

Present work is a comprehensive up to date study on the most widely distributed penaeid prawn found in Indian water. Family Penaeidae comprises 20 genera and 79 species from Indian water and during the present study only 24 species are found to be most widely distributed throughout Indian coast line. These 24 species belongs to 9 genera under family Penaeidae. The genus Penaeus, Metapenaeus and Metapenaeopsis comprises the most commercially important species among the penaeid prawn found in Indian water. In the present book all the genus and species are diagnosed and a suitable key is provided for identification of each genus and species under the family Penaeoidea. Last of all a comprehensive list of reference has been provided for each citation in the text.

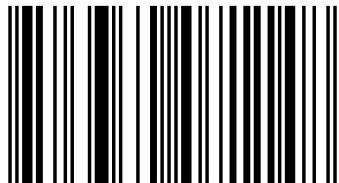


Angsuman Chanda



Dr. Angsuman Chanda, B. Sc (Gold Medallist), M. Sc (Gold Medallist), Ph. D., FISCA (awarded as fellow of International Science Congress Association), is an Assistant Professor of Zoology, Post Graduate Department of Zoology, Raja N. L. Khan Women's College (NAAC Accredited – 'A' Grade ;NR-98), affiliated under Vidyasagar University, Midnapur.

Systematics of Most Widely Distributed Penaeid Prawns of India



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Systematics of most widely distributed penaeid prawns of India



Dr. Angsuman Chanda, Asst. Professor, PG Dept. of Zoology, Raja N.

L. Khan Women's College, Midnapur, Paschim Medinipur, West

Bengal, INDIA. Mail ID: angsumanchanda@yahoo.in

2017

This book is dedicated

To my wife

Puspita

TABLE OF CONTENTS

	Page No
Introduction	1
Materials & methods	2
Systematic Account	4
1. Family <i>Penaeidae</i> Rafinesque – Schmaltz, 1815	4
a. <i>Helleropenaeopsis</i> Chanda, 2016	6
1. <i>Helleropenaeopsis sculptilis</i> (Heller, 1862)	7
b. <i>Kishinouyepenaeopsis</i> Chanda, 2016	8
2. <i>Kishinouyepenaeopsis cornuta</i> (Kishinouye, 1900)	9
c. <i>Metapenaeopsis</i> Bouvier, 1905	10
3. <i>Metapenaeopsis coniger</i> (Wood-Mason, 1891)	12
4. <i>Metapenaeopsis mogiensis</i> (Rathbun, 1902)	13
5. <i>Metapenaeopsis stridulans</i> Alcock, 1905	15
d. <i>Metapenaeus</i> Wood-Mason, 1891	16
6. <i>Metapenaeus affinis</i> (H. Milne Edwards, 1837)	19
7. <i>Metapenaeus brevicornis</i> (Milne Edwards, 1837)	20
8. <i>Metapenaeus dobsoni</i> (Miers, 1878)	22
9. <i>Metapenaeus ensis</i> (De Haan, 1850)	24
10. <i>Metapenaeus lysanasa</i> (De Man, 1888)	25
11. <i>Metapenaeus monoceros</i> (Fabricius, 1798)	27
12. <i>Metapenaeus moyebi</i> (Kishinouye, 1896)	29
e. <i>Parapenaeopsis</i> Alcock, 1901	30
13. <i>Parapenaeopsis stylifera stylifera</i> (Milne Edwards, 1837)	31
f. <i>Parapenaeus</i> Smith, 1885	33
14. <i>Parapenaeus investigatoris</i> Alcock and Anderson, 1899	34
g. <i>Penaeopsis</i> Bate, 1881	35
15. <i>Penaeopsis jerryi</i> Pérez Farfante, 1979	37
16. <i>Penaeopsis rectacuta</i> (Bate, 1881)	38
h. <i>Penaeus</i> Fabricius, 1798	39
17. <i>Penaeus canaliculatus</i> Olivier, 1811	41
18. <i>Penaeus indicus</i> H. Milne Edwards, 1837	43

19. <i>Penaeus japonicus</i> Bate, 1888	44
20. <i>Penaeus latisulcatus</i> Kishinouye, 1900	46
21. <i>Penaeus marginatus</i> Randall, 1840	47
22. <i>Penaeus monodon</i> Fabricius, 1798	48
23. <i>Penaeus semisulcatus</i> De Haan, 1844	50
i. <i>Trachysalambria</i> Burkenroad, 1934	51
24. <i>Trachysalambria curvirostris</i> (Stimpson, 1860)	53
Acknowledgements	54
Reference	54

Resumes

Author's previous study revealed that Indian water represent 79 species of penaeid prawns, out of which 24 species of penaeid prawns were found to be distributed all through Indian coast line including Andaman Sea. Present attempt is the systematic study of these widely distributed species into a comprehensive manner so that a researcher can get all these in a single content. These 24 species belongs to nine different genera under family Penaedae. Systematics, distribution including synonyms, taxonomic remarks and a comprehensive list of up to date reference are the main feature of the present dissertation.

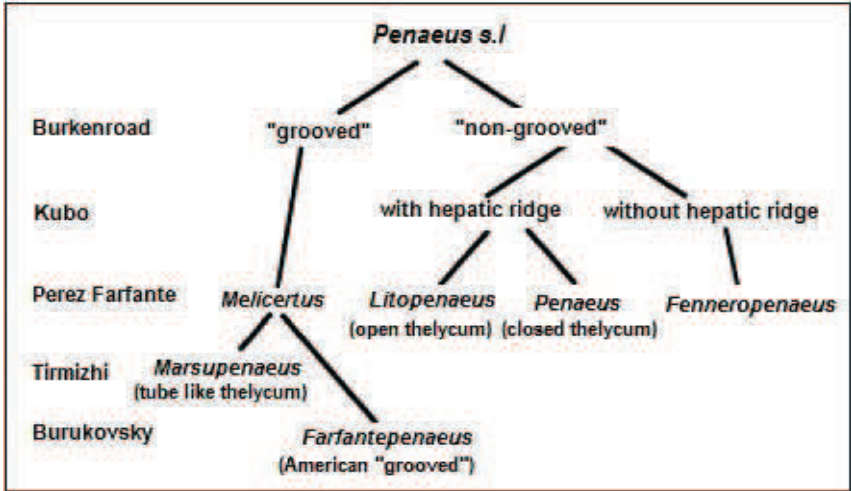
Systematics of most widely distributed penaeid prawns (Decapoda: Penaeidae) of India

Dr. Angsuman Chanda, Assistant Professor,
PG Department of Zoology, Raja N. L. Khan Women's College, Midnapore, Paschim
Medinipur, West Bengal, India. E-mail: angsumanchanda@yahoo.in

