

**SYSTEMATIC ACCOUNT OF INDIAN MANTIS SHRIMPS  
COLLECTED DURING THE EXPEDITIONS OF  
FORV SAGAR SAMPADA**



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& N. SARAVANANE**



**CENTRE FOR MARINE LIVING RESOURCES & ECOLOGY  
MINISTRY OF EARTH SCIENCES, GOVERNMENT OF INDIA  
ATAL BHAVAN, PUTHUVYPE, KOCHI – 682508.**

**JULY 2021**

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सत्यमेव जयते

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## FOREWORD

As stated in the Convention on Biological Diversity document, at least 40 per cent of the world's economy and 80 per cent of the needs of the poor are derived from biological resources. The unprecedented loss of biodiversity from the World Oceans is the key concern the humanity is facing while dealing with the sustainability of the ocean services. I am pleased to note that the Centre for Marine Living Resources & Ecology (CMLRE), Kochi is taking up the imperative task of documenting the diversity of deep-sea living resources of Indian EEZ, which would eventually help to assess not only the status of living resources within the country but also remain as a source of information about the genetic resources with biotechnological potential.

The present book entitled "***Systematic account of Indian mantis shrimps collected during the expeditions of FORV Sagar Sampada***" is an excellent compilation of taxonomic keys of mantis shrimps found in Indian waters along with photographic illustrations and maps indicating sampling locations. The species included in this catalogue represent inhabitants of subtidal and deep-water mantis shrimps, and would also serve as a ready reckoner and field guide for the budding crustacean taxonomists and students in identifying the lesser-known deep-water forms. The Stomatopoda known as mantis shrimps is the special crustacean group in the morphological, systematical and ecological aspects and also important as the fisheries resources. I believe that this beautiful and well-documented book based on the detailed studies is appreciated by not only the carcinologists and ichthyologists but also all the fields of marine biologists.

I wish to congratulate CMLRE in their endeavours on biodiversity documentation from the vast seas of the Indian EEZ.

武田 正徳

Masatsune TAKEDA

Curator Emeritus

National Museum of Nature and Science, Tokyo

(ii)





## PREFACE

India is one of the most biodiverse nations on the planet with diverse marine ecosystems supporting an estimated 20,000 + animal species. The climate change coupled with human-induced disturbances through fishing, mining, tourism and pollution observed to impair their sustainability, in some cases lead to extinction. Although, several studies have been undertaken to document the biodiversity of the Indian waters (presently Indian Exclusive Economic Zone), they remained as patchy in terms of geographic coverage, thereby necessitating comprehensive surveys across the region for understanding discernible changes in biodiversity. In this regard, the “Resource Exploration and Inventorization System” sponsored by the Ministry of Earth Sciences, Government of India, and executed by the Centre for Marine Living Resources & Ecology, Kochi has been at the forefront of these efforts. Comprehensive surveys of the seas in the Indian EEZ by the CMLRE-owned *Fisheries Oceanographic Research Vessel (FORV) Sagar Sampada* have resulted in moderately large faunal collections that have been deposited in the Referral Centre of the CMLRE. The present work on the mantis shrimps is a part of a series of e-books on various groups of marine crustaceans collected on-board the *FORVSS*.



## ACKNOWLEDGEMENTS

The authors are grateful to the Director, CMLRE, Kochi, India for providing an opportunity and facilities to carry out taxonomic studies on marine crustaceans. The study has been a part of the “Resource Exploration and Inventorization System” Project funded by the Ministry of Earth Sciences, Government of India. The authors are also grateful to the scientific staff and crew members of the *FORV Sagar Sampada* for meticulously collecting the samples. A special thanks to Dr. Venkata Ramu Cherukuri, Project Scientist B, CMLRE for plotting the maps.



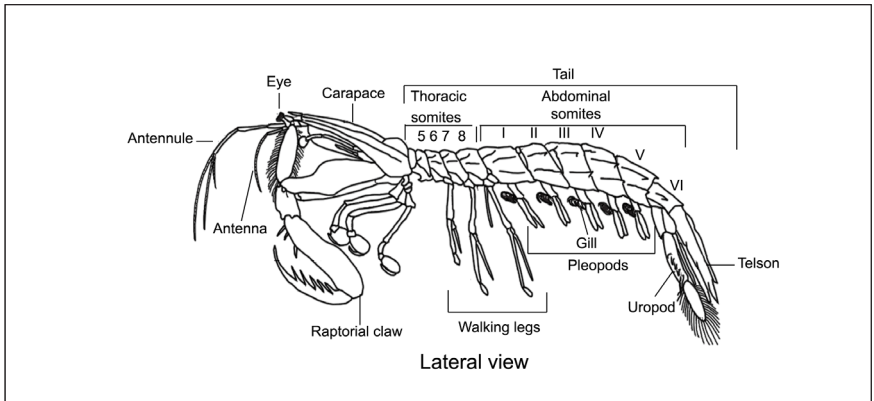


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# INTRODUCTION

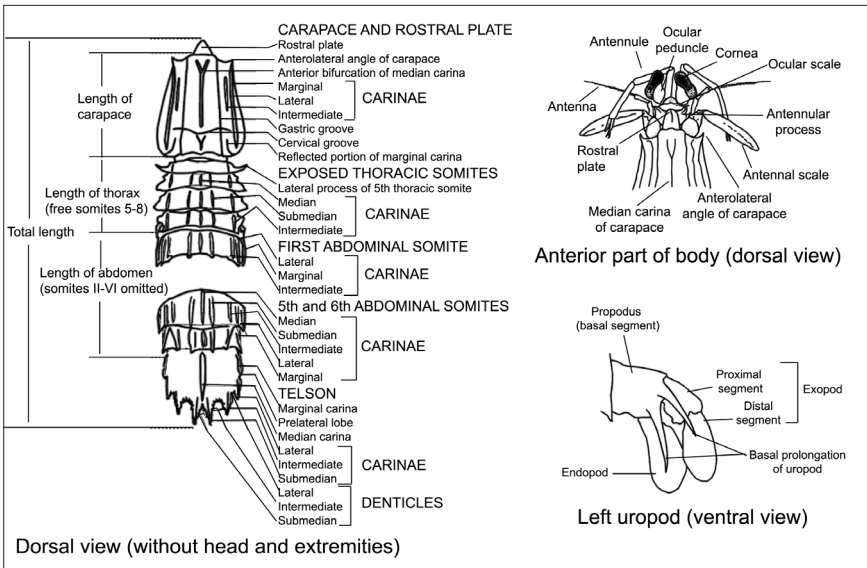


**Fig. 1.** Lateral view of a mantis shrimp (Order Stomatopoda) indicating body parts (modified from Manning, 1998).

Mantis shrimps are primitive burrowing predators (Schram, 1986) belonging to Subclass Hoplocarida Calman, 1904: Order Stomatopoda Latreille, 1817: Suborder Unipeltata Latreille, 1825. Their body is covered by chitinous exoskeleton and divided into head, thorax and abdomen. Each division contains definite number of segments such as 6 cephalic, 8 thoracic and 6 abdominal somites. The carapace covers all cephalic and first 4 thoracic somites, and bears 1 pair of compound eyes, biramous antennules and antennae, uniramous mandibular palp and maxillipeds (mouth parts). The second pair of maxillipeds is modified into hugeraptorialclawsfolded under the carapace. The last 4 thoracic sternites and all abdominal somites are covered by separate calcareous plates. The thoracic somites bear 3 pair of walking appendages called pereopods; abdominal somites bear 5 pairs of pleopods. The telson is expanded and bears appendages called uropods,

which consist of 1 basal protopod, and 1 pair of apical segments namely the inner endopod and outer exopod (Figs. 1–3; Manning, 1998). These organisms are classified into 7 superfamilies namely Bathysquilloidea Manning, 1967a; Erythrosquilloidea Manning & Bruce, 1984; Eurysquilloidea Manning, 1977a; Gonodactyloidea Giesbrecht, 1910; Lysiosquilloidea Giesbrecht, 1910; Parasquilloidea Manning, 1995; Squilloidea Latreille, 1802 based on the differences in shape of cornea, and maxilliped propodi, as well as external armature on carapace, raptorial claw, thoracic somites, abdomen, telson and uropods (Ahyong, 2001).

Mantis shrimps inhabit estuaries, coral reefs, subtidal sandflats, and waters beyond 200 m depth. They play an important ecological role in structuring marine benthic food webs (Antony *et al.*, 2010) as diet of crustaceans (Hamano & Matsuura, 1986), fishes (Navia *et al.*, 2011) and



**Fig. 2.** Morphological terminology of exoskeleton, head and tail of mantis shrimp (Order Stomatopoda) (modified from Manning, 1998).

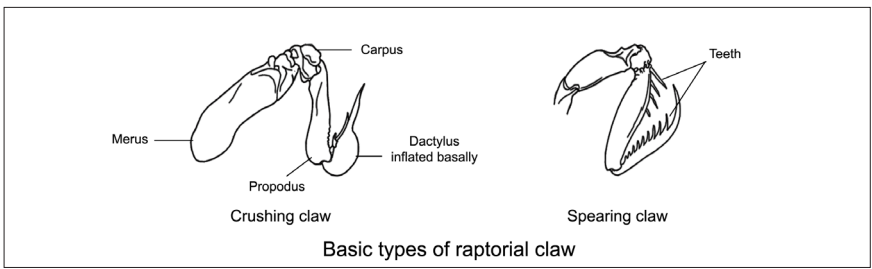
seabirds (Copello *et al.*, 2008). Their burrowing activities were found to bioturbate the sediments, thus affecting the energy flow and nutrient cycling (Laverock *et al.*, 2011). They are good ecological indicators of pollution stress in coral reef ecosystems (Erdmann & Caldwell, 1997), and also support economically important fishery resources worldwide (Lai & Leung, 2003). However, despite their economic and ecological importance, taxonomy of stomatopods is least studied among the Indian crustaceans. Most published literature dates back to the British colonial period, resulting in lacunae in information on the taxonomy, habitat and geographical distribution of these organisms, thereby necessitating detailed work on this aspect. This e-book provides brief illustrated taxonomic accounts of stomatopods

collected on-board *FORV Sagar Sampada* from several locations in the Indian EEZ.

**Historical background**

Studies on stomatopod taxonomy commenced with the following description of *Cancer mantis* Linnaeus, 1758 (= *Squilla mantis* (Linnaeus, 1758)) from the Mediterranean Sea: “*Thoracis testa membranacea. Pedes utrinque 3. Pollex serrato-dontatus, terminalis. Dactyli sub abdomine trium parium. Antennae trifidae: lamina ovata ad oculos.*” Subsequently, substantial volumes of literature have been published over the next 250 years.

Prof. James Wood-Mason (1875) initiated stomatopod taxonomy in India when he described *Haptosquilla glyptocercus* (Wood-Mason, 1875) from Nicobar Islands, *Clorida decorata* Wood-Mason, 1875 from Andamans,



**Fig. 3.** Types of raptorial claw of mantis shrimps (modified from Manning, 1998).

and *Alimopsis supplex* (Wood-Mason, 1875) from Mumbai. Wood-Mason & Alcock (1891) described *Squilloides tenuispinis* (Wood-Mason, 1891 (in Wood-Mason & Alcock, 1891) from Bay of Bengal. Alcock (1894) published a new species *Kempina stridulans* (Wood-Mason, 1894) posthumously described by Prof. Wood-Mason from Bay of Bengal. Wood-Mason (1895) compiled an illustrated monograph of 9 species deposited in the Indian Museum, Kolkata, including *Acanthosquilla multifasciata* (Wood-Mason, 1895), new to science. Alcock & Anderson (1899) reported *S. leptosquilla* from Andaman Sea. Lanchester (1903) reported 7 varieties of *Gonodactylus chiragra* (Fabricius, 1781) from Lakshadweep, out of which *Gonodactylellus incipiens* (Lanchester, 1903) was new to science.

Kemp (1911) described 12 new species out of which 9 namely *Heterosquilloides insignis* (Kemp, 1911), *Lenisquilla gilesi* (Kemp, 1911), *Alima hieroglyphica* (Kemp, 1911), *Quollastris gonypetes* (Kemp, 1911), *Miyakella holoschista* (Kemp, 1911), *Oratosquillina perpensa* (Kemp, 1911), *O. interrupta* (Kemp, 1911), *Erugosquilla woodmasoni* (Kemp, 1911), and *Harpiosquilla annandalei* (Kemp,

1911) are considered valid species. Kemp (1913) published the first comprehensive monograph of 97 Indo–West Pacific species deposited in the Indian Museum, out of which *Cloridopsis immaculata* (Kemp, 1913), and *Lysiosquilla sulcirostris* (Kemp, 1913) were new discoveries from the Indian waters. Kemp (1915a) reported *Cloridopsis scorpio* (Latreille, 1828), *C. immaculata*, *O. interrupta* from Chilka Lake along with larval stages of *C. immaculata*. Gravelly (1927) reported *Gonodactylaceus glabrous* (Brooks, 1886) and *Gonodactylellus demanii* (Henderson, 1893) from Gulf of Mannar. Chopra (1934) provided brief descriptions of 22 species from the mouth of River Hugli including 5 new records of *Areosquilla indica* (Hansen, 1926), *C. decorata*, *L. gilesi*, *Lysiosquillina maculata* Fabricius, 1793 and *Bigelowina phalangium* Fabricius, 1798. Alikunhi (1944, 1952, 1967) reported the late pelagic larval and post-larval stages of *Alima hieroglyphica* (Kemp, 1911).

