Pachysoma) quadratus* (Fabricius) (on pl. 8 fig. 3). Plate 8 fig. 3, however, does not show *Cancer quadratus* Fabricius, 1798 (= *Sesarma plicatum* Latr 1806) nor *Cancer quadratus* Fabricius, 1787 (= *Ocypode quadrata* (Fabr., 1787)), but *Sesarma dehaani* H. Milne Edwards, 1853, of which species the specimen figured by De Haan is the lectotype. No valid type selection has, so far as I can ascertain, ever been made for the genus *Pachysoma* De Haan. Both Fowler (1912:439) and Rathbun (1918:284) indicated as such *Grapsus (Pachysoma) bidens* De Haan, 1835 which however, was not mentioned in the original publication of the genus. Therefore, here the species *Grapsus (Pachysoma) haematocheir* De Haan, 1833 is chosen as the type species of the genus *Pachysoma* De Haan, 1833, and this species thus automatically becomes also the type species of the genus *Chiromantes* Gistel, 1848. The result is that *Chiromantes* Gistel, 1848, becomes a senior objective synonym of the generic name *Holometopus* H. Milne Edwards (1853:187), which also has *Grapsus haematocheir* De Haan, 1833 as its type species (by monotypy). If the other of the two species included by De Haan (1833) in the genus *Pachysoma* had been chosen as the type of that genus

the result would have been the same as *Sesarma dehaani* also belongs in the subgenus *Holometopus*.

Because of this action *Chiromantes* Gistel, 1848, becomes the correct name for the subgenus usually indicated as *Holometopus*, while the subgenus, indicated by most authors (including Serène and Soh, 1970) as *Chiromantes*, should be known as *Perisesarma* De Man, 1895.

Rathbun (1918:284) indicated as type species of the genus *Perisesarma* the species *Grapsus (Pachysoma) bidens* De Haan, 1835. This action, however, is incorrect as in the original description of *Perisesarma* only three species are specifically assigned to it: *Sesarma dussumieri* H. Milne Edwards, 1853, *S. (Perisesarma) eumolpe* De Man, 1895 and *S. (Perisesarma) onychophora* De Man, 1895. In the discussion of these species several others, like *Sesarma bidens*, *S. haswelli* De Man and *S. guttatum* A. Milne Edwards are mentioned for comparative purposes, but nowhere is it indicated that these are considered as belonging to the subgenus *Perisesarma*. As far as I know no valid type has ever been selected for *Perisesarma* and, therefore, *Sesarma (Perisesarma) eumolpe* De Man is here selected as such.

A single species of *Sesarma* is known at present from the Red Sea; it belongs to the subgenus *Perisesarma*.

Sesarma (Perisesarma) guttatum A. Milne Edwards, 1869

Sesarma guttatum-. Lewinsohn and Fishelson, 1968:65; Fishelson, 1971:130.

Material Examined

Ethiopia

Dahlak Archipelago:

Museri Island, near Camping Bay; 21.X.1965; ISRSE 1965/1474; 1 juvenile ♂.

Ethiopian mainland:

Melita Bay, Gulf of Zula, S of Massawa; on mangroves (*Avicennia marina* (Forskål)); 12, 14.IV.1962; ISRSE 1962/2411, 2418; 4 ♂, 5 ♀.

Description

An excellent description with good figures was published by Crosnier (1965:68, figs. 94, 97, 106).

Distribution

So far this species has only been reported from the Red Sea, the east coast of Africa and Madagascar. The only previous records from the Red Sea are those by Lewinsohn and Fishelson (1968) and Fishelson (1971), based on the material from Melita Bay.

Biology

The fact that until very recently the species has been overlooked in the Red Sea is probably due to its being an inhabitant of mangroves, a habitat which is relatively scarce along the Red Sea coasts, and has been little explored there.

The specimens from Melita Bay were found, together with *Metopograpsus thukuhar*, on the trunks of *Avicennia* out of the water.

Nanosesarma Tweedie, 1950

Nanosesarma Tweedie, 1950a, Bull. Raffles Mus. Singapore, 23:310. Types species, by original designation: *Sesarma andersoni* De Man, 1887, Zool. Jb. Syst., 2:657. Gender: neuter.

Serène and Soh (1970:393) indicated *Sesarma minutum* De Man, 1887 as the type species of the genus. This is incorrect as Tweedie (1950b:310) clearly stated that the type species of *Nanosesarma* is *S. andersoni* ("Genotype, by present designation, *Sesarma andersoni* De Man, 1887"). Actually, *S. andersoni* was placed by Serène and Soh (1970:394) in a new subgenus, *Beanium*, which they erected within *Nanosesarma*. If their assignment of *S. andersoni* to *Beanium* is correct then *Beanium* falls as a junior synonym of *Nanosesarma* and a new name is needed for the taxon that Serène and Soh considered the nominate subgenus of *Nanosesarma*. I refrain from proposing such a new name as I am not quite convinced of the necessity to distinguish two subgenera within the genus *Nanosesarma*. The differences given by Serène and Soh for their two subgeneric taxa are rather vague and not too clear cut. Thus, for instance, the telson of the male (p. 393, 394; in the key on p. 389, the entire abdomen is mentioned) in *Nanosesarma*, s.s., is "remarkably elongated", while in *Beanium* it is "not remarkably" elongated. However, of the four species of *Beanium*, the male abdomen is not or not clearly described. In *N. nunongi* only the length of the telson and the length and width of the 6th somite are indicated. In the original description of *N. edamensis* and *N. batavicum*, the male abdomen is not described but De Man merely stated that it "verhält sich wie bei" or "nearly agrees with" *N. andersoni*. In the original description of *N. andersoni* it is stated that "the male abdomen has about the same form as in *S. quadrata* Fabr." (= *S. plicatum* Latr.). Many of the other characters are also vague: the anterolateral tooth is present in *Nanosesarma*, s.s. (sensu Serène and Soh), and absent or indicated (the latter in *N. batavicum* and *N. andersoni* (not *N. edamensis*)) in *Beanium*. Not being sufficiently acquainted with the species of this genus, I leave it to others to take a decision here.

A single species is known from the Red Sea.

Nanosesarma jousseaumei Nobili, 1906

Sesarma (Sesarma) Jousseaumei Nobili, 1906b: 411; Nobili, 1906a: 323, pl. 8 fig. 9.
Sesarma (Sesarma) jousseaumei - Laurie, 1915:416; Guinot, 1967a:288.

Material Examined

Ethiopia

Dahlak Archipelago:

Entedebir Island: Landing Bay, intertidal zone; 16.III.1962; ISRSE 1962/155; 1 ovigerous ♀.

Description

The only specimen is very small, the carapace breadth being only 3.5 mm. The fact that it is ovigerous shows it to be adult. Eggs 0.25-0.3 mm in diameter.

The carapace is square, broader than long, 3 mm in length. The lateral margins are

almost parallel. In dorsal view the frontal margin shows as an almost straight line with a shallow rounded emargination in the middle. In frontal view the emarginate narrow central area is somewhat produced and the frontal margin at each side of it is concave, and passes under a rounded angle into the lateral margin of the front. The two submedian postfrontal lobes are distinct and rounded, the two lateral are hardly noticeable. The front is not sharply deflexed, but regularly curved downward. It is about half as wide as the carapace. The posterior margin of the orbit is crenulate and the inner half is slightly convex, the outer slightly concave. The outer orbital angle is sharp, the single lateral tooth is placed slightly behind it. The tooth is small and blunt, but distinctly visible. The upper surface of the carapace bears many small tufts of feathered setae which give the species a very hairy appearance.

The third maxillipeds are well described and figured by Nobili.

Nobili's remark that the chelipeds are relatively large, evidently pertains only to the male. In my female specimen they are small. The merus and carpus are covered by many short hairs, some of which are plumose. There are no teeth or spines on these segments, only small granules are present on the outer and lower surface. The chela has the lower surface smooth and naked. A granulated ridge extends over the full length of the outer lower half of the palm and ends at the base of the fixed finger. The area above this ridge is hairy and when the hairs are cleaned from the dirt that clings to the plumose setae, three longitudinal rows of granules are visible there. Scattered granules are present on the dorsal surface. The inner surface of the chela is smooth and naked. The upper surface of the palm bears several bristles but no carina. The chela regularly narrows from the base of the palm to the tips of the fingers. The fingers end in spoon-shaped tips and carry a few small teeth on the cutting edge. The fingers are not gaping or hardly so, when closed. Nobili's description of the gaping fingers probably refers to those of the male.