Introduction

Shrimps and Prawns of various kinds have certainly been a source of protein for human consumptions from very early times. Within historical times reference is made to prawn in ancient Chinese and Japanese literature (Pérez Farfante & Kensley, 1997). Usage of the term 'Prawn' and 'Shrimp' are somewhat confusing. In some western literature the term 'Shrimp' is applied for *Penaeoidea* and *Sergestoidea*, but in the east these are called 'Prawn'. Holthuis (1980) discussed the contradiction but did not arrive at any conclusion. In the Prawn Symposium of the Indo-Pacific Fisheries Council held at Tokyo in 1955 it was decided that the word 'Prawn' should be applied to the Penaeids, Pandalids and Palemonids while 'Shrimp' to the smaller species belonging to the other families (Kurian & Sebastian, 1993). As such in the present study the term 'Prawn' is used for all the species belonging to family Penaeidae. Among a variety of edible decapod crustaceans, prawns contribute largely to the fishery wealth of many nations. Exploitation of prawn resource from the seas around each country is playing increasingly significant role in furthering their national economy. In recent years, in spite of some ecological hazards, the demand for prawns and prawn products has increased so much that every country is making efforts to utilize hitherto unknown but usable stocks and expansion of prawn fisheries and industries near coast line is rightly being given the maximum encouragement in the development programme of each nation.

After the work of Burkenroad (1934) and Kubo (1949), the genus *Penaeus* has been revised in several times by Perez Farfanty (1959), Tirmizi (1971), Burukovsky (1972) and Perez Farfanty & Kensley (1997) and had classified into six established genera. The chronological history of the development of six genera has been given bellow.



Chronological history of the development of six genera (After Lavery et al., 2004)

Flegel (2007, 2008) strongly questioned the six genera classification of the genus *Penaeus* s.l. The taxonomic revision of the prawns formerly classified in *Penaeus* s.l. into six genera is still widely debated. Although these prawns can be easily separated into several groups morphologically, whether these subdivisions are truly monophyletic and warrant a generic rank continues to be hotly debated among taxonomists (Ma et al., 2011). While some taxonomists have accepted the revision, others are questioning the necessity of such a classification. Ma et al. (2011) refuted the six genera classification of *Penaeus* s.l. on the basis of examination of mitochondrial and nuclear genes and advocated the restoration of the old *Penaeus* genus (= *Penaeus* s.l.) as the classification scheme is in agreement with both morphological and the molecular data. Therefore, present study follows the old classification scheme and up to date the taxonomic status for the species has been undertaken

Materials and Methods

Present study is mainly based on the specimens collected by the author from different commercial fish landing centers throughout Indian coast line. In addition to this penaeid prawns preserved in the National Collection of the Zoological Survey of India, Kolkata, India; Central Marine Fishery Research Institute, Cochin, Kerala and its regional stations at Mandapam, Tamil Nadu and National Institute of Oceanography have also been studied.

The materials preserved in rectified spirit (90%) and body parts of taxonomic importance have been dissected and studied under a stereoscopic binocular microscope. All the type species have been illustrated with a lateral view of whole specimen, petasma and thelycum. The illustrations have been drawn with the aid of line drawing and by camera Lucida. The detailed synonymies have been furnished to the genera & species and also their diagnosis, distribution, taxonomic remarks have been furnished. Key to the genera and species has been provided. The genera and species have been arranged alphabetically for convenience. In addition an attempt has been made to consult and cite an up to date literature and included in the Reference Section. For all citations of taxon author's name and year of publication has been given.

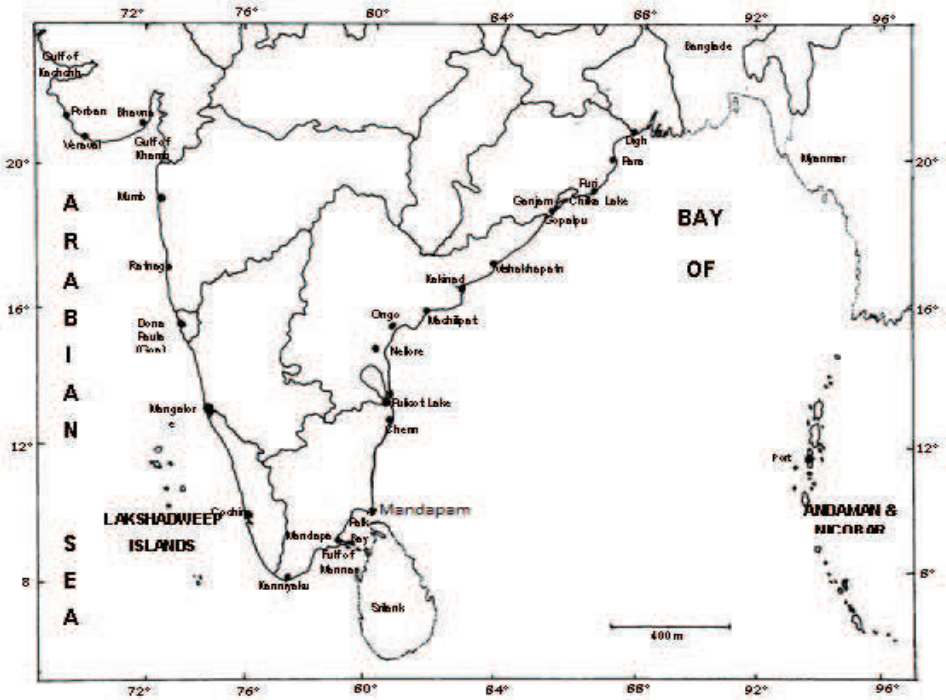


Fig. 1 : Study area & collection spots along Indian Coast.

Systematic accounts

Penaeoid prawn belongs to the largest phylum in the Animal Kingdom, the Arthropoda, characterized by jointed appendages and an exoskeleton or cuticle which is periodically molted. There are thousands of terrestrial species in this phylum, and large, predominately aquatic subphylum, the Crustacea. The more highly evolved crustaceans (Class Malacostraca) include the penaeid prawns (Order Decapoda). The class Malacostraca contains about three-fourths of the known species and includes crayfish, lobsters, shrimps and crabs (Bailey-Brock & Moss, 1992). Prawns are included in the decapod suborder Dendrobranchiata, which are distinguished from other prawn-like Crustacea (the Caridea) and the remainder of the Decapoda by their gill structure and by not carrying the developing eggs on the pleopods of the abdomen. Decapods can be distinguished from other higher crustaceans by examining differences in the thoracic appendages. The first three pairs of thoracic appendages, the maxillipeds, are modified for feeding and the remaining five pairs are the walking legs, hence the name Decapoda or “ten-legs”. Penaeid appendages typically consist of two branches (biramous), the exopodite and endopodite. These structures are variously developed for feeding, locomotion or burrowing; or they bear feathery gills (modified epipodites) contained beneath the lateral side of carapace, or sensory structures on the antennae and antennules (Bailey-Brock & Moss, 1992). To study the different genera and species of the prawns, one must have sufficient knowledge on fundamentals of morphology, based on these characters, species are identified. Family *Penaeidae* comprises 17 genera and 79 species from Indian water (Chanda, 2016) and during the present study only 24 species among the penaeid prawn found in Indian water are distributed throughout Indian coast line.