Post-independence, Kurian (1947) reported *A. hieroglyphica* from Travancore coast. Tiwari & Biswas (1952) reported 13 species deposited in the Indian Museum, out of which *Cloridopsis bengalensis* (Ti-



wari & Biswas, 1952) was new to science. Balasubramanyan & Natarajan (1965) reported *Acanthosquilla tigrina* (Nobili, 1903) from Porto Novo coast. Rao *et al.* (1965) reported *S. leptosquilla* from deep-water surveys off Kerala coast. Chhapgar & Sane (1967) described 2 new species namely *Clorida bombayensis* (Chhapgar & Sane, 1967) and *C. denticauda* (Chhapgar & Sane, 1967) from Mumbai coast. Manning (1969a) described *H. indica* Manning, 1969a from the Gulf of Mannar in his revision of the genus *Harpiosquilla* Holthuis, 1964. Shanbhogue (1971a, 1971b) described *Heterosquilla jonesi* (= *Tetrasquilla mccullochae* (Schmitt, 1940) and reported new records of *Lysiosquilla tredecimdentata* Holthuis, 1941, *Alima neptuni* (Linnaeus, 1768) and *Carinosquilla lirata* (Kemp & Chopra, 1921) from Indian waters. Tiwari & Ghosh (1973) re-described *C. bengalensis* from India. Dutt & Ravindranath (1975) reported 6 species from Andhra Pradesh coast. Ghosh (1975) described *Manningia andamanensis* Ghosh, 1975 from North Andaman Island. Manning (1975) described *Chorisquilla andamanica* from Andaman Sea. Shanbhogue (1975) listed 115 species from the Indian Ocean region, along with identification keys to all the species. Manning (1978a) described *Oratosquillina pentadactyla* (Manning, 1978a) and *Q. subtilis* (Manning, 1978a) from Indian waters. Shanbhogue (1987) reported 30 species of stomatopods of the Indian region. In addition, the Zoological Survey of India has reported several stomatopod species

in its publications (Ghosh, 1976, 1984, 1987, 1990, 1995a, 1995b, 1999; Ghosh & Manning, 1988). Lyla *et al.* (1997) reported the stomatopod fauna of Parangipettai coast, Tamil Nadu. Dev Roy & Gokul (2012) published a checklist of 79 species known from Indian waters based on published literature. Ah Yong & Kumar (2018) reported 17 species, including 7 new records of *L. lisa* Ah Yong & Randall, 2001, *Odontodactylus cultrifer* (White, 1850), *O. japonicus* (De Haan, 1844), *Faughnia formosae* Manning & Chan, 1997, *Busquilla plantei* Manning, 1978b, *Carinosquilla spinosa* Ah Yong & Naiyanetr, 2002, and *Q. kapala* Ah Yong, 2001, from by-catch of trawlers operating off southern India. Niveditha *et al.* (2019) reported *Gonodactylus smithii* (Pocock, 1893) from the South Andaman Island. Trivedi *et al.* (2020) published a checklist of 72 species from the Indian waters, including the first record of *Erugosquilla hesperia* (Manning, 1968a).

## MATERIALS AND METHODS

The present study area extended from 6°–23°N latitudes, and from 68°–94°E longitudes at 53–514 metres depths. Samples were collected on-board the *FORV Sagar Sampada* during cruise numbers 292, 334 (leg I), 334 (leg II), 349 (leg II), 367 (leg II), 388 (Andaman waters), 372, 378 (Arabian Sea), 391 and 392 (Bay of Bengal).

Specimens were hand-picked from the catch, washed under running tap water to remove debris, photographed using an Olympus TG-5 field camera, and preserved in 10% formalin solution and/ or 70% ethanol. These specimens

were deposited as reference vouchers at the Referral Centre, Centre for Marine Living Resources & Ecology, Kochi. Taxonomic identification involved morphology, meristic counts, and morphological measurements following the identification keys provided by Ah Yong (2001). Terminology used in the taxonomic descriptions of stomatopods follows Ah Yong (2001).

Abbreviation used in the text is as follows: TL – Total length.

## SYSTEMATICS

***Gonodactylopsi drepanophorus* (de Man, 1902)**  
**(Sickle-tailed mantis shrimp)**



Fig. 4. *Gonodactylopsi drepanophorus* (de Man, 1902) (western Andaman Sea): Dorsal habitus (preserved colouration), 24.0 mm TL. Scale: 5 mm.

Superfamily Gonodactyloidea  
 Giesbrecht, 1910  
 Family Gonodactylidae Giesbrecht,  
 1910  
 Genus *Gonodactylopsi* Manning,  
 1969b  
*Gonodactylopsi drepanophorus* (de  
 Man, 1902)  
 (Figs. 4, 5A–D, 6A–D, 7)

### Synonymy

*Gonodactylus drepanophorus* De  
 Man, 1902: 914, pl. 27, fig. 68, 68a  
 (type locality: Ternate, Indonesia);  
 Kemp, 1913: 11 (list), 148 (key), 173;  
 Hansen, 1926: 30, pl. 2, fig. 1a.

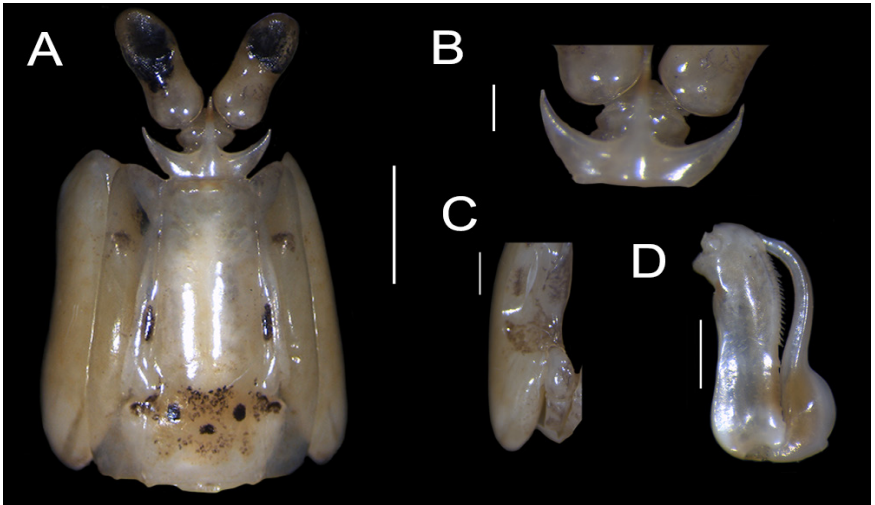
*Gonodactylopsi drepanophora*:  
 Manning, 1969b: 150 (key); Moosa,  
 1974: 73, figs. 1a–c; Manning, 1995:  
 20 (list); Erdmann & Manning, 1998:  
 621 (remarks).

*Mesacturus drepanophorus*: Man-  
 ning, 1967a: 2; Shanbhogue, 1975:  
 524 (list), 539 (key).

### Diagnosis (modified from De Man, 1902)

Body cylindrical, convex (Fig. 4).  
 Eye large, reaching beyond distal end  
 of second antennular segment (Fig.  
 5A). Cornea subglobular, as wide as  
 eyestalk. Ocular scales rounded, sep-  
 arate; anterior margin of ophthalmic  
 somite triangular, distal tip acuminate  
 (Fig. 5B). Antennule 3-segmented,  
 bearing well-developed flagellum;  
 dorsal process of first somite with jag-  
 ged margin. Antennal protopod with  
 articulated plate dorsally, distal spine  
 ventrally, peduncle 2-segmented, fla-  
 gellum well-developed, antennal scale  
 setose throughout, length 0.31 times  
 CL.

Rostral plate trispinous, median  
 spine slender, not reaching corneal  
 base, lateral spines broad triangu-  
 lar, directed anterolaterally (Fig. 5B).  
 Carapace anterolateral and postero-  
 lateral angles rounded; dorsal sur-



**Fig. 5.** *Gonodactylopsis drepanophorus* (de Man, 1902): A) Dorsal carapace, ocular and rostral plates; B) Ocular and rostral plates; C) Raptorial claw ischio-meral articulation lateral; D) Raptorial claw dactylus and propodus lateral. Scale: A, 2 mm; B, 500  $\mu$ m; C–D, 10 mm.

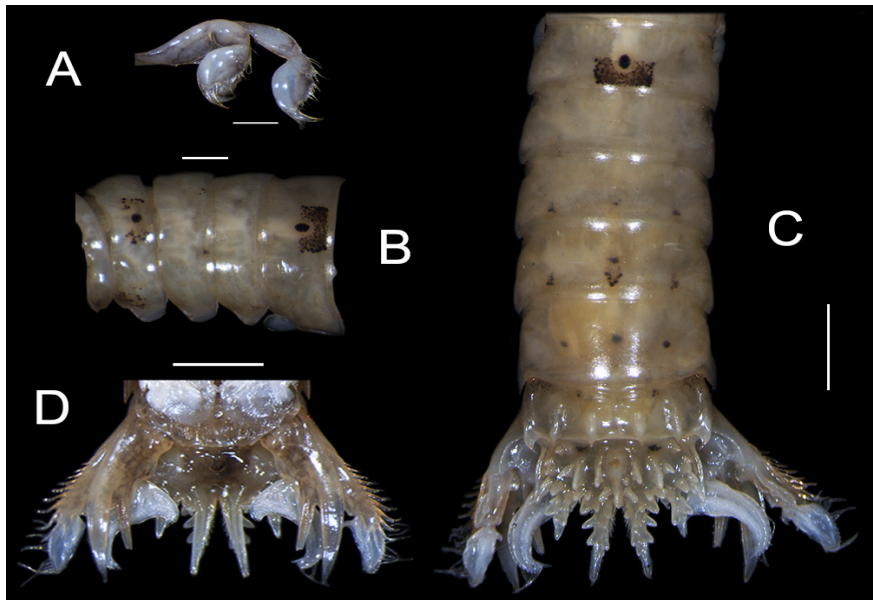
face smooth, carinae absent; gastric grooves present, cervical groove absent.

Mandibular palp present. Maxillipeds 1–5 with epipods, first epipod largest; maxillipeds 1, 3–5 with ischium elongate, merus moderately long, carpus short, propodus ovate, dactylus elongated, apposed to propodus (Fig. 6A). Maxilliped 5 merus and carpus expanded ventrally. Raptorial claw ischio-meral articulation subterminal (Fig. 5C); propodus opposable margin minutely serrated, bearing 1 movable spine proximally; dactylus inflated basally, inner margin finely serrated (Fig. 5D).

Thoracic sternites 5–8 smooth dorsally, lateral margins rounded (Fig. 6B). Abdominal somites 1–5 smooth dorsally, bearing marginal carinae, somite 6 articulating with telson, dorsal surface with submedian, intermediate and lateral ridges, each ridge termi-

nating in spine; somite 1 with pleural plate on anterolateral margin; somites 1–5 with laterally depressions (Fig. 6C).

Telson wider than long, dorsal surface with well-separated carinae. Median carina inflated, terminating posteriorly in blunt tooth, followed by blunt median spine; accessory median carinae with 2 pairs of posterior directed short spines; submedian carinae terminating posteriorly in blunt spine, followed by 5 blunt spines, of which anterior 4 spines arranged in two pairs, fifth spine located at base of submedian marginal tooth; short spine on inner side of base of submedian tooth; intermediate carina bearing 3 spines, posterior-most spine located at base of intermediate marginal tooth. Marginal teeth: sub-median teeth long, bearing 4–5 blunt spines dorsally, spinules on inner margin; intermediate teeth moderately long, bearing 1 pair of blunt



**Fig. 6.** *Gonodactylopsis drepanophorus* (de Man, 1902): A) propodi of maxillipeds 3–4; B) thoracic sternites 5–8; C) dorsal view of abdomen, telson and uropods; D) ventral view of telson and uropods. Scale: A–B, 1 mm; C–D, 2 mm.

spines dorsally; lateral teeth sharp. Uropodal protopod bearing 2 gently curved terminal spines, outer spine longer, overreaching posterior margin of exopod; slender spine anterior to the articulation of endopod, inner margin smooth; endopod shorter than exopod, crescent-shaped, distal tip curved inwards, margin setose; exopod segments articulating subterminally, proximal segment with 12 spines on outer margin, posterior 8 spines distinctly recurved, distal segment elongate (Fig. 6C–D).

### **Geographical distribution and habitat**

Indonesia: Ternate, Halmahera (De Man 1902), Timor (Hansen 1926), Ambon Bay, Maluku (Moosa, 1974); margins delimiting mud and coral, among

*Lithothamnium* (Hansen, 1926), also in mud and rubble, at a 34–80 m depth (Hansen, 1926; Moosa, 1974). The present specimen was collected from coral reef at 53 m depth (Fig. 7). The present observation is the first record from Indian waters.



**Fig. 7.** Geographical location of collection of *Gonodactylopsis drepanophorus* (de Man, 1902).



***Odontodactylus latirostris* Borradaile, 1907  
(Pink-eared mantis shrimp)**



**Fig. 8.** *Odontodactylus latirostris* Borradaile, 1907 (Andaman Sea): Dorsal habitus: A) 41.0 mm TL (live colouration); B) 25.5 mm TL (preserved colouration). Scale: 10 mm.

Superfamily Gonodactyloidea  
Giesbrecht, 1910

Family Odontodactylidae Manning,  
1980

Genus *Odontodactylus* Bigelow, 1893

*Odontodactylus latirostris* Borradaile,  
1907

(Figs. 8A–B, 9A–E, 10A–C, 11)

**Synonymy**

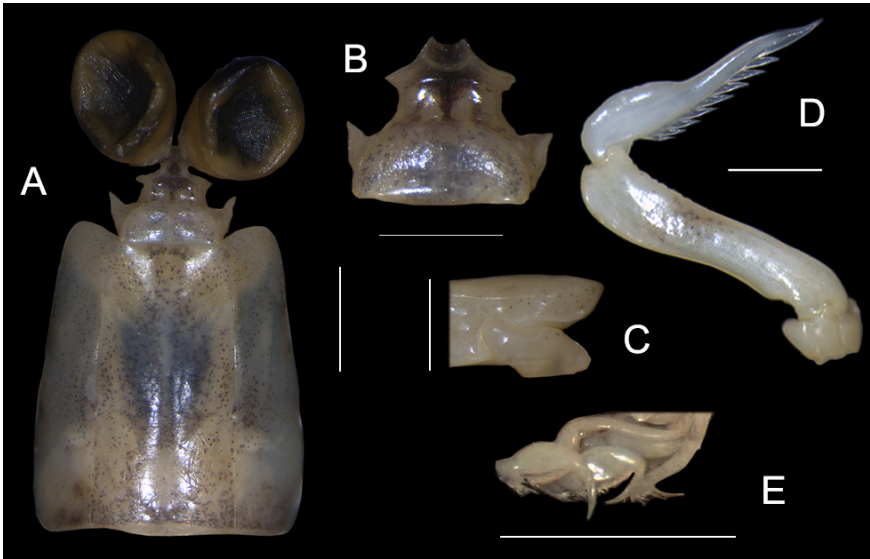
*Odontodactylus latirostris* Borradaile, 1907: 212, Pl. 22: Figs. 3, 3a (type locality: Amirante Is, Seychelles); Debelius, 1999: 280–281; Ah Yong, 2001:

79 (key), 83–84, Fig. 40, 313 (checklist); Trivedi *et al.*, 2020: 225 (Table 1).

*Odontodactylus southwelli* Kemp, 1911: 94; Kemp, 1913: 142, Pl. 9: Figs. 103–106 (type locality: Andaman Is).

