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Report on the Stomatopoda and Macrurous Decapoda collected by Mr. Cyril Crossland in the Sudanese Red Sea.

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MUSEUM

(PLATES 27, 28.)

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THE collections of Stomatopoda and Macrurous Decapoda collected by Mr. Crossland in the Sudanese Red Sea were kindly entrusted to me for examination and report by Professor W. A. Herdman, to whom I desire to express my thanks for the opportunity of examining so interesting a collection. The latter comprises 10 species and varieties of Stomatopoda, and 60 species and varieties of Macrurous Decapoda, 8 of which, viz., 1 *Athanas*, 2 *Alpheus*, 4 *Periclimenes*, and 1 *Nikoides*, I have been unable to determine specifically owing to the defective nature and small number of the specimens. Four species are described as new to science—*Athanas crosslandi*, *Synalpheus quinquedens*, *Periclimenes calmani*, and *Upogebia pseudochelata*, and a further twelve species are new to the fauna of the Red Sea. These latter are *Penaeopsis stridulans* (W.-M.), *Eusicyonia carinata* (Oliv.), *Athanas parvus*, De Man, *Synalpheus streptodactylus*, Cout., *Synalpheus hululensis*, Cout., *Alpheus bucephaloides*, Nobili, *Alpheus consobrinus*, De Man, *Harpilius depressus* (Stimpson), *Harpilius gerlachei*, Nobili, *Anchistus inermis*, Miers, *Leander concinnus* (Dana), and *Gonodactylus pulchellus*, Miers.

Among the more interesting points brought out by the material in the collection are :—

The material of *Gonodactylus demani* and its variety *spinosus* suggests that these two forms are constantly distinguished by characters which may ultimately be considered of specific value.

Gonodactylus brevisquamatus, Paulson is represented by nine specimens, and my observations lend support to Mr. Patience's view that *G. fimbriatus* of Lenz is synonymous with Paulson's species.

I am able to supplement Nobili's descriptions and figures of *Penaeopsis stebbingi* and *P. caillaudi* in some few points.

My observations on the species of the genus *Athanas* have led me to suggest a slightly different explanation of the so-called "trimorphism" discovered by Kemp in *A. polymorphus* and to show that dimorphism among males is exhibited by at least three species of the genus.

The re-discovery of *Synalpheus savigny*, Guér., apparently lost sight of for nearly a hundred years, is a point of some interest.

1921 Tattersall W.M.

I have suggested that *Pontonia pinnæ*, Ortmann, is a synonym of the earlier described *Anchistus inermis* (Miers).

The examination of the single specimen of *Leander tenuicornis*, Say (= *L. natator*, M.-Ed.) emphasises the necessity of a revision of the genus, with special reference to the number of joints in the mandibular palp and its value as a generic character.

The most recent complete list of Red Sea Crustacea is contained in Nobili's work "Fauna carcinologique de la Mer Rouge," where 142 species of Macrurous Decapoda and 16 species of Stomatopoda are enumerated. Of the Stomatopoda, *Gonodactylus graphurus* is considered by Kemp as a doubtful record, leaving 15 species of this group as members of the Red Sea Fauna, to which the present collection makes no additions beyond recording *Gonodactylus pulchellus*, Miers, definitely from within the Rea Sea proper, this species appearing in Nobili's list on specimens from Aden.

Nobili's list of Macrurous Decapoda omitted the following species recorded by earlier writers :—

(1) *Synalpheus savignyi*, the name given by Guérin to the *Athanas nitescens* of Audouin and Savigny's great work.

(2) *Pterocaris typica* and *Lysmata trisetacea*, both described by Heller from Red Sea specimens.

(3) *Penæopsis velutinus*, Dana, recorded by Paulson in 1875.

(4) *Parabetæus cullereti*, recorded by Coutière (1897 *a*).

(5) *Alpheus djeddensis*, Cout., and *A. macrodactylus*, Ortm., recorded by Coutière (1897 *e*), and *A. malleodigitus* (Sp. Bate) by the same author (1899).

