



DESCRIPTIONS OF STOMATOPOD LARVAE FROM THE ARABIAN SEA
WITH A LIST OF STOMATOPOD LARVAE AND ADULTS FROM THE
INDIAN OCEAN AND A KEY FOR THEIR IDENTIFICATION — PART II*

S. L. SHANBHOGUE**

22440

Central Marine Fisheries Research Institute, Cochin-682 018

ABSTRACT

Studies on stomatopods from seas around India have brought to light the need for an assessment of stomatopod fauna known from the Indian Ocean. No recent work fulfils this need and so an attempt has been made in the present paper to list all the known species of adults which are at present 115 from the Indian Ocean proper and to provide identification keys for them.

INTRODUCTION

THE STOMATOPOD fauna from the Indian Ocean region is fairly well known mainly due to the excellent monograph of Kemp (1913). He reported 97 species and varieties from the Indo-Pacific and 54 from seas around India. Under the Indo-Pacific region, he included all localities from Suez and S. Africa to Australia, New Zealand, Oceania and Japan.

The major contributions from the Indian Ocean region prior to Kemp's monograph are that of Lanchester (1903) in which he reported 2 species. In one of them, namely *Gonodactylus chiragra*, he described 21 varieties from the Maldives and Laccadive Archipelagoes many of which have been later given the specific rank. Tattersall (1906) reported 10 species from Sri Lanka. From the Western Indian Ocean, Borradaile (1907) reported 15 species.

Kemp (1913) treated the subject in great detail and his work was so comprehensive that not many publications of importance appeared on the subject after that year.

In 1921, Kemp and Chopra reported 15 species from the region under review. From the coral reefs of Krusadi Island in the Gulf of Mannar, Gravely (1927) reported two species. Chopra (1934) reported 13 species from the Sandheads, off the mouth of the Hughli River. The John Murray Expedition collected 16 species and varieties which have been reported by Chopra (1939). Holthuis (1941) reported 14 species from the collections of the Snellius Expedition. In his report on the stomatopods from South Africa, Barnard (1950) reported 17 species. Tiwari and Biswas (1951) described two new species and added notes on 8 species. From the Karachi Coast, Baig (1954) reported 4 species.

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**Present Address : Fisheries College, Mangalore

[1]

JOSEPH PAUL VARGHESE, K.G. M.Sc
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

The Australian stomatopod fauna is fairly well known through the works of Stephenson and Mc Neill (1955) and Manning (1966) who reported 48 species.

Manning (1962) reported 10 species collected by the Yale Seychelles Expedition. The stomatopods occurring in the Red Sea have been reviewed by Ingle (1963) who lists 20 species. Holthuis (1967) reported 20 species from Red Sea, of which two were new to science, and most of the specimens reported there were collected by the 1962 and 1965 Israel South Red Sea Expeditions. Chhapgar and Sane (1966) published a key to stomatopods of Bombay, listing 17 species. From Madagascar, Manning (1968) reported 28 species of which six were new to science.

In an important contribution from Madras Coast on the post-larvae Alikunhi (1967) reported 18 species. The extensive studies mainly pertain to the detailed description of post-larval stages, frequency of moults, growth and age at different sizes. The studies also include observations on shrinkage in length during metamorphosis, relative sizes of adults and post-larvae, the post-larval characters and their relation to adult characters, relative growth during post-larval stages, duration of post-larval stages and inter-generic relationships in stomatopods.

In the present account a check list with keys for identification of all the known species of adult stomatopods from the Indian Ocean region is given for the first time. The 115 species listed below fall under 27 genera of 4 families. The area covered is roughly from 20°E to 125°E and 45°S. The following publications have been mainly consulted for the preparation of the keys presented here and liberal use is made of them; Miers (1880); Kemp (1913); Stephenson and Mc Neill (1955); Ingle (1963); Manning (1966, 1968, 1968 a). Keys to families and genera are from Manning (1968 a). The key to species of *Gonodactylus* is compiled from Manning (1966, 1967 a) incorporating the new species described in 1968. The keys for the species belonging to the following genera are reproduced as such from the following sources, *Odontodactylus* from Manning (1967 b); *Acanthosquilla*, *Lysiosquilla*, *Clorida* and *Harpiosquilla* from Manning (1968). The keys for the species of the following genera include all the species so far known; *Odontodactylus*, *Carinosquilla*, *Clorida*, *Harpiosquilla* and *Squilloides*. The genera *Bathysquilla*, *Eurysquilla*, *Hoplosquilla*, *Austrosquilla*, *Coronida*, *Nannosquilla*, *Dictyosquilla*, *Leptosquilla*, *Lophosquilla* and *Pterygosquilla* are known from a single species in the Indian Ocean and only these are mentioned here. The species which were recently described have been included at appropriate places in the keys.

In the recent years, many revisions of the group have appeared at the generic and family levels and a large number of new species have been described from different parts of the world. In all about 275 species of stomatopods are recognised at present and the number is increasing, indicating that there are still many undescribed ones.

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JOSEPH PAUL VARGHESE, K.G. M.Sc
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

[2]