*Odontodactylus japonicus*: Stephenson, 1962: 35 [not *O. japonicus* (de Haan, 1844)].

*Odontodactylus brevisrostris*: Manning, 1967c: 22 (part); Moosa, 1991: 161–162 [not *O. brevisrostris* (Miers, 1884)].



**Fig. 9.** *Odontodactylus latirostris* Borradaile, 1907: A) Carapace dorsal; B) Ocular and rostral plates dorsal; C) Raptorial claw ischio-meral articulation lateral; D) Raptorial claw dactylus and propodus lateral; E) Maxillipeds 3–4 propodi lateral. Scale: A–D, 2 mm; E, 10 mm.

### **Diagnosis (modified from Ah Yong, 2001)**

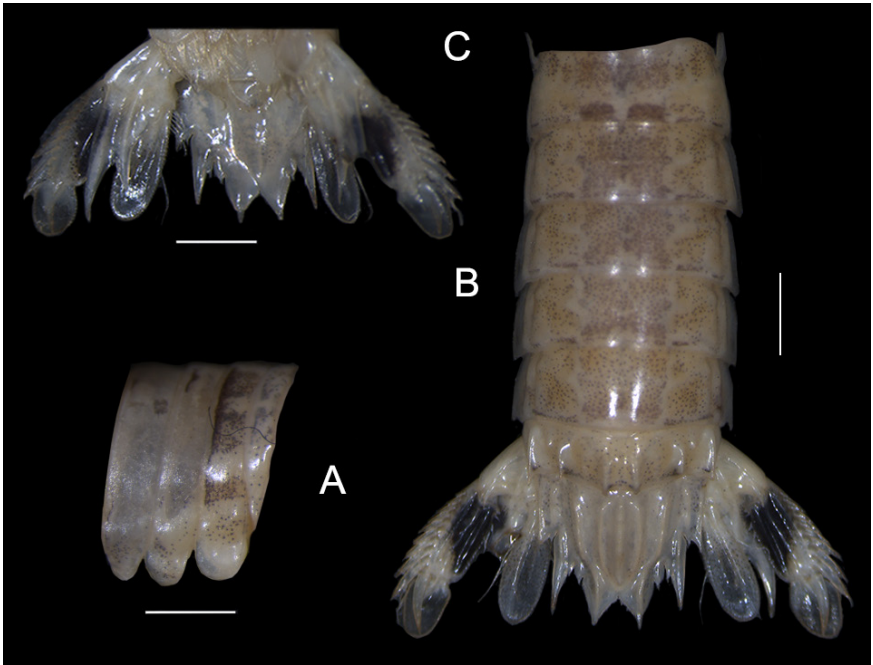
Body sub-cylindrical, strongly convex (Fig. 8A,B). Eye large, cornea sub-globular. Ocular scales truncated, widely separated by concavity (Fig. 9A,B); anterior margin of ophthalmic somite with concavity. Antennal protopod bearing articulated plate dorsally. Rostral plate ovoid, wider than long, apex rounded (Fig. 9A,B). Carapace smooth, corners rounded (Fig. 9A).

Raptorial claw ischio-meral articulation sub-terminal (Fig. 9C); dactylus base strongly inflated into blunt heel, inner margin bearing 8 short teeth (Fig. 9D). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 9E).

Thoracic sternites 5–8 smooth dorsally, sternites 6–8 lateral mar-

gins rounded (Fig. 10A). Abdominal somite 5 bearing postero-lateral spine; somite 6 articulating with telson, dorsal surface bearing sub-median, intermediate, lateral ridges ending in spine (Fig. 10B).

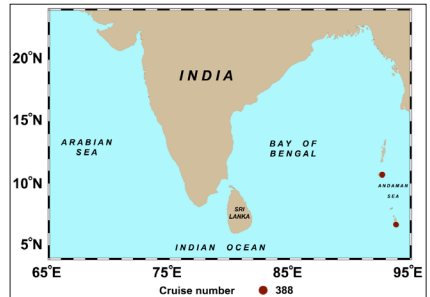
Telson bearing distinct median carina, single accessory median carina present on either side of median carina; sub-median, intermediate, lateral carinae slender, apices of sub-median carinae movable; marginal denticles including 10 sub-median, 2 intermediate, 1 lateral (Fig. 10B, C). Uropodal protopod bearing 2 primary spines, outer spine longer; exopod distal segment distinctly shorter than proximal segment, articulating terminally; proximal segment almost entirely black, bearing 11 movable spines on outer margin (Fig. 10B, C).



**Fig. 10.** *Odontodactylus latirostris* Borradaile, 1907: A) Thoracic sternites 5–8 lateral; B) Abdomen, telson and uropods dorsal; C) Telson and uropods ventral. Scale: B, C, 2 mm; A, 1 mm.

### **Geographical distribution and habitat**

Amirante Islands to the Andaman Sea, Indonesia, New Caledonia, Australia (Ahyong, 2001), at depths of 20–30 m (Ahyong, 2001). The present specimens were collected from the Andaman Sea at depths of 53 m off Little Andaman Island, and 56 m off Great Nicobar Island (along with rocks and boulders) (Fig. 11).



**Fig. 11.** Geographical location of collection of *Odontodactylus latirostris* Borradaile, 1907.

***Chorisquilla andamanica* Manning, 1975**  
**(Andaman lobe-tail mantis shrimp)**



**Fig. 12.** *Chorisquilla andamanica* Manning, 1975 (Andaman Sea): Dorsal habitus: A) 28.0 mm TL (live colouration); B) 28.0 mm TL (preserved colouration). Scale: 10 mm.

Superfamily Gonodactyloidea  
 Giesbrecht, 1910  
 Family Protosquillidae Manning, 1980  
 Genus *Chorisquilla* Manning, 1969b  
*Chorisquilla andamanica* Manning, 1975  
 (Figs. 12A–B, 13A–D, 14A–D, 15)

**Synonymy**

*Gonodactylus excavatus*: Kemp, 1913: 187, pl. 10 Figs. 122, 123; Manning, 1969b: 158.

*Chorisquilla lenzi*: Manning, 1969b: Fig. 6 (refer in figure legend).

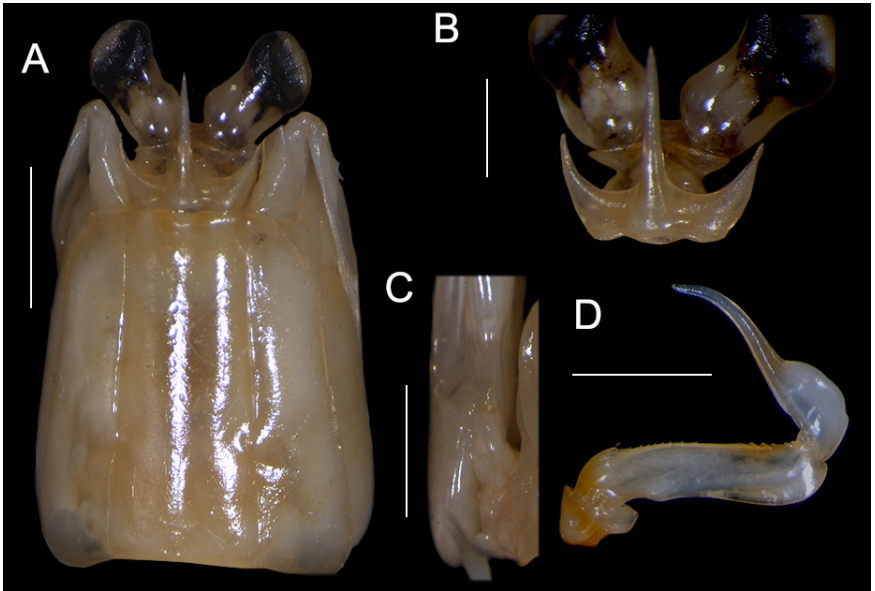
*Chorisquilla excavata*: Manning,

1969b: 159 (key); Dev Roy & Gokul, 2012: 88 (checklist).

*Chorisquilla andamanica* Manning, 1975: 258–260, Fig. 3a, b (type locality: Andaman Islands, 9.5–20 fathoms (= 17–37 m) depth); Ah Yong, 2001: 88 (key); Trivedi *et al.*, 2020: 224 (table 1), 232 (table 2).

**Diagnosis (modified from Manning, 1975)**

Body sub-cylindrical, convex (Fig. 12 A,B). Eye large, cornea flattened. Ocular scales oblique, fused; anterior margin of ophthalmic somite triangular, distal



**Fig. 13.** *Chorisquilla andamanica* Manning, 1975: A) Carapace dorsal; B) Ocular and rostral plates dorsal; C) Raptorial claw ischio-meral articulation lateral; D) Raptorial claw dactylus and propodus lateral. Scale: A, C–D, 2 mm; B, 1 mm.

tip acuminate (Fig. 13A, B). Antennal protopod bearing 1 distal spine dorsally. Rostral plate trispinous, median spine longer (Fig. 13A, B). Carapace smooth, antero-lateral corner angular, postero-lateral corner rounded (Fig. 13A).

Raptorial claw ischio-meral articulation sub-terminal (Fig. 13C); propodus opposable margin bearing 9–10 teeth proximally, dactylus base strongly inflated into blunt 13D). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 14A).

Thoracic sternites 5–8 smooth dorsally, sternites 6–8 lateral margins rounded (Fig. 14B). Abdominal somite 5 postero-lateral angle sharp; somite 6 articulating with telson, dorsal surface bearing smooth sub-median, intermediate, lateral bosses, intermediate

bosses irregular (Fig. 14B).

Telson posterior margin divided into 2 halves by U-shaped median emargination; dorsal surface bearing 5 unarmed longitudinal bosses, sub-median bosses extending posteriorly beyond apex of median emargination, not reaching to base of sub-median teeth; marginal denticles including only sub-marginal denticle under sub-median lobes (Fig. 14C, D). Uropodal protopod bearing 2 primary spines, outer spine distinctly longer; exopod distal segment shorter than proximal segment, articulating terminally; proximal segment bearing 9 movable spines on outer margin (Fig. 14C, D).



**Fig. 14.** *Chorisquilla andamanica* Manning, 1975: A) Maxillipeds 3–4 propodi lateral; B) Thoracic sternites 5–8 lateral; C) Abdomen, telson and uropods dorsal; D) Telson and uropods ventral. Scale: A–D, 2 mm

### ***Geographical distribution and habitat***

Coral reefs off Andaman Islands (Manning, 1975), at depths of 17–37 m (Manning, 1975). The present specimens were collected from 56 m depth off Great Nicobar Island (Fig. 15).



**Fig. 15.** Geographical locations of collection of *Chorisquilla andamanica* Manning, 1975.



***Haptosquilla tuberosa* (Pocock, 1893)**  
**(Bump-tail mantis shrimp)**



**Fig. 16.** *Haptosquilla tuberosa* (Pocock, 1893) (Andaman Sea): Dorsal habitus: A) 28.0 mm TL (live colouration); B) 28.0 mm TL (preserved colouration). Scale: 10 mm.

Superfamily Gonodactyloidea  
 Giesbrecht, 1910

Family Protosquillidae Manning, 1980

Genus *Haptosquilla* Manning, 1969b

*Haptosquilla tuberosa* (Pocock, 1893)  
 (Figs. 16A–B, 17A–D, 18A–D, 19)

**Synonymy**

*Gonodactylus tuberosus* Pocock, 1893: 476, pl. 20B, Fig. 2 (type locality: Macclesfield Bank, South China Sea); Kemp, 1913: 5, 11, 149, 181; Kemp, 1915b: 183–186, table IV.

*Gonodactylus nefandus* Kemp, 1911: 93 (type localities: Andaman Is., Cheduba, Straits of Malacca); Kemp, 1913: 179, pl. 10: Figs. 119, 120; Kemp, 1915b: 183–184, table IV; Kemp &

Chopra, 1921: 311; Hansen, 1926: 33; Ghosh & Manning, 1988: 654.

*Haptosquilla nefanda*: Manning, 1969b: 162 (key); Moosa, 1973: 4 (list), 10 (synonymy); Manning, 1995: 21 (checklist); Dev Roy & Gokul, 2012: 88 (checklist).

*Haptosquilla tuberosa*: Manning, 1969b: 162 (key); Moosa, 1973: 4 (list), 12; Manning, 1995: 21 (checklist), 99 (key), 105–106, Pl. 19, Figs. 9k, 43e, 55–58; Ah Yong, 2001: 101 (key), 109–110, Fig. 53A–H, 313 (checklist); Ah Yong & Naiyanetr, 2002: 287, 305 (list); Ah Yong, 2004: 7; Trivedi *et al.*, 2020: 225 (table 1).

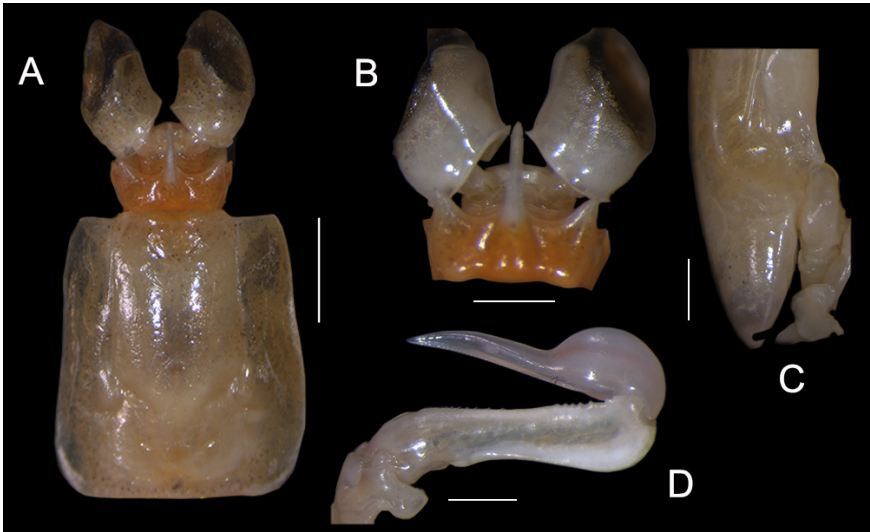


Fig. 17. *Haptosquilla tuberosa* (Pocock, 1893): A) Carapace dorsal; B) Ocular and rostral plates dorsal; C) Raptorial claw ischio-meral articulation lateral; D) Raptorial claw dactylus and propodus lateral. Scale: A, 2 mm; B–D, 1 mm.