Since Nobili's paper appeared the following additions to the Red Sea fauna have been made :—

(1) Coutière in 1909 added *Synalpheus heroni*, Cout., and in 1910, *Saron neglectus*, De Man ; (2) De Man in 1909 *b* added *Alpheus djiboutensis*, Cout. ; and (3) Balss (1911 *a* & *b*) recorded the following eight additional species : — *Haliporus steindachneri*, Balss, *Parapenæus fissurus* (Sp. Bate), *Parapandalus pristis* (Risso) and *P. adensameri*, Balss, *Dorodotes levicarina*, Sp. Bate, *Ægeon pennatus*, Sp. Bate, *Stenopus spinosus* (Risso), and *Paratypton siebenrocki*, Balss. Admitting the validity of all the old records and with the addition of the 11 species herein recorded for the first time from the Red Sea, and the four new species described below, the total number of Macrurous Decapoda now known from the Red Sea amounts to 176, an increase of 34 on Nobili's total.

The Red Sea in the past has received a considerable amount of attention at the hands of carcinologists, with the result that no fewer than 60 out of

the 176 species (35 per cent.) of Macrurous Decapoda known from its waters have so far not been met with outside that area. In attempting to make a comparison of the species found in the Red Sea with those found in other parts of the Indian and Pacific Oceans, such as has been done by Laurie (1915) for the Brachyura, it at once becomes evident that our knowledge of the Macrurous Decapoda of the Indo-Pacific region is not nearly so complete as it is for the Brachyura. The enquiry is complicated by the intricate synonymy of various species particularly among the Penæidæ and the Alpheidæ, so that an exact knowledge of the distribution of many of the species is not easily come by. The general results which have emerged from my enquiry as to the distribution of the species found in the Red Sea may be stated as follows :—

Persian Gulf. Nobili, 1906 *b*.

26 Red Sea species are recorded in this report from various stations in the Persian Gulf and Arabian Sea = 15 per cent. of the total Red Sea species.

Maldive and Laccadive Archipelago. Coutière, 1905.

A comparison between the whole of the Macrura of the Red Sea with those of the Maldives is not possible, but the Alpheidæ of the latter locality have been thoroughly worked by Coutière and afford material for a comparison. 35 out of the 69 species of the Red Sea Alpheidæ or 50 per cent. have been recorded from the Maldive Archipelago.

Ceylon. Pearson, 1905 and 1911. Kemp, 1914.

27 out of 176 Red Sea species or 15·5 per cent. are included in Pearson's papers.

The Alpheidæ again afford a better basis for a comparison, 14 out of 69 Red Sea species, or 20 per cent., having been recorded from Ceylon.

India. Alcock, 1908. Henderson, 1893. Kemp, 1914 & 1915.

A total of 28 Red Sea species out of 176 or 16 per cent. have been recorded from the coasts of India.

The families of the Penæidæ and Hippolytidæ are perhaps the best known of the Indian Macrurous Decapods. Of the former (Alcock, 1906) 7 Red Sea species out of 19, or 37 per cent., are known from India, and of the latter (Kemp, 1914) 7 Red Sea species out of 12, or 58 per cent., are also Indian forms.

Malay Archipelago and Dutch East Indies. De Man, 1887, 1888, 1896–98, 1902, 1911 *a* & *b*.

The waters of this region of the Indo-Pacific have been more thoroughly explored than perhaps any other, and the comprehensive works of De Man afford material for a more exact comparison of the

Macrurous Decapoda of the Red Sea and the Malay Archipelago than is possible for any other region.

57 out of 176 Red Sea species, or 33 per cent., are known from the Malay Archipelago and its adjacent waters. This percentage agrees closely with that given by Laurie for the Brachyura of the Red Sea compared with the Seychelles, Maldive Archipelago, Ceylon, and the Hawaiian Isles.

The Siboga Reports on the Penæidæ and the Alpheidæ provide interesting results.

9 out of 19 Red Sea species of Penæidæ or 47·5 per cent., and 29 out of 69 Red Sea species of Alpheidæ or 42 per cent., were taken by the Siboga Expedition in the waters of the Dutch East Indies.

East Coast of Africa. Borradaile, 1910. Lenz, 1905 and 1910. Miers, 1884. Ortmann, 1894.

29 out of 176 Red Sea species, or 16·5 per cent., are known from this region.