LIST OF SPECIES OF STOMATOPODA KNOWN FROM THE INDIAN OCEAN

1. BATHYSQUILLIDAE Manning, 1968
 - 1.1 *Bathysquilla* Manning, 1963
 - (1) *Bathysquilla crassispinosa* (Fukuda) 1910
2. GONODACTYLIDAE Giesbrecht, 1910
 - 2.1 *Eurysquilla* Manning, 1963
 - (2) *Eurysquilla sewelli* (Chopra) 1939
 - 2.2 *Gonodactylus* Berthold, 1827
 - (3) *Gonodactylus bicarinatus* Manning, 1968
 - (4) *G. chiragra* (Fabricius) 1781
 - (5) *G. choprai* Manning, 1967
 - (6) *G. crosnieri* Manning, 1968
 - (7) *G. demaniti* Henderson, 1893
 - (8) *G. falcatus* (Forsskal) 1775
 - (9) *G. graphurus* (Miers) 1880
 - (10) *G. hendersoni* Manning, 1967
 - (11) *G. incipiens* Lankester, 1903
 - (12) *G. lankesteri* Manning, 1967
 - (13) *G. platysoma* Wood-Mason, 1895
 - (14) *G. segregatus* Lankester, 1903
 - (15) *G. smithii* Pocock, 1893
 - (16) *G. spinosus* Bigelow, 1893
- 2.3 *Hoplosquilla* Holthuis, 1964
 - (17) *Hoplosquilla acanthurus* (Tattersall) 1906
- 2.4 *Manningia* Serène, 1962
 - (18) *Manningia amabilis* Holthuis, 1967
 - (19) *M. pilaensis* (de Man) 1888
- 2.5 *Mesacturus* Miers, 1880
 - (20) *Mesacturus brevisquamatus* (Paulson) 1875
 - (21) *M. crinitus* (Manning) 1962
 - (22) *M. drepanophorus* (de Man) 1902
 - (23) *M. fimbriatus* (Lenz) 1905
 - (24) *M. herdmanni* (Tattersall) 1906
- 2.6 *Odontodactylus* Bigelow, 1893
 - (25) *Odontodactylus brevirostris* Miers, 1884
 - (26) *O. japonicus* (de Haan) 1844
 - (27) *O. hansenii* (Pocock) 1893 = *O. brevirostris*
 - (28) *O. southwelli* Kemp, 1911 = *O. brevirostris*
 - (29) *O. elegans* (Miers) 1884 = *O. scyllarus*
- 2.7 *Protosquilla* Brooks, 1886
 - (28) *Protosquilla brooksi* de Man, 1887
 - (29) *P. ectypa* Müller, 1886
 - (30) *P. excavata* (Miers) 1880
 - (31) *P. glyptocerca* (Wood-Mason) 1875
 - (32) *P. guerini* (White) 1861
 - (33) *P. gyrosa* (Odhner) 1923
 - (34) *P. lenzi* (Holthuis) 1941
 - (35) *P. nefanda* (Kemp) 1911
 - (36) *P. pulchella* (Miers) 1880
 - (37) *P. spinosissima* (Pfeffer) 1888
 - (38) *P. stoliura* Müller, 1886
 - (39) *P. trispinosa* (Dana) 1852
 - (40) *P. tuberculata* (Borradaile) 1907
- 2.8 *Pseudosquilla* Dana, 1852
 - (41) *Pseudosquilla ciliata* (Fabricius) 1787
 - (42) *P. megalophthalma* Bigelow, 1893
 - (43) *P. oculata* (Brullé) 1836
 - (44) *P. ornata* Miers, 1880
3. LYSIOSQUILLIDAE Giesbrecht, 1910
 - 3.1 *Acanthosquilla* Manning, 1963
 - (45) *Acanthosquilla acanthocarpus* (Miers) 1880
 - (46) *A. humesi* Manning, 1968
 - (47) *A. multifasciata* (Wood-Mason) 1895
 - (48) *A. tigrina* (Nobili) 1903
 - (49) *A. vicina* (Nobili) 1904
 - 3.2 *Austrosquilla* Manning, 1966
 - (50) *Austrosquilla osculans* (Hale) 1924
 - 3.3 *Coronida* Brooks, 1886
 - (51) *Coronida trachura* (Von Martens) 1881
 - 3.4 *Heterosquilla* Manning, 1963
 - (52) *Heterosquilla insignis* (Kemp) 1911
 - 3.5 *Lysiosquilla* Dana, 1852
 - (54) *Lysiosquilla capensis* Hansen, 1895
 - (55) *L. maculata* (Fabricius) 1793
 - (56) *L. sulcirostris* Kemp, 1913
 - (57) *L. tredecimdentata* Holthuis, 1941

{3}

- 3.6 *Nannosquilla* Manning, 1963
 - (58) *Nannosquilla hystricotelson* (Barnard) 1958
4. SQUILLIDAE Latreille, 1803
 - 4.1 *Alima* Leach, 1817
 - (59) *Alima hieroglyphica* (Kemp) 1911
 - (60) *A. hyalina* Leach, 1817
 - (61) *A. hildebrandi* (Schmitt), 1940 = *A. hieroglyphica*
 - (62) *A. labadiensis* (Ingle) 1960 = *A. hieroglyphica*
 - (63) *A. alba* (Bigelow) 1894 = *A. hyalina*
 - (64) *A. laevis* (Hess) 1865
 - (65) *A. supplex* (Wood-Mason) 1875
 - 4.2 *Anchisquilla* Manning, 1968
 - (63) *Anchisquilla fasciata* (de Haan) 1844
 - (64) *A. mcneilli* (Stephenson) 1953
 - (65) *A. miles* (Hess) 1865
 - 4.3 *Carinosquilla* Manning, 1968
 - (66) *Carinosquilla carinata* (Serène) 1950
 - (67) *C. lirata* (Kemp & Chopra) 1921
 - (68) *C. multicarinata* (White) 1847
 - 4.4 *Clorida* Eydoux and Souleyet, 1842
 - (69) *Clorida bombayensis* (Chhapparg & Sane) 1967
 - (70) *C. chlorida* (Brooks) 1886
 - (71) *choprai* (Tweedie) 1935
 - (72) *C. decorata* Wood-Mason, 1876
 - (73) *C. denticauda* (Chhapparg & Sane) 1967
 - (74) *C. fallax* (Bouvier) 1914
 - (75) *C. granti* (Stephenson) 1953
 - (76) *C. latreilli* Eydoux & Souleyet, 1841
 - (77) *C. merguensis* (Tiwarei & Biswas) 1952
 - (78) *C. microphthalma* H. Milne Edwards, 1837
 - (79) *C. miersi* Manning, 1968
 - (80) *Cloridopsis bengalensis* (Tiwarei & Biswas) 1952
 - (81) *C. immaculata* (Kemp) 1913
 - (82) *C. scorpio* (Latreille) 1825
 - (83) *C. terrareginensis* (Stephenson) 1953
 - 4.5 *Cloridopsis* Manning, 1968
 - (84) *Cloridopsis foveolata* (Wood-Mason) 1895
 - 4.6 *Dictyosquilla* Manning, 1968
 - (85) *Dictyosquilla annandalei* (Kemp) 1911
 - (86) *H. harpax* (de Haan) 1844
 - (87) *H. melanoura* Manning, 1968
 - (88) *H. raphidea* (Fabricius) 1798
 - 4.7 *Harpisquilla* Holthuis, 1964
 - (89) *Leptosquilla miersi* (A. Milne Edwards) 1873
 - (90) *Lophosquilla costata* (de Haan) 1844
 - 4.8 *Leptosquilla* Miers, 1880
 - (91) *Oratosquilla fabricii* (Holthuis) 1941
 - (92) *O. gonypetes* (Kemp) 1911
 - (93) *O. hesperia* (Manning) 1968
 - (94) *O. holoschista* (Wood-Mason) 1895
 - (95) *O. indica* (Hansen) 1926
 - (96) *O. inornata* (Tate) 1883
 - (97) *O. interrupta* (Wood-Mason) 1895
 - (98) *O. investigatoris* (Lloyd) 1907
 - (99) *O. massavensis* (Kossmann) 1880
 - (100) *O. mauritiana* (Kemp) 1913
 - (101) *O. mikado* (Kemp & Chopra) 1921
 - (102) *O. nepa* (Latreille) 1825
 - (103) *O. oratoria* (de Haan) 1844
 - (104) *O. perpenso* (Kemp) 1911
 - (105) *O. quadrata* (Fukuda) 1910
 - (106) *O. quinquedentata* (Brooks) 1885
 - (107) *O. simulans* (Holthuis) 1967
 - (108) *O. stridulans* (Wood-Mason) 1894
 - (109) *O. woodmasoni* (Kemp) 1911
 - (110) *Pterygosquilla armata* (H. Milne-Edwards) 1837
 - 4.9 *Lophosquilla* Manning, 1968
 - (111) *Squilloides gilesi* (Kemp) 1911
 - (112) *S. lata* (Brooks) 1886
 - (113) *S. leptasquilla* (Brooks) 1886
 - (114) *S. minor* (Jurich) 1904
 - (115) *S. tenuispinis* (Wood-Mason) 1891.
 - 4.10 *Oratosquilla* Manning, 1968
 - (110) *Pterygosquilla armata* (H. Milne-Edwards) 1837
 - 4.11 *Pterygosquilla* Hilgendorf, 1890
 - (110) *Pterygosquilla armata* (H. Milne-Edwards) 1837
 - 4.12 *Squilloides* Manning, 1968
 - (111) *Squilloides gilesi* (Kemp) 1911
 - (112) *S. lata* (Brooks) 1886
 - (113) *S. leptasquilla* (Brooks) 1886
 - (114) *S. minor* (Jurich) 1904
 - (115) *S. tenuispinis* (Wood-Mason) 1891.