### **Diagnosis (modified from Ah Yong, 2001)**

Body subcylindrical, convex (Fig. 16A, B). Eye large, cornea cylindrical. Ocular scales rectangular, separate; anterior margin of ophthalmic somite triangular, distal tip acuminate (Fig. 17A,B). Antennal protopod bearing 1 distal spine dorsally. Rostral plate trispinous, median spine longer (Fig. 17A,B). Carapace smooth, corners rounded (Fig. 17A).

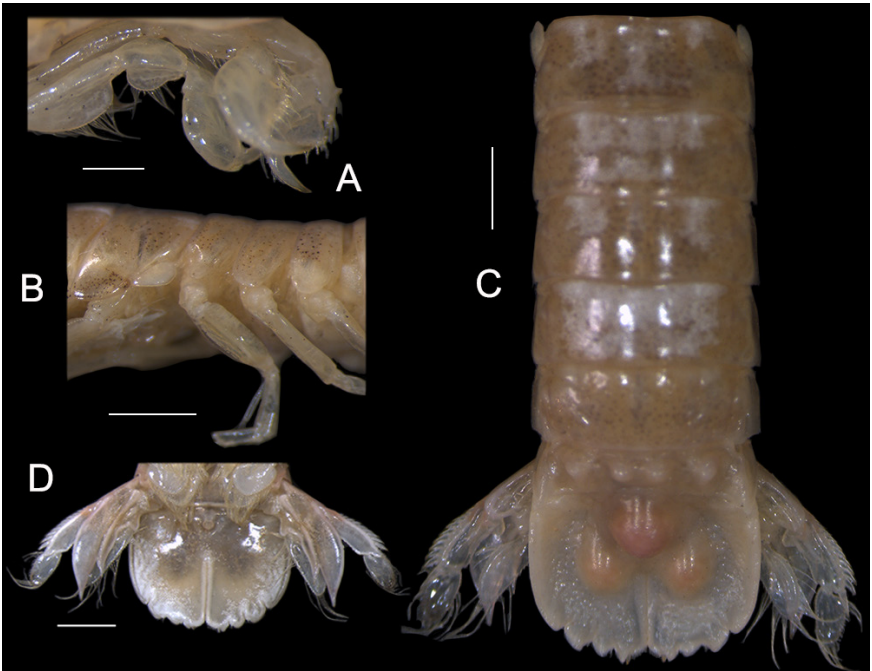
Raptorial claw ischio-meral articulation sub-terminal (Fig. 17C); propodus opposable margin bearing 9–10 minute spines proximally, dactylus base strongly inflated into blunt heel, inner margin minutely serrated (Fig. 17D). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 18A).

Thoracic sternites 5–8 smooth dorsally, sternites 6–8 lateral margins rounded (Fig. 18B). Abdominal somite

5 corrugated dorsally; somites 1–5 with irregular depression laterally; somite 6 articulating with telson, dorsal surface bearing sub-median, intermediate, lateral bosses (Fig. 18C).

Telson posterior margin bearing 4 pairs of primary teeth, thin median fissure dividing posterior half; dorsal surface bearing median sub-circular, 1 pair of ovate sub-median bosses, sub-median bosses slightly posterior to median boss; marginal denticles including 7 sub-median, 1 intermediate, 1 lateral (Fig. 18C,D). Uropodal protopod bearing 2 primary spines, outer spine distinctly longer; exopod distal segment shorter than proximal segment, articulating terminally; proximal segment bearing 10 movable spines on outer margin (Fig. 18C,D).

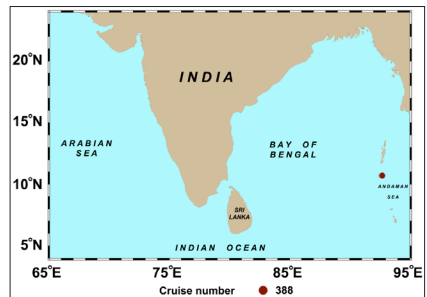




**Fig. 18.** *Haptosquilla tuberosa* (Pocock, 1893) (Andaman Sea): A) Maxillipeds 3–4 propodi lateral; B) Thoracic sternites 5–8 lateral; C) Abdomen, telson and uropods dorsal; D) Telson and uropods ventral. Scale: B–D, 2 mm; A, 1 mm.

### ***Geographical distribution and habitat***

South China Sea, Indonesia, Bay of Bengal, Andaman Sea, Australia (Ahyong, 2001), at depths of 30–82 m, on sand, rubble or coarse shell substrates (Ahyong, 2001). The present specimens were collected from 53 m depth off Little Andaman Island (Fig. 19).



**Fig. 19.** Geographical locations of collection of *Haptosquilla tuberosa* (Pocock, 1893).

***Pseudosquilla ciliata* (Fabricius, 1787)**  
**(Ciliated mantis shrimp)**



**Fig. 20.** *Pseudosquilla ciliata* (Fabricius, 1787) (Andaman Sea): Dorsal habitus: 26.0 mm TL (preserved colouration). Scale: 10 mm.

Superfamily Gonodactyloidea Giesbrecht, 1910

Family Pseudosquillidae Manning, 1977a

Genus *Pseudosquilla* Dana, 1852

*Pseudosquilla ciliata* (Fabricius, 1787) (Figs. 20, 21A–D, 22 A–D, 23)

### **Synonymy**

*Squilla ciliata* Fabricius, 1787: 333 (type locality: Exmouth Gulf, Western Australia, restricted by neotype selection).

*Squilla stylifera* Lamarck, 1818: 189 (type locality: unknown).

*Squilla quadrispinosus* Eydoux & Souleyet, 1842: 262, pl. 5: Fig. 1 (type locality: Sandwich Is. (= Hawaii)).

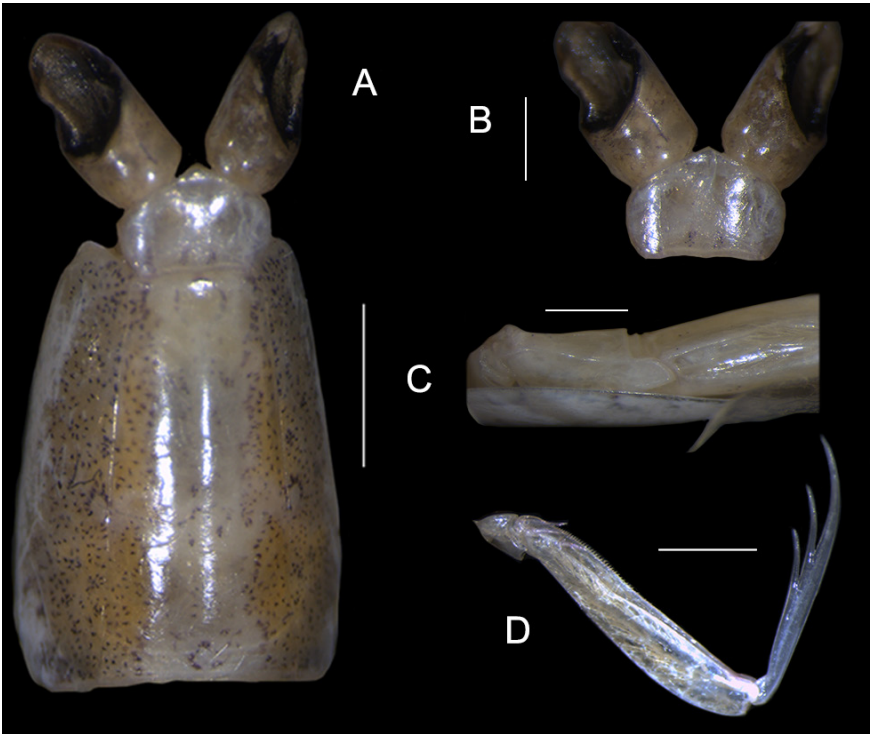
*Pseudosquilla ciliata* var. *occidentalis* Borradaile, 1900: 398, 402 (type locality: West Indies).

*Pseudosquilla ciliata*: Haswell, 1882: 209–210; Kemp, 1913: 3, 10, 96 (key, synonymy), 196; Kemp, 1915b: 172; Hale, 1929: 34; Holthuis, 1941:

261; Tweedie, 1950: 140; Stephenson, 1952: 9; Stephenson, 1953: 44; Stephenson & McNeill, 1955: 245; Stephenson, 1962: 34; Manning, 1968a: 42; Manning, 1968b: figs. 1d, 2g–i; McNeill, 1968: 88; Manning, 1977a: 96 (key), 100, figs. 30, 31, 55; Moosa, 1986: 385; Moosa, 1991: 169; Manning, 1995: 21 (checklist), 111 (synonymy), pl. 20, 21, Figs. 59a, 60a, b, e, 61–63; Gosliner *et al.*, 1996: 195; Ah Yong & Norrington, 1997: 104; Debelius, 1999: 290; Ah Yong, 2001: 112–115, Fig. 55A–I, 313 (checklist); Ah Yong & Naiyanetr, 2002: 287, 305 (list); Ah Yong, 2012: 243, fig. 4G; Dev Roy & Gokul, 2012: 88 (checklist); Trivedi *et al.*, 2020: 225 (table 1).

### **Diagnosis (modified from Ah Yong, 2001)**

Body sub-cylindrical, convex (Fig. 20). Eye large, cornea sub-globular. Ocular scales triangular, separate; anterior margin of ophthalmic somite



**Fig. 21.** *Pseudosquilla ciliata* (Fabricius, 1787): A) Carapace dorsal; B) Ocular and rostral plates dorsal; C) Raptorial claw ischio-meral articulation lateral; D) Raptorial claw dactylus and propodus lateral. Scale: A, C, 2 mm; B, D, 1 mm.

triangular, distal tip acuminate (Fig. 21A, B). Antennal protopod bearing articulated plate dorsally. Rostral plate pentagonal, apex obtusely angled (Fig. 21A, B). Carapace smooth, corners rounded (Fig. 21A).

Raptorial claw ischio-meral articulation terminal (Fig. 21C); propodus opposable margin evenly pectinate proximally, sparsely pectinate distally, bearing 3 movable spines; dactylus slender, bearing 3 serrated teeth (Fig. 21D). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 22A).

Thoracic sternites 5–8 smooth dorsally, lateral margins rounded (Fig. 22B). Abdominal somites 1–5 smooth

dorsally, marginal carinae indistinct, somites 4–5 bearing spinules posterolaterally; somite 6 articulating with telson, dorsal surface bearing sub-median, intermediate, lateral ridges ending in spine (Fig. 22C).

Telson bearing median carina, 1 pair each of accessory, anterior sub-median, marginal carinae; median, sub-median carinae apices ending in spine; marginal denticles including 1 intermediate, 1 lateral; sub-median denticles movable (Fig. 22C, D). Uropodal protopod bearing 2 primary spines, inner spine longer; slender spine anterior to endopod articulation; exopod distal segment shorter than proxi-

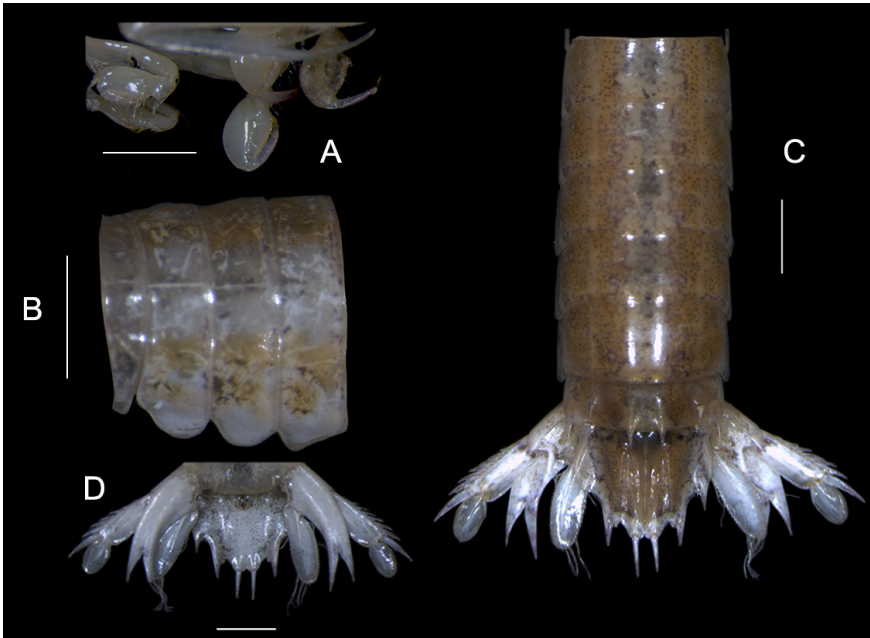


Fig. 22. *Pseudosquilla ciliata* (Fabricius, 1787) : A) Maxillipeds 3–4 propodi lateral; B) Thoracic sternites 5–8 sub-dorsal; C) Abdomen, telson and uropods dorsal; D) Telson and uropods ventral. Scale: A–D, 2 mm.

mal segment, articulating terminally, proximal segment bearing 8 movable spines on outer margin (Fig. 22C, D).

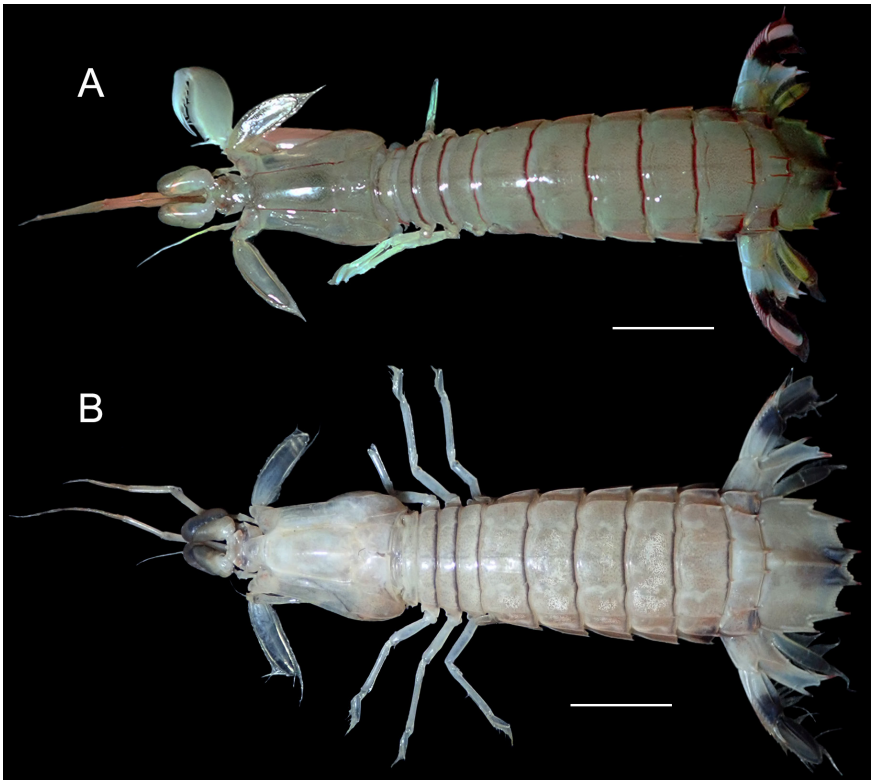
### **Geographical distribution and habitat**

All tropical oceans except the eastern Pacific, at depths up to 86 m, under boulders, coral rubble on coral and rocky reef flats, burrows in seagrass beds, sand and mudflats (Ahyong, 2001). The present specimen was collected from 53 m depth off Little Andaman Island (Fig. 23).