It is obvious from these results that much remains to be done before the Macrurous Decapoda of the Indo-Pacific can be said to be fully known. So far as they go, they support Laurie's contention that the fauna of the Red Sea forms an integral part of the fauna of the Indo-Pacific Ocean.

To save frequent repetition I give a list of stations from which the present collection was made. It has been compiled to suit the present report, from Laurie (1915, p. 419). Crossland (1907) should be consulted for a detailed account of the collecting grounds.

I. Suez. Lat. 28° N.

A. Suez mud-flats.
B. Suez flats and docks. Dec. 1904.
C. Suez mud-flats and dock walls, from yellow sponge.
D. Suez, from among coral.
E. Purchased, Nov. 1904.

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

III. Mersa Abu Hamâma. Lat. 21° 30′ N. 12 fathoms. Mud.

IV. Khor Shinab. Lat. 21° 20′ N. 10–12 fathoms. Mud among sponges and Polyzoa.

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

A. Washed from nullipore and branched coral from the reef off Beacon Island. Lat. 20° 55′ N. 26 April, 1905.
B. Just west of Beacon Island. Lat. 20° 55′ N. Washed from nullipore dredged in 3–5 fathoms, 26 April, 1905.

C. Engineer Island. Lat. 20° 50′ N. Washed from old coral and weed obtained from Reef Flat.

D. Engineer Island. Lat. 20° 50′ N. Washed from weed and coral dredged in 3 fathoms of water.

E. Khor Dongonab. Among coral on reef.

F. North of the Barrier (see Crossland's map, p. 15), 20 fathoms. Mud.

G. Washed from ribbon-like sponge characteristic of the nullipore beds.

VI. Mersa Ar-rakiya. Lat. 20° 15′ N. Among coral in one fathom of water.

VII. Suakin Harbour. Lat. 19° 8′ N.

A. Suakin Harbour.

B. Suakin Harbour. 26 Jan., 1905.

C. Suakin Harbour. From coral, 1905.

D. From ascidians and barnacles of buoy moored in Suakin Harbour.

E. Washed from sponges.

F. „ „ „ 11 Jan., 1905.

G. Commensal in Black Pinna.

VIII. Shubuk. Lat. 18° 52′ N. to 18° 43′ N.

A. Mersa Makdah in Shab-ul-Shubuk.

B. We Shubuk, south-east corner, 16 Feb., 1905.

C. "Dredge washings, 17 Feb., 1905."

IX. Tella Tella Kebira, a small group of islands in the northern part of the Suakin Archipelago. Lat. 18° 48′ N.

A. Tella Tella Kebira. Washed from the half-loose coral fragments and nullipore which compose the edge of the Southern Reef. 3 March, 1905.

B. Tella Tella Kebira. From sand.

X. Trinkitat Harbour entrance. Lat. 18° 40′ N. 2 fathoms. Rock, weed, and nullipore.

XI. Agig. Lat. 18° 13′ N. From among coral in 4½ fathoms of water.

The distribution of the species in the present collection among the above stations is set forth in the following table, from which it will be seen that the coral reefs at Khor Dongonab and Suakin Harbour were by far the most productive in species.