{4}

KEY FOR IDENTIFICATION

1. Exopod of uropods one-segmented, with movable spines on outer margin; fossil, Jurassic to Cretaceous..... Family: *Sculdidae* Dames, 1886

Exopods of uropods two-segmented, proximal only with movable spines; fossil and recent.....2

2. (1) Telson lacking sharp median carina; propodi of last 3 maxillipeds broad beaded or ribbed ventrally. Family: *Lysiosquillidae* Giesbrecht, 1910.....3

Telson with sharp median carina; propodi of last 3 maxillipeds elongate, not beaded or ribbed ventrally.....19

FAMILY : LYSIOSQUILLIDAE

3. (2) Distal segment of endopod of first 2 walking legs elongate; proximal portion of outer margin of uropodal endopod at most angled inward, not folded.....4

Distal segment of endopod of first 2 walking legs ovate or subcircular; proximal portion of outer margin of uropodal endopod folded.....10

4. (3) Dactylus of raptorial claw inflated basally; propodus of claw pectinate proximally only; rostral plate rounded or subrectangular. Genus: *Coronida* Brooks, 1886.....*Coronida trachura* (Von Martens) 1881

Dactylus of raptorial claw not inflated basally; propodus fully pectinate; rostral plate cordiform or triangular.....5

5. (4) Median dorsal surface of telson with at most a low triangular boss; movable submedian teeth rarely present; marginal teeth of telson usually fused. Genus: *Lysiosquilla* Dana, 1852.....6

Median dorsal surface of telson with raised median projection, lobed or spined posteriorly; movable submedian marginal teeth of telson always present, remainder of teeth and denticles distinct, not fused. Genus: *Heterosquilla* Manning, 1963.....9

KEY TO INDO-WEST PACIFIC SPECIES OF *LYSIOSQUILLA*

6. (5) Rostral plate triangular, greatest width at base; median carina of plate flanked by longitudinal grooves; dactylus of claw with 8 teeth.....*L. sulcirostris* Kemp, 1913

Rostral plate cordiform, greatest width in advance of base; median carina of plate, when present, not flanked by longitudinal grooves; dactylus of claw with more than 8 teeth.....7

[5]

JOSEPH PAUL VARCHESE, K.G. M.Sc
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

7. (6) Antennal scale oval, less than twice as long as broad; anterior margin of antennal protopod lacking projection; ventral keel of eighth thoracic somite rounded.....*L. maculata* (Fabricius) 1793

Antennal scale slender, elongate, more than twice as long as broad; anterior margin of antennal protopod with projection; ventral keel of eighth thoracic somite acute, sharp, posteriorly.....8

8. (7) Rostral plate lacking median carina; ventral surface of uropodal protopod with slender spine at articulation of endopod.....*L. capensis* Hansen, 1895

Rostral plate with median carina; ventral surface of uropodal protopod lacking spine at articulation of endopod.....*L. tredecimdentata* Holthuis, 1941

KEY TO SPECIES OF *HETEROSQUILLA* KNOWN FROM THE INDIAN OCEAN

9. (5) Two intermediate marginal denticles present on telson.....*H. spinosa* (Wood-Mason) 1895

Four intermediate marginal denticles present on telson.....*H. insignis* (Kemp) 1911

10. (3) Dorsal surface of telson with fan-shaped series of 5 or more spines. Genus: *Acanthosquilla* Manning, 1963.....11

Dorsal surface of telson unarmed or with at most a single median projection.....15

KEY TO INDO-WEST PACIFIC SPECIES OF *ACANTHOSQUILLA*

11. (10) Telson with 4 pairs of fixed marginal teeth.....12
Telson with 2 pairs of fixed marginal teeth.....14

12. (11) Ventral margin of sixth abdominal somite with posterior spines.....*A. tigrina* (Nobili) 1903
Ventral margin of sixth abdominal somite unarmed.....13

13. (12) Rostral plate trispinous; dactylus of claw with 10-11 teeth; submedian denticles arranged in semicircle.....*A. vicina* (Notili) 1904
Rostral plate angled anterolaterally, with median spine; dactylus of claw with 7 teeth; submedian denticles in transverse row.....*A. humesi* Manning, 1968

14. (11) Lobes on outer margin of dactylus subequal; submedian denticles in transverse row; first and third intermediate denticles larger than second and fourth.....*A. acanthocarpus* (Miers) 1880

Distal lobe on outer margin of dactylus much larger than proximal; submedian denticles in oblique row; second and fourth intermediate denticles larger than first and third.....*A. multifasciata* (Wood-Mason) 1895.

[6]

JOSEPH PAUL VARCHESE, K.G. M.Sc
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

15. (10) Posterior margin of dorsal surface of telson produced into false eave overhanging true posterior armature.....16
Posterior margin of dorsal surface of telson with single median projection, not produced into false eave.....17
16. (15) Antennal protopod with papillae; 5 epipods present; spines on uropodal exopod not spatulate..... *Hadrosquilla* Manning, 1966
Antennal protopod without papillae; 4 epipods present; spines on uropodal exopod spatulate. Genus: *Nannosquilla* Manning, 1966.....
Nannosquilla hystericotelson (Barnard) 1958
17. (15) Mandibular palp present; telson with 1 pair of fixed marginal teeth.....*Coronis* Desmarest, 1823
Mandibular palp absent; telson with more than 1 pair of fixed marginal teeth.....18
18. (17) Telson with 4 pairs of fixed marginal teeth; inferodistal angle of ischium of raptorial claw unarmed.....*Platysquilla* Manning, 1967
Telson with 2 pairs of fixed marginal teeth; inferodistal angle of ischium of claw with strong spine. Genus: *Austrosquilla* Manning, 1966.....
Austrosquilla osculans (Hale) 1924
19. (2) All marginal teeth of telson with movable apices. Family: *Bathysquillidae* Manning, 1967. Genus: *Bathysquilla* Manning, 1963.....
Bathysquilla crassispinosa (Fukuda) 1910
At most, submedian marginal teeth with movable apices.....20
20. (19) More than 4 intermediate denticles present on telson. Family: *Squillidae* Latreille, 1803.....21
No more than 2 intermediate denticles present on telson. Family: *Gonodactylidae* Giesbrecht, 1910.....83
21. (20) Propodus of raptorial claw with erect spines; posterolateral margin of carapace with deep excavation. Genus: *Harpiosquilla* Holthuis, 1964.....22
Propodus of claw pectinate, without erect spines; posterolateral margins of carapace entire.....52