The merus of the last four pereopods has a distinct disto-ventral tooth. Above this tooth the distal margin of the merus bears several very small denticulations. The posterior margin of the merus shows one or two indistinct blunt teeth in about the middle. The pereopods have the upper surface covered with the same pubescence of tufts of plumose setae as the dorsal surface of the carapace. Nobili (1906a) stated that the posterior margin of the merus of the last pereopods is denticulated "sur tout son bord postérieur." This is not true in my specimen, which apart from the distal tooth and minute distal denticulations shows a blunt short tooth in the middle but no other denticulation. However, some hairs, especially where they have accumulated some dirt, may give a strong impression of being denticles; cleaning the specimen reveals the true nature of these supposed "denticles".

The female abdomen is almost circular with the telson deeply sunken into the sixth segment.

Distribution

Nanosesarma jousseaumei is known only from the Red Sea and the Gulf of Aden. Nobili (1906a, 1906b) reported it from "Mer Rouge" (without more accurate locality indication) and Obock, Gulf of Aden. Laurie's (1915) and Guinot's (1967a) Red Sea records of the species are evidently based on Nobili's and not on new material. If

Crosnier's (1965) material belongs to the present species, its range extends south to Madagascar. *N. gordonii* is known from Hong Kong, southern China and Japan, and *N. minutum* from Singapore, Thailand, South China Sea and Java.

Remarks

The status of the several species of *Nanosesarma* is still rather unclear. Serène and Soh (1970:393, 404, 405) synonymized *N. jousseaumei* and *N. gordonii* (Shen, 1935) with *N. minutum* (De Man, 1887) (the synonymy of *N. gordonii* and *N. minutum* on p. 393 is said to be probable, on p. 405 it is treated as definite). Tweedie (1950a:310, 311), who had seen several specimens of *N. minutum* (cf. Tweedie, 1936:52, 53) stated that the outer surface of the palm of the cheliped has a single row of granules, while in *N. gordonii* three of such rows are present. *N. jousseaumei*, as shown by the present specimen, in this respect resembles *N. gordonii* and not *N. minutum*. In fact, the present specimen so closely resembles *N. gordonii*, that it might well be identical with that form, but without males of *N. jousseaumei* and no material at all of *N. gordonii*, I am not in a position to give a definite verdict on this question. Possibly such additional material will enable us to find characters for distinguishing between the two.

Crosnier (1965:70, textfigs. 89, 109-115, pl. 6 fig. 4) identified Madagascar specimens as *Nanosesarma* cf. *minutum* (De Man). His material, like ours, showed three rows of granules over the outer surface of the palm of the cheliped and thus is closer to *N. gordonii*, but a direct comparison of his material with the type of *N. gordonii* showed the Madagascar species to be specifically distinct. It is possible that Crosnier's material should be assigned to *N. jousseaumei* as in most characters, e.g., in the shape and ornamentation of the chela there is a close resemblance. In my specimen, however, the front shows a deeper median emargination, the outer orbital angles are sharper and the meri of the walking legs show one or two, sometimes indistinct, lobiform teeth on the posterior margin. These differences, which are based only on a comparison with Crosnier's figures and are not confirmed by his text, are quite minor and perhaps partly non-existent.

Sarmatium Dana, 1851

Sarmatium Dana, Proc. Acad. Nat. Sci. Philadelphia, 5:251. Type species, by monotypy: *Sarmatium crassum* Dana, 1851, Proc. Acad. Nat. Sci. Philadelphia, 5:251. Gender: neuter.

Only a single species is known from the Red Sea.

Sarmatium crassum Dana, 1851

Sarmatium crassum-. Fishelson, 1971:128, 130.

Material Examined

Ethiopian mainland

Melita Bay, Gulf of Zula, S of Massawa; mangrove swamp; 12, 14.IV.1962; ISRSE 1962/2656, 2985, 2988, 2999; 11♂, 7 ♀ (2 ovigerous).

Description

Crosnier (1965:74, textfigs. 121-124, pl. 5 fig. 1) provided an excellent characterization of the species, with which our specimens agree quite well. Recently, Serène and Soh (1971) showed that the genus *Sarmatium* consists of two species only, *S. crassum* Dana and *S. germaini* (A. Milne Edwards). The present specimens agree fully with their description of *S. crassum*.

Distribution

The species has a wide distribution in the Indo-West Pacific region, being known from the Red Sea and East Africa to Polynesia. The type locality is Upolu, Samoa. The only previous record of the species from the Red Sea (Fishelson, 1971) is based on the present material.

Biology

This is a typical inhabitant of mangroves.

Helice De Haan, 1833

Helice De Haan, 1833, in Von Siebold, Fauna Japonica (Crust.) (1):5, Type species by subsequent monotypy (De Haan, 1835, in Von Siebold, Fauna Japonica, (Crust.) (2):28, 57, pl. 11 fig. 2, pl. 15 fig. 6, pl. C): *Ocypode (Helice) tridens* De Haan, 1835, in Von Siebold, Fauna Japonica, (Crust.) (2):28, 57, pl. 11 fig. 2, pl. 15 fig. 6, pl. C. Gender: feminine.

One species is known from the Red Sea.

Helice leachii Hess, 1865

Helice leachii— Holthuis, 1958:51.

Helice leachi— Guinot, 1967a:287.

Description

Crosnier (1965:76, textfigs. 125-128, pl. 5 fig. 2) provided a good description and illustrations of the species.

Distribution

From the Red Sea and East Africa to Japan, Australia and New Caledonia. The Israel South Red Sea Expeditions did not collect material of this species, and the only known Red Sea specimens are those reported upon by me in 1958 from Ras Muhammad (southern part of Sinai Peninsula) and Abu Zabad (east coast of Sinai Peninsula, Gulf of 'Aqaba). Guinot's (1967a) record of the species from the Red Sea is evidently based on the 1958 one.

Biology

The species was found in mangroves.

PLAGUSIINAE Dana, 1852

Plagusia Latreille, 1804

Plagusia Latreille, 1804, *Nouv. Dict. Hist. Nat.*, 24:125. Type species by designation by Latreille, 1810 (*Consid. gén. Anim. Crust. Arachn. Ins.*: 96, 422): *Cancer depressus* Fabricius, 1775, *Syst. Ent.*: 406. Gender: feminine.

So far only one species is known from the Red Sea.

Plagusia tuberculata Lamarck, 1818

Plagusia tuberculata— Miers, 1878:148; Guinot, 1967a: 288.

Plagusia squamosa— H. Milne Edwards, 1837:94; White, 1847:43; H. Milne Edwards, 1853:178; Heller, 1861a: 18, 32; Heller, 1861b: 363; Hilgendorf, 1869:109; Von Martens, 1872:112; Nobili, 1906a:324.

Cancer squamosus— Heller, 1861a:31.

Grapsus squamosus— Heller, 1861a:31.

Plagusia depressa tuberculata— Laurie, 1915:416; Balss, 1924:16; Monod, 1938:152.

*Material Examined**Sinai Peninsula*

Gulf of 'Aqaba:

Near Coral Beach, S of Elat; found among rocks in the tidal zone; 26.IV.1976, L.B. Holthuis; RMNH; 1 ♀, fresh molt. Near Elat, Israel; X.1951; E. Theodor, no E 51/120; 1 ♀.

Gulf of Suez:

Red Sea, probably coast of Egypt; 1846-1854; L.W. Ruysenaers; RMNH; 2 ♂, 2 ♀ (dry).

Ethiopia

Dahlak Archipelago:

Romia Island: poisoning; 0-3 m deep; 29.III.1962; ISRSE 1962/1413, 1415; 3 ♂, 7 ovigerous ♀.

Description

Crosnier (1965:80, pl. 7 fig. 3) provided a good description of the species.

Distribution

Plagusia tuberculata is widely distributed in the Indo-West Pacific region, from the Red Sea and East Africa to Japan and Polynesia. The species has repeatedly been reported from the Red Sea, the records in the literature being the following: Red Sea (H. Milne Edwards, 1837, 1853; White, 1847; Heller, 1861a, 1861b; Hilgendorf, 1869; Von Martens, 1872; Miers, 1878; Nobili, 1906a; Laurie, 1915; Guinot, 1967a), Gulf of Suez (Monod, 1938), Et Tur (= Tor), west coast of Sinai Peninsula, Gulf of Suez (Balss, 1924), Shadwan Island, mouth of Gulf of Suez (Balss, 1924).