29.	„ pachychirus, *Stimp.*	..	..	..	..	..	..	..	..	×				
30.	„ insignis, *Heller*	..	..	..	..	..	..	..	..	×				
31.	„ paracrinitus, *Miers*	..	..	..	..	..	..	×						
32.	„ Audouinii, *Cout.*	..	..	..	..	×								
33.	„ strenuus, *Dana*	×	..	..	..	×	..	×						
34.	„ bouvieri, *A. M.-Ed.*, var. hululensis, *Cout.*	..	..	..	..	×								
35.	„ parvirostris, *Dana*	..	..	..	..	×	..	×	..	×				
36.	„ sp.?	..	..	..	..	..	×							
37.	Saron neglectus, *De Man*	..	..	..	..	..	..	..	..	×				
38.	Thor paschalis (*Heller*)	..	..	..	..	×								
39.	Hippolyte proteus (*Paulson*)	..	..	..	..	..	..	..	..	..	..	..	×	
40.	Periclimenes petitthouarsii (*Aud.*)	..	..	..	..	×	..	×	..	..	..	..	×	
41.	„ calmani, *Tattersall*	..	..	..	..	..	..	..	..	..	..	..	×	
42.	„ sp.?	..	..	..	..	×	..	×						
43.	„ sp.?	..	..	..	..	..	..	×						
44.	„ sp.?	..	..	..	..	..	..	..	..	..	..	..	×	
45.	„ sp.?	..	..	..	..	..	..	×						
46.	Coralliocaris superba (*Dana*)	..	..	..	..	×								
47.	„ lucina, *Nobili*	..	..	..	..	×								
48.	Harpilius beaupresii (*Aud.*)	..	..	..	..	..	..	×						
49.	„ depressus, *Stimp.*	..	..	..	..	..	..	×						
50.	„ gerlachei, *Nobili*	..	..	..	..	×								
51.	Anchistus miersii (*De Man*)	..	..	..	..	..	..	×	..	..	..	..	×	
52.	„ inermis (*Miers*)	..	..	..	..	..	..	×						
53.	Conchodytes meleagrinæ, *Peters*	..	..	..	..	..	..	..	..	..	..	..	×	
54.	Palæmonella tenuipes, *Dana*	..	..	..	..	×	..	×						
55.	Leander tenuicornis (*Say*)	..	×											
56.	„ concinnus (*Dana*)	×												
57.	Nikoides sp.?	..	..	..	..	..	..	..	×					
58.	Axiopsis æthiopica, *Nobili*	..	..	..	..	×								
59.	Upogebia pseudochelata, *Tattersall*	..	..	..	..	..	..	×						
60.	„ savignyi (*Strahl*)	×	..	..	..	×	..	×	..	..	..	..	×	
61.	Squilla massavensis, *Koss.*	×												
62.	Pseudosquilla ciliata (*Fabr.*)	..	×											
63.	„ megalophthalma, *Bigelow*	..	..	..	..	..	..	..	..	×				
64.	Lysiosquilla multifasciata, *W.-M.*	..	..	..	..	..	..	..	×					
65.	Gonodactylus chiragra (*Fabr.*), var. smithii, *Pocock*	..	..	..	..	×	×							
66.	„ demani, *Henderson*	..	..	..	..	..	×	×	×					
67.	„ „ „ var. spinosus, *Bigelow*	..	..	..	..	×	..	..	..	..	..	×		
68.	„ glaber, *Brooks*	×	..	..	..	×	..	×	..	..	..	×	×	
69.	„ brevisquamatus, *Paulson*	..	..	..	..	..	..	..	..	×				
70.	„ pulchellus, *Miers*	..	..	..	..	..	..	..	×					

List of Literature.

The following list contains a complete bibliography of all papers as far as I have been able to discover, which deal in any way with material of Macrurous Decapoda and Stomatopoda from the Red Sea. As regards the Penæidæ and Alpheidæ, I have included in the synonymies of the species, as far as possible, references to De Man's Siboga reports, as the last authoritative pronouncement on these two families. In the same way Kemp's paper on the Hippolytidæ (1914) has been used for that family, and the same author's monograph on the Stomatopoda (1913) for that group of Crustacea, while Borradaile's monograph of the Pontoniinæ (1917) has been followed for that group.

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In the preparation of this report I am greatly indebted to Mr. Patience for kindly allowing me to see the manuscript of his forthcoming paper on the Stomatopods collected by Mr. J. J. Simpson in the Mergui Archipelago, with reference to *Gonodactylus brevisquamatus*, Paulson. The Rev. T. R. R. Stebbing has kindly allowed me to consult and retain for several months his copy of Paulson's rare work on the Crustacea of the Red Sea, and Dr. W. T. Calman has also given me great assistance in the loan of literature. To these gentlemen and to Professor Herdman, I desire to record my grateful thanks.

The types of the new species have been deposited in the British Museum. The remainder of the collection is housed in the Zoological Department of the University of Liverpool.

STOMATOPODA.

Genus Squilla, *J. C. Fabricius.*

Squilla massavensis, *Kossmann*, 1880. *See* Kemp, 1913, p. 76.

Locality. Station I. E. 3 ♀, 216 mm.

Remarks. These specimens are considerably larger than any which have hitherto been recorded. Kossmann's type measured 140 mm., Kemp's largest specimen had a length of 108 mm., Nobili gives the length of one of his specimens as 134 mm., while Balss gives no size for those he examined. They agree very closely with the descriptions given by Balss and Kemp. The latter author, however, states that the anterior bifurcation of the median carina of the carapace was not present in any of the specimens he examined.

