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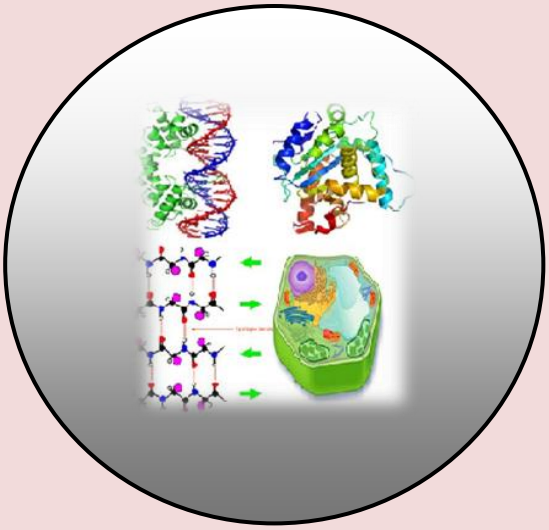

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RESEARCH PAPER

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Penaeid Prawn (*Crustacea: Decapoda: Penaeidae*) of Andhra Pradesh, India: Diagnosis of Genera and Distribution of Species

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ABSTRACT

Present study reveals that a total of 42 species under 12 genera of family Penaeidae Rafinesque – Schmaltz, 1815 have been recorded from Andhra Pradesh coast. Majority of the previous works on the group for the study area were scattered and fragmentary once. Therefore, present work is an attempt to prepare a comprehensive study of Penaeid prawns of Andhra Pradesh coastal region. All the genera of the family Penaeidae were represented with diagram of a representative species as lateral view of a whole specimen, ventral view of female thelycum and male petasma for easy diagnosis and recognition. Fishery potentiality of the commercially important species is the added character of the present study.

Key words: Study, Penaeidae, Andhra Pradesh and Coast.

INTRODUCTION

Among a variety of edible decapods crustacean, prawns contribute largely to the fishery wealth of many nations. Exploitation of prawn resource from the seas around each country is playing significant role in furthering their national economy. In recent years, the demand for prawns and prawn products has increased. Therefore, 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. In India, with the introduction of mechanization and due to the development of efficient export industries, prawn fishery has substantially improved during last three decades. The foreign exchange earnings by export of prawns and prawn products from the country have grown up considerably and the industry concerned with prawn products export are playing increasingly prominent role in the economy of the country. Given this economic significance and the fact that penaeid prawns occur in a wide variety of shallow – water marine, estuarine and back water habitats, knowledge on the ecology, feeding, reproduction, lifecycle, fecundity, prey predator relationship, behavior, population dynamics and fisheries potentials have vastly increased over the last three decades. The knowledge of the systematics of prawns is an essential prerequisite for their wise management and exploitation. Earliest contribution on the penaeid prawn from Indian water was by Fabricius (1798). Some important contributions on the prawns of this region during nineteenth century were by

Milne Edwards (1837), Miers (1878), Bate (1888), Wood-Mason (1891), Wood-Mason and Alcock (1891), Alcock and Anderson (1894, 1899). Alcock (1901, 1905, and 1906) and George (1979) was the taxonomist of twenth century who tried to make a comprehensive study on the penaeid taxonomy of Indian region. Beside these there are so many taxonomic works on the group like by Fisher and Beanchi (1983), Paulinose (1986), Achuthankutty and Parulekar (1986), Reddy (1995), Pathan and Jahlihal (1997), Chanda & Bhattacharya (2002, 2003, 2004, 2014), Chanda and Roy (2005), Chanda (2014a, 2014b, 2014c, 2015). In spite of these work, there are some lacuna on the penaeid systematics and distribution of Indian region. Penaeid taxonomy of Andhra Pradesh Coastal region is very scattered; infact there is no comprehensive work on the group for the present study area. Rao (1975), Chanda and Roy (2005), Rath and Deb Roy (2008, 2010), Rath, Deb Roy and Ghosh (2016) contribute a lot to the penaeid fauna of Andhra Pradesh coast but all these are restricted to certain estuaries like Godavori, Krishna, Vamsadhara and Nagavali estuary etc. Very recently Samuel et al (2016) has published an up dated check list of Indian shrimps and has enlisted 85 species of Penaeidae along with other groups but their distribution has not been strictly mention like Andhra Pradesh Coast, Odisha Coast or Tamil Nadu Coast etc., it has been mentioned like South-East Coast, Bay of Bengal and so on. So, present work is an attempt to make an up to date comprehensive systematic document on Penaeid prawn of Andhra Pradesh Coast.