A brief account of its systematic position is given below:

- Superclass : *Crustacea* Pennant, 1777.
- Class : *Malacostraca* Latreille, 1806.
- Order : *Decapoda* Latreille, 1803.
- Suborder : *Dendrobranchiata* Bate, 1888.
- Super family : *Penaeioidea* Rafinesque-Schmaltz, 1815.
- Family : *Penaeidae* Rafinesque – Schmaltz, 1815.

Family: *Penaeidae* Rafinesque – Schmaltz, 1815.

Rafinesque-Schmaltz (1815) erected *Penedia* as a subfamily of *Plyonuria*. Subsequent history of the family name has been given in detail by Perez Farfante and Kensley (1997).

Alcock (1901) reported this family from Indian water for the first time. Some important contributions in the Indian context are listed below.

1888 *Penaeidae* Bate, Rep. scient. Results Voy. Challenger, 24:220.
1901 *Penaeidae* Alcock, Descr. Cat. Indian Deep-Sea Crust., :11.
1969 *Penaeidae* George, Bull. Cent. Mar. Fish. Res. Inst., 14: 5-48; 1979. In “Contribution to Marine Science”, dedicated to Dr. C. V. Kurian 21-59.
1978 *Penaeidae* Pérez Farfante, FAO Sp. Indent. Sh., 6:1; 1988, NOAA Tech. Rep. NMFS, 64: iii, 8; Perez Farfante & Kensley, 1997, Mem. Mus. nat. Hist. nat. no. 175, 233 pp.
1997 *Penaeidae* Pathan & Jalihal, J. Bombay Nat. Hist. Soc., 94(3): 496-514.

Diagnosis of the family:

Body compressed, well developed rostrum, extending to or beyond the distal margin of first antennular segment [except Genus *Miyadiella* Kubo, 1949 and *Trachypenaeopsis* Burkenroad, 1934]; armed with dorsal and in some genera with ventral teeth; carapace having no post orbital spine, antennal and hepatic spine usually present; cervical sulcus never extending beyond gastric region; posterior three or four abdominal somites with dorsal carina; telson sharply pointed, with or without lateral spines.

Eye with optic calathus lacking median tubercle; basis of eye stalk with moderately developed distomedian scale; ocular plate lacking styliform projection; antennule with prominent foliaceous prosartema, flagella of about almost equal length; exopod present on second and third maxilliped and first four pereopod; third, fourth and fifth pleopods biramous; pleurobranchia on somite IX to XII and sometimes on XIII and XIV; rudimentary arthrobranchia usually present on somite VII two arthrobranchiae on VIII to XII and posterodorsal one on XIII; podobranchia on second maxilliped only; epipod present on first and second maxilliped, lacking on fourth and fifth pereopods; petasma semi-open or semi-closed; second pair of pleopod of male bearing appendix masculina; thelycum open or close. During the present study 24 species belonging to nine different genera under family *Penaeidae* has been dealt among the penaeid prawn found in Indian water which are distributed throughout Indian coast line.

Key to the genera found in India

- 1. Rostrum armed with dorsal and ventral teeth; *Penaeus* Fabricius, 1798
- Rostrum armed with dorsal teeth only; 2
- 2. Longitudinal suture present; transverse suture present3

- Longitudinal suture absent; transverse suture absent 5
3. Body thickset, densely pubescent, integument thick; hepatic carina absent
..... *Trachysalambria* Burkenroad, 1934
- Body smooth or very minutely pubescent, integument thin; hepatic carina present
..... 4
4. Postocular sulcus prominent; parapenaeid spine absent..... 7
- Postocular sulcus absent; parapenaeid spine present*Parapenaeus* Smith, 1885.
5. Pterygostomian spine absent; postocular sulcus prominent, exopod absent on fifth
pereopod*Metapenaeus* Wood-Mason, 1891.
- Pterygostomian spine present; postocular sulcus absent; exopod present on all
maxillipeds and pereopods 6
6. Carapace with a small orbital spine; sixth abdominal somite without cicatrix; first and
second pereopod and third maxilliped with basal spine; petasma asymmetrical
..... *Metapenaepsis* Bouvier, 1905.
- Carapace without orbital spine; sixth abdominal somite bearing long, interrupted
cicatrix; only first pereopod with basal spine; petasma
symmetrical..... *Penaepsis* Bate, 1881.
7. Longitudinal suture short, not reaching cardiac region; a median tuft of long hairs
present behind thelycum.....*Kishinouyepenaepsis* Chanda,2016.
- Longitudinal suture long, extending upto or beyond cardiac region; a median tuft of
hairs absent behind thelycum..... 8
8. Longitudinal suture extending upto cardiac region; orbital spine prominent
.....*Parapenaepsis* Alcock, 1901.
- Longitudinal suture extending beyond cardiac region; orbital spine reduced like an
angle.....*Helleropenaepsis* Chanda,2016.

Genus *Helleropenaepsis* Chanda,2016.

- A. Chanda (2016) created the genus *Helleropenaepsis* by splitting *Parapenaepsis* Alcock(1901).

Diagnosis of the genus:

This new genus can be distinguished from the other congeners by the following characters: distolateral projections shorter than distomedian projections, directed anterolaterally; anterior plate of thelycum semicircular with a posteromedian cleft, posterior plate trapezoidal. This genus includes four species viz. *Helleropenaepsis sculptilis* (Heller,

1962); *Helleropenaeopsis hardwickii* (Miers, 1878); *Helleropenaeopsis indica* (Muthu, 1972) and *Helleropenaeopsis cultirostris* (Alcock, 1906), found in the ocean around Indian subcontinent.

Type Species: By present designation *Penaeus sculptilis* Heller, 1862a, Verh. Zool. Bot. Ges. Wien., 12 : 519-528.

Type Locality: Java Sea, Indonesia.