This feature can be distinctly traced in the specimens here dealt with, though the actual carinæ are almost obsolete. The three rows of tubercles on the telson are well developed.

Distribution. Red Sea (Kossman, Nobili, Balss); Gulf of Oman and Persian Gulf (Kemp).

Genus PSEUDOSQUILLA, *Dana*, 1852.

PSEUDOSQUILLA CILIATA (*Fabricius*). *See* Kemp, 1913, p. 96.

Locality. Station II, 1 ♂, 50 mm.

Remarks. This specimen is an absolutely typical example of the species, without a spine on the postero-lateral angle of the fourth abdominal segment, and having the inner spine of the bifurcate process of the uropod slightly longer than the outer.

Previously recorded from the Red Sea by Nobili, 1906, and Balss, 1910.

PSEUDOSQUILLA MEGALOPHTHALMA, *Bigelow*, 1894. *See* Kemp, 1913, p. 103.
(Pl. 27. figs. 1–3.)

Locality. Station IX. B, 1 ♀, 30 mm.

Remarks. It is with a considerable amount of reserve that I refer this specimen to Bigelow's species. Compared with his description the following differences are to be noted:—

(1) The corneal axis of the eye (Pl. 27. fig. 2) is only five-sixths of the peduncular axis. In Bigelow's specimen the corneal axis is considerably broader than the peduncular axis (11 to 8).

(2) The length of the rostrum (Pl. 27. fig. 1) is only four-sevenths of the breadth. It is thus shorter than in Bigelow's specimen (where the proportions are 5 to 7), and, though it covers the ophthalmic segment, it leaves the whole of the eye itself exposed.

(3) The lateral margins of the eighth thoracic segment are provided with a well-marked notch. No mention of such a notch is made by Bigelow.

(4) There are only six spines (Pl. 27. fig. 3) on the sixth abdominal segment, there being no trace of the small spines on the inner side of the intermediates mentioned by Bigelow.

(5) Only the fourth, fifth, and sixth segments of the abdomen have spines at the postero-lateral corners. In Bigelow's specimen, the second and third segments also had these spines.

There are eight carinæ on the dorsal surface of the telson (Pl. 27. fig. 3), in addition to the median one. In the nomenclature used by Kemp, these carinæ are the submedian, intermediate, second lateral, and marginal, the first laterals being absent. If my identification of this specimen is correct, it supports Kemp's suggestion that the carinæ next the marginals in this species are homologous with the second laterals of his nomenclature. In the

present specimen they are quite well marked and terminate in the lateral spines of the telson. The submedian carinæ of our specimen are interrupted at about their centre. This may be what Bigelow means in calling it serrated. I may also remark that between the submedian and intermediate spines of the telson there are two lobes on the left side but only one on the right. There are ten spines on the outer margin of the proximal joint of the exopod of the uropods, the last of which reaches the level of the apex of the distal joint. The outer spine of the bifurcate process of the uropods is slightly longer than the inner, the latter reaching the apex of the endopod of the uropods, the former reaching half-way down the distal joint of the exopods. The raptorial claws of this specimen agree with Bigelow's description in having the pectinations on the inner margin of the propodus confined to the proximal half of that margin. There are no traces of eye-spots on the carapace. The most serious differences from Bigelow's description presented by the present specimen are the characters of the eye and the number of spines on the sixth abdominal segment. The notch on the lateral margin of the eighth thoracic segment may have been overlooked, while the spiniform nature of the postero-lateral corners of the abdominal segments is a variable character. Nobili, in recording this species from the Red Sea, notes that in his specimens only the fourth, fifth, and sixth segments of the abdomen had spines at the postero-lateral corners. But in his specimens the inner and outer spines of the bifurcate process of the uropods were subequal. He makes no mention of the size of the eyes, and we must presume that the sixth abdominal segment bore eight spines. The nearest relative of this species is *P. ocalata*, from which the present specimen is distinguished by the absence of a spine on the rostrum, and by the presence of second lateral carinæ on the telson instead of first laterals. On the whole, I prefer to leave the present specimen in the species to which I have referred it. More material of both sexes is required before it can be stated whether the differences I have pointed out between my specimen and Bigelow's description are constant enough to be of specific importance.