KEY TO SPECIES OF *HARPIOSQUILLA*

22. (21) Fifth thoracic somite with a lateral spine.....23
Fifth thoracic somite rounded laterally.....24
23. (22) Submedian carinae of fifth abdominal somite armed posteriorly: distal segment of uropodal exopod black with a white midrib.....
H. annandalei (Kemp) 1911
Submedian carinae of fifth abdominal somite unarmed; distal segment of uropodal exopod with inner half only dark, not black.....
H. raphidea (Fabricius) 1798

JOSEPH PAUL VARGHESE, K.G. M.Sc

XLII/2491, POWER HOUSE ROAD

ERNAKULAM DISTRICT

COCHIN-682 018, KERALA

[7]

24. (22) Carapace with median carina; first 5 abdominal somites with submedian carinae.....*H. harpax* (de Haan) 1844
Carapace lacking median carina; first 5 abdominal somites lacking submedian carinae.....*H. melanoura* Manning, 1968
25. (21) Lateral process of fifth thoracic somite with a single spine or lobe.....26
Lateral process of fifth thoracic somite bilobed.....57
26. (25) Submedian teeth of telson with movable apices.....27
Submedian teeth of telson with fixed apices.....48
27. (26) Antennular somite greatly elongated, rostral plate not extending to midlength; cornea subglobular. Genus: *Leptosquilla* Miers, 1880.....
Leptosquilla schmeltzii (A. Milne Edwards) 1873
Antennular somite not elongated, rostral plate extending beyond midlength; cornea flattened or bilobed.....28
28. (27) Ocular scales each produced into an erect spine; sub-Antarctic. Genus: *Pterygosquilla* Hilgendorf, 1890.....
Pterygosquilla armata (H. Milne-Edwards) 1837
Ocular scales rounded or subtruncate, never produced into erect spines; tropical or temperate.....29
29. (28) Eyes very small, stalk usually inflated, cornea rarely broader than stalk; ocular scales fused. Genus: *Clorida* Eydoux and Souleyet, 1842.....30
Eyes small or of moderate size, stalk not inflated, cornea always broader than stalk; ocular scales separate.....45

KEY TO SPECIES OF *CLORIDA*

30. (29) Mandibular palp absent.....31
Mandibular palp present.....35
31. (30) One rounded lobe present between spines of basal prolongation of uropod.....32
Two rounded lobes present between spines of basal prolongation of uropod.....34
32. (31) Cornea broader than stalk; rostral plate with median carina.....
Clorida incerta (Hansen) 1926
Cornea not as broad as stalk; rostral plate lacking median carina.....33
33. (32) Lateral margins of intermediate teeth of telson with prominent denticles; inner margin of basal prolongation of uropod with 3-4 spines.....
C. denticulata (Chhappgar and Sane) 1967

JOSEPH PAUL VARGHESE, K.G. M.Sc

XLII/2491, POWER HOUSE ROAD

ERNAKULAM DISTRICT

COCHIN-682 018, KERALA

[8]

- Lateral margins of intermediate teeth of telson not denticulate; inner margin of basal prolongation of uropod with 6-9 spines.....*C. granti* (Stephenson) 1953
34. (31) Sixth abdominal somite with supplementary spinules on posterior margin in addition to spines of dorsal carinae.....*C. mauiana* (Bigelow) 1931
- Sixth abdominal somite armed at most with spines of dorsal carinae.....*C. fallax* (Bouvier) 1914
35. (30) First 5 abdominal somites lacking submedian carinae.....36
- Submedian carinae present on one or more of the first 5 abdominal somites41
36. (35) Carapace lacking anterolateral spines.....*C. rotundicauda* (Miers) 1880
- Carapace with anterolateral spines.....37
37. (36) Postanal carina absent.....38
- Postanal carina present.....39
38. (37) Marginal carinae of abdomen unarmed.....*C. choprai* (Tweedie) 1935
- Marginal carinae of at least second through fifth abdominal somites with posterior spine.....*C. depressa* (Miers) 1880
39. (37) Cornea broader than stalk.....*C. miersi* Manning, 1968
- Cornea not as broad as stalk.....40
40. (39) Width of cornea about one-third eye length; lateral margin of carapace, posterior to anterolateral spine, straight or convex; rostral plate longer than broad.....*C. microphthalma* (H. Milne-Edwards) 1837
- Width of cornea about one-half eye length; lateral margin of carapace, posterior to anterolateral spine, concave; rostral plate broader than long.....*C. chlorida* (Brooks) 1886
41. (35) No submedian carinae on first through third abdominal somites.....42
- All 6 abdominal somites with submedian carinae.....43
42. (41) Fifth and sixth abdominal somites with submedian carinae.....*C. merguensis* (Tiwari and Biswas) 1952
- Fourth, fifth and sixth abdominal somites with submedian carinae.....*C. verrucosa* (Hansen) 1926
43. (41) Lateral processes of sixth and seventh thoracic somites with posterolateral spine.....*C. bombayensis* (Chhappagar and Sane) 1967

[9]

JOSEPH PAUL VARCHESE, K.G. M.Sc
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

Lateral processes of sixth and seventh thoracic somites unarmed.....44

44. (43) Ventral surface of telson smooth on either side of postanal carina.....*C. latreillei* Eydoux and Souleyet, 1842
- Ventral surface of telson tuberculate and carinate on either side of postanal carina.....*C. decorata* Wood-Mason, 1875
45. (29) Telson lacking prelateral lobes; first to fifth abdominal somites without submedian carinae.....*Meiosquilla* Manning, 1968
- Prelateral lobes of telson usually present; if absent, submedian carinae present on first 5 abdominal somites. Genus: *Anchisquilla* Manning, 1968.....46