Percnon Gistel, 1848

Percnon Gistel, 1848, Naturgeschichte Thierreichs höhere Schulen: viii. Replacement name for *Acanthopus* De Haan, 1833, in Von Siebold, Fauna Japonica (Crust.) (1): 5 (preoccupied by *Acanthopus* Klug, 1807). Type species, by selection by Rathbun, 1918 (Bull. U.S. Nat. Mus., 97:337): *Plagusia clavimana* Latreille, 1806, Gen. Crust. Ins., 1:34 (= *Cancer planissimus* Herbst, 1804, Naturgesch. Krabben Krebse, 3(4):3). Gender: neuter.

The only species of this genus thus far reported from the Red Sea is mentioned below.

***Percnon planissimum* (Herbst, 1804)**

Cancer planissimus-. Heller, 1861a:30.

Acanthopus planissimus-. Heller, 1861a:18, 30; Heller, 1861b:364.

Acanthopus clavimanus-. Heller, 1861a:30.

Cancer planipes-. Heller, 1861a:30.

Grapsus clavimanus-. Heller, 1861a:31.

Plagusia clavimana-. Heller, 1861a:33.

Percnon planissimus-. Nobili, 1906a:324.

Percnon planissimum-. Laurie, 1915:416; Guinot, 1967a:289.

Description

A good description and figures of this species are given by Crosnier (1965:90, figs. 135, 138, 144, 150, 151).

Distribution

Red Sea and East Africa to Japan and Polynesia. Notwithstanding the above rather impressive list of references to Red Sea specimens of this species, there are only two original records of the species from the Red Sea, and neither of them with a more accurate locality indication. Heller (1861a, b) reported upon specimens collected in the Red Sea by Georg Ritter von Frauenfeld, and Nobili (1906a) mentioned Red Sea material obtained by F. Jousseau. No material was obtained by the ISRSE expeditions.

Remarks

Heller (1861b) gave a rather extensive description of his material, which shows that he indeed had *Percnon planissimum*, and not one of the other species of *Percnon* that were later recognized as distinct from Herbst's species. He described the epistome as having three spines, and the surface of the carapace as "eben und stark tomentös" "mit Ausnahme einiger kleiner vorspringender nackter Höckerwülste".

GECARCINIDAE Macleay, 1838

Although from the recent enumerations of Red Sea crabs (Nobili, 1906a; Laurie, 1915) one gets the impression that no Gecarcinidae have been reported from the area, two species were mentioned from the Red Sea as early as 1861. These records were

published in an obscure place and one of the species was only identified as far as the genus. Both species are represented in the material studied.

Cardisoma Latreille, 1824

Cardisoma Latreille, 1824, Encycl. méthod. Hist. nat. (Insectes), 10:685. Type species selected by H. Milne Edwards, 1838: Cuvier, Règne anim., (ed. 3, discip. ed.) (5): pl. 20: *Cardisoma guanhumii* Latreille, 1824, Encycl. méthod. Hist. nat. (Insectes), 10:685. Gender: neuter.

Cardisoma carnifex (Herbst, 1796)

Ocypode (Cardisoma) Carnifex—Herklots, 1861:128.

Material Examined

West Coast of Red Sea

Red Sea, probably Egypt; 1846-1854; L.W. Ruysenaers; RMNH; 1 or 2 specimens (dry).

Ethiopian mainland

Alifat (= Al Fat), west coast of Zula Bay, S of Massawa, Eritrea; in dry wadi; 14.IV.1962; ISRSE 1962/2984; 1 ♀.

Description

The specimens agree quite well with the published descriptions, (e.g., Türkay, 1974:224, figs. 3, 11).

Distribution

The species is known from the Red Sea and East Africa to Polynesia, it is one of the common land crabs of the Indo-West Pacific area.

Herklots (1861) listed *Ocypode (Cardisoma) Carnifex* in his arrangement of the Crustacea of the Rijksmuseum van Natuurlijke Historie with the indication "Mer rouge. Sourabaia." This lot is still present in the collection. It consists of four dry specimens and is labelled Red Sea and Soerabaja, legit C.G.C. Reinwardt. Of two specimens the mouthparts are entirely removed and pasted on pieces of cardboard, one piece carrying the inscription "*Ocypode (Cardisoma) Carnifex* Herbst Sourabaja" in De Haan's handwriting, the other has the same inscription without the locality indication. This second cardboard clearly carries the mouthparts figured by De Haan (1835, Fauna Japonica Crust., (2):pl. C). As De Haan mentioned (1835:27), material of *Ocypode (Cardisoma) carnifex* "ab Javae littoribus", both these specimens must be from Surabaja, East Java, collected there between 1815 and 1822 by C.G.C. Reinwardt. Of the two remaining specimens the history cannot now be traced anymore. It is not clear whether one or both are from the Red Sea. Both are adult males, but one is much larger (CB 70 mm) than the other (CB 37 mm) and is similar in size to the two Javanese specimens; therefore it could be from the same lot, which would make the smaller specimen the only one from the Red Sea. It is likely that, like so

much of the earlier Red Sea material in the Leiden Museum, the Red Sea *Cardisoma* was obtained through Mr. C.W. Ruysenaers, Dutch consul at Alexandria, Egypt. On several occasions between 1846 and 1854 Mr. Ruysenaers sent material to the Leiden Museum, and it seems likely that most, if not all, of his Crustacea reached the Museum in July 1849. This dry material proves the correctness of Herklots's record. The existence of the species on the coasts of the Red Sea is now confirmed by the ISRSE specimen.

Biology

The specimen from Alifat was found in a dry wadi, which at other times may contain fresh water. The animal walked around at the base of an embankment which showed burrows, probably of this species. To the north of this area is a region with fresh or brackish wells and marshes, where a dead specimen, presumably of the same species, was seen but not collected.

Gecarcoidea H. Milne Edwards, 1837

Gecarcoidea H. Milne Edwards, 1837, Hist. Nat. Crust., 2:25. Type species, by monotypy: *Gecarcoidea lalandii* H. Milne Edwards, 1837, Hist. Nat. Crust., 2:25. Gender: feminine.

In Neaves's (1939) Nomenclator Zoologicus (2:449) it is stated that *Gecarcoidea* H. Milne Edwards, 1837, was proposed as a replacement name for *Gecarcinus* De Haan, 1835. This statement, however, is erroneous. In the first place, H. Milne Edwards (1837:25) in the description of his new genus and species did not give a single reference to previous literature. Secondly, there is no genus *Gecarcinus* De Haan, 1835. De Haan (1835:30, pl. C) described what he thought to be *Gecarcinus* Leach (1814) and provided a figure of the mouthparts of what he thought to be *Grapsus* (*Gecarcinus*) *uricola* (L.). Only much later H. Milne Edwards (1853:203; 1854:183-185) pointed out that De Haan's (1835) description and figure of *Gecarcinus* and of *Grapsus* (*Gecarcinus*) *uricola* were based on a specimen of *Gecarcoidea lalandii*. H. Milne Edwards at the same time changed the latter name to *Pelocarcinus lalandei* for reasons which, under the present rules of nomenclature, are not valid. *Pelocarcinus* H. Milne Edwards, 1853, is an invalid replacement name and thus an invalid junior objective synonym of *Gecarcoidea* H. Milne Edwards, 1837.

A single species of *Gecarcoidea* was found in the Red Sea.

Gecarcoidea lalandii H. Milne Edwards, 1837

Grapsus (*Gecarcinus*) *uricola*— De Haan, 1835, in Von Siebold, Fauna Japonica, (Crust.) (2):30, pl. C.

Grapsus (*Gecarcinus*) n. sp. Herklots, 1861:129.

Material Examined

Red Sea; received probably 1828; E. Rüppell; RMNH; 1 ♀ (dry).

Description

Türkay (1974:240, figs. 5, 16) gave an extensive account of the species.

Distribution

Gecarcoidea lalandii has a wide range, which extends from the Red Sea to Formosa, the Marshall and Fiji Islands.

In the dry collection of the Rijksmuseum van Natuurlijke Historie there is a well developed male specimen (CB 82 mm) of this species, collected in the Red Sea by E. Rüppell some time before 1828. This is the specimen that served De Haan (1835:30) for his description of *Gecarcinus*, and its mouthparts are figured on De Haan's pl. C. These mouthparts have been dissected and glued to a piece of cardboard carrying, in De Haan's handwriting, the inscription: "*Grapsus (Gecarcinus) ruricola* Herbst." H. Milne Edwards (1853:203; 1854:183) has already pointed to the true identity of De Haan's specimen. Its origin was not given by De Haan. The same specimen was again mentioned in 1861, when Herklots (1861:129) listed it in his catalogue of the Crustacea of the Leiden Museum as *Grapsus (Gecarcinus)* nov. spec. and provided it (for the first time) with a locality indication "Mer rouge". I know of no other records of this species from the Red Sea.