Fig. 23. Geographical locations of collection of *Pseudosquilla ciliata* (Fabricius, 1787).

***Busquilla plantei* Manning, 1978**  
**(Plante's spearer mantis shrimp)**



**Fig. 24.** *Busquilla plantei* Manning, 1978 (Bay of Bengal): Dorsal habitus: A) 62.0 mm TL (live colouration); B) 62.0 mm TL (preserved colouration). Scale: 10 mm.

Superfamily Squilloidea Latreille, 1802  
 Family Squillidae Latreille, 1802  
 Genus *Busquilla* Manning, 1978b  
*Busquilla plantei* Manning, 1978b  
 (Figs. 24A–B, 25A–D, 26A–D, 27)

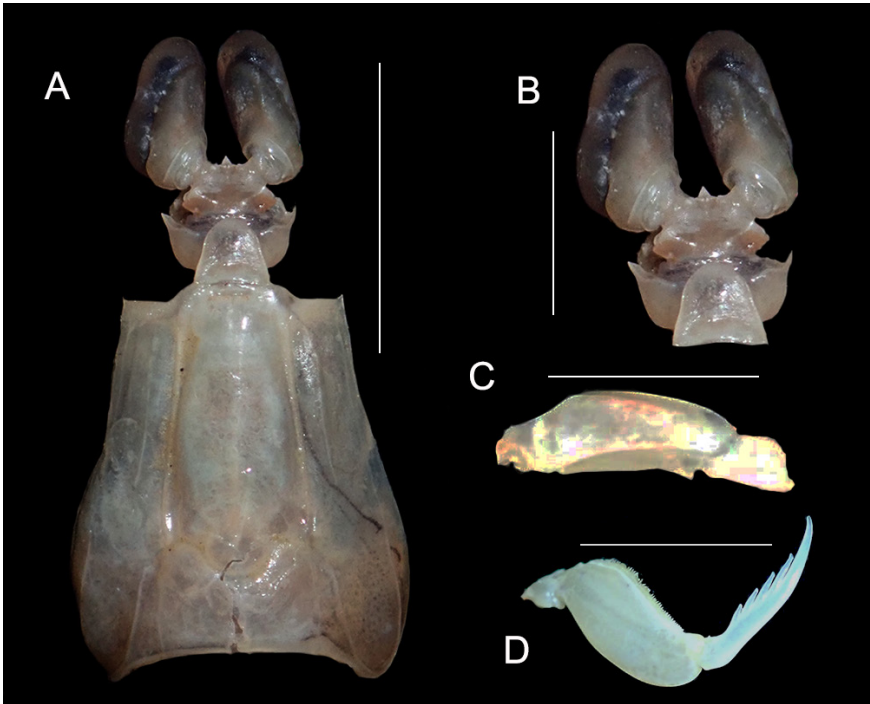
**Synonymy**

*Busquilla plantei* Manning, 1978b: 23–24, Fig. 11 (type locality: Passe Lokobe, Madagascar); Manning, 1995: 23 (checklist), 170 (key); Ah Yong, 2001: 204 (key), 204–205, Fig. 99A–H, 314

(checklist); Ah Yong & Kumar, 2018: 385; Trivedi *et al.*, 2020: 226 (table 1).

**Diagnosis (modified from Ah Yong, 2001)**

Body depressed (Fig. 24A, B). Eye long, cornea bilobed. Ocular scales separate, sub-quadrate distally; anterior margin of ophthalmic somite triangular bearing distal spine (Fig. 25A, B). Antennal protopod unarmed. Rostral plate bluntly triangular, wider than



**Fig. 25.** *Busquilla plantei* Manning, 1978: A) Carapace dorsal; B) Ocular and rostral plates dorsal; C) Raptorial claw ischio-meral articulation lateral; D) Raptorial claw dactylus and propodus lateral. Scale: A, C–D, 10 mm; B, 5 mm.

long (Fig. 25A, B). Carapace bearing antero-lateral spine, postero-lateral corner rounded; dorsal surface bearing intermediate, lateral, marginal, reflected marginal carinae (Fig. 25A).

Raptorial claw ischio-meral articulation terminal (Fig. 25C); propodus opposable margin closely pectinate, bearing 3 movable spines proximally; dactylus slender, bearing 5 teeth (Fig. 25D). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 26A).

Thoracic sternite 5 smooth, dorsally, bearing pair of acuminate spines laterally, anterior spine longer, obliquely directed; sternites 6–8 bearing intermediate carinae, bilobed laterally, anterior lobe smaller than pos-

terior (Fig. 26B). Abdominal somites 1–5 bearing sub-median, intermediate, lateral, marginal carinae, somite 6 lacking marginal carinae; sub-medians of somites 5–6, intermediates of 4–6, all laterals, marginals bearing posterior spine; somite 5 with triangular spot between lateral and marginal carinae, somite 6 with small dark patch between intermediate and lateral carinae (Fig. 26C).

Telson bearing median carina; sub-median, intermediate, lateral carinae slender; sub-median carinae apices fixed; marginal denticles including 4 sub-median, 9 intermediate, 1 lateral; post-anal carina present (Fig. 26C, D). Uropodal protopod bearing





**Fig. 26.** *Busquilla plantei* Manning, 1978 : A) Maxillipeds 3–4 propodi lateral; B) Thoracic sternites 5–8 lateral; C) Abdomen, telson and uropods dorsal; D) Telson and uropods ventral. Scale: A–D, 10 mm.

2 primary spines, inner spine longer, bearing large lobe on outer margin; slender spine anterior to endopodal articulation, inner margin crenulate; exopod distal segment subequal to proximal, articulating terminally, inner half of distal segment, distal half of proximal segment black; proximal segment bearing 8 movable spines on outer margin (Fig. 26C, D).

### **Geographical distribution and habitat**

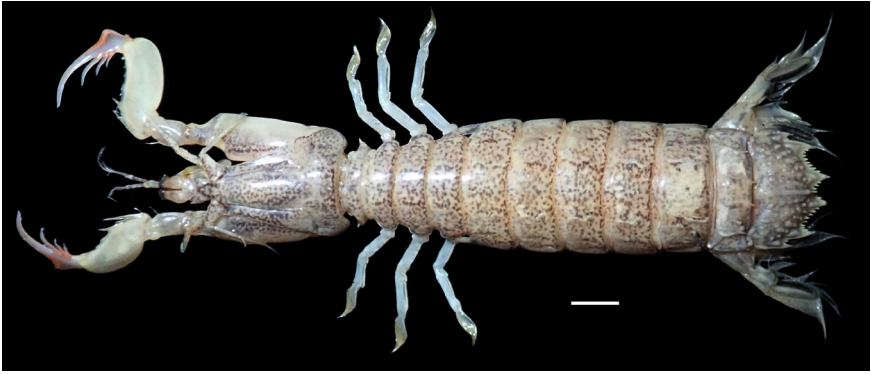
Madagascar, India, Australia, Hawaii (Ahyong & Kumar, 2018), at 17–221 m depths, on soft, sandy substrates (Ahyong, 2001, 2002). The present spec-

imen was collected from 56 m depth in the southwestern Bay of Bengal off Tamil Nadu coast (Fig. 27).



**Fig. 27.** Geographical locations of collection of *Busquilla plantei* Manning, 1978.

***Cloridina malaccensis* (Manning, 1968)**  
**(Malaccan mottled mantis shrimp)**



**Fig. 28.** *Cloridina malaccensis* (Manning, 1968) (southwestern Bay of Bengal): Dorsal habitus (live colouration), 68.0 mm TL. Scale: 10 mm.

Superfamily Squilloidea Latreille, 1802  
 Family Squillidae Latreille, 1802  
 Genus *Cloridina* Manning, 1995  
*Cloridina malaccensis* (Manning, 1968c)  
 (Figs. 28, 29A–D, 30A–D, 31)

### Synonymy

*Clorida malaccensis* Manning, 1968c: 244, fig. 2a–e; Manning, 1978b: 26; Naiyanetr, 1980a: 43 (list); Naiyanetr, 1980b: 54; Moosa, 1986: 399; Moosa, 1991: 202.

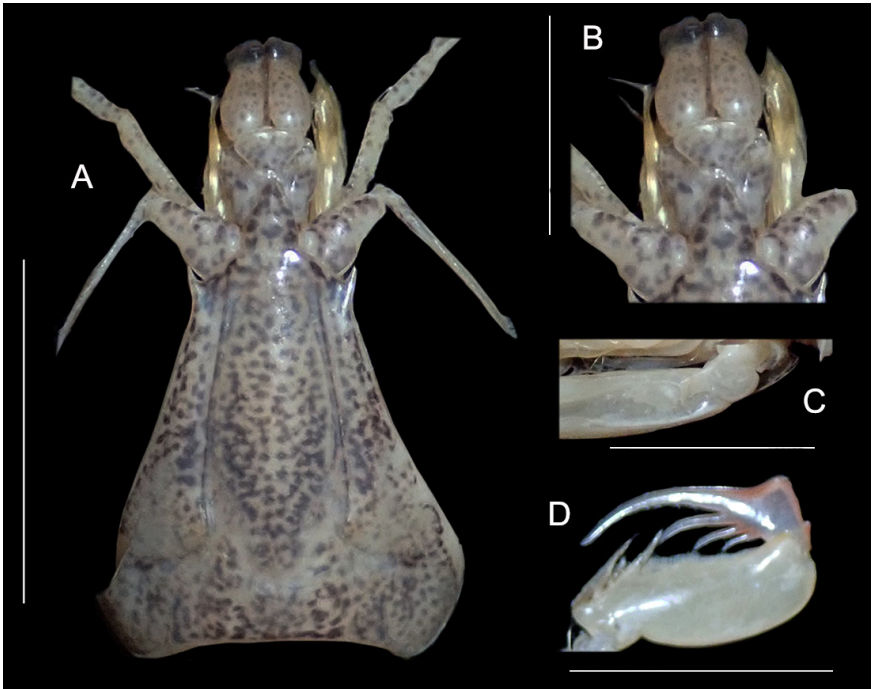
*Cloridina malaccensis*: Manning, 1995: 24 (list), 180 (remarks), 192 (key); Moosa, 2000: 410 (list), 439; Ah Yong, 2001: 230 (list), 231 (key); Ah Yong & Naiyanetr, 2002: 306 (list); Ah Yong, 2006: 335; Naiyanetr, 2007: 142 (list); Poupin, 2010: 39 (list).

### Diagnosis (modified from Manning, 1968b)

Body depressed (Fig. 28). Eye small, reaching distal end of first antennular segment. Eyestalk bulging in the mid-

dle. Cornea bilobed, dark, as wide as eyestalk. Ocular scale fused into single plate, rounded distally; anterior margin of ophthalmic somite rounded (Fig. 29A, B). Antennule 3-segmented, bearing well-developed flagellum; dorsal process of first somite trianguloid, with sharp apices directed anterolaterally. Antennal protopod unarmed, peduncle 2-segmented, flagellum well-developed, antennal scale with setose margins throughout, length 0.46 times CL. Rostral plate cordiform, longer than wide, median projection slender (Fig. 29A, B). Carapace with anterolateral spine, posterolateral margin rounded (Fig. 29A). Dorsal surface with only marginal carina on posterolateral margin; gastric and cervical groove present. Mandibular palp present. Maxillipeds 1–4 with epipods, first epipod largest; maxillipeds 1, 3–5 ischium elongate, merus moderately long, carpus short, propodus ovate, dactylus elongated, apposed to propodus (Fig. 30A).





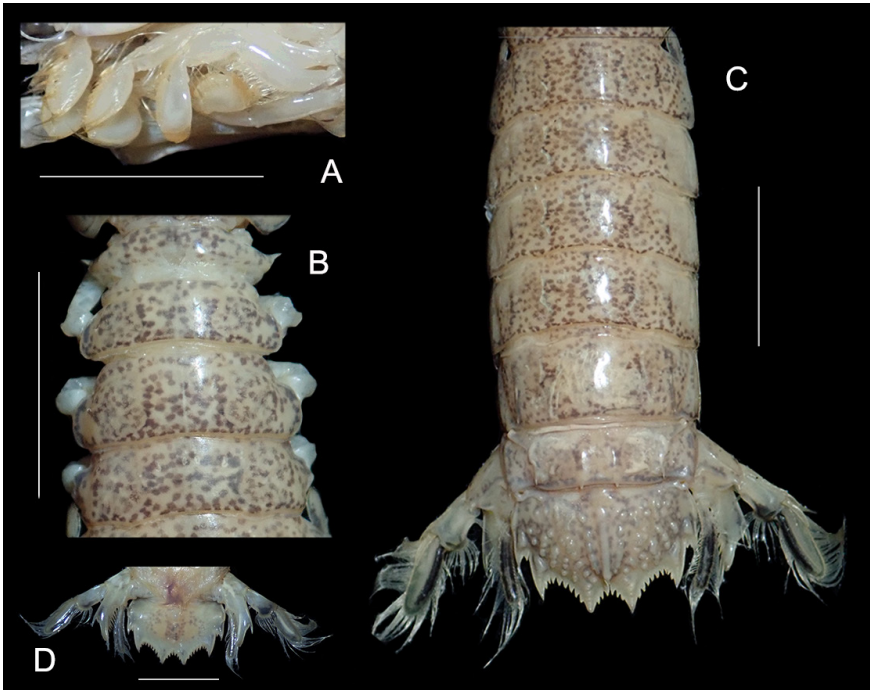
**Fig. 29.** *Cloridina malaccensis* (Manning, 1968). A) dorsal view of carapace; B) dorsal view of ocular and rostral plates; C) ischio-meral articulation of raptorial claw; D) external view of raptorial claw dactylus and propodus. Scale: A, C–D, 10 mm; B, 5 mm.