KEY TO SPECIES OF *ANCHISQUILLA* KNOWN FROM THE INDIAN OCEAN

46. (45) No longitudinal carinae on either side of median crest of telson other than the thickenings of the marginal teeth.....*Anchisquilla mcneilli* (Stephenson) 1953
- Numerous sharp longitudinal carinae on either side of median crest of telson.....47
47. (46) Anterolateral angles of carapace rounded.....*A. miles* (Hess) 1865
- Anterolateral angles of carapace spinous.....*A. fasciata* (de Haan) 1844
48. (26) No more than 3 epipods present. Genus: *Cloridopsis* Manning, 1968.....49
- Four or five epipods present.....52

KEY TO SPECIES OF *CLORIDOPSIS* KNOWN FROM THE INDIAN OCEAN

49. (48) Mandibular palp present.....50
- Mandibular palp absent.....51
50. (49) Raptorial claw with six teeth.....*C. bengalensis* (Tiwari and Biswas) 1951
- Raptorial claw with five teeth.....*C. terrareginensis* (Stephenson) 1953
51. (49) Lateral process of fifth thoracic somite with a large black dorsal spot.....*C. scorpio* (Latreille) 1825
- Lateral process of fifth thoracic somite without a black dorsal spot.....*C. innoculata* (Kemp) 1913
52. (48) Carapace with full complement of carinae; inner margin of basal prolongation of uropod usually serrate, if spined, telson with dorsal tubercles.....*Squilla* Fabricius, 1787
- Carapace usually with reduced complement of carinae; inner margin of basal prolongation of uropod with spines; telson without dorsal tubercles. Genus: *Squilloides* Manning, 1968.....53

JOSEPH PAUL VARCHESE, K.G. M.Sc
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

[10]

KEY TO SPECIES OF *SQUILLOIDES*

53. (52) Telson with long intermediate marginal teeth.....54
 Telson with intermediate marginal teeth of normal length.....55
54. (55) Median and lateral carinae sharp and distinct in anterior half of carapace; lateral process of fifth thoracic somite directed straightly outwards.....*Squilloides leptosquilla* (Brooks) 1886
 Median and lateral carinae entirely absent from anterior half of carapace; lateral process of fifth thoracic somite trending obliquely forwards.....*S. tenuispinis* (Wood-Mason) 1891
55. (53) Submedian carinae present on all abdominal somites.....*S. gilesi* (Kemp) 1911
 Submedian carinae absent from at least first three abdominal somites.....56
56. (55) The rostrum is about one and a half times as long as broad; on the carapace fine intermediate carinae are found on either side of the gastric groove.....*S. lata* (Brooks) 1886
 The rostrum is little broader than long; intermediate carinae on carapace absent.....*S. minor* (Jurich) 1904
57. (25) Lateral processes of sixth and seventh thoracic somites not bilobed. Genus: *Alima* Leach, 1817.....58
 Lateral processes of sixth and seventh thoracic somites bilobed.....61

KEY TO SPECIES OF *ALIMA* KNOWN FROM THE INDIAN OCEAN

58. (57) First five abdominal somites with more than eight longitudinal carinae.....*Alimas upplex* (Wood-Mason) 1875
 First five abdominal somites each with eight longitudinal carinae.....59
59. (58) Anterior bifurcation of median carina of carapace sharp and distinct.....*A. laevis* (Hess) 1685
 Anterior bifurcation of median carina of carapace absent.....60
60. (59) Raptorial dactylus with five teeth.....*A. hieroglyphica* (Kemp) 1911
 Raptorial dactylus with six teeth.....*A. hyalina* Leach, 1817
61. (57) Eye small, stalk inflated, much broader than cornea; body covered with raised carinae forming mesh-like reticulations. Genus: *Dictyosquilla* Manning, 1968.....*Dictyosquilla foveolata* (Wood-Mason) 1895
 Eye large, stalk not inflated, cornea broader than stalk; body not covered with carinae forming mesh-like reticulations.....62

[11]

JOSEPH PAUL VARCHESE, K.G. M.Sc
 XLII/2491, POWER HOUSE ROAD
 ERNAKULAM DISTRICT
 COCHIN-682 018, KERALA

62. (61) Abdomen with no more than 8 longitudinal carinae. Genus: *Oratosquilla* Manning, 1968.....63
 Abdomen with numerous longitudinal carinae, more than eight.....80

KEY TO SPECIES OF *ORATOSQUILLA* KNOWN FROM THE INDIAN OCEAN

63. (62) Raptorial dactylus with five teeth.....64
 Raptorial dactylus with six teeth.....66
 Raptorial dactylus with 7 or more teeth.....79
64. (63) Rostrum with median carina; breadth of cornea more than 1/3 median length of carapace; lateral margin of seventh thoracic somite not bilobed.....*Oratosquilla quadrata* (Fukuda) 1910
 Rostrum without median carina; breadth of cornea much less than 1/3 of median length of carapace, lateral margin of seventh thoracic somite distinctly bilobed.....65
65. (64) Cornea set almost at right angles to eyestalk; outer inferior margin of raptorial merus terminating in a sharp tooth; anterior lobe of seventh thoracic somite short.....*O. quinquedentata* (Brooks) 1886
 Cornea set obliquely on eyestalk; outer inferior margin of raptorial merus not terminating in a tooth; anterior lobe of 7th thoracic somite well developed and more than half as long as posterior lobe.....*O. gonypetes* (Kemp) 1911
66. (63) Cornea set almost at right angles to eyestalk.....67
 Cornea set obliquely on eyestalk.....68
67. (66) Posterior half of median carina of carapace anterior to cervical groove, simple; submedian carinae of fourth abdominal somite ending in spines.....*O. nepa* (Latreille) 1825
 Posterior half of median carina of carapace anterior to cervical groove, finely bicarinate throughout its entire length; submedian carinae of fourth abdominal somite not ending in spines.....*O. holoschista* (Wood-Mason) 1895
68. (66) Lateral carinae of first 5 abdominal somites bicarinate.....69
 Lateral carinae of first 5 abdominal somites simple, not bicarinate.....70
69. (68) Rostrum with an obscure mid-dorsal tubercle. Undivided portion of mid-dorsal carina of carapace, anterior to dorsal pit, less than 1/3 as long as bifurcated portion.....*O. stridulans* (Wood-Mason) 1894
 Rostrum with a well defined median carina. Undivided portion of mid-dorsal carina of carapace, anterior to dorsal pit about half as long as bifurcated portion.....*O. mikado* (Kemp & Chopra) 1921

JOSEPH PAUL VARCHESE, K.G. M.Sc
 XLII/2491, POWER HOUSE ROAD
 ERNAKULAM DISTRICT
 COCHIN-682 018, KERALA

[12]