Remarks

Tweedie (1947:38, 39, fig. 1) showed that the form of *Gecarcoidea* of Christmas Island is different from that found in the Andaman and Nicobar Islands and he used the names *Gecarcoidea humei natalis* (Pocock, 1888) and *G. h. humei* (Wood-Mason, 1873) for the two forms. The specific epithet *lalandii* H. Milne Edwards, 1837, the first ever to be given to a species of this genus, was not accepted by Tweedie. The type locality of *Gecarcoidea lalandii* as given by H. Milne Edwards, i.e., Brazil, is clearly erroneous as the genus has so far only been found in the Indo-West Pacific region. From H. Milne Edwards's descriptions it was not possible to conclude as to which of the two forms recognized by Tweedie the type specimen of *G. lalandii* belonged, and therefore Tweedie ignored the epithet *lalandii* and used that of *humei* instead. Türkay (1974:244) pointed out that the figure of the holotype of *Gecarcoidea lalandii* published by H. Milne Edwards (1854:pl. 15 fig. 2) shows this species to be identical with *G. h. humei* (Wood-Mason), and that the epithet *humei* therefore has to be replaced by *lalandii*. Türkay treated the two forms as two distinct species: *Gecarcoidea lalandii* H. Milne Edwards, 1837 and *G. natalis* (Pocock, 1888). Several years ago, when visiting the U.S. National Museum, Washington, D.C., I examined an extensive material of *Gecarcoidea* from Christmas Island and the Pacific and reached the same conclusion as Türkay about the distinctness of the two species. The present Red Sea specimen shows the characters of *Gecarcoidea lalandii* and is different from *G. natalis*.

The present specimen, the first of this genus ever to be described and figured, is so far the only one recorded from the Red Sea.

PALICIDAE Rathbun, 1898

The family is represented in the known fauna of the Red Sea by two genera and four species.

Palicus Philippi, 1838

Palicus Philippi, 1838, Jahresber. Ver. Naturk. Cassel, 2:11. Type species by monotypy: *Palicus granulatus* Philippi, 1838, Jahresber. Ver. Naturk. Cassel, 2:11 (a junior subjective synonym of *Cymopolia Caronii* Roux, 1830, Crust. Mediterr.: pl. 21 fig. 1-7). Gender: masculine.

The genus, also known by the preoccupied name *Cymopolia* Roux, 1830, consists of numerous species, of which so far three have been found in the Red Sea, one of these is new to science.

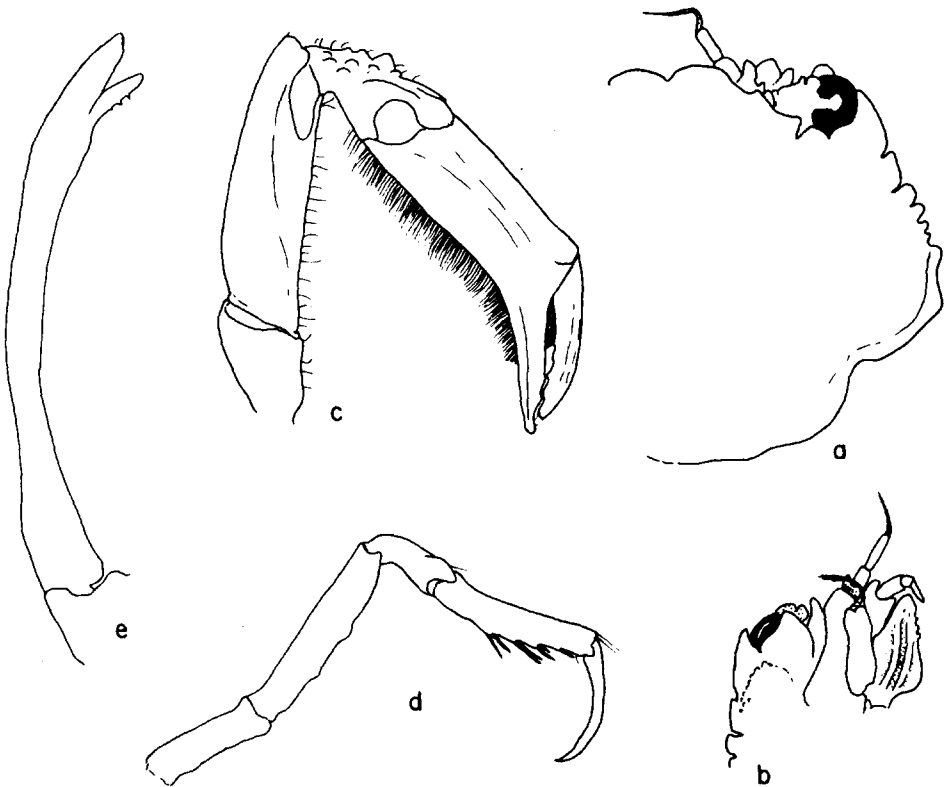


Fig. 2. *Palicus carinipes* Paulson. a. Outline of right side of carapace in dorsal view. b. Orbital area in ventral view. c. Cheliped of male. d. Last pereopod. e. First pleopod of male. a-d, Specimen from Sta. 8. e. Specimen from Sta. 36. a & b, $\times 7.5$; c & d, $\times 15$; e, $\times 12.5$.

***Palicus carinipes* (Paulson, 1875)**

Cymopolia carinipes Paulson, 1875:73, pl. 9 fig. 4; Paulson, 1961:79, pl. 9 fig. 4.

Palicus Jukesii-. Nobili, 1906a: 325.

Palicus jukesii-. Laurie, 1915:416; Zarenkov, 1971:173.

*Material Examined**Sinai Peninsula*

Gulf of 'Aqaba:

Off Marsa Murach, 29° 24'N; 40-45 fm (= 73-82 m); 9.X.1969; "La-Merkhav" Sta. 36; Ch. Levinsohn; 2 ♂, 3 ♀; 40-45 fm (= 73-82 m); beam trawl; 9.X.1969; "La-Merkhav" Sta. 38; Ch. Lewinsohn; 2 ♀. Off Elat; 22-25 fm (= 37-45 m); 6.IX.1966; "La-Merkhav" Sta. 4; NS 1163; 1 ♀; 33-44 fm (60-80 m); 7.IX.1966; "La-Merkhav" Sta. 8; NS 1190, 1191; 1 ♂, 1 ♀.

Description

There can be little doubt that the present specimens are specifically identical with Paulson's *Cymopolia carinipes*. Several authors identified Paulson's species with *Cymopolia jukesii* White, 1847, and indeed the two are very similar. Calman (1900:29-31), who was the first author to synonymize the two species, pointed to a few differences between his specimens and Paulson's figures. The most important of these is that in Calman's Torres Strait specimen the subhepatic region shows a single tubercle behind the orbit, while in Paulson's figure a sharp curved tubercular crest is shown there. Both Laurie (1906a:430, 431) and Rathbun (1911:240, pl. 19 fig. 9) remarked that in their specimens the single subhepatic tubercle was replaced by a curved ridge or row of tubercles, evidently as in *P. carinipes*. Such a curved granular subhepatic crest is present in all my specimens. As in Rathbun's (1911) specimen, and unlike Calman's material, the outer orbital fissure is open.

The specimens have the broadly rounded frontal lobes that are also typical for *P. jukesii*. The anterolateral margin, however, bears two large, rather blunt teeth and two much smaller, but still distinct ones, and occasionally a fifth, still smaller one, behind the outer orbital angle. Calman described and figured "two well-marked teeth, with a slight indication of a third" behind the outer orbital tooth.

The eyes resemble those described by Calman in having three lobes, the upper being largest and situated uppermost on the line between the cornea and the stalk, the other two being lower, more anterior and at greater distances from the corneal base.

The lower orbital margin differs from that of *P. jukesii*. As in *P. jukesii* it shows three lobes (apart from the outer orbital angle), of which the outer is large and broadly triangular. In *P. jukesii* as figured by Calman, however, the middle lobe is also broad and triangular, being slightly narrower than the outer. Furthermore, Calman figured the inner lobe narrowly triangular and lying against the inner side of the antennal peduncle. In *P. carinipes* on the contrary, the middle lobe is narrowly triangular, being by far the narrowest of the three lobes; the inner lobe here is broad, being rounded, truncate or slightly emarginate at the top and partly covering the base of the antenna.

The subhepatic crest, as discussed above, is very conspicuous in my specimens.

The male abdomen in the present material resembles that of *P. jukesii* as figured by Calman.