***Helleropenaeopsis sculptilis* (Heller, 1862)**

H. sculptilis was originally described by Heller (1862) as *Penaeus sculptilis* from Java Sea, Indonesia. It was first recorded from India by Alcock (1906) from both coasts. A brief history of the species with special reference to Indian contributions has been given below.

1862 *Penaeus sculptilis* Heller, Verh. Zool. Bot. Ges. Wien., 12: 519-528; 1865, Zool., 2(3): 1-280.

1903 *Parapenaepsis sculptilis* Nobili, Boll. Mus. Zool. Anat. Comp., 18(452) : 5P; Balss, 1914, Abh. Bayer. Akad. Wiss. Suppl., 2(10): 1-101; Menon, 1956, Proc. Indo-Pacif. Fish. Council., 6(3): 345-347; George, 1969, Bull. Cent. Mar. Fish. Res. Inst. No. 14 : 5-48; 1972, J.mar. Sc., 1(1): 89-92; 1979, Contribution to Marine Sciences, dedicated to Dr. C.V. Kurian, 21-59; Muthu, 1971, Indian J. Fish., 15: 145-154; George and Suseelan, 1982, Proc. Symp. Coastal Aquaculture, 1 : 273-284.

1906 *Parapeneopsis sculptilis* Alcock, Cat. Indian Dec. Crust. Part-III. Mac. Fas. I: 1-55.

Type Species: *Penaeus sculptilis* Haller, 1862a, Verh. Zool. Bot. Ges. Wien., 12: 519-528.

Type Locality: Java Sea, Indonesia.

Material Examined:

1 female (120 mm.), ZSI. Reg. No. C4903/2, Veraval Sea, Gujarat, 16.12.1992, H.C. Ghosh and Party; 1 male (71 mm.), ZSI. Reg. No. C4850/2, Mungergudi, Machelipattnam, Andhra Pradesh, 5.9.1995. A. Chanda; 4 males (50-110 mm.) and 2 females (79-92 mm.), ZSI. Reg. No. C4858/2, Ramachandrapuram, Andhra Pradesh, 22.3.1997, T. Roy and Party; 2 females (90 mm. both), ZSI. Reg. No. C4779/2, Freserganj, 24 Parganas (South), West Bengal, 14.11.1990, N.C. Nandi; 2 females (89-92 mm.), ZSI. Reg. No. C4940/2, Mahad beach, Maharashtra, 31.8.1996, A. Chanda.

Diagnosis of the species:

Body slender; integument thin, minutely setose rostrum sigmoidal, armed with 7-9+1 dorsal teeth, more than half distal portion toothless, in female exceeding antennular peduncle; epigastric tooth conspicuously separated from penultimate tooth; in large male rostrum down curving, toothless portion absent, not exceeding third segment of antennular peduncle;

postrostral carina reaching posterior border of carapace; feebly sulcate or flat, adrostral carina and sulcus not exceeding epigastric tooth posteriorly; orbital spine absent, hepatic and antennal spine prominent, hepatic antennal carina extending half distance between hepatic and antennal spine, cervical sulcus indistinguishable, hepatic sulcus prominent, carina distinguishable at anterior portion and slopes anteroventrally towards pterygostomian angle but not reaching it; longitudinal suture long reaching behind gastric region, transverse suture prominent, placed at the level of third pereopod; median carina on second and third abdominal terga low, prominent from fourth to sixth; antennular flagella subequal, upper one slightly longer than lower, shorter than carapace; epipod and basial spines present on first and second pereopods; basis of third pereopod and telson unarmed; distomedian projection of median lobe of petasma long, rabbit ear-shaped, deeply concave ventrally, diverted anterolaterally; distolateral projection of lateral lobe short, directed laterally with a short tapering tip; anterior plate of thelycum distally rounded, broadly articulating with posterior plate, anterior plate roughly triangular with rounded corners, posterior plate broad, with a median tubercle bearing a tuft of long hairs.

Distribution:

India: Entire East coast & West coast of India and Andaman Islands.

Elsewhere: Pakistan; Myanmar; Malaysia; Indonesia; South China Sea; Hong Kong; Philippines; Taiwan; New Guinea; North Australia.

Genus *Kishinouyepenaepsis* Chanda, 2016.

A. Chanda (2016) created the genus *Kishinouyepenaepsis* by splitting *Parapenaepsis* Alcock (1901).

Diagnosis of the genus:

This new genus can be distinguished from other congeners by the following characters: distolateral projections of petasma longer than distomedian projections, slender, horn-like, diverging proximally, curving inward distally; anterior plate of thelycum rectangular with rounded corners, fused with posterior plate by a posteromedian broad process, posterior plate with a pair of lateral depressed region; a median tuft of long hairs presents behind thelycum. This genus includes two species viz. *Kishinouyepenaepsis cornuta* (Kishinouye, 1900) and *Kishinouyepenaepsis maxillipedo* (Alcock, 1906), found in the ocean around Indian subcontinent.

Type Species: *Penaeus cornutus* Kishinouye, 1900, J. Fish. Bureau Tokyo, 8: 1-29.

Type Locality: Ariake-Wan, Japan.

***Kishinouyepenaepsis cornuta* (Kishinouye, 1900)**

K. cornuta was originally described by Kishinouye (1900) from Ariake-Wan, Japan as *Penaeus cornutus*. It was first recorded by Muthu (1972a) from Andhra Pradesh coast, East coast of India. A brief history of the species with special reference to Indian contributions has been given below.

1900 *Penaeus cornutus* Kishinouye, J. Fish. Bureau Tokyo, 8: 1-29.

1911 *Parapenaepsis cornuta* De Man, Siboga Exped. Monogr., 29a: 1-131; De Bruin, 1965, Zool. Meded., 41 (A) : 95; Muthu, 1971, Indian J. Fish., 15 : 145-154; Silas and Muthu, 1976, J. mar. biol. Ass. India, 18 (1): 78-90; George, 1979, Cont. Mar. Sci. dedicated to Dr. C.V. Kurian, 21-59; 1980, J. Bombay Nat. Hist. Soc., 76: 297-304.

Type Species: *Penaeus cornutus* Kishinouye, 1900, J. Fish. Bureau Tokyo, 8 : 1-29.

Type Locality: Ariake-Wan, Japan.

Material Examined:

6 males (50-57 mm.), ZSI. Reg. No. C4843/2, Muthukuru F.L.C., Nellore Andhra Pradesh, 1.9.1995, A. Chanda, 1 male (72 mm.), ZSI. Reg. No. C4854/2, Lowsom's Bay Visakhapatnam, Andhra Pradesh, 26.3.1997. T. Roy & Party.