Raptorial claw ischio-meral articulation terminal (Fig. 29C); carpus bearing sharp dorsal ridge; propodus opposable margin closely pectinate, bearing 3 movable spines proximally; dactylus expanded into triangular lobe proximally, bearing 5 teeth, basal lobe short (Fig. 29D).

Thoracic sternites 5–8 smooth, without carinae; sternite 5 with obliquely directed acuminate lateral process, ventral process acuminate; sternites 6–7 single lobed laterally (Fig. 30B). Abdominal somites 1–5 with intermediate, lateral and marginal carinae, somite 6 bearing only submedian, intermediate and lateral carinae; submedians of somite 6, intermediates

and laterals of somites 5–6 and marginals of somite 5 bearing posterior spine; somite 1 with pleural plate on anterolateral margin (Fig. 30C).

Telson subquadrate, inflated, dorsal surface with rows of tubercles, bearing sharp, elevated, median carina; submedian, intermediate and lateral carinae slender; apices of submedian carinae movable; prelateral lobe present. Marginal denticles include 3 submedian, 8–9 intermediate, and 1 lateral. Ventral surface bearing median row of tubercles (Fig. 30C, D). Uropodal protopod bearing 2 curved terminal spines, inner spine longer, with lobe on outer margin; long slender spine anterior to the articulation of endopod, inner



**Fig. 30.** *Cloridina malaccensis* (Manning, 1968): A), propodi of maxillipeds 3–4; B) thoracic sternites 5–8; C) dorsal view of abdomen, telson and uropods; D) ventral view of telson and uropods. Scale: A–D, 10 mm.

margin with row of 7 spines; endopod shorter than exopod; exopod with 2 segments articulating terminally, distal segment longer than proximal; proximal segment with 6 blunt movable spines on outer margin (Fig. 30C, D).

### **Geographical distribution and habitat.**

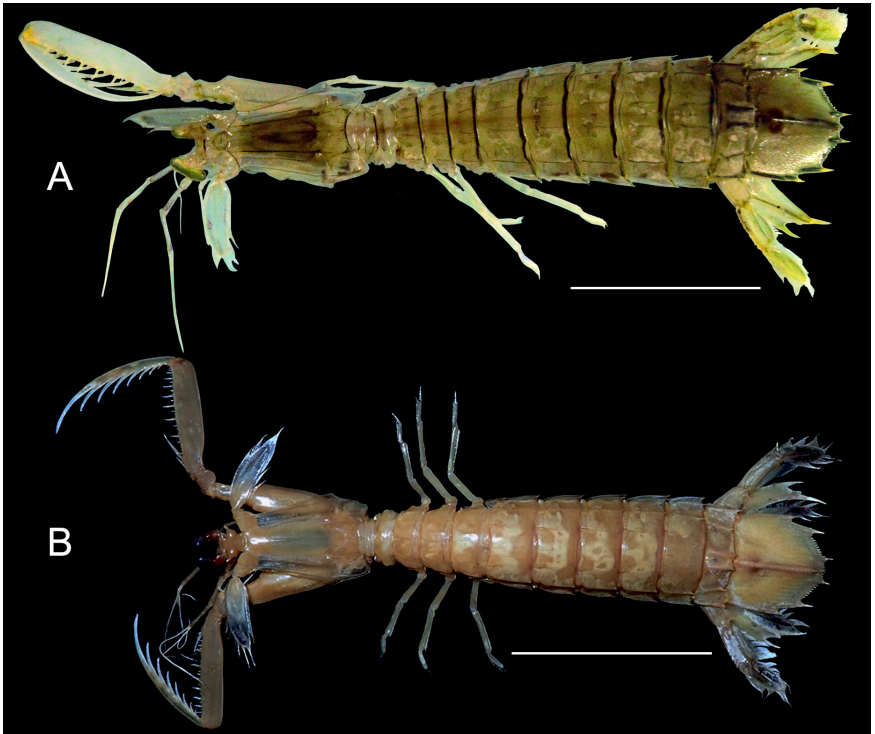
Malacca Straits (Manning, 1968b), Madagascar (Manning, 1978b), Andaman Sea (Naiyanetr 1980a, 1980b), Philippines (Moosa, 1986), New Caledonia (Moosa, 1991; Ahyong, 2006), Gulf of Thailand (Naiyanetr, 2007); 42 m in muddy sand (Manning, 1978b), 36–37 m (Moosa, 1986), 29–80 m in mud, fine sandy mud with bryozoans

to coarse sand and blocks (Moosa, 1991). The present specimens were collected from sandy silt substratum at 56 m depth in the southwestern Bay of Bengal off Tamil Nadu coast. The present observation is the first record from the Indian waters (Fig. 31).



**Fig. 31.** Geographical locations of collection of *Cloridina malaccensis* (Manning, 1968).

***Harpiosquilla harpax* (de Haan, 1844)**  
**(Robber harpiosquillid mantis shrimp)**



**Fig. 32.** *Harpiosquilla harpax* (de Haan, 1844) (north-eastern Arabian Sea): Dorsal habitus: A) 170.0 mm TL (live colouration); B) 152.5 mm TL (preserved specimen). Scale: 50 mm.

Superfamily Squilloidea Latreille, 1802  
 Family Squillidae Latreille, 1802

Genus *Harpiosquilla* Holthuis, 1964

*Harpiosquilla harpax* (de Haan, 1844)  
 (Figs. 32A–B, 33A–D, 34A–C, 35)

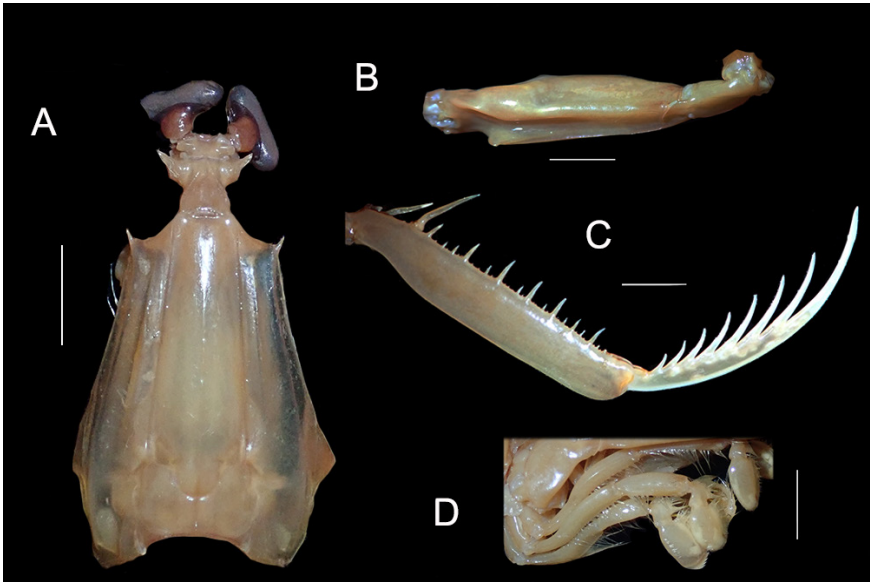
**Synonymy**

*Squilla harpax* de Haan, 1844 (atlas): Pl. 51, Fig. 1 (type locality: Japan); de Haan, 1849: 222 (text); Tiwari & Biswas, 1952: 358, Figs. 3b, d, f; Manning, 1968b: 121.

*Squilla raphidea*: Stephenson, 1952: 4, 5; Stephenson, 1953: 43; Stephen-

son & McNeill, 1955: 239–240 (part, not *Squilla raphidea* Fabricius, 1787).

*Harpiosquilla harpax*: Manning, 1968a: 14 (key), 15, Fig. 4; Manning, 1968b: fig. 3; Manning, 1969a: 6 (key), 25, Figs. 28–38; Dutt & Ravindranath, 1975: 62, figs. 7–12; Manning, 1991: 8; Manning, 1995: 23 (checklist), 148 (key), 153–158, pl. 28, Figs. 90a, 92b, 93, 95, 96; Yamaguchi & Baba, 1993: 179–180, Fig. 11; Ah Yong & Norrington, 1997: 106; Ah Yong *et al.*, 1999: 38, 41, Fig. 2a–d; Ah Yong & Ebach, 1999: 227–228; Ah Yong, 2001:



**Fig. 33.** *Harpiosquilla harpax* (de Haan, 1844): A) Carapace, ocular and rostral plates dorsal; B) Raptorial claw ischio-meral articulation lateral; C) Raptorial claw dactylus and propodus lateral; D) Maxillipeds 3–4 propodi lateral. Scale: 10 mm.

256 (key), 257–260, Fig. 126A–L, 314 (checklist); Ah Yong & Naiyanetr, 2002: 307 (list); Dev Roy & Gokul, 2012: 89 (checklist); Trivedi *et al.*, 2020: 228 (table 1), 232 (table 2).

*Harpiosquilla japonica* Manning, 1969a: 6 (key), 15, figs. 10–11 (type locality: Wakanoura, Kii, Japan); Garcia, 1978: 236; Garcia, 1981: 14–16; Manning, 1995: 23 (checklist), 149 (key), 158–160, Figs. 87b, d, 88b, 91b, 92a, e, 94b; new synonymy.

*Harpiosquilla intermedia* Manning & Michel, 1973: 113, Figs. 1, 2b (type locality: Baie de Ducos, New Caledonia); Garcia, 1978: 236; Garcia, 1981: 13–14; new synonymy; Manning, 1995: 23 (checklist), 149 (key).

*Harpiosquilla malagasiensis* Manning, 1978b: 30, Fig. 15 (type locality: Tamatave, Madagascar); new synonymy; Manning, 1995: 23 (checklist), 149

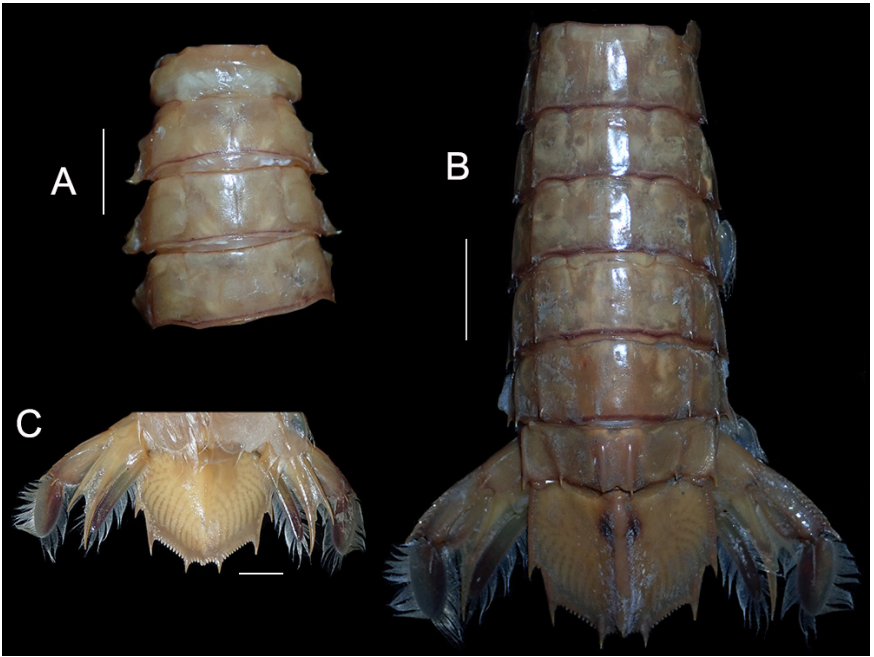
(key).

*Harpiosquilla paradipa* Ghosh, 1987: 306, Fig. 1 (type locality: Paradip, India); new synonymy; Manning, 1995: 23 (checklist), 148 (key); Trivedi *et al.*, 2020: 232 (table 2).

### **Diagnosis (modified from Ah Yong, 2001)**

Body depressed (Fig. 32A, B). Eye large, cornea bilobed. Ocular scale separate, truncate distally; anterior margin of ophthalmic somite rounded (Fig. 33A). Antennal protopod unarmed. Rostral plate longer than wide, median projection slender (Fig. 33A). Carapace bearing antero-lateral spine, postero-lateral corner excavated; dorsal surface bearing median, intermediate, lateral, marginal, reflected marginal carinae (Fig. 33A).

Raptorial claw ischio-meral artic-



**Fig. 34.** *Harpiosquilla harpax* (de Haan, 1844): A) Thoracic sternites 5–8 dorsal; B) Abdomen, telson and uropods dorsal; C) Telson and uropods ventral. Scale: 10 mm.

ulation terminal (Fig. 33B); propodus opposable margin bearing 8 long, 8–10 medium-sized, 12–14 short erect spines, 3 movable spines proximally; dactylus bearing 8 teeth, outer margin angular (Fig. 33C). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 33D).

Thoracic sternites 6–8 bearing sub-median carinae, sternites 5–8 bearing intermediate carinae; sternite 5 ventral process triangular; sternites 6–7 bilobed laterally, anterior lobe shorter than posterior (Fig. 34A). Abdominal somites 1–5 bearing sub-median, intermediate, lateral, marginal carinae, somite 6 lacking marginal carina; sub-medians of somite 6, intermediates of somites 2–6, all laterals, marginals bearing posterior spine (Fig.

34B).

Telson bearing median carina; sub-median, intermediate, lateral carinae slender; carinae apices fixed; marginal denticles including 4–5 sub-median, 8–10 intermediate, 1 lateral; post-anal carina present (Fig. 34B, C). Uropodal protopod bearing 2 primary spines, inner spine longer, bearing lobe on outer margin; slender spine anterior to endopodal articulation, inner margin crenulate; endopod distal half black; exopod distal segment shorter than proximal segment, articulating terminally, inner half black; proximal segment bearing 9 movable spines on outer margin (Fig. 34B, C).



### **Geographical distribution and habitat**

Red Sea, western Indian Ocean to Taiwan, Philippines, Vietnam, Japan, New Caledonia, Australia, on sandy mud substrates in intertidal zone, shallow coastal waters, estuaries and embayments up to 93 m depth (Ahyong, 2001). The present specimens were collected from 72 m depth in the north-eastern Arabian Sea off Gujarat coast (Fig. 35).