MATERIALS AND METHODS

The present study is mainly based on the specimens collected by the author from commercial trawler catch of different fish landing centres. Some of the specimens were purchased from fish market from the nearby fish landing centres. In addition to this penaeid prawns preserved in the National Collection of the Zoological Survey of India, Kolkata; Central Marine Fishery Research Institute, Cochin, Kerala and its regional stations at Mandapam, Tamil Nadu; National Institute of Oceanography, Goa were also studied. Total materials studies for the species foumd in Andhra Pradesh coast are included in the present dissertation.

The materials were preserved in rectified spirit (90%) and body parts of taxonomic importance have been dissected and studied under a stereoscopic binocular microscope. The detailed synonymies have been furnished to the family, genera and species and also their keys, diagnosis, distribution, taxonomic remarks have been furnished.

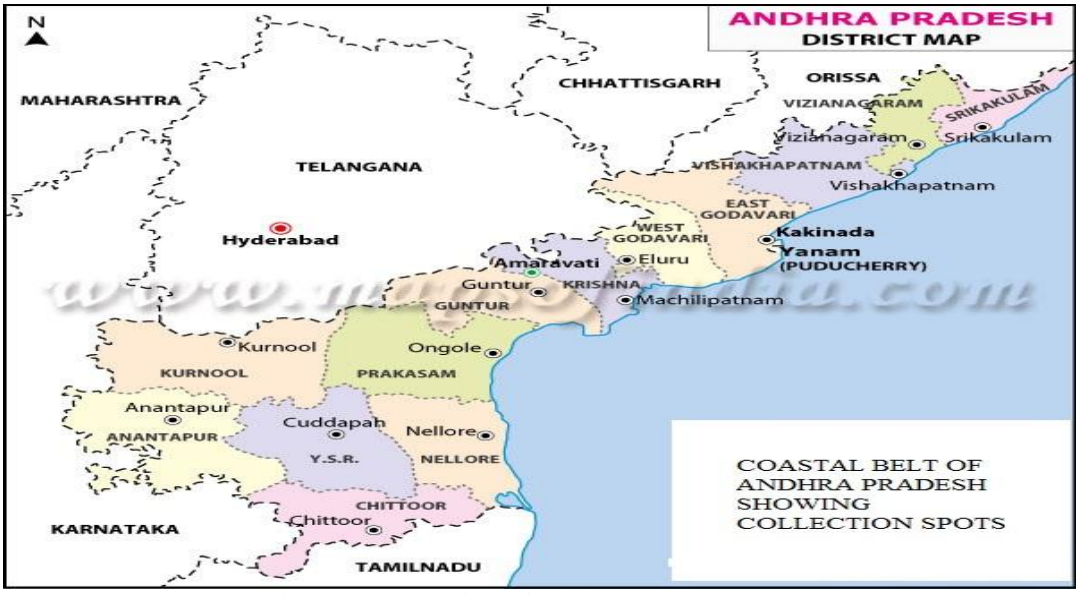


Figure 1. Coast line of Andhra Pradesh State.

RESULTS

Systematic Account

Super class – Crustacea Penant, 1777

Class – Malacostrace Latreille, 1806
Order – Decapoda Latreille, 1806
Suborder – Dendrobranchiata Bate, 1888
Sperfamily – Penaeoidea Rafinesque – Schmaltz, 1815
Burkenroad (1983) divided the order Decapoda into two Suborder, namely Dendrobranchiata and Pleocyemata. Suborder Dendrobranchiata includes Superfamilies Penaeoidea and Sergestoidea and Suborder Pleocyemata includes Stenopodidea and Caridea. This scheme of classification was followed by Abele (1982), Dall et al. (1990) and Perez Farfante and Kensley (1997), present contribution also follows the same scheme of classification for the Crustaceans.
Family: Penaeidae Rafinesque – Schmaltz, 1815
1815 Penedia Rafinesque – Schmaltz, *Anal. Nat. Tabl. Univers*: 98 [subfamily of Plyonuria.]
1888 Penaedae Bate, *Rep. Scient. Results Voy.Challenger*, 24:220; Alcock, 1901, *Desc. Cat. Indian Deep Sea Crust*., De Man, 1911, *Siboga Exped*., 39:1.
1969 Penaeidae George, *Bull. Cent. Mar. Fish. Res. Inst*., 14: 5-48; 1979. *Cont Mar. Sci*.,: 21-59
1978 Penaeidae Perez Farfante, FAO *Sp. Indent. Sh*., 1988, NOAA, *Tech. Rep*. NMFS, 64; iii, 8
Distinctive features of the family: Body compressed, slender, well developed rostrum, carapace without postorbital spine; cervical sulcusnever reaching rostral carina; telson sharply pointed antennuls with well developed prosartema, flagella slender; exopod present on first maxilliped but lacking on fourth and fifth pereopods.
Remarks
This family represents twelve genera in Andhra Pradesh coast. Accounts of these are given bellow.