The chelipeds in my largest male specimen are equal, and are quite short compared to the third and fourth legs. The fingers are both directed obliquely down in relation to the longitudinal axis of the palm; they are distinctly shorter than the palm and

slender, showing some small teeth in the distal part of the cutting edges. Both fingers have a faint ridge on the outer surface. The palm is about twice as long as high and of about equal height throughout. The outer surface shows a low and broad longitudinal median carina; it bears a few scattered hairs. The inner surface of the palm and the base of the fingers (i.e., the surface which in the flexedly-borne cheliped is turned towards the body) bears a thick clothing of long plumose hairs. Such hairs are also present in the distal inner part of the carpus. The outer surface, especially the upper part, bears several conspicuous tubercles and curved hook-shaped hairs.

The first to third walking legs strongly resemble those figured by Paulson for the present species and those by Calman for *P. jukesii*. In the fifth leg of the present material the dactylus is $\frac{3}{4}$ as long as the propodus. The latter is somewhat widened in the middle and bears some long spinules in the distal part of the posterior margin; with the curved dactylus it makes a distinct subchela, which is not shown in Calman's (1900) figure of this leg. However, Miers's (1874, pl. 3 fig. 4) illustrations of the type of *Cymopolia jukesii* does show the 5th pereopod subchelate.

The gonopods of my male specimens differ from Calman's (1900) figure of that organ of a male *P. jukesii* from Torres Strait in having the distal part far less distinctly widened at the base of the two lobes, while these lobes are strongly diverging, and one of the lobes is distinctly wider than the other.

The differences from the descriptions of *P. jukesii* shown by my specimens are too many for the latter to be confidently identified with White's species. It is possible, however, that several of these differences may eventually prove to fall within the variation of the species or are based on incorrect information.

Laurie's (1906a:430, 431, pl. 1 fig. 12) specimens from the Gulf of Manaar, Ceylon, which he assigned to *Palicus jukesii* possibly belong to *P. carinipes*, as the subhepatic region does not show a tubercle, but a curved row of granules. Laurie did not give more information on his material.

Rathbun (1911:240, pl. 19 fig. 9) assigned several female specimens from the Saya de Malha Bank and Amirante Islands, both western Indian Ocean, to *P. jukesii*. She remarked, however, that in her material the outer supraorbital notch is subtriangular, and that there is an arcuate subhepatic ridge. In these two characters her material resembles *P. carinipes* rather than *P. jukesii*. Rathbun's pl. 19 fig. 9, however, shows a specimen in which the dactyli of the walking legs are extremely short, much shorter than in either *P. carinipes* or *P. jukesii*; it is possible therefore that Rathbun's material belongs to an unnamed species rather than to *P. carinipes*.

Zarenkov (1971:173) reported *Palicus jukesii* from the Red Sea; it is probable that his specimens belong to the present species, but he gave no morphological details.

Distribution

Palicus carinipes is only known with certainty from the Red Sea. Paulson's (1875 1961) material came either from Et Tur (= Tor) on the west coast of the Sina Peninsula or from Ras Muhammad at the southern tip of the peninsula. It is probable that the specimens from "Mer Rouge" reported by Nobili (1906a:325) as *Palicu: jukesii*, and those from the southern Gulf of Suez near Et Tur (Stn. 412), from nea

the Farasan Islands (Stn. 596), from W of Kamaran (Stn. 644) and from the extreme southern part of the Red Sea, S of 15°N (Stn. 601, 602, 635) listed by Zarenkov (1971:173) as *Palicus jukesii*, actually belong to the present species. Some of the records of *P. jukesii* from outside the Red Sea may also belong to *P. carinipes* (e.g., those from Ceylon reported upon by Laurie, 1915, see above).

Biology

The present specimens were taken in depths varying from 37 to 45 m and 73 to 82 m. Zarenkov's (1971:173) specimens came from depths between 25 and 60 m.



Fig. 3. *Palicus elaniticus* n.sp., holotype ♂. a. Animal in dorsal view. b. Orbital region in ventral view (third maxilliped strongly foreshortened). c. Third maxilliped. d. Cheliped. e. Fifth pereopod. f. Telson. g. Gonopod. a & f, x 13.75; b-e, g x 27.5.

***Palicus elaniticus* n. sp.**

Fig. 3

Material Examined

Off Elat, Gulf of 'Aqaba, 33-44 fm (= 60-80 m); 7.IX.1966: "La-Merkhav" Sta. 8; NS 1192; 1 ♂.

Description

The specimen, an adult male, has a carapace 3.5 mm long and 4.5 mm wide. The front shows a triangular median incision, and the frontal lobes are bluntly triangular. The dorsal orbital margin shows no distinct incisions, only the outer part has a shallow triangular indentation. The outer orbital tooth is large and has a lobe on its inner margin. The lateral margin of the carapace shows a single, large triangular tooth, which is directed more sideways than forward. Between this lateral tooth and the outer orbital tooth the margin of the carapace is irregularly and finely crenulated.

The regions of the carapace are well marked. The frontal region shows very small tubercles and has a median longitudinal groove, the orbital region is smooth. The hepatic region is rather smooth and low, with a single large and some small tubercles behind the eye. The protogastric region is somewhat elevated and bears some large and small tubercles. The mesogastric region is elevated and tubercular and separated by a narrow groove from the urogastric region which shows a transverse row of about six distinct tubercles with some smaller in between. The cardiac area bears two large submedian tubercles (separated by a median longitudinal depression) and some small tubercles. The intestinal area has a large blunt median tubercle. The branchial region shows three elevated transverse tuberculated areas separated by wide irregular grooves. The anterior of these areas is lowest and situated at the level of the urogastric region; the second area, situated behind the first, is higher and shows several very large tubercles. The posterior of these three branchial areas lies next to the intestinal area and is not clearly separated from it, it bears several large tubercles, three of which (one submedian and two at each posterolateral angle) are placed on the margin of the carapace. This third branchial area forms with the intestinal region an elevated transverse ridge-like elevation along the posterior margin of the carapace. Likewise, the second branchial area forms with the cardiac region a similar transverse ridge-like elevation in front of it.

The lower orbital border, apart from the outer orbital angle, shows three teeth. The outer of these is the smallest, being rather narrowly triangular with a bluntish top; it is separated from the next tooth by a deep and wide rounded excavation. The middle tooth is broad, somewhat obliquely truncated, with a blunt and rounded top; it is much longer and wider than the outer tooth. It is separated from the third tooth by a deep and wide triangular excavation. The inner tooth is somewhat shorter than, but about as wide as, the second; it is triangular with a rounded top. The subhepatic region of the carapace shows a field of sharp tubercles. A single blunt tooth is present near the base of the cheliped.

The third maxilliped shows an oblique not too sharply defined groove on the ventral surface of the merus. The inner anterior part of the merus is produced. The

carpus shows a large blunt anterodorsal lobe. The peduncle of the exopod ends in two lobes and bears a flagellum.

The chelipeds in this specimen are small. The fingers are slender with the tips crossing; they are about as long as the palm. The carpus is short and bears several tubercles. The second to fourth pereopods are slender. The dactylus is slender and as long as or longer than the propodus. The propodus is narrow, and has the posterior margin entire. The merus is the broadest segment and is tuberculate on the upper (posterior) surface, it ends in a bluntly rounded anterodorsal lobe; the upper margin showing some indistinct and irregular crenulations, which are most distinct on the dorsal surface of the third leg. The dactylus of the third and fourth pereopods bears a dorsal fringe of hairs; no such fringe is visible on the propodus. The fifth pereopod is the smallest of all. Its dactylus is only slightly shorter than the propodus. The propodus is slender and about the same width throughout; its posterior margin bears some spinules, but it does not make a subchela with the dactylus.

The abdomen of the male is bluntly triangular. The second segment is much narrower than the first. The third shows two rather compressed large tubercles, about halfway between the median line and the lateral margin of the segment. The fourth segment has a single median tubercle of similar shape.

The male pleopod is elongate, curved outwards at the end. It narrows to a slender point and shows a lappet-like lobe on the inner margin.

Type

The ♂ holotype is preserved in the Rijksmuseum van Natuurlijke Historie, Leiden under reg. no. Crust. D 30334.

Remarks

The species resembles *P. carinipes*, *P. jukesii* and *P. whitei* in that the propodi of the walking legs have the posterior margin unserrated. It resembles *P. whitei* and differs from the other species in the propodi of pereopods 2 to 4, which are not broadened; furthermore the frontal lobes are narrower and more triangular in shape. The species may, however, at once be distinguished from *P. whitei* by the orbits which have no (or extremely indistinct) incisions, in having the lateral margins of the carapace armed with a single tooth only, in the more strongly tuberculate carapace, in the more slender pereopods, the third and fourth of which have a dorsal fringe of hairs on the dactyli but not on the propodi, and in the presence of three tooth-like tubercles on the third and fourth abdominal somites of the male (cf. Calman's (1900) account of *P. whitei*).