70. (68) Tubercles on either side of median crest of telson present.....71
 Tubercles on either side of median crest of telson absent.....72
71. (70) Submedian carinae of abdomen divergent on each somite and very few tubercles on the dorsal surface of telson.....*O. hesperia* (Manning) 1968
 Submedian carinae of abdomen subparallel on each somite and many tubercles in rows on the dorsal surface of telson.....*O. massavensis* (Kossmann) 1880
72. (70) Carapace broad with its breadth behind the anterolateral angles more than half its median length, including the rostrum; anterior margin of ophthalmic somite with a minute median point.....*O. woodmasoni* (Kemp) 1911
 Carapace narrow, with its breadth behind the anterolateral angles less than half its median length, including the rostrum; anterior margin of ophthalmic somite various, but never with a median point.....73
73. (72) Median carina of carapace sharp and distinct throughout its course; dorsal carina of raptorial carpus with 3-5 tubercles.....74
 Median carina of carapace interrupted at base of anterior bifurcation (rarely, the anterior bifurcation is obsolete); dorsal carina of raptorial carpus with less than three tubercles.....75
74. (73) Submedian carinae of the fourth and the lateral carinae of the first and second abdominal somites not spined posteriorly.....*O. oratoria* (de Haan) 1844
 Submedian carinae of the fourth and the lateral carinae of the first and second abdominal somites spined posteriorly.....*O. mauritiana* (Kemp) 1913
75. (73) Margin of longer spine of bifurcate process of uropods, in front of external lobe, convex.....*O. interrupta* (Kemp) 1911
 Margin of longer spine of bifurcate process of uropods, in front of external lobe, concave.....76
76. (75) Dorsal margin of raptorial carpus with two tubercles.....*O. fabricii* (Holthuis) 1941
 Dorsal margin of raptorial carpus with an entire carina.....77
77. (76) Merus of raptorial claw with the distoventral angle rounded.....*O. simulans* (Holthuis) 1967
 Merus of raptorial claw with the distoventral angle sharply pointed.....78

78. (77) Rostral plate slender, longer than broad; the anterior lobe of the lateral process of the sixth thoracic somite is more truncate; the distal segment of the outer branch of the uropod is divided into a clear outer half and a dark inner half.....*O. inornata* (Tate) 1883
 Rostral plate is short, blunt, broader than long; the anterior lobe of the lateral process of the sixth thoracic somite is less truncate; the distal segment of the outer branch of the uropod has the inner half suffused with dark pigment but there is no sharp line dividing inner and outer halves.....*O. perpensa* (Kemp) 1911
79. (63) Raptorial dactylus with 7 or 8 teeth.....*O. indica* (Hansen) 1926
 Raptorial dactylus with 10 to 18 teeth.....*O. investigatoris* (Lloyd) 1807
80. (62) Carapace with more than 7 longitudinal carinae. Genus: *Carinosquilla* Manning, 1968.....81
 Carapace with no more than 7 longitudinal carinae. Genus: *Lophosquilla* Manning, 1968.....*Lophosquilla costata* (de Haan) 1844

KEY TO SPECIES OF *CARINOSQUILLA*

81. (80) Mandibular palp is absent.....*Carinosquilla lirata* (Kemp and Chopra) 1921
 Mandibular palp is present.....82
82. (81) Ocular peduncles irregularly and strongly carinate; ophthalmic process usually bifurcated at extremities.....*C. carinata* (Serène) 1950
 Ocular peduncles smooth, without carinae; ophthalmic processes not bifurcated at extremities.....*C. multicarinata* (White) 1847

FAMILY : *GONODACTYLIDAE*

83. (20) Ischiomerale articulation terminal; merus grooved inferiorly throughout its length.....84
 Ischiomerale articulation subterminal, merus projecting posteriorly beyond articulation; inferior groove on merus incomplete.....95
84. (83) Dactylus unarmed; sixth abdominal somite unarmed posteriorly.....*Hemisquilla* Hansen, 1895
 Dactylus with teeth; sixth abdominal somite with armed carinae or with posterior spines.....85
85. (84) Outer spine of basal prolongation of uropod longer than or subequal to inner.....86
 Inner spine of basal prolongation of uropod longer than outer.....91

86. (85) Basal prolongation of uropod with 2 spines, inner margin unarmed; carapace without carinae. Genus : *Pseudosquilla* Dana, 1852.....87
- Basal prolongation of uropod with 3 spines, proximal smallest, with or without additional spinules on inner margin; carapace with marginal carina present on posterior portion of each lateral plate.....90

KEY TO SPECIES OF *PSEUDOSQUILLA* KNOWN FROM THE INDIAN OCEAN

87. (86) Telson with only three carinae on either side of median crest, the intermediate being absent.....88
- Telson with four carinae on either side of median crest, the intermediate present.....89
88. (87) Eyes long and cylindrical; cornea set very obliquely on stalk.....*Pseudosquilla ciliata* (Fabricius) 1787
- Eyes shot and flattened; cornea set transversely on stalk.....*P. ornata* Miers, 1880
89. (87) Breadth of cornea scarcely equal to whole length of eye; six posterior spines on last abdominal somite; intermediate carinae of telson parallel, terminating behind base of intermediate marginal teeth.....*P. oculata* (Brullé) 1836-44
- Breadth of cornea greater than whole length of eye; eight posterior spines on last abdominal somite; intermediate carinae of telson posteriorly divergent, coterminous with lateral marginal teeth.....*P. megalophthalma* Bigelow, 1894
90. (86) First 5 abdominal somites with prominent carinae; telson with submedian denticles.....*Parasquilla* Manning, 1961
- First 5 abdominal somites not carinate; telson lacking submedian denticles.....*Pseudosquillopsis* Serène, 1962
91. (85) Rostral plate with 2 apical spines.....*Coronidopsis* Hansen, 1926
- Rostral plate with or without 1 apical spine.....92
92. (91) Dactylus of claw with 4 teeth; rostral plate pentagonal. Genus : *Manningia* Serène, 1962.....93
- Dactylus of claw with more than 4 teeth; rostral plate variable in shape but not pentagonal.....94

KEY TO SPECIES OF *MANNINGIA* KNOWN FROM THE INDIAN OCEAN

93. (92) Rostrum anteriorly produced in a long and slender tooth which reaches beyond eyes.....*Manningia pilaensis* (de Man) 1888
- Rostrum anteriorly not produced in a long and slender tooth.....*M. amabilis* Holthuis, 1967

[15]

JOSEPH PAUL VARCHESE, K.G. M.Sc
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

94. (92) Antennular somite greatly elongated; telson with submedian denticles.....*Eurysquilloides* Manning, 1963
- Antennular somite not elongate; telson without submedian denticles. Genus : *Eurysquilla* Manning, 1963.....*Eurysquilla sewelli* (Chopra) 1939
95. (83) Dactylus of claw with teeth; rostral plate without slender median spine. Genus : *Odontodactylus* Bigelow, 1893.....96
- Dactylus of claw unarmed; rostral plate with slender median spine.....100