Diagnosis of the species:

Body slender and setose; rostrum more or less straight, tip slightly upward, armed with 7-8+1 dorsal teeth located through entire dorsal margin except a short distal toothless portion, not extending beyond third antennular segment of peduncle; epigastric tooth conspicuously separated from penultimate tooth; adrostral carina and sulcus ending between epigastric and penultimate tooth, postrostral carina extending upto the posterior border of carapace, carapace with a sharp minute orbital spine; hepatic and antennal spine prominent; cervical carina and sulcus not distinct; hepatic sulcus long starting posterior to hepatic spine and gradually slopping anteroventrally towards pterygostomial angle, ending before pterygostomial angle, a carina accompanied at anterior half of the hepatic sulcus; longitudinal suture short not reaching cardiac region; transverse suture also short and prominent, located on branchial region at the level of third pereopod; antennular flagella equal, shorter than carapace; dorsal carination on abdomen prominent from fourth terga ending at midposterior margin of sixth somite with a sharp spine; epipod and basal spine present on first and second pereopods, basis of third pereopod without spine; telson armed with two to four pairs of very short distolateral fixed spine; distomedian projection of median lobe of petasma very short; distolateral projection of lateral lobe horn-like, diverging

proximally, curving inward distally, with a small dorsal spine like process; anterior plate of thelycum oblong, concave ventrally with scattered median hairs, fused posteromedially with posterior plate, posterior plate with a pair of lateral depression.

Remarks:

Present observation extends the distribution of the species to the north of Chennai. George (1969) collected the species from Chennai, East coast of India. Present observation is the first record of the species from Andhra Pradesh.

K. cornuta is quite similar to the *K. maxillipedo* in general structure of their petasma and thelycum but former can be separated from later by comparatively slender body, a dorsal spine like process present on distal horny projection of lateral lobe of petasma, posterior process of anterior plate of thelycum fused with posterior plate by overlapping with two lateral ridge, a close tuft of hairs behind thelycum. Therefore, these are two distinct species.

Distribution:

India: Goa, Maharashtra, Kerala, West coast and Chennai; Andhra Pradesh East coast and also from Andaman Islands.

Elsewhere: Sri Lanka; Singapore; Malaysia; Myanmar; Indonesia; South China sea; Philippines; Hong Kong; Taiwan; Japan; New Guinea; Australia.

Genus *Metapenaeopsis* Bouvier, 1905

Genus *Metapenaeopsis* was created by Bouvier (1905) with *M. pubescens* as type. Burkenroad (1934) redefined the genus and relegated this genus as a subgenus of *Penaeopsis* Bate, 1881, on the basis of the shape of petasma. Kubo (1949), however, re-elevated it to the generic status. *Metapenaeopsis* has been placed on the official list of Generic Names in Zoology, International Commission of Zoological Nomenclature, 1969, Opinion 864, Name No. 1819, Bull. Zool. Nom., 25 (4/5): 139. Wood-Mason (1891) was the first to record this genus from Indian water as *Metapenaeus*. A chronological history of the genus with special reference to Indian contributions has been given below.

1891 *Metapenaeus* Wood-Mason, Ann. Mag. Nat. Hist., 8(6): 271.

1905a *Metapenaeopsis* Bouvier, C.r.hebd. Séanc. Acad. Sci., Paris, 140: 381; Nataraj, 1942, Curr. Sc., 11(12): 468; Kunju, 1960, J. mar. biol. Ass. India, 2(1): 82-84; George, 1967, Proc Symp. Crustacea. Mar. biol. Ass. India, Pt. I: 337-346.

1906 *Metapeneus* Alcock, Cat. Indian Dec. Crust., 3(1): 16.

1954 *Penaeopsis* Kurian, Bull. Cent. Res. Univ. Travancore, Ser. C., Nat. Sci., 3 (1): 69-91.

Type Species: *Metapenaeopsis pubescens* Bouvier. 1905, Comptes Rendus de L'Academie des Sciences, Paris. 140: 980-988.

Type Locality: Cape Verde Islands.

Diagnosis of the Genus:

Body pubescent; rostrum with dorsal teeth only, variable in length; carapace without suture; hepatic, cervical and orbitoantennal sulci indistinct, post ocular sulcus absent; antennal, hepatic and pterygostomial spine well developed; orbital spine very short; mid-dorsal carina on abdomen well developed, variable in length; antennule with parapenaeid spine on first segment of antennular peduncle at distoventral half; antennular flagella variable in length; basal spine present on third maxilliped and on first and second pereopod, absent on third; exopod present on all maxilliped and pereopod; telson with a pair of well developed sub-apical fixed spine, variable number of movable lateral spine present anterior to fixed pair; petasma asymmetrical, divided into proximal and distal complex half; distal half with several projections and proximal half with dorsolateral lobules produced proximally into spurlike projections; thelycum consisting of well developed median plate on sternite-XIII and variable structures on sternite XIV.

Remarks:

George (1979) listed 9 species under *Metapenaeopsis* from Indian coastal water. Subsequently Fischer & Bianchi (1983), Muthu, M.S. 1971 and Chanda (2014) added another three species viz., *M. toloensis* Hall, 1962, *M. Novaeguineae* (Haswell, 1879) and *M. palmensis* (Haswell, 1879) respectively to this list. As such at present there are 12 species under this genus. Out of these three species namely *M. stridulans* (Alcock, 1905), *M. coniger* (Wood-Mason, 1891) and *M. mogiensis* (Rathbun, 1902) are widely distributed in Indian water. A detailed taxonomic account of the species found in India along with the key for identification is given below.

Key to the species found in India

- 1. Stridulating organ present on posterior branchiostegite of carapace *M. stridulans* (Alcock, 1905)

- Stridulating organ absent on posterior branchiostegite of carapace2
2. Parapenaeid spine on ventral surface of first antennular segment small or vestigial *M. mogiensis* (Rathbun, 1902)
- Parapenaeid spine on ventral surface of first antennular segment prominent.. *M. coniger* (Wood-Mason, 1891).

***Metapenaeopsis coniger* (Wood-Mason, 1891)**

M. coniger was originally described as *Metapenaeus coniger* from Ganjam, Orissa coast, India by Wood-Mason (1891). A brief history of the species with special reference to Indian contributions has been given below.