Palicus whitei (Miers, 1884)

Palicus whitei-. Laurie, 1915:416, 421, 473.

I have not examined this species and it is not present in the collections studied.

Description

As pointed out under the previous species, *P. whitei* is rather close to *P. elaniticus*, but there are so many striking differences that it is very unlikely that the two have

ever been confused. The best description of the present species is the one by Calman (1900:31, pl. 2 figs. 14-19).

Distribution

Palicus whitei is known from the Red Sea, Seychelles, India and the Torres Straits. It was reported from the Red Sea by Laurie (1915), who examined material from Mersa Wadi Lehama, Egypt at 24°45'N.

Crossotonotus A. Milne Edwards, 1873

Crossotonotus A. Milne Edwards, 1873, *Nouv. Arch. Mus. Hist. Nat. Paris*, (1) 9 (mém):282. Type species, by monotypy: *Crossotonotus compressipes* A. Milne Edwards, 1873, *Nouv. Arch. Mus. Hist. Nat. Paris*, (1) 9 (mém):283. Gender: masculine.

So far only one species is known from the Red Sea.

Crossotonotus spinipes (De Man, 1888)

(?) *Manella spinipes*— Monod, 1938:153, fig. 29.

Manella spinipes— Guinot, 1967a:280.

Description

A good description of the species is provided by De Man (1888:344, pl. 15 fig. 1). Monod (1938) published an excellent figure of the only known Red Sea specimen, a female. As Monod had no male at his disposal, he was not quite certain whether his specimen belonged to the present species or to *Manella gardineri* Rathbun, 1911, a species known from the western Indian Ocean.

Distribution

Crossotonotus spinipes has been reported from the Red Sea, Indonesia, Japan and Hawaii. No material was present in the Red Sea collections examined.

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REFERENCES

- ALCOCK, A., 1900, The Brachyura Catometopa, or Grapsoidea. Materials for a carcinological fauna of India. No. 6, *J. Asiat. Soc. Bengal*, 69: 279-456.

- AUDOUIN, V., 1826, Explication sommaire des planches de Crustacés de l'Égypte et de la Syrie, publiées par Jules-César Savigny, membre de l'Institut; offrant un exposé des caractères naturels des genres avec la distinction des espèces. Description de l'Égypte ou recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française, *Hist. Nat.*, 1(4): 77-98.
- AUDOUIN, V., 1827, Explication sommaire des planches de Crustacés de l'Égypte et de la Syrie, publiées par Jules-César Savigny, membre de l'Institut; offrant un exposé des caractères naturels des genres avec la distinction des espèces. Description de l'Égypte ou recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française, 2 ed, 22: 249-290, *Atlas Hist. Nat.*, 2 (Crust.) pls. 1-13.
- BALSS, H., 1924, Die Parthenopiden, Cyclo- und Catometopen. Decapoden des Roten Meeres III. Expedition S.M. Schiff "Pola" in das Rote Meer. Nördliche und südliche Hälfte 1895/96-1897/98. Zoologische Ergebnisse XXXIV, *Denkschr. Akad. Wiss. Wien*, 99: 1-18. fig. 1.
- BANERJEE, S.K., 1960, The genera *Grapsus*, *Geograpsus* and *Metopograpsus* (Crustacea, Brachyura). Biological results of the Snellius Expedition XVIII, *Temminckia*, 10: 132-199, figs. 1-6.
- CALMAN, W.T., 1900, On a collection of Brachyura from Torres Straits, *Trans. Linn. Soc. Lond., Zool.*, (2)8:1-50, pls. 1-3.
- CALMAN, W.T., 1927, Report on the Crustacea. Decapoda (Brachyura). Zoological Results of the Cambridge Expedition to the Suez Canal, 1924. XIII, *Trans. Zool. Soc. Lond.*, 22: 211-219.
- CANO, G., 1889a, Crostacei Brachiuri ed Anomuri raccolti nel viaggio della "Vettor Pisani" intorno al globo-Studio preliminare, *Boll. Soc. Nat. Napoli*, 3: 79-105.
- CANO, G., 1889b, Crostacei Brachirui ed Anomuri Viaggio della R. Corvetta Vettor Pisani attorno al globo, *Boll. Soc. Nat. Napoli*, 3: 169-268, pl. 7.
- CATESBY, M., 1754, *The Natural History of Carolina, Florida, and the Bahama Islands: containing the figures of birds, beasts, fishes, serpents, insects and plants: particularly the forest-trees, shrubs, and other plants, not hitherto described, or very incorrectly figured by authors. Together with their descriptions in English and French. To which are added, observations on the air, soil, and waters: with remarks upon agriculture, grain, pulse, roots, etc.*, 2:(2): 1-100, 1-20, (8), pls. 1-100, 1-20.
- CHACE, F.A., 1951, The oceanic crabs of the genera *Planes* and *Pachygrapsus*, *Proc. U.S. Nat. Mus.*, 101: 65-103, figs. 1-8.
- CROSNIER, A., 1965, Crustacés Décapodes Grapsidae et Ocypodidae, *Faune de Madagascar*, 18: 1-143, textfigs. 1-260, pls 1-11.
- DEL PRATO, A., 1896, I crostacei della collezione Eritrea bottego, *Atti Soc. Ital. Sci. Nat.*, 36: 181-186.
- DOFLEIN, F., 1900, Weitere Mitteilungun über dekapode Crustaceen der k. Bayerischen Staatssammlungen, *S.B. Bayer. Akad. Wiss.*, 30: 125-145, figs. 1-3.
- FISHELSON, L., 1971, Ecology and distribution of the benthic fauna in the shallow waters of the Red Sea, *Mar. Biol.*, 10: 113-133, figs. 1-11.
- FOREST, J. and D. GUINOT, 1961, Crustacés Décapodes Brachyours de Tahiti et des Tuamotu, *Expéd. Français Récifs Nouvelle Calédonie*, (Vol. pré.): i-xi, 1-195, text-figs. 1-178, pls. 1-18.
- FORSKAL, P., 1775, *Descriptiones Animalium, Avium, Amphibiorum, Piscium, Insectorum, Vermium*: 1-19, i-xxxii, 1-164.
- FOWLER, H.W., 1912, The Crustacea of New Jersey, *Ann. Rep. New Jersey State Mus.*, 1911: 29-650, pls. 1-150.
- GISTEL, J.N.F.X., 1848, *Naturgeschichte des Thierreichs, für höhere Schulen*, 1-216, i-xvi, (4), text-figs, pls. 1-32.
- GOHAR, H.A.F. and A.A. AL-KHOLY, 1957, The larvae of some brachyuran Crustacea (from the Red Sea), *Publ. Mar. Biol. Stn. Ghardaqa, Red Sea*, 9: 145-176, pls. 1-14.
- GRIFFIN, D.J.G. and H.A. TRANTER, 1974, Spider crabs of the family Majidae (Crustacea: Decapoda: Brachyura) from the Red Sea, *Isr. J. Zool.*, 23: 162-198, text-figs. 1-4, pl. 1.
- GRONOVIVS, L.T., 1764, *Zoophylacii Gronoviani Fasciculus secundus exhibens Enumerationem Insectorum quae in Museo suo adservat, examini subjecit, systematice disposuit atque descripsit*: 141-236, pls. 15-17.