Since writing the above, I have received a copy of Mr. Kemp's paper "On a collection of Stomatopod Crustacea from the Philippine Islands," in which he gives some notes on a single specimen of *Pseudosquilla megalophthalma* which he examined from that locality. I am now certain that my specimen belongs to that species. Kemp's specimen agrees with the present one in characters 3, 4, and 5 given above as points of difference between my specimen and Bigelow's description. Kemp gives no measurements for the eye, and the rostrum of his specimen is longer in proportion to the breadth than in mine, but these differences are trifling. Unfortunately, the Red Sea specimen shows no traces of the distinctive coloration described by Kemp.

Distribution. Mauritius (Bigelow); Obock in the Red Sea, and Djibouti (Nobili); Philippine Islands (Kemp).

Genus LYSIOSQUILLA, *Dana*, 1852.

LYSIOSQUILLA MULTIFASCIATA, *Wood-Mason*, 1895. *See* Kemp, 1913, p. 122. (Pl. 28. fig. 6.)

Locality. Station VIII. B, 1 ♂.

Remarks. The specimen is imperfect, the last two segments of the abdomen, and the telson having been broken off. Identification is, therefore, a matter of some uncertainty. The raptorial claw (Pl. 28. fig. 6), however, has the characteristic form of *L. multifasciata* as described by Kemp. The dactylus bears five teeth, including the terminal one, of which the penultimate is short. The two lobes at the base of its external margin are very unequal, the proximal quite small, the distal very much expanded. The colour of the present specimen in alcohol is distinctive. The carapace shows three bands of dark colour, two anterior paler ones, almost fused, and a posterior one, well marked. The last three thoracic segments each has a single dark band, occupying the posterior half of the segment. The first four abdominal segments possess a single very dark transverse line in the centre third of their posterior border. Above this line and separated from it by a pale line is a rather indistinct broad dark band which does not quite reach the lateral margins. From the postero-lateral corners of this pale transverse band, on each side, there is a much darker band running to the lateral margins. These latter bands have the appearance of being the lateral portions of an interrupted band, the centre part of which is missing. There is a distinct break in contour where these very dark bands meet the centre paler band, suggesting that the latter represents an anterior and separate band of colour.

Previously recorded from the Red Sea by Nobili (1906).

Genus GONODACTYLUS, *Latreille*.

GONODACTYLUS CHIRAGRA (*Fabricius*). *See* Kemp, 1913, p. 155.

Localities. Station V., 1 ♀, 60 mm. Station VI., 1 ♂, 40 mm.

Remarks. Both these specimens are of the variety represented by *smithii*, except that the median carina of the telson of the male does not end in a spine but is obtusely rounded.

A widely distributed Indo-Pacific species recorded from the Red Sea by Miers, Kossmann, and Nobili.

GONODACTYLUS DEMANI, *Henderson*, 1893. *See* Kemp, 1913, p. 164, pl. 9. figs. 108–111.

Localities. Station VI., 1 ♀, 22 mm. Station VII. C, 1 ♀, 14 mm., 2 ♂, 14 and 19 mm. Station VIII. C, 2 ♀, 27 and 30 mm.

Remarks. All these specimens agree with Henderson's figure of the type-specimen (1893) in being without setæ on the inner margin of the inner uropod (except for three or four at the extreme proximal part).

In the arrangement and number of tubercles on the telson, they agree generally with that shown in Kemp's figure 109, that is, the tubercles are large and few, but they show evidence that the tubercles increase in number with age and, likewise, become more obtuse, as the following description of the tuberculation of each specimen will show.

♂, 14 mm.

Two median tubercles, one behind the other, on the median carina, one on each submedian carina, one on the carinæ of the submedian teeth, and one on the carinæ of the intermediate teeth. All the tubercles very acutely pointed and spiniform. Carinæ of the sixth abdominal segment likewise ending in sharply pointed spines.

♀, 14 mm.

As above, except that there are two tubercles on the carinæ of the intermediate teeth.

♂, 19 mm.