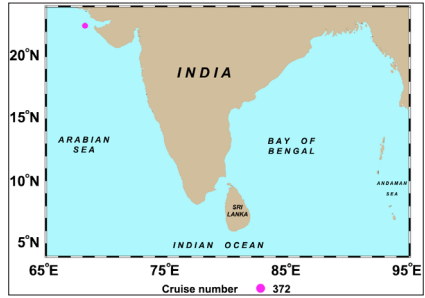
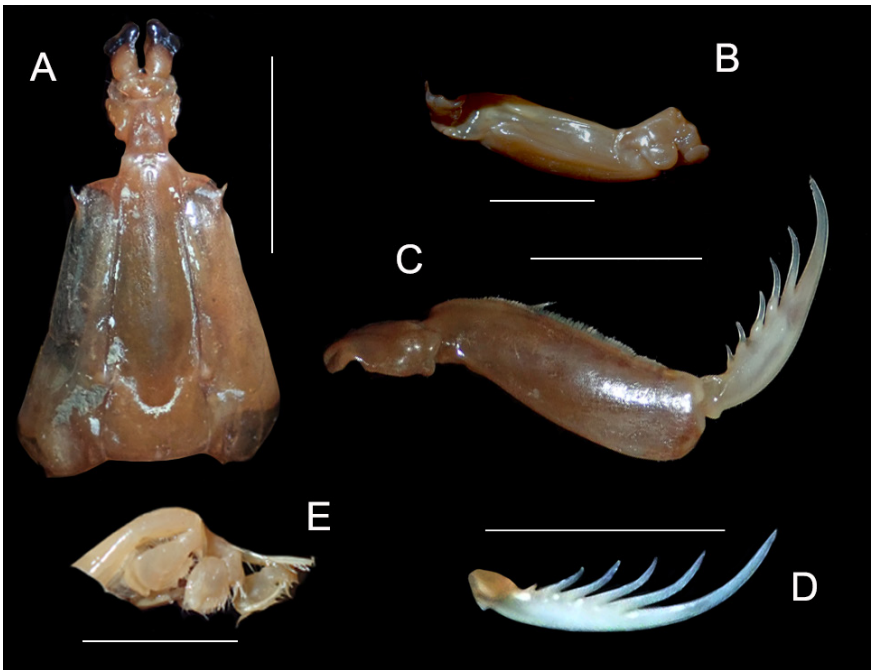


Fig. 35. Geographical locations of collection of *Harpiosquilla harpax* (de Haan, 1844).

### ***Lenisquilla gilesi* (Kemp, 1911) (Giles' smooth mantis shrimp)**



Fig. 36. *Lenisquilla gilesi* (Kemp, 1911) (north-eastern Arabian Sea): A) 91.0 mm TL (live colouration); B) 85.0 mm TL (preserved colouration).



**Fig. 37.** *Lenisquilla gilesi* (Kemp, 1911): A) Carapace, ocular and rostral plates dorsal; B) Raptorial claw ischio-meral articulation lateral; C) Male raptorial claw dactylus and propodus lateral; D) Female raptorial claw dactylus; E) Maxillipeds 3–4 propodi lateral. Scale: 10 mm.

Superfamily Squilloidea Latreille, 1802  
 Family Squillidae Latreille, 1802  
 Genus *Lenisquilla* Manning, 1977b  
*Lenisquilla gilesi* (Kemp, 1911)  
 (Figs. 36A–B, 37A–E, 38A–E, 39)

### Synonymy

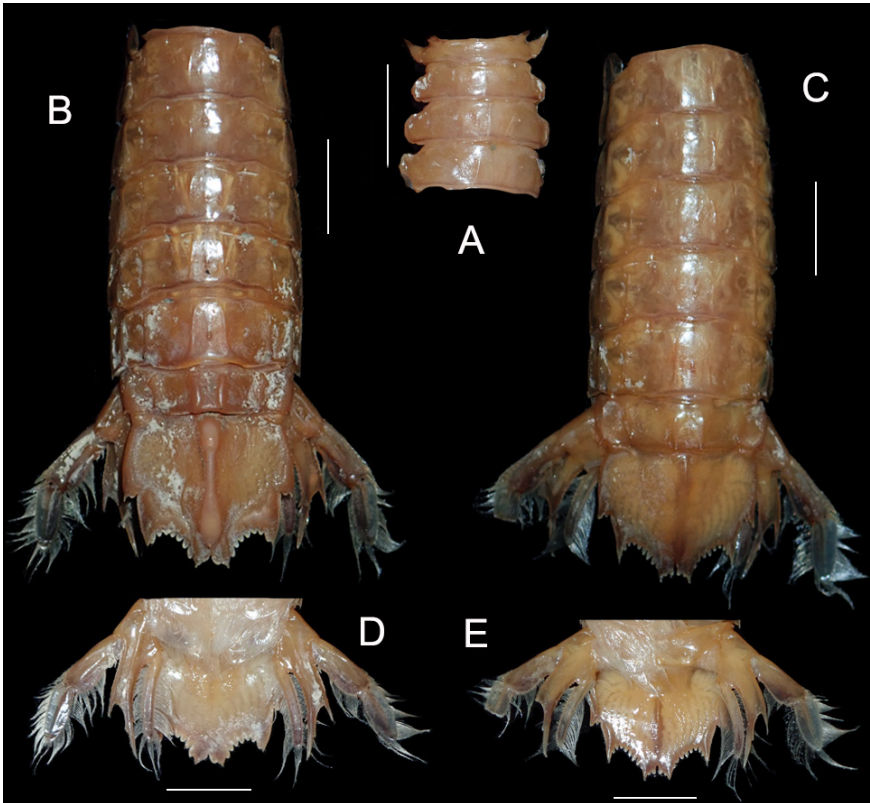
*Squilla gilesi* Kemp, 1911: 95 (type locality: Bay of Bengal, 80–110 fathoms (= 146–202 m); Kemp, 1913: 39, Pl. 2, Figs. 25–27; Manning, 1968b: 131 (list); Ghosh & Manning, 1988: 657; Trivedi *et al.*, 2020: 233 (table 2).

*Lenisquilla gilesi*: Manning, 1995: 24 (checklist), 208 (key); Ah Yong, 2001: 269 (key); Dev Roy & Gokul, 2012: 90 (checklist); Trivedi *et al.*, 2020: 228 (table 1), 233 (table 2).

### Diagnosis (modified from Kemp, 1911)

Body depressed (Fig. 36A, B). Eye long, cornea bilobed. Ocular scale separate, blunt distally; anterior margin of ophthalmic somite rounded (Fig. 37A). Antennal protopod unarmed. Rostral plate triangular, longer than broad (Fig. 37A). Carapace bearing antero-lateral spine, postero-lateral corner rounded; dorsal surface bearing intermediate, lateral, marginal, reflected marginal carinae (Fig. 37A).

Raptorial claw ischio-meral articulation terminal (Fig. 37B); propodus opposable margin closely pectinate, bearing 3 movable spines proximally; dactylus basally inflated in male (Fig.



**Fig. 38.** *Lenisquilla gilesi* (Kemp, 1911) : A) Thoracic sternites 5–8 dorsal; B) Male abdomen, telson and uropods dorsal; C) Female abdomen, telson and uropods dorsal; D) Male telson and uropods ventral; E) Female telson and uropods ventral. Scale: 10 mm.

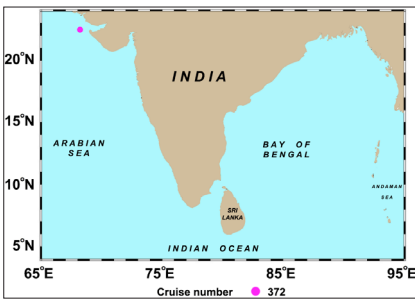
37C), slender in female (Fig. 37D), bearing 6 teeth (Fig. 37C, D). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 37E).

Thoracic sternites 7–8 bearing sub-median carinae, sternites 5–8 bearing intermediate carinae; sternite 5 bearing obliquely directed acuminate lateral process, ventral process acuminate; sternites 6–7 single lobed laterally (Fig. 38A). Abdominal somites 1–5 bearing sub-median, intermediate, lateral, marginal carinae, somite 6 lacking marginal carina; submedians of somite 6, intermediate of somites 3–6,

laterals of somites 2–6, all marginals bearing posterior spine (Fig. 38B, C).

Telson bearing median carina inflated at both ends in males (Fig. 38B), slender in females (Fig. 38C); sub-median, intermediate, lateral carinae slender; submedian carinae apices movable; marginal denticles including 2 sub-median, 7 intermediate, 1 lateral; postanal carina present (Fig. 38D,E). Uropodal protopod bearing 2 primary spines, inner spine longer, bearing lobe on outer margin; slender spine anterior to endopodal articulation, inner margin crenulate, bearing 2 spines





**Fig. 39.** Geographical locations of collection of *Lenisquilla gilesi* (Kemp, 1911).

at the end of crenulation in male (Fig. 38B, C), 1 spine in female (Fig. 38B,

C); endopod distal half black; exopod distal segment shorter than proximal segment, articulating terminally; proximal segment bearing 8 movable spines on outer margin (Fig. 38B, C).

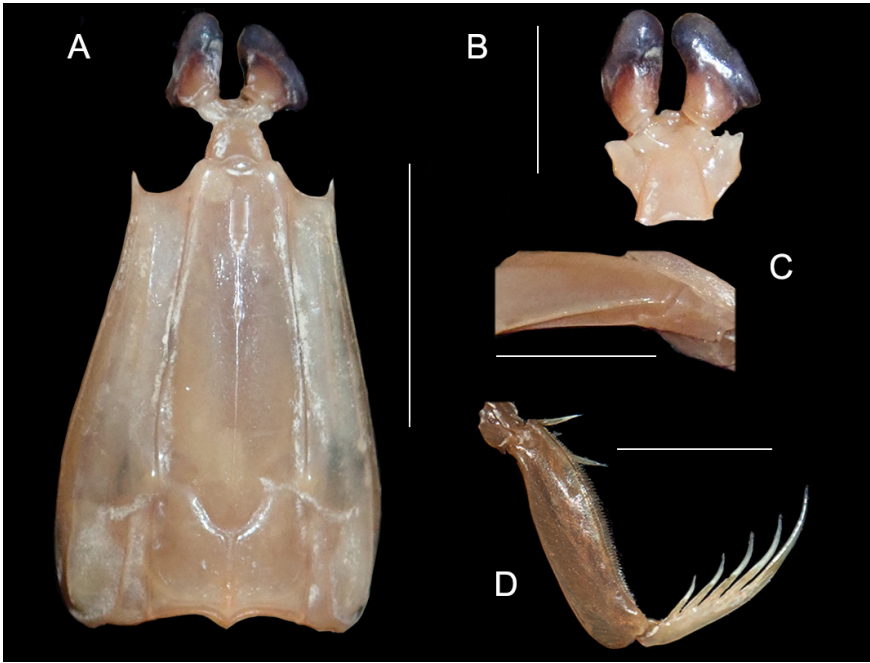
### ***Geographical distribution and habitat***

Persian Gulf to Bay of Bengal, at depths of 64–202 m (Kemp, 1913). The present specimens were collected from 72 m depth in the north-eastern Arabian Sea off Gujarat coast (Fig. 39).

## ***Quollastria gonypetes* (Kemp, 1911) (Black-spotted deep-water mantis shrimp)**



**Fig. 40.** *Quollastria gonypetes* (Kemp, 1911) (north-eastern Arabian Sea): A) 79.0 mm TL (live colouration); B) 79.0 mm TL (preserved colouration). Scale: 10 mm.



**Fig. 41.** *Quollastria gonypetes* (Kemp, 1911): A) Carapace dorsal; B) Ocular and rostral plates dorsal; C) Raptorial claw ischio-meral articulation lateral; D) Raptorial claw dactylus and propodus lateral. Scale: A, C–D, 10 mm; B, 5 mm.

Superfamily Squilloidea Latreille, 1802  
 Family Squillidae Latreille, 1802  
 Genus *Quollastria* Ah Yong, 2001  
*Quollastria gonypetes* (Kemp, 1911)  
 (Figs. 40A–B, 41A–D, 42A–D, 43)

### Synonymy

*Squilla gonypetes* Kemp, 1911: 96 (type locality: restricted to vicinity of Cheduba I., Myanmar, 13 m, by lectotype selection; Kemp, 1913: 3, 10, 22, 54, pl. 4, figs. 42–44 (part); Stephenson, 1962: 35; Manning, 1965: 250, pl. 11 fig. b; Manning, 1968a: 23, fig. 7; Manning, 1968b: 135 (list); Ghosh & Manning, 1988: 657.

*Oratosquilla gonypetes*: Manning, 1971: 14 (key); Manning, 1978a: 7 (key), 12, fig. 5; Moosa, 1986: 408; Dev

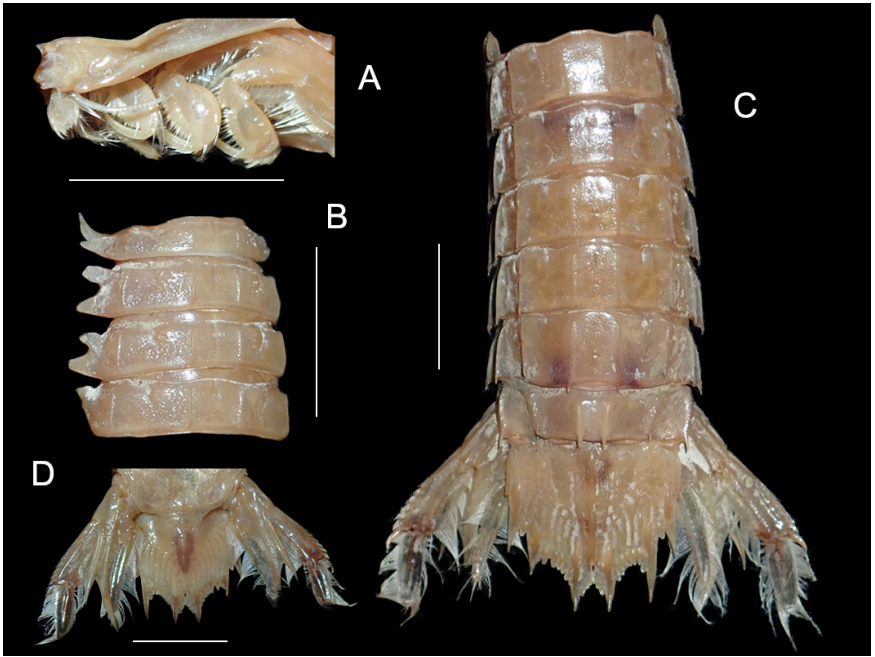
Roy & Gokul, 2012: 90 (checklist).