- 1891 *Metapenaeus coniger* Wood-Mason, Ann. Mag. nat. Hist. : 269-286.
- 1906 *Metapeneus coniger* Alcock, Cat. Indian Dec. Crust. Part-III, Macr. Fas. I. : 1-55.
- 1938 *Penaeopsis (Metapenaeopsis) coniger* Ramadan, John Murray Exped. Sci. Rep., 5: 35-76.
- 1957 *Metapenaeopsis coniger* Dall. Aust. J. Mar. Freshw. Res., 8: 136-231; George, 1979, Cont. Mar. Sci., dedicated to Dr. C.V. Kurian: 21-59.

Type Species: *Metapenaeus coniger* Wood-Mason, 1891, Ann. Mag. Nat. Hist.,: 269-286.

Type Locality: Ganjam, Orissa, east coast of India.

Material Examined:

4 males (64-72 mm) and 10 females (56-79 mm), ZSI. Reg. No. C4855/2, Lowsom's Bay, Visakhapatnam, Andhra Pradesh. 26.3.1997, T. Roy and Party; 1 male (89 mm), ZSI. Reg. No. 4174/9 (Type), Ganjam, Orissa coast, 4.2.1889, 1 female (87 mm), ZSI. Reg. No. 4296/7, Andaman, Bay of Bengal, 31.1.1894, Wood-Mason.

Diagnosis of the species:

Body pubescent; rostrum more or less straight, reaching to the tip of the antennular peduncle, armed with 6-8+1 dorsal teeth; epigastric tooth conspicuously separated from

penultimate tooth; postrostral carina not reaching posterior border of carapace; penultimate tooth anterior to the orbital margin of carapace; orbital spine vestigial, antennal and hepatic spine prominent but devoid of posterior carina; hepatic and cervical sulcus indistinguishable; branchiostegal spine prominent; stridulating organ absent; dorsal carination on second segment indistinct sharp carination found from third to sixth segment; distinct subcarination found from fourth segment to sixth segment; parapenaeid spine very small, antennular flagella unequal, dorsal one longer than ventral; left distoventral projection larger than right, bearing two small apical processes; right distoventral projection narrow and carrying 4 small apical processes; distoventral flap moderate; right distodorsal lobule fused with outer and inner intermediate lobule; left distodorsal lobule elongated; distomedian lobule proximally narrow with semicircular apical plate like structure; two very short processes found on the sternite XI and on XII with an anterior, a posterior pair of low bosses, latter pair slightly larger and bound posteriorly by conspicuous lateral extensions of coxae of the third pereopods; anterior thelycal plate on sternite XIII 'T' shaped, horizontal limb of 'T' narrow, vertically placed plate with convex anterior surface; vertical limb narrow, short, with short setae at its posterior margin; a deep transverse sulcus with posterior extension on the vertical limb present on this plate, edges of this sulcus setose; posterior plate on sternite XIV broader than long concave with anterolateral margin slightly raised; minute setae present on concave surface of the plate.

Distribution:

Indian: Orissa to Andhra Pradesh, east coast, Cochin, south-west coast, Andaman Islands.

Elsewhere: Gulf of Aden; Gulf of Oman; Japan.

***Metapenaepsis mogiensis* (Rathbun, 1902)**

M. mogiensis was originally described by Rathbun (1902) as *Parapenaeus mogiensis* from Japan. Alcock (1906) recorded the species from India for the first time as *Metapenaepsis mogiensis*. A brief history of the species with special reference to Indian contributions has been given below.

1902 *Parapenaeus mogiensis* Rathbun, Proc. U.S. Nat. Mus. 26: 23-55.

- 1906 *Metapenus mogiensis* Alcock, Cat. Indian. Dec. Crust. Part-III. Mac. Fas. I: 1-55.
- 1942 *Metapenaeopsis mogiensis* Nataraj, Curr. Sci., 11(12): 468-469; Muthu, 1971. Indian J. Fish., 15: 145-154; George, 1976, J. mar. biol. Ass. India, 18(1): 78-90; 1979, Cont. Mar. Sci., dedicated to Dr. C.V. Kurian, 21-59.

Type Species: *Parapenaeus mogiensis* Rathbun, 1902, Proc. U.S. Nat. Mus., 26: 23-55.

Type Locality: Japan sea.

Material Examined:

2 males (52-56 mm) and 1 female (56 mm), ZSI. Reg. No. C4770/2, Chilagalapudi, Kakinada, Andhra Pradesh, 11.9.1995, A. Chanda; 1 male (40 mm) and 1 female (42 mm), ZSI. Reg. No. C4798/2, Pulicot Lake, Andhra Pradesh, 26.8.1995, A. Chanda.

Diagnosis of the Species:

Body pubescent; rostrum short extending upto second segment of antennular peduncle, slightly uptilted, armed with 6+1 dorsal teeth; epigastric tooth conspicuously separated from penultimate tooth; penultimate tooth situated at the level of orbital margin of carapace; carapace with four spine; orbital spine and pterygostomian spine very small; antennal and hepatic spine strong; cervical sulcus short, oblique; hepatic sulcus long, posteriorly horizontal, extend upto cardiac region, anterior portion descend vertically but not reaching ventral margin of carapace; stridulating organ absent; third abdominal somite with a sulcus on its dorsal carina; parapenaeid spine on ventral side of first antennular segment vestigial; left distoventral projection of petasma longer than right bearing 4-5 short processes distally; terminal filaments present in the left lobe of petasma; distal plate of fused intermediate lobe pointed, distomedian lobule broad distally, shorter than distoventral flap; in female sternite XI with a pair of long spine, a pair of blunt tooth present on sternite XII; apex of anterior plate of thelycum on sternite XIII pointed, laterally rounded; a pair of spine in excavation between the fourth pair of pereopod on sternite XIII small and pointed at tip; anterior border of sternite XIV bears four protuberances, median two are incurved and enclose the spines situated on posterior part of sternite XIII; coxal plates on fourth pereopod small and rounded.

Distribution:

India: Andhra Pradesh East coast; Cochin, West coast and Andaman sea.

Elsewhere: Natal, South Africa; Djibouti, East Africa; Red Sea; Gulf of Aden; Madagascar, Seychelles, Persian Gulf; Sri Lanka; South China Sea, Indonesia.

***Metapenaeopsis stridulans* Alcock, 1905**

Original description of *M. stridulans* was given by Alcock (1905) as *Metapenus stridulans* from Orissa coast. A brief history of the species with special reference to Indian contributions has been given below.

1905 *Metapenus stridulans* Alcock, Ann. Mag. nat. Hist., 16(7): 508-532; 1906, Cat. Indian. Dec. Crust. Part-III Mac. Fas. I : 1-55.

1942 *Metapenaeopsis stridulans* Nataraj. Curr. Sci. 11(2): 468-469; George, 1976, J. mar. biol. Ass. India, 18(1): 78-90; 1979, Cont. Mar. Sci., dedicated to Dr. C.V. Kurian, 21-59.