KEY TO SPECIES OF *ODONTODACTYLUS*

95. (95) Ocular scales appressed along median line; telson with two pairs of accessory median carinae.....97
- Ocular scales separate; telson with one pair of accessory median carinae.....99
97. (96) Fifth abdominal somite unarmed posterolaterally; telson with longitudinal carina extending anteriorly from inner intermediate denticle.....*Odontodactylus japonicus* (de Haan) 1844
- Fifth abdominal somite with posterolateral spines; telson lacking longitudinal carina extending anteriorly from inner intermediate denticle.....98
98. (97) Dactylus of claw with less than five teeth; movable spines of uropodal exopod broad, inflated distally.....*O. scyllarus* (Linnaeus) 1758
- Dactylus of claw with more than five teeth; movable spines of uropodal exopod tapering distally.....*O. hawaiiensis* Manning, 1967
99. (96) Median carina of telson thin, high; dactylus of claw with less than 5 teeth; posteriorly recurved portion of submedian carinae of fifth abdominal somite absent.....*O. cultrifer* (White) 1850
- Median carina of telson not noticeably thin or high; dactylus of claw with more than 5 teeth; submedian carinae of fifth abdominal somite recurved posteriorly.....*O. brevirostris* (Miers) 1884
100. (95) Anterolateral angles of carapace anterior to base of rostral plate.....101
- Anterolateral angles of carapace not anterior to base of rostral plate.....119
101. (100) Rostral plate with anterolateral angles rounded or acute; distal spines on uropodal exopod not strongly recurved. Genus : *Gonodactylus* Berthold, 1827.....102
- Rostral plate sharply trispinous; distal spines of uropodal exopod strongly recurved. Genus : *Mesacturus* Miers, 1880.....115

JOSEPH PAUL VARCHESE, K.G. M.Sc [16]
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

KEY TO SPECIES OF *GONODACTYLUS* KNOWN FROM THE INDIAN OCEAN

102. (101) Central area of telson with 5 longitudinal carinae.....103
 Central area of telson with 3 longitudinal carinae.....104
103. (102) First 5 abdominal somites each with a fine transverse groove.....
Gonodactylus graphurus Miers, 1875
 Abdominal somites not grooved.....*G. falcatus* (Forsskal) 1775
104. (103) Dorsal process of ophthalmic somite large and subtriangular; median keel of telson not very strongly arched in lateral view, its depth less than half its greatest breadth, no spinules on dorsal surface of telson.....105
 Dorsal process of ophthalmic somite consisting of a pair of small and inconspicuous transverse plates; median keel of telson very strongly arched in lateral view, its depth fully half its greatest breadth; dorsal surface of telson usually beset with spinules.....107
105. (104) Eye-scales, broad, extending laterally to anterolateral angles of rostral plate; lateral teeth of telson suppressed.....
G. platysoma Wood-Mason, 1895
 Eye-scales narrow; lateral teeth of telson distinct.....106
106. (105) Anterolateral angles of rostral plate sharp; uropodal inner branch convex on inner margin.....*G. smithii* Pocock, 1893
 Anterolateral angles of rostral plate rounded; uropodal inner branch sinuous on inner margin.....*G. chiragra* (Fabricius) 1781
107. (104) Inner margin of uropodal endopod largely or completely devoid of setae, margin smooth.....108
 Inner margin of uropodal endopod completely fringed with setae, margin serrate at insertion of setae111
108. (107) Lateral teeth on telson obscure and uropodal endopod broad which is half or more than half as broad as the telson.....
G. crosnieri Manning, 1968
 Lateral teeth on telson prominent and uropodal endopod narrow which is less than half as broad as the telson.....109
109. (108) Two ventral carinae on each submedian tooth and a short median postanal keel present.....*G. bicarinatus* Manning, 1968
 No ventral carinae on submedian tooth and postanal keel absent110
110. (109) Rostral plate with sharp anterolateral angles; submedian teeth of telson with well-marked ventral carinae; inner margin of uropodal endopod completely devoid of setae..... *G. hendersoni* Manning, 1967

[17]

JOSEPH PAUL VARCHESE, K.G. M.Sc

XLII/2491, POWER HOUSE ROAD

ERNAKULAM DISTRICT

COCHIN-682 018, KERALA

- Rostral plate with rounded anterolateral angles; submedian teeth of telson poorly or not carinate; inner margin of uropodal endopod with 1-10 proximal setae.....*G. demanii* Henderson, 1893
111. (107) Telson with dorsol spinules or spines.....112
 Telson smooth dorsally.....113
112. (111) Telson broader than long, dorsal spinules large, lateral marginal teeth prominent.....*G. lanchesteri* Manning, 1967
 Telson as long as broad, dorsal spinules small; lateral marginal teeth obscure.....*G. spinosus* Bigelow, 1893
113. (111) Proximal segment of uropodal exopod lacking fixed distal spines ventrally; lateral process of sixth and seventh thoracic somites subequal.....*C. choprai* Manning, 1967
 Proximal segment of uropodal exopod with fixed distal spine ventrally; lateral process of sixth thoracic somite noticeably larger than that of seventh somite.....114
114. (113) Rostral plate rounded anterolaterally; endopod of uropod short, broad not much tapering.....*G. incipiens* Lanchester, 1903
 Rostral plate acute anterolaterally; endopod slender and distally tapering.....*G. segregatus* Lanchester, 1903

KEY TO SPECIES OF *MESACTURUS* KNOWN FROM THE INDIAN OCEAN

115. (101) Spines on external edge of basal segment of outer uropod forming an even series throughout its length, outermost slightly recurved; inner uropod more or less crescentic in shape, apex curved inwards.....116
 On external edge of basal segment of outer uropod two or three spines at distal end form large hooks, proximal part bare or with few small straight spines; apex of inner uropod more or less curved outwards.....117
116. (115) Submedian teeth on telson without spinules on inner margins; lateral teeth represented by blunt rounded lobes; dorsal surface with three keels and a few rounded tubercles.....
Mesacturus herdmanni Tattersall, 1906
 Submedian teeth of telson with spinules on inner margins; lateral teeth sharp and well-formed; dorsal surface with three keels and large sharp spinules.....*M. drepanophorus* (de Man) 1902
117. (115) Telson with 11 dorsal carinae; the dorsal surface of the proximal segment of exopod of uropod without a patch of setae; the endopods without setae on the ventral surface.....*M. crinitus*, (Manning) 1962

[18]

JOSEPH PAUL VARCHESE, K.G. M.Sc

XLII/2491, POWER HOUSE ROAD

ERNAKULAM DISTRICT

COCHIN-682 018, KERALA

Telson with 9 dorsal carinae; the dorsal surface of the proximal segment of uropod with a patch of setae; the endopod with setae on the ventral surface.....118

118. (117) No spinules on inner edges to submedian marginal teeth of telson; intermediate ridges of last abdominal somite much narrower than sub-medians; mid-dorsal portion of telson occupied by three large ridges (not reckoning the ridge that runs to the apex of the intermediate marginal teeth.....*M. brevisquamatus* (Paulson) 1875