*Oratosquillina gonypetes*: Manning, 1995: 25 (checklist), 226 (key), 228; Ah Yong & Naiyanetr, 2002: 306 (list).

*Quollastria gonypetes*: Ah Yong, 2001: 301 (key), 304–306, fig. 147A–L, 314 (checklist); Ah Yong, 2004: 21; Ah Yong & Kumar, 2018: 390, fig. 3A; Trivedi *et al.*, 2020: 230 (Table 1).

### Diagnosis (modified from Ah Yong, 2001)

Body depressed (Fig. 40A, B). Eye long, cornea bilobed. Ocular scales separate, sub-quadrangle distally; anterior margin of ophthalmic somite rounded (Fig. 41A, B). Antennal protopod unarmed. Rostral plate bluntly triangular, longer than broad (Fig. 41A,



**Fig. 42.** *Quollastria gonypetes* (Kemp, 1911): A) Maxillipeds 3–4 propodi lateral; B) Thoracic sternites 5–8 sub-dorsal; C) Abdomen, telson and uropods dorsal; D) Telson and uropods ventral. Scale: 10 mm.

B). Carapace bearing antero-lateral spine, postero-lateral corner rounded; dorsal surface bearing median, intermediate, lateral, marginal, reflected marginal carinae, branches of anterior bifurcation of median carina separated from the median carina, dorsal pit present (Fig. 41A).

Raptorial claw ischio-meral articulation terminal (Fig. 41C); propodus opposable margin closely pectinate, bearing 3 movable spines proximally; dactylus slender, bearing 5 teeth (Fig. 41D). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 42A).

Thoracic sternites 5–8 bearing sub-median, intermediate carinae; sternite 5 bearing pair of acuminate spines laterally, anterior spine longer, obliquely directed; sternites 6–8 bi-

lobed laterally, anterior lobe smaller than posterior (Fig. 42B). Abdominal somites 1–5 bearing sub-median, intermediate, lateral, marginal carinae, somite 6 lacking marginal carina; sub-medians of somites 5–6, intermediate of somites 3–6, all laterals, marginals bearing posterior spine; somites 2, 5 with 1 pair each of dark squares on either side of sub-median carinae (Fig. 42C).

Telson bearing median carina; sub-median, intermediate, lateral carinae slender, apices fixed; marginal denticles including 3–4 sub-median, 7 intermediate, 1 lateral; post-anal carina medially interrupted (Fig. 42C, D). Uropodal protopod bearing 2 primary spines, inner spine longer, bearing lobe on outer margin; long slender spine

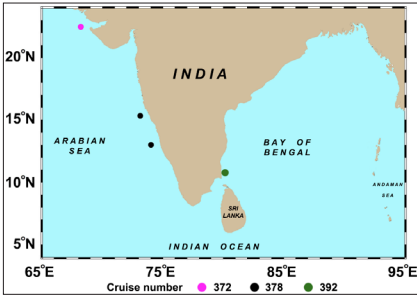


Fig. 43. Geographical locations of collection of *Quollastra gonypetes* (Kemp, 1911).

anterior to endopodal articulation, inner margin crenulate; exopod distal segment slightly shorter than proximal segment, articulating terminally;

proximal segment bearing 8 movable spines on outer margin (Fig. 42C, D).

### ***Geographical distribution and habitat***

Western Indian Ocean, India, Australia, Indonesia, Philippines, Vietnam to Japan (Ahyong & Kumar, 2018), on sandy mud substrates at depths of 13–110 m (Ahyong, 2001). The present specimens were collected from 72 m depth in the north-eastern Arabian Sea off Gujarat, 106 m off Goa, 110 m off Mangalore, and 56 m in the south-western Bay of Bengal off Tamil Nadu coast (Fig. 43).

## ***Squilloides leptosquilla* (Brooks, 1886) (Carinated deep-water mantis shrimp)**

Superfamily Squilloidea Latreille, 1802  
Family Squillidae Latreille, 1802  
Genus *Squilloides* Manning, 1968  
*Squilloides leptosquilla* (Brooks, 1886)  
(Figs. 44A–B, 45A–D, 46A–C, 47)

### ***Synonymy***

*Squilla leptosquilla* Brooks, 1886: 30–34, pl. 1 figs. 1–2 (type locality: Celebes Sea, Philippines); Kemp, 1913: 46; Jurich, 1904: 370–372, pl. 25(l) fig. 1; Manning, 1968b: 131 (list).

*Squilla leptosquilla* var. *dentata* Jurich, 1904: 372, pl. 25(l) fig. 2.

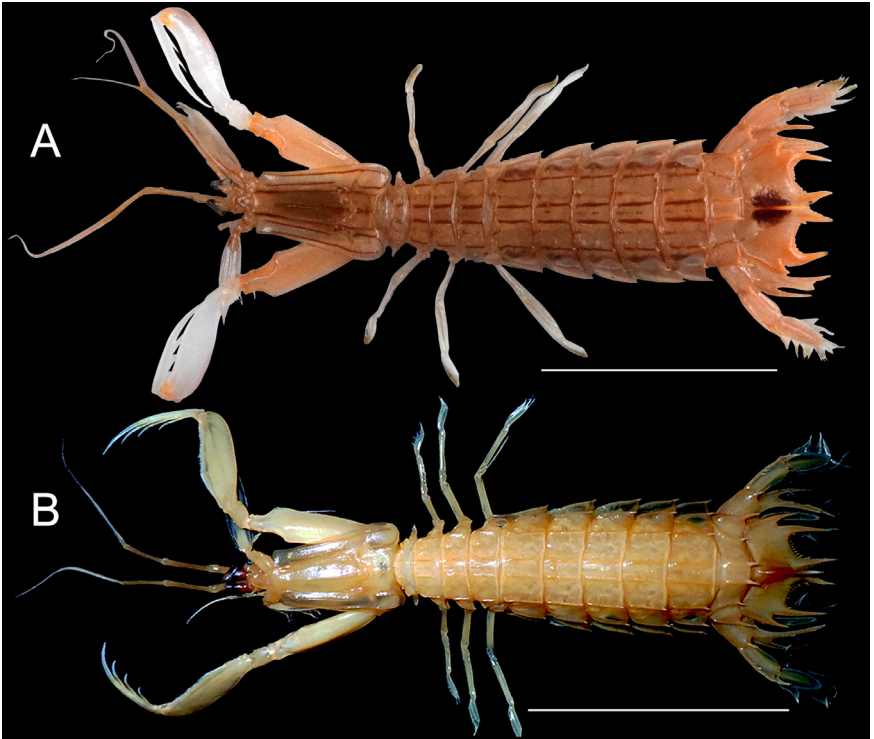
*Squilloides leptosquilla*: Manning, 1968b: figs. 5b, 6c, 8d, 9c; Moosa & Cleva, 1984: 80; Moosa, 1986: 410, pl. I, figs. D, E; Manning, 1991: 15; Manning, 1995: 26 (checklist); Ahyong, 2001: 310 (key), 310–312, Fig. 150A–K, 314 (checklist); Ahyong & Naiyane-tr, 2002: 307 (list); Dev Roy & Gokul,

2012: 91 (checklist); Ahyong & Kumar, 2018: 391, fig. 3C; Trivedi *et al.*, 2020: 230 (Table 1).

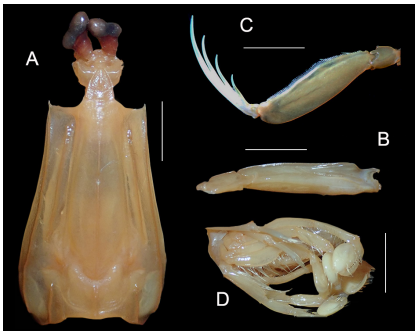
### ***Diagnosis (modified from Ahyong, 2001)***

Body depressed (Fig. 44A, B). Eye long, cornea bilobed. Ocular scales separate, rounded distally; anterior margin of ophthalmic somite rounded (Fig. 45A). Antennal protopod unarmed. Rostral plate triangular, longer than wide (Fig. 45A). Carapace bearing antero-lateral spine, postero-lateral corner rounded; dorsal surface bearing median, intermediate, lateral, marginal, reflected marginal carinae (Fig. 45A).

Raptorial claw ischio-meral articulation terminal (Fig. 45B); propodus opposable margin closely pectinate, bearing 3 movable spines proximally;



**Fig. 44.** *Squilloides leptosquilla* (Brooks, 1886) (south-eastern Arabian Sea): A) 127.0 mm TL (live colouration); B) 113.0 mm TL (preserved colouration). Scale: 50 mm.



**Fig. 45.** *Squilloides leptosquilla* (Brooks, 1886): A) Carapace, ocular and rostral plates dorsal; B) Raptorial claw ischio-meral articulation lateral; C) Raptorial claw dactylus and propodus lateral; D) Maxillipeds 3–4 propodi lateral. Scale: 10 mm.

dactylus slender, bearing 4 teeth (Fig. 45C). Maxillipeds 3–4 propodi ovate, lacking distal ribbing (Fig. 45D).

Thoracic sternites 5–8 bearing sub-median, intermediate carinae; sternite 5 bearing long straight lobe laterally, ventral process acuminate; sternites 6–7 bearing single lobe laterally (Fig. 46A). Abdominal somites 1–5 bearing sub-median, intermediate, lateral, marginal carinae, somite 6 lacking marginal carina; sub-medians of somite 6, intermediates of somites 2–6, laterals of 1–6, all marginals, bearing posterior spine (Fig. 46B).

Telson bearing sharp median carina; sub-median carina slender, intermediate, lateral carinae thick ta-



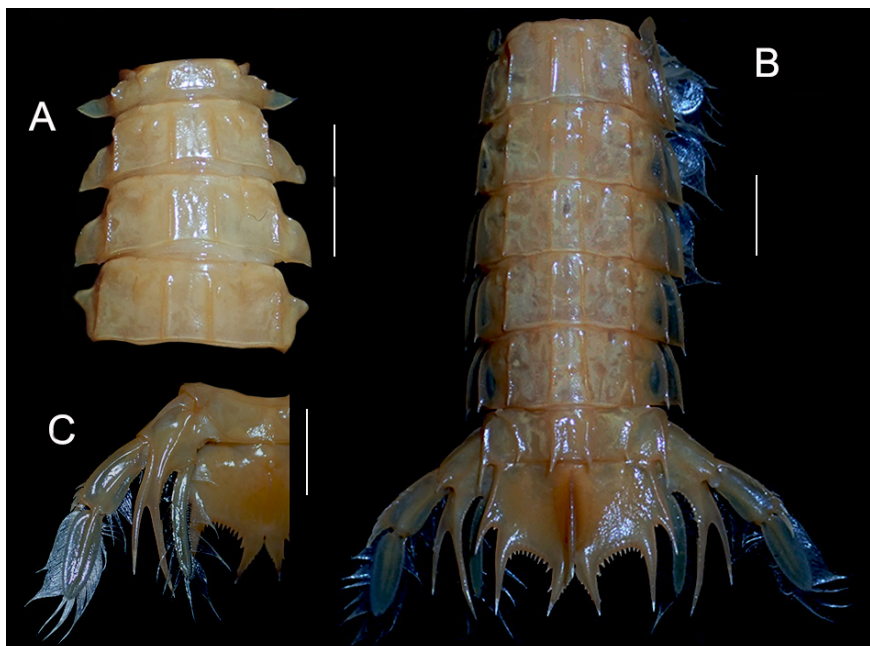


Fig. 46. *Squilloides leptosquilla* (Brooks, 1886): A) Thoracic sternites 5–8 dorsal; B) Abdomen, telson and uropods dorsal; C) Telson and uropods ventral. Scale: 10 mm.

pering, carinae apices fixed; marginal denticles including 13–14 sub-medians, 11–12 intermediate, 1 lateral; post-anal carina present (Fig. 46 B, C). Uropodal protopod bearing 2 primary spines, inner spine longer; slender spine anterior to endopodal articulation, inner margin crenulate; exopod distal segment shorter than proximal segment, articulating terminally; proximal segment bearing 8 movable spines on outer margin (Fig. 46B, C).

### **Geographical distribution and habitat**

Arabian Sea to Andaman Islands, Philippines, Indonesia, Australia, South China Sea, Taiwan, Japan and Korea (Ahyong, 2001) at depths of 170–754 m (Moosa, 1986). The pres-

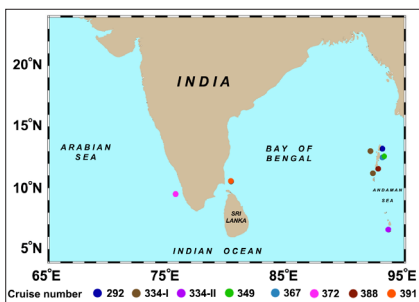


Fig. 47. Geographical locations of collection of *Squilloides leptosquilla* (Brooks, 1886).

ent specimens were collected from 327 m in the south-eastern Arabian Sea off Kerala coast, 173 and 238 m in the southwestern Bay of Bengal off Tamil Nadu coast, and 299–514 m in the Andaman Sea (Fig. 47).

## SUMMARY

The deep-water and coral reef-associated stomatopod fauna of India was, until recently, known to be represented by 72 species (Trivedi *et al.*, 2020). The present document based on the documentation of samples collected on-board the *FORV Sagar Sampada* provides systematic classification, detailed synonymy, morphological diagnosis and notes on geographical distribution and habitat (supplemented with photographic illustrations of diagnostic morphological characters and maps indicating sampling locations) of 11 species of mantis shrimps including 1 deep-water species, 3 shelf-water species and 7 coral-reef associated species. Among the species reported in this study, the deep-water mantis shrimp *Squilloides leptosquilla* was collected from the Arabian Sea, Bay of Bengal as well as the Andaman waters; the shelf-water species *Harpiosquilla harpax* and *Lenisquilla gilesi* only from the Arabian Sea; the shelf-water species *Quollastris gonypetes* from the Arabian Sea and Bay of Bengal. The reef-associated mantis shrimps namely *Gonodactyloopsis drepanophorus*, *Odontodactylus latirostris*, *Chorisquilla andamanica*, *Haptosquilla tuberosa* and *Pseudosquilla ciliata* were recorded only from the Andaman waters; *Busquilla plantei* and *Cloridina malaccensis* were recorded only from the southwestern Bay of Bengal. The highlights of this study are 2 new geographical records of *G. drepanophorus* and *C. malaccensis* for the Indian waters.

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NOTES



**A systematic identification guide to mantis shrimps  
containing detailed synonymies and morphological descriptions  
of 11 species illustrated with 33 colour plates and 11 maps**