Type Species: *Metapenaeus stridulans* Alcock, 1905, Ann. Mag. nat. Hist., 16(7): 508-532.

Type Locality: Off Ganjam, Orissa Coast, India.

Material Examined:

1 male (62 mm.) and 1 female (66 mm.), ZSI. Reg. No. C4838/2, Lowsom's Bay, Visakhapatnam, Andhra Pradesh, 14.9.1995, A. Chanda; 1 male (71 mm.) and 2 females (71-72 mm.), ZSI. Reg. No. C4840/2, Muthukuru F.L.C., Nellore, Andhra Pradesh, 1.9.1995, A. Chanda; 6 males (52-61 mm.) and 4 females(51-66 mm.), ZSI. Reg. No. C4939/2, Dwarka F.L.C., Gujarat, 14.3.1994, P.K. Moorthy.

Diagnosis of the species:

Body densely pubescent; rostrum low, straight or slightly uptilted, reaching tip of third segment of antennular peduncle, armed with 7+1 dorsal teeth; epigastric tooth conspicuously separated from penultimate tooth; penultimate tooth anterior to the level of orbital margin of carapace; stridulating organ on posterior branchiostegal region of carapace consisting of 5 to 7, strong ridges in a wide straight band; carapace with hepatic, antennal and pterygostomial spines; mid-dorsal carina on third abdominal somite with a broad sulcus; antennular flagella short and equal in length; petasma asymmetrical, right distoventral

projection shorter than left, bearing a few small apical processes, left distoventral projection with 5 to 12 large apical processes; dorsal intermediate projection broadly quadrangular, longer than right dorsal projection; anterior plate on sternite XIII of thelycum subquadrate with rounded corners, slightly broader than long; posterior thelycal plate on sternite XIV broadly trapezoidal, much wider than long, with a shallow median sulcus situated transversely; coxal plate of pereopod fourth smaller than anterior thelycal plate.

Remarks:

During present study, distribution of the species extends upto Gujarat, West coast of India.

Distribution:

India: Orissa, Andhra Pradesh, East coast of India; Gujarat, Maharashtra and Travancore, West coast of India and Andaman sea.

Elsewhere: Gulf of Aden; Persian Gulf; Gulf of Oman; Arabian sea; Maldives Island; Sri Lanka; Malaysia; Singapore; Thailand; Vietnam; South China Sea; Philippines; Indonesia; Chesterfield Islands; New Caledonia.

Genus *Metapenaeus* Wood-Mason 1891

The genus *Metapenaeus* was created by Wood-Mason (1891) with *Penaeus affinis* Milne Edwards, 1837 as type from Kerala coast, West coast of India. Genus *Mangalura* was created by Miers (1878) with *Mangalura dobsoni* as type from Mangalore coast, West Coast of India. Nobili (1903) transferred the species to *Metapenaeus* Wood-Mason (1891). *Metapenaeus* has been placed on the official list of Generic Names in Zoology, International Commission on Zoological Nomenclature, 1969, Opinion 864, Name No. 1829, Bull. Zool. Nom., 25(4/5): 140. "Ruled under the plenary powers to be given precedence over *Mangalura* Miers, 1878". A brief history of the genus with special reference to Indian contributions has been given below.

1878 *Penaeus* Miers, Proc. Zool. Soc. London: 301.

1878 *Mangalura* Miers, Proc. Zool. Soc. London: 303;

1891 *Metapenaeus* Wood-Mason, Ann. Mag. nat. Hist., 8(6): 271; George, 1969a, Bull. Cent. Mar. Fish. Res. Inst. No. 14: 5-48; 1969b, Bull. Cont. Mar. Fish. Res. Inst., No.

14: 77-126; 1970, FAO Fish. Rep., (57)4: 1335-1357; 1972, Indian J. Mar. Sci., 1: 89-92; 1980, J. Bombay Nat. Hist. Soc., 76: 297-304; George and Suseclan, 1982, Proc. Symp. Coastal Aquaculture, 1: 273-284; Silas and Muthu, 1974, J. mar. biol. Ass. India, 6(2): 645-648; Paulinose and Vengayil, 1987, J. Indian Soc. Coastal Agric. Res., 5(2): 431-436; Dall et al., 1990, Adv. Mar. Biol., 27 : 79.

1901 *Peneus (Metapeneus)* Alcock, Descr. Cat. Indian deep-sea Crust., : 14.

1905 *Metapeneus* Alcock, Ann. Mag. nat. Hist., 16(7): 516; 1906, Cat. Indian Dec. Crust., 3(1): 16.

Type Species: *Penaeus affinis* Milne Edwards, 1837, Hist. Nat. Crust., 2: 416.

Type Locality: Kerala Coast, Southwest Coast of India.

Diagnosis of the Genus: Body pubescent or glabrous; rostrum dorsally toothed; carapace with blunt orbital spine, antennal and hepatic spines prominent, pterygostomial spine absent; gastroorbital carina absent; postocular sulcus deep; orbitoantennal, cervical and hepatic sulcus prominent, accompanied by ventral carina, hepatic sulcus anterior to hepatic spine, hepatic carina descends vertically from spine; branchiocardiac carina developed variably in different species, some times indistinct; transverse and longitudinal suture absent; sixth abdominal somite with single long or interrupted cicatrices; telson lacking subapical fixed spine, has movable sometimes minute, numerous posterolateral spines present; antennule lacking parapeneid spine, flagella moderate, slender, shorter than carapace; basial spine present on first, second and third pereopod; in some species ischial spine present on first pereopod; fifth pereopod modified in male; ischium usually bearing distolateral keel shaped structure, merus containing proximal notch followed by a distal conspicuous knob or spiniform process; exopod lacking on fifth pereopod, this is the most unique character of the genus; petasma symmetrical, semiclosed, depressed, median lobes usually produced into curved, hood like, or convoluted distal projections; sclerotized lateral lobes produced distally in spoutlike obliquely or fully lateral projections and with ventrolateral recurved, flaplike to complex medial process; appendix masculina longer than wide, narrow basally, expanded distally and convex ventrally; thelycum closed, with paired lateral plate on sternite XIV often continuous across sternite, usually more or less enveloping posterior end of elongate median protuberance of sternite XIII.

Remarks: George (1979) presented a comprehensive key to 11 species of *Metapenaeus*, considering material and data then available to him from Indian water. Chanda (2014) presented a key of 14 species under *Metapenaeus* from Indian region. Present study reveals that out of 14 species 7 species are widely distributed. Following key is for 14 species from Indian water.