Spinules present on both edges of submedian marginal teeth of telson; intermediate and submedian ridges of last abdominal somite of equal breadth; mid-dorsal portion of telson with 3 keels closely packed together in middle with two fainter keels on either side (not reckoning the ridge that runs to the apex of the intermediate marginal teeth.....*M. fimbriatus* (Lenz) 1905

119. (100) Mandibular palp present; posterior margin of sixth abdominal somite convex in dorsal view; sixth abdominal somite usually fused with telson. Genus: *Protosquilla* Brooks, 1886.....120

Mandibular palp absent; posterior margin of sixth abdominal somite straight (transverse) in dorsal view; sixth abdominal somite not fused with telson. Genus: *Hoplosquilla* Holthuis, 1964.....*Hoplosquilla acanthurus* (Tattersall) 1906

KEY TO SPECIES OF *PROTOSQUILLA* KNOWN FROM THE INDIAN OCEAN

120. (119) Large spines on last abdominal somite and telson with a soft fleshy process protruding from apex.....*Protosquilla guerini* (White) 1861
- Large spines on last abdominal somite and telson, if present, without fleshy process at apex.....121
121. (120) Distal margin of telson divided into right and left halves by a long and very narrow median fissure with its edges partly in contact with one another.....122
- Distal margin of telson divided into right and left halves by a large wide and deep excavation128
122. (121) Three bosses in centre of telson, external boss on each side terminating in a point on distal margin.....123
- Three round or oval bosses in centre of telson, external boss on each side not reaching distal margin.....124
123. (122) Fifth abdominal somite smooth mid-dorsally; sixth with six rounded bosses; bosses of telson smooth and entire.....*P. ectypa* Müller, 1886
- Fifth and sixth abdominal somites finely grooved; dorsal bosses of telson incised at margins by fine grooves running towards summit of each boss.....*P. glyptocerca* (Wood-Mason) 1875

[19]

JOSEPH PAUL VARCHESE, K.G. M.Sc

XLII/2491, POWER HOUSE ROAD

ERNAKULAM DISTRICT

COCHIN-682 018, KERALA

124. (122) External boss on each side reaching only to middle of telson.....125
- External boss on each side reaching well beyond middle of telson, but not extending to distal margin127
125. (124) Median portion of fifth abdominal somite longitudinally wrinkled.....*P. trispinosa* (Dana) 1852
- Median portion of fifth abdominal somite entirely smooth.....126
126. (125) Rostrum sharply trispinous; dorsal process of ophthalmic somite produced, with acute anterolateral corners.....*P. pulchella* (Miers) 1880
- Anterolateral angles of rostrum acute but not spinous; dorsal processes of ophthalmic somite not produced anterolaterally*P. nefanda* (Kemp) 1911
127. (124) Median portion of fifth abdominal somite smooth; distal margin of telson with three large teeth on either side of median fissure.....*P. lenzi* (Holthuis) 1941
- Median portion of fifth abdominal somite furrowed; distal margin of telson with four large teeth on either side of median fissure.....*P. stoliura* Müller 1886
128. (121) No spines or spinules on dorsal surface of telson.....129
- Dorsal surface of telson beset with spines or spinules.....130
129. (128) Telson with three distinct mid-dorsal bosses.....*P. excavata* (Miers) 1880
- Telson with many longitudinal ridges and grooves.....*P. gyrosa* (Odhner) 1923
130. (128) Telson with long dorsal spines.....*P. spinosissima* (Pfeffer) 1888
- Telson with short dorsal spinules131
131. (130) Distal part of telson with one wide and deep triangular excavation.....*P. brooksii* de Man, 1887
- Distal part of telson with three wide and deep triangular excavations.....*P. tuberculata* Borradaile, 1907

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JOSEPH PAUL VARCHESE, K.G. M.Sc

XLII/2491, POWER HOUSE ROAD

ERNAKULAM DISTRICT

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[20]

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[21]

JOSEPH PAUL VARCHESSE, K.G. M.Sc.
XLII/2491, POWER HOUSE ROAD
ERNAKULAM DISTRICT
COCHIN-682 018, KERALA

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[22]

JOSEPH PAUL VARCHESSE, K.G. M.Sc.
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DISTRIBUTION OF COPPER IN THE AQUATIC ENVIRONMENT OF THE BOMBAY HARBOUR BAY*

S. GANAPATHY AND K. C. PILLAI

Health Physics Division, Bhabha Atomic Research Centre, Bombay, India

ABSTRACT

Copper is an essential constituent of living matter. Because of its biological significance it is necessary to obtain information on the distribution of copper in the aquatic environment. Even though estimation of copper in the off-shore waters in the Arabian Sea have been reported, no detailed studies on the copper content in the different matrices of an estuarine environment have been made.

The paper reports concentration of copper obtained in sea water, marine organisms and sediments collected from different locations in Bombay Harbour Bay. The estimation of copper was carried out using sodium diethyl dithiocarbamate as a complexing agent. Contamination arising from reagent chemicals used were also investigated.

It was observed that copper concentration in sea water in the bay varies from 2.6-7.34 $\mu\text{g/l}$. Of the organisms studied barnacles and crab showed high concentration factors for copper. Bottom sediments in the bay had copper concentrations ranging from 162-276 $\mu\text{g/g}$. There was no correlation between organic matter and copper content in the sediment. Other parameters which influence the distribution of copper in sediments like particle size distribution are being investigated.

SEA WATER is known to contain many elements most of which are present only in trace quantities. Though present in trace concentration in sea water, as a result of physico-chemical and biological interactions many of these trace elements get accumulated in organisms and sediments. Copper is one of the essential trace elements for the growth and normal development of micro organisms, plants and animals. Its biochemical role as an enzyme activator and as a constituent of respiratory pigment of many marine invertebrates are well known (Brooks and Rumsby, 1965). Copper compounds are used as fungicides and herbicides and they are potential sources of aquatic pollution. The study of distribution of copper in different matrices of the environment thus assumes significance.

Copper occurs in sea water principally in the ionic form and the concentration ranges between 1-20 $\mu\text{g/l}$ although considerable seasonal and geographical variations can occur (Riley and Skirrow, 1965). Copper values are reported to range from 2.7-16.8 $\mu\text{g/l}$ in the Arabian Sea coastal waters and 3.9-16.2 $\mu\text{g/l}$ in the open ocean (Sreekumaran *et al.*, 1966). The Tarapur coastal waters have copper values ranging from 13.35-45.12 $\mu\text{g/l}$ (Sarma *et al.*, 1967). No detailed studies on the distribution pattern of copper in the coastal waters, sediments and organisms have been made.

METHOD

The paper presents the results of a study conducted to obtain the distribution of copper in sea water, sediments and organisms of the Bombay Harbour Bay. Surface sea water samples were collected on polythene containers. The bottom

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