- GUINOT, D., 1962a, Sur une collection de Crustacés Décapodes Brachyours de Mer Rouge et de Somalie, *Boll. Mus. Civ. Stor. Nat. Ven.*, 15: 7-63, text-figs. 1-37, pls. 1-4.
- GUINOT, D., 1962b, Sur quelques Crustacés Décapodes Brachyours indo-pacifiques des collections du Musée de Munich, *Opusc. Zool. München*, 60: 1-14, figs. 1-10.
- GUINOT, D., 1967a, La faune carcinologique (Crustacea Brachyura) de l'Océan Indien occidental et de la Mer Rouge, Catalogue, remarques biogéographiques et bibliographie, *Mem. Inst. Fond. Afr. Noires*, 77: 235-352.
- GUINOT, D., 1967b, Les espèces comestibles de crabes dans l'Océan Indien occidental et la Mer Rouge, *Mem. Inst. Fond. Afr. Noire*, 77: 353-390, figs. 1-8.
- HAAN, W. de, 1833-1850, Crustacea, in: P.F. de Siebold, *Fauna Japonica sive descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batava Imperium tenent, suscepto, annis 1823-1830 collegit, notis, observationibus et adumbrationibus illustravit*: ix-xvi, vii-xvii, i-xxxii, 1-243, pls. 1-55, A-Q, 2.
- HASWELL, W.A., 1882, *Catalogue of the Australian Stalk- and Sessile-Eyed Crustacea*: i-xxiv, 1-324, pls. 1-4.
- HELLER, C., 1861a, Synopsis der im rothen Meere vorkommenden Crustaceen, *Verh. Zool.-Bot. Ges. Wien*, 11: 3-32.
- HELLER, C., 1861b, Beiträge zur Crustaceen-Fauna des rothen Meeres. Erster Theil, *Sitzungsber. Akad. Wiss. Wien (Math.-Naturwiss. Kl.)*, 43: 297-374 pls 1-4.
- HERBST, J.F.W., 1782-1790, *Versuch einer Naturgeschichte der Krabben und Krebse nebst einer systematischen Beschreibung ihrer verschiedenen Arten*, 1: 1-274, pls. 1-21 (1782: 1-86, pl. 1; 1783: 87-182, pls. 2-9; 1785: 183-206, pls. 10-13; 1788: 207-238, pls. 14-17; 1790: 239-274, pls. 18-21).
- HERKLOTS, J.A., 1861, Symbolae carcinologicae. I. Catalogue des Crustacés qui ont servi de base au système carcinologique de M.W. de Haan, rédigé d'après la collection du Musée des Pays-Bas et les Crustacés de la Faune du Japon, *Tijdschr. Entomol.*, 4: 116-156.
- HILGENDORF, F., 1869, *Crustaceen. Baron Carl Claus von der Decken's Reisen in Ost-Afrika in den Jahren 1859-1865*, 3(1): 67-116, 147, pls. 1-6.
- HILGENDORF, F., 1879, Die von Hrn. W. Peters in Mocambique gesammelten Crustaceen, *Mber. Akad. Wiss. Berlin*, 1878, 782-852, pls. 1-4.
- HILGENDORF, F., 1892, Eine neue *Brachynotus*-Art von Aden (*Br. harpax*), *Sitzungsber. Ges. Naturforsch. Freunde Berlin*, 1892: 37-40.
- HOLTHUIS, L.B. 1958, Hippidea and Brachyura (Dromiacea, Oxystomata and Grapsoidea). Crustacea Decapoda from the northern Red Sea (Gulf of Aqaba and Sinai Peninsula). Contributions to the knowledge of the Red Sea. No. 9, *Sea Fish. Res. Stn. Haifa, Bull.*, No. 17: 41-54, figs. 1-4.
- HOLTHUIS, L.B., 1968, The Palinuridae and Scyllaridae of the Red Sea. The Second Israel South Red Sea Expedition, 1965, Report No. 7. *Zool. Meded. Leiden*, 42(26): 281-301, pls. 1, 2.
- KLUNZINGER, C.B., 1870, Eine zoologische Exkursion auf ein Korallriff des Rothen Meeres *Verh. Zool.-Bot. Ges. Wien*, 20: 389-394.
- KLUNZINGER, C.B., 1878a, *Bilder aus Oberägypten, der Wüste und dem Rothen Meere*, Ed. 2, pp. i-xiv, 1-400, figs. 1-21.
- KLUNZINGER, C.B., 1878b, *Upper Egypt: Its People and its Products. A descriptive account of the manners, customs, superstition, and occupations of the people of the Nile Valley, the desert, and the Red Sea coast, with sketches of the natural history and geology*, i-xv 1-408, text-figs., pls.
- KOSSMANN, R., 1877, Malacostraca, in: *Zoologische Ergebnisse einer im Auftrage der königlichen Akademie der Wissenschaften zu Berlin ausgeführten Reise in die Küstengebiete des Rothen Meeres*, 1(3) (1): 1-66, pls. 1-3.
- KOSSMANN, R., 1878, Kurze Notizen über einige neue Crustaceen sowie über neue Fundorte einiger bereits beschriebenen, *Arch. Naturgesch.*, 44 (1): 251-258.
- LAURIE, R.D., 1906, Report on the Brachyura collected by Professor Herdman, at Ceylon, in 1902, in: *Report to the government of Ceylon on the pearl oyster fisheries of the Gulf of Manaar*, W.A. Herdman, ed., 5: 349-432, text-figs. 1-12, pls. 1, 2.

- LAURIE, R.D., 1915, On the Brachyura. Reports on the marine biology of the Sudanese Red Sea. XXI, *J. Linn. Soc. Lond. Zool.*, 31: 407-475, text-figs. 1-4, pls. 42-45.
- LENZ, H., 1912, Afrikanische Crustaceen aus schwedischen Sammlungen, *Ark. Zool.*, 7(29): 1-10.
- LEWINSOHN, C., 1969, Die Anomuren des Roten Meeres (Crustacea Decapoda: Paguridea, Galatheidea, Hippidea). The Second Israel South Red Sea Expedition, 1965, Report no. 6, *Zool. Verh. Leiden*, 104: 1-213, text-figs. 1-37, maps 1-3, pls. 1, 2.
- LEWINSOHN, C. and L. FISHELSON, 1968, The Second Israel South Red Sea Expedition, 1965 (General Report). The Second Israel South Red Sea Expedition, 1965, Report no. 3, *Isr. J. Zool.*, 16: 59-68, text-fig. 1, 1 map.
- LINNAEUS, C., 1758, *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*, 10th ed. vol. 1, pp. 1-824, i-iii.
- MACCAGNO, T., 1936, Crostacei di Assab: Decapodi Stomatopodi Anfipodi. Spedizione del Barone Raimondo Franchetti in Dancalia (1928-29), *Ann. Mus. Stor. Nat. Genova*, 59: 171-186.
- MAGNUS, D.B.E., 1965, Bewegungsweisen des amphibischen Schleimfisches *Lophalticus kirkii magnusi* Klausewitz (Pisces, Salariaidae) im Biotop, *Verh. Dtsch. Zool. Ges.*, 1965: 542-555, figs. 1-10.
- MAKKAVEEVA, E.B., 1965, Sargassum Biocenoses in the Red Sea, in: *Benthos*, M.A. Dogopolskaja, ed., pp. 81-93, 1 fig. (in Russian).
- MAN, J.G. de, 1880, On some podophthalmous Crustacea presented to the Leyden Museum by Mr. J.A. Kruyt, collected in the Red Sea near the city of Djeddah, *Notes Leyden Mus.*, 2: 171-185.
- MAN, J.G. de, 1881, On a new collection of podophthalmous Crustacea, presented by Mr. J.A. Kruyt, collected in the Red Sea near the town of Djeddah, *Notes Leyden Mus.*, 3: 93-107.
- MAN, J.G. de, 1883, Carcinological studies in the Leyden Museum. No. 3, *Notes Leyden Mus.*, 5: 150-169.
- MAN J.G. de, 1887, 1888, Bericht über die von Herrn Dr. J. Brock im indischen Archipel gesammelten Decapoden und Stomatopoden, *Arch. Naturgesch.*, 53(1): 215-600, pls. 7-22a (1887: 215-288, pls. 7-10; 1888: 289-600, pls. 11-22a).
- MAN, J.G. de, 1891, Carcinological studies in the Leyden Museum. No. 5, *Notes Leyden Mus.*, 13: 1-61, pls. 1-4.
- MAN, J.G. de 1895, Bericht über die von Herrn Schiffskapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelten Decapoden und Stomatopoden. Zweiter Theil, *Zool. Jahrb. Syst.*, 9: 75-218.
- MAN, J.G. de, 1898, Bericht über die von Herrn Schiffskapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelten Decapoden und Stomatopoden. Sechster (Schluss-) Theil, *Zool. Jahrb. Syst.*, 10: 677-708, pls. 28-38.
- MARTENS, E. von, 1866, Verzeichniss der von Dr. E. Schweinfurth im Sommer 1864 auf seiner Reise am Rothen Meere gesammelten und nach Berlin eigesendeten zoologischen Gegenstände, *Verh. Zool.-Bot. Ges. Wien*, 16: 379-382, 2 figs.
- MARTENS, E. von, 1872, Ueber Cubanische Crustaceen nach den Sammlungen Dr. J. Gundlach's, *Arch. Naturgesch.*, 38 (1): 77-147, pls. 4, 5.
- MIERS, E.J., 1874, *Crustacea. The Zoology of the voyage of H.M.S. Erebus and Terror, under the command of Captain Sir James Clark Ross, R.N., F.R.S., during the years 1839 to 1843*: 1-5, pls. 1-4.
- MIERS, E.J., 1878, On a small collection of Crustacea made by Major Burton in the Gulf of Akaba, *Ann. Mag. Nat. Hist.*, (5) 2: 406-411.
- MIERS, E.J., 1884, *Crustacea. Report of the zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. Alert, 1881-2*: 178-322, 513-575, pls. 18-35, 46-52.
- MILNE EDWARDS, A., 1873, Recherches sur la faune carcinologique de la Nouvelle-Calédonie Deuxième Partie, *Nouv. Arch. Mus. Hist. Nat. Paris*, (1) 9(mém.): 155-332, pls. 4-18.
- MILNE EDWARDS, H., 1837, *Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux*, 2: 1-532; atlas: 1-32, pls. 1-42.