Key to the species found in India:

1. Rostrum short, not exceeding second segment of antennular peduncle; epigastric tooth close to penultimate tooth on rostrum 2
- Rostrum moderate, exceeding second segment of antennular peduncle; epigastric tooth conspicuously separated from penultimate tooth on rostrum 3

2. Rostrum very short, not exceeding first segment of antennular peduncle; telson without lateral movable spine; body pubescent; distomedian projection of petasma with a minute filament on distomedian margin *M. lysanasa* (De Man, 1888)
- Rostrum exceeding first segment of antennular peduncle; telson with two pairs of lateral movable spine; body smooth; distomedian projection of petasma with a long, slender apical filament on either side *M. brevicornis* (Milne Edwards, 1837).

3. Entire body pubescent 4
- Pubescence restricted on some regions of carapace and abdomen *M. moyebi* (Kishinouye, 1896)

4. Branchiocardiac carina mostly indistinct, when distinct not continuous with the hepatic spine ; anterior theylical narrow, distolateral projection of petasma, bearing, a short filament on both ventral and dorsal sides *M. dobsoni* (Miers, 1878).
- Branchiocardiac carina always distinct and continuous with hepatic spine; anterior theylical broad, distolateral projection of petasma without, filament 5

5. Distomedian projection of petasma crescent-shaped; anterior plate of thelycum wide posteriorly, deeply grooved longitudinally *M. affinis* (Milne Edwards, 1837).
- Distomedian projection of petasma convoluted and swollen; anterior plate of thelycum narrow, long and deeply grooved 6

6. Antennular flagella unequal, upper one longer; distomedian projection of petasma bisected into two bulbiform structure; lateral plate of thelycum with strongly raised lateral margins forming two longitudinal crests..... *M. monoceros* (Fabricius, 1798)
- Antennular flagella equal; distomedian projection of the lobe bisected anteriorly into two conical structure tip of which with a small pore through which a fine needle can be inserted; lateral plate of thelycum with strongly raised lateral margins, curving inward like two flap of collar*M. ensis* (DeHaan, 1844).

***Metapenaeus affinis* (H. Milne Edwards, 1837)**

M. affinis was originally described as *Penaeus affinis* by H. Milne Edwards (1837) from Malabar coast, South-West coast of India. A brief history of the species with special reference to Indian contributions has been given below.

- 1837 *Penaeus affinis* H. Milne Edwards, Hist. Nat. Crust., 2: 416.
- 1906 *Metapeneus affinis* Alcock, Cat. Indian Dec. Crust. Coll. Indian Mus. Part III. Mac. Fas. I: 1- 55.
- 1934 *Metapenaeus affinis* Burkenroad, Bull. Bing. Oceanogr. Coll., 4(7): 1-109; Menon, 1956, Proc. Indo-Pacif. Fish. Counc., 6(3): 345-347; George, 1967, FAO World Sci. Conf. Biol. Cult. Shr. Prawns, Mexico, 12-24; 1969, Cent. Mar. Fish. Res. Inst. Bull. No. 14:5-48; 1979, Contribution to Marine Science, dedicated to Dr. C.V. Kurian : 21-59; Muthu, 1971, Indian J. Fish., 15: 145-154; Silas & Muthu, 1976, J.mar. biol. Ass. India, 18(1) : 78-90.

Type Species: *Penaeus affinis* H. Milne Edwards, 1837, Hist. Nat. Crust., 2:416.

Type Locality: Côte de Malabar (now Kerala), South-West Coast of India.

Material Examined: 1 female (170 mm), ZSI. Reg. No. C4911/2, Subhas port, Gujarat, 10.12.92 H.C. Ghosh and Party; 1 male (27 mm), ZSI.Reg. No. C4781/2, Kakdwip Central Fishery, Kakdwip, 24 pags(s), 16.2.1989, N.C. Nandi and Party; 2 male (70-90 mm) and 1 female (98 mm), ZSI. Reg. No. C4791/2, Choprti, Girjaon, Maharastra 29.8.1996, A. Chanda; 1 male (56 mm) and 2 female (78-93 mm), ZSI. Reg. No. C4803/2, Palk Bay, Tamil Nadu, 8.8.1997, A. Chanda; 3 male (40-50 mm) and 1 female (60 mm), ZSI, Reg.No.

C4917/2, Chilka Lake, Orissa, 25.2.1975, G. Ramakrishna; 1 female (83 mm), ZSI. Reg. No. C4935/2, Petkilla Port, Ratnagiri, Maharashtra, 2.9.1996, A. Chanda.

Diagnosis of the species: Entire body pubescent; rostrum long, slender, extend upto tip of antennular peduncle, slightly uptilted tip, armed dorsally with 8-11+1 teeth; epigastric tooth conspicuously separated from penultimate rostral tooth; post rostral carina extend upto the posterior margin of carapace, adrostral carina ending in between first and second antennal tooth; adrostral sulcus extending beyond epigastric tooth, antennal, cervical and hepatic carina prominent, branchiocardiac carina distinct, reaching hepatic spine, hepatic carina slopes anteroventrally below pterygostomial angle, dorsal carination start from posterior one third of fourth somite ending at posterior margin of sixth somite; sixth and fifth somite with a long cicatrix; telson with very minute spines; antennular flagella equal, shorter than carapace; distomedian projection of petasma crescent-shaped, transversely placed on distolateral projection, partly concealing them; distolateral projections directed anterolaterally; anterior plate of thelycum deeply grooved longitudinally, considerably wide posteriorly; posterior transverse plate on sternite XIV with 2 anterolateral rounded projections partly covering median lateral plates; impregnated female occasionally with white irregular conjoined pads on thelycum.

Distribution: India: West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, east coast and Kerala, Goa, Maharashtra, Gujarat, West Coast of India i.e. entire coast of India & Andaman Sea.

Elsewhere: Parsian Gulf, Arabian Sea from Gulf of Oman; Sri Lanka; Malaysia; Singapore; Borneo; Thailand; Gulf of Tonkin; South China Sea; Philippines; Hong Kong; Taiwan; New Guinea; Hawaii.

***Metapeneus brevicornis* (Milne Edwards, 1837)**

M. brevicornis was originally described as *Peneus brevicornis* by Milne Edwards (1837) from Ganjam, Orissa, east coast of India. A brief history of the species with special reference to Indian contributions has been given below.

1837 *Peneus brevicornis* H. Milne Edwards, Hist. Nat. Crust. T. II., Paris: 417.

1906 *Metapeneus brevicornis* Alcock, Cat. Indian Deca. Crust. Fas.I: 1-55.