Three spinous tubercles, forming a well-marked trident at the distal end of the median carina, two tubercles on each submedian carina, two at the base of the submedian teeth, and three on the carinæ of the intermediate teeth. All the tubercles acutely spinous, as are also the carinæ of the sixth abdominal segment.

♀, 22 mm.

Three spinous tubercles, forming a trident, at the distal end of the median carina; anterior to them a smaller median spinous tubercle flanked by a very small obtuse tubercle on each side: two tubercles on each submedian carina, three at the base of the submedian teeth, and three on the carinæ of the intermediate teeth. All the tubercles and the carinæ on the sixth abdominal segment, acute but not so sharply pointed as in the smaller specimens.

♀, 27 mm.

Almost exactly the tuberculation of the last specimen but all the tubercles obtusely rounded. This specimen agrees very closely with Kemp's figure 109.

♀, 30 mm.

Like the last, but only two tubercles at the base of each submedian tooth. All the tubercles obtuse.

These six specimens, therefore, form a compact group agreeing in the unarmed inner margin of the inner uropods and having a tuberculation of the telson following a general plan though varying with age. I regard them as referable to the typical form of the species, though Henderson (1893) figures the spinules on the telson of the type as distinctly smaller and

more acute than they are on the specimen of corresponding size in the present collection.

Previously recorded from the Red Sea by Nobili (1906).

GONODACTYLUS DEMANI, *Henderson*, 1893, *var.* SPINOSUS, *Bigelow*, 1893. *See* Kemp, 1913, p. 165, pl. 9. fig. 112.

Localities. Station V. D, 1 ♂, 15 mm. Station XI., 2 ♀, 22 and 32 mm.

Remarks. The two specimens from Agig have the entire surface covered with small spinules, densely packed. The small specimen from Khor Dongonab has the telson very much of the form shown in Lenz (1905, fig. 12), except that there is only one row of spinules on the submedian teeth. In all three specimens the intermediate and lateral teeth of the telson appear to me to be as well developed as in the typical form of the species. All three agree in having the inner uropod armed with setæ all round. It is this last character which has led me to refer these specimens to the variety *spinosus* of *G. demani*. Bigelow (1894), when describing this form originally, made no mention of the form of the inner uropod, but Lenz, in the figure already quoted, shows the inner uropod invested with setæ on the entire margin. When Kemp wrote the main part of the text of his valuable monograph, all the specimens, with one exception, of *G. demani* and its varieties to which he had access had the inner uropod setose all round, and it was only later (Addendum, p. 198) after he had examined a number of specimens from the Gulf of Manaar, which all agreed in having the inner margin of the inner uropod unarmed, that he became aware of this character. In Henderson's figure of the type specimen the inner margin of the inner uropod is figured as unarmed, and it seems to me to be just possible that the var. *spinosus* may be constantly differentiated from the typical form by this character. If this is so, then *G. spinosus*, Lenz has been correctly determined and is not a synonym of *G. demani*, Henderson, as given by Kemp. As I have already remarked, the tubercles on the telson of the typical form appear to be fewer, larger, and more obtuse than in the variety, and it may subsequently be discovered that this type of tuberculation goes with the unarmed character of the inner uropod, to emphasise the distinction between the type and its variety. Kemp does not give the character of the inner uropod of the specimen from which his figure 109 was taken. This figure, as I have pointed out, gives the general arrangement of the tubercles on the telson of those specimens which I have referred to the type form, all of which agree in having unarmed inner margins to the inner uropods. In support of the generally accepted opinion that *G. demani* and *G. spinosus* are varieties of one species, I may observe that the copulatory organs on the first pleopod of the male specimen from Khor Dongonab, referred here to the variety

spinosus agree in detail with those from one of the males from Suakin Harbour referred to the typical form.

This variety has been previously recorded from the Red Sea by Nobili (1906).

GONODACTYLUS GLABER, *Brooks*, em. *Henderson*, non *Kemp*, 1913, p. 182.

Localities. Station I. D, 1 ♀, 47 mm.
Station V. E, 20 ♂, 24–54 mm., 15 ♀, 24–58 mm.
Station VII. B, 1 ♀, 68 mm. Station XI., 1 ♀, 35 mm.
Station V. B, 1 ♂, 16 mm. Station V. C, 2 ♀, 9 and 11 mm.
Station V. D, 1 ♀, 30 mm. No locality, 1 ♀, 60 mm.