- MILNE EDWARDS, H., 1853, Mémoire sur la famille des Ocypodiens. Suite, *Ann. Sci. Nat. Paris. Zool.*, (3)20: 163-228, pls. 6-11.
- MILNE EDWARDS, H., 1854, Notes sur quelques Crustacés nouveaux ou peu connus conservés dans la collection du Muséum d'Histoire Naturelle, *Arch. Mus. Hist. Nat. Paris*, 7: 145-192, pls. 9-16.
- MONOD, T., 1938, Decapoda Brachyura. Mission Robert Ph. Dollfus en Égypte. VIII, *Mem. Inst. Egypte*, 37: 91-162, figs. 1-29.
- MONOD, T., 1956, Hippidea et Brachyura ouest-africains, *Mem. Inst. Fr. Afr. Noire*, 45: 1-674, figs. 1-884.
- MUNRO FOX, H., 1927, Appendix to the report on the Crustacea Decapoda (Brachyura). Zoological Results of the Cambridge Expedition to the Suez Canal, 1924, *Trans. Zool. Soc. Lond.*, 22: 217.
- NEAVES, S.A., 1939, *Nomenclator Zoologicus*, 2, pp. 1-1025.
- NEUMANN, R., 1878, *Systematische Uebersicht der Gattungen der Oxyrhynchen. Catalog der Podophthalmen Crustaceen des Heidelberger Museums. Beschreibung einiger neuer Arten*: 1-39.
- NOBILI, G., 1906a, Faune carcinologique de la Mer Rouge. Décapodes et Stomatopodes, *Ann. Sci. Nat. Zool.*, (9) 4: 1-347, textfigs. 1-12, pls. 1-11.
- NOBILI, G., 1906b, Diagnoses préliminaires de 34 espèces et variétés nouvelles, et de 2 genres nouveaux de Décapodes de la Mer Rouge, *Bull. Mus. Hist. Nat. Paris*, 11: 393-411.
- ODHELIUS, J.L., 1754, *Chinensia Lagerströmiana*, in: C. Linnaeus, *Amoenitates Academicæ*, 4(61): 1-36, 1 pl.
- OLIVIER, A.G., 1791, Crabe. Cancer, *Encycl. Method. Hist. Nat. Insectes*, 6: 136-182.
- ORTMANN, A.E., 1894, Abtheilung: Brachyura (Brachyura genuina Boas) III. Unterabtheilung: Cancroidea, 2. Section: Cancrinea, 2. Gruppe: Catametopa. Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und zur Zeit im Strassburger Museum aufbewahrten Formen, *Zool. Jahrb. Syst.*, 7: 683-772, pl. 23.
- PAULSON, O., 1875, *Investigations on the Crustacea of the Red Sea with Notes on Crustacea of the Adjacent Sea. Part I. Podophthalmata and Edriophthalmata (Cumacea)*, pp. i-xiv, 1-144, pls. 1-21 (in Russian).
- PAULSON, O., 1961, *Podophthalmata and Edriophthalmata (Cumacea). Studies on Crustacea of the Red Sea with Notes regarding Other Seas, Part I* pp. (1-10), 1-164, pls. 1-21 (translation of Paulson, 1875).
- PESTA, O., 1927, Dekapoden aus dem Hafen von Port Sudan. Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaften in Wien aus der Erbschaft Treitl von F. Werner unternommenen zoologischen Expedition nach dem Anglo-Ägyptischen Sudan (Kordofan) 1914. XXIV. Miscellanea Sudanica, C, *Denkschr. Akad. Wiss. Wien*, 101: 71-72.
- POR, F.D., H. STEINITZ, I. FERBER and W. ARON, 1972, The biota of the Red Sea and the eastern Mediterranean (1967-1972). A survey of the marine life of Israel and surroundings, *Isr. J. Zool.*, 21: 459-523. maps 1-5.
- RAMADAN, M.M., 1936, Report on a collection of Stomatopoda and Decapoda from Ghardaqa, Red Sea, *Bull. Fac. Sci. Egypt. Univ.*, 6: 1-43, pls. 1, 2.
- RATHBUN, M.J., 1910, Brachyura. The Danish Expedition to Siam 1899-1900. 5, K. *Dans. Vidensk. Selsk. Skr.*, (7) 5(4): 301-367, text-figs. 1-44, pls. 1, 2, 1 map.
- RATHBUN, M.J., 1911, Marine Brachyura. The Percy Sladen Trust Expedition to the Indian Ocean in 1905 under the leadership of Mr. J. Stanley Gardiner. Volume III. No. XI, *Trans. Linn. Soc. Lond. Zool.*, (2) 14: 191-261, text-figs. 1, 2, pls. 15-10.
- RATHBUN, M.J., 1918, The grapsoid crabs of America, *Bull. U.S. Nat. Mus.* 97: i-xxii, 1-461, text-figs. 1-173, pls. 1-161.
- SEBA, A., 1759, *Locupletissimi rerum naturalium thesauri accurata descriptio et iconibus artificiosissimis expressio per universam physicds historiam*, 3: 1-212, pls. 1-116.
- SERÈNE, R. and C.L. SOH, 1970, New Indo-Pacific genera allied to *Sesarma* Say 1817 (Brachyura, Decapoda, Crustacea), *Treubia*, 27: 387-416, pls. 1-8.

- SERÈNE, R. and C.L. SOH, 1971, On the species of *Sarmatium* Dana, 1851 (Decapoda, Brachyura), *Crustaceana*, 21: 237-240, text-figs. 1, 2, pls. 1, 2.
- STELLA, E., 1955, Crostacei Decapodi e Stomatopodi. Spedizione subacquea Italiana nel Mar Rosso. Ricerche zoologiche. III, *Riv. Biol. Colon.*, 13: 51-70, 1 fig.
- STEPHENSEN, K., 1945, The Brachyura of the Iranian Gulf, *Dan., Sci. Invest. Iran*, 4: 57-237, figs. 1-60.
- TESCH, J.J., 1918, Hymenosomidae, Retroplumidae, Ocypodidae, Grapsidae and Gecarcinidae. The Decapoda Brachyura of the Siboga Expedition. I, *Siboga Exped.*, mon. 39c, 1-148, pls. 1-6.
- TÜRKEY, M., 1974, Die Gecarcinidae Asiens und Ozeaniens (Crustacea: Decapoda), *Senckenbergiana Biol.*, 55: 223-259, figs. 1-19.
- TWEEDIE, M.W.F., 1936, On the crabs of the family Grapsidae in the collection of the Raffles Museum, *Bull. Raffles Mus. Singapore*, 12: 44-70, text-figs. 1-3, pls. 14, 15.
- TWEEDIE, M.W.F., 1940, New and interesting Malaysian species of *Sesarma* and *Utica* (Crustacea, Brachyura), *Bull. Raffles Mus. Singapore*, 16: 88-113, text-figs. 1-12, pl. 24.
- TWEEDIE, M.W.F., 1947, On the Brachyura of Christmas Island, *Bull. Raffles Mus. Singapore*, 18: 27-42, fig. 1.
- TWEEDIE, M.W.F., 1949, The species of *Metopograpsus* (Crustacea, Brachyura), *Bijdr. Dierkd.*, 28: 466-471, fig. 1.
- TWEEDIE, M.W.F., 1950a, Grapsoid crabs from Labuan and Sarawak, *Sarawak Mus. J.*, 5: 338-369, figs. 1-9.
- TWEEDIE, M.W.F., 1950b, Notes on grapsoid crabs from the Raffles Museum, *Bull. Raffles, Mus. Singapore*, 23: 310-324, text-fig. 1, pl. 7.
- WHITE, A., 1847, *List of the specimens of Crustacea in the collection of the British Museum*, pp. i-viii, 1-143.
- ZARENKOV, N.A., 1971, On the species composition and ecology of the decapod Crustacea of the Red Sea (in Russian), *Benthos of the Red Sea Shelf*: 155-203, figs. 63-88.