Remarks. This species is by far the commonest Stomatopod found in the Red Sea. All the specimens, except one listed above, may be referred to the var. *ternatensis*, De Man, and bear traces of the green colour characteristic of the majority of specimens of this species. The one exception, already noted, appears to be referable to the var. *rotundus* of Borradaile. The keels on the telson are broad and swollen so as to touch one another, but there are traces of spines on the three middle keels. This specimen shows no traces of the two black spots on the telson which form so constant a feature of this species, and its colour, as preserved, suggests a mottled or marbled light brown colour in life.

This species has been recorded from the Red Sea previously by Nobili and Balss.

GONODACTYLUS BREVISQUAMATUS, *Paulson*, 1875. (Pl. 27. figs. 5–6.)

G. brevisquamatus, Nobili, 1906*a*.
G. fimbriatus, Lenz, 1905.
G. fimbriatus, Borradaile, 1907.
G. fimbriatus, Lenz, 1910.
G. brevisquamatus and *G. fimbriatus*, Kemp, 1913.

Locality. Station IX. A, 5 ♂, 4 ♀, 13–28 mm.

Remarks. From Kemp's monograph I learnt that Mr. Patience had found a specimen of this species in a collection of Stomatopods from Mergui and, as a result of his researches, had come to the conclusion that *G. brevisquamatus*, Paulson and *G. fimbriatus*, Lenz are synonymous. On my writing to him, he very kindly allowed me to see the manuscript of his paper and, after comparing my specimens with his description, I can unhesitatingly support his view. There seems to me to be no doubt whatever that the two species are one and the same.

In the largest of my specimens the antennal scale reaches forward to the extremity of the eye, and is therefore relatively longer than shown in Paulson's figure, but in the smaller specimens the scale approaches much

more nearly to the proportions shown by Paulson, and the size of the scale evidently increases with age.

On the sixth abdominal segment (Pl. **27.** fig. 6) the median carinæ are invariably wider than the intermediates. In the male the median carinæ are parallel, but in the female they are slightly divergent. All the carinæ on this segment are smooth and do not terminate in spines, though the lateral carinæ terminate more acutely than shown in Paulson's figure 3 *r*.

The telson (Pl. **27.** fig. 6) bears in the middle of the dorsal surface an oval smooth elevation terminating distally in young specimens in an obtuse slightly transverse tubercle. This tubercle becomes obsolete or almost so with growth ; it is hardly discernible in the largest specimens. On each side of the median elevation there is a prominent submedian carina in close contact with the median one throughout its length. Lateral to the submedian again there is on each side a much fainter carina, distinct in its posterior half but merging into the submedian carina anteriorly. It presents the appearance of a half carina only. Lenz in his figure of the telson of *G. fimbriatus* figures *two* faint carinæ lateral to the submedians, but none of the present specimens show traces of more than one. The carinæ of the intermediate spines are well marked and smooth, while the lateral margin of the telson is thickened to form a ridge. There are two tubercles near the anterior margin of the telson, one on each side of the median elevation and homologous with those found in *G. chiragra*.

There are no lateral spines on the telson. The intermediate spines are about half as long as the submedians. The inner margins of the latter bear a row of from nine to twelve slender spinules. There is in most of the specimens a single similar spinule on the outer margin of the submedian spines and one on the inner margin of the intermediates. In one specimen I found traces of more spinules on the outer margin of the submedians, on one side of the specimen only.

The inner spine of the ventral prolongation of the uropods is longer than figured by Paulson, being at least half the length of the outer. The latter has the very distinct shape shown in Paulson's figure, with the distal extremity rather strongly incurved.

The uropods (Pl. **27.** fig. 6) are very distinctive. The peduncular segment bears a strong spine dorsally on the distal margin. The basal segment of the exopod projects far beyond the articulation of the ultimate segment, and bears on its outer margin, at the distal end, three (in one case two) stout strongly falciform spines, outwardly recurved, and proximally to these, from three to five short straight spines. On the dorsal surface of the basal segment of the uropods, near to the articulation of the distal segment, there is a pad of rather long densely plumose setæ. The dorsal surface of the distal segment of the exopod is beset all over with short plumose setæ and