Key to the genera under family *Penaeidae*, found in Indian water

1. Rostrum not reaching distal end of first antennular segment ……..……. 2
---- Rostrum extend up to or beyond distal end of first antennular segment …… 3
2. Eye stalk longer than rostrum and extend beyond first antennular segment; eye ball small ……*Miyadiella* Kubo, 1949.
---- Eye stalk smaller than rostrum and not extend beyond first antennular segment; eye ball large ……..... *Trachypenaeopsis* Burkenroad, 1934.
3. Rostrum armed with dorsal and ventral teeth; 4
---- Rostrum armed with dorsal teeth only; absence of gastro-orbital carina..…… 5
4. Presence of gastro-orbital carina; sixth abdominal somite with three interrupted cicatrix ……..……..…… *Penaeus* Fabricius, 1798.
----- Absence of gastro-orbital carina; sixth abdominal somite with single long cicatrix …….*Pelagopenaeus* Perez Farfante and Kensley, 1997.
5. Antennal spine very small; hepatic spine reduced or absent ……..……. …… *Atypopenaeus* Alcock, 1905.
---- Antennal spine prominent; hepatic spine always present and prominent …….. 6
6. Longitudinal suture present; transverse suture present ……..……...7
Longitudinal suture absent; transverse suture absent ……..…….10
7. Body thickset, densely pubescent, integument thick; hepatic carina absent ……..8
---- Body smooth or very minutely pubescent, integument thin; hepatic carina present ……..…….. 9
8. Anterior thelycal plate on sternite XIII with a tongue-like caudal extension; distolateral projection of petasma with laterally directed broad base and tip directed forward like a hook …… *Megokris* Perez Farfante and Kensley, 1997.
---- Anterior thelycal plate on sternite XIII without caudal extension, distolateral projection of petasma directed laterally like a wing ……..... ……..……*Trachysalambria* Burkenroad, 1934.
9. Postocular sulcus prominent; parapenaeid spine absent…….....…… 13
---- Postocular sulcus absent; parapenaeid spine present…….*Parapenaeus* Smith, 1885.
10. Petasma semiopen; thelycum open ……..……...*Funchalia* Johnson, 1867.
---- Petasma closed or semiclosed; thelyum close ……..……11

11. 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 ……..……...……...……..12

12. Carapace with a small orbital spine; sixth abdominal somite without cicatrix; first and second pereopod and third maxilliped with basial spine; petasma asymmetrical …….. *Metapenaeopsis* Bouvier, 1905.

---- Carapace without orbital spine; sixth abdominal somite bearing long, interrupted cicatrix; only first pereopod with basial spine; petasma symmetrical…….. *Penaeopsis* Bate, 1881.

13. Epigestric tooth ptesent; epipod absent on third pereopod.....14

------ Epigastric toot absent; epipod absent on all pereopods..... *Batepenaeopsis* Chanda, 2016.

14. Orbital spine absent; antennular flagella equal to antennular peduncle; width of anterior thelycal plate is greater than its length……..*Alcockpenaeopsis* Chanda, 2016.

---- Orbital spine present; antennular flagella not equal to antennular peduncle; width of anterior thelycal plate not grater than its length…….15

15. Longitudinal suture short, not reaching cardiac region; a median tuft of long hairs present behind thelycum..…….....*Kishinouyepenaeopsusis* Chanda, 2016.

---- Longitudinal suture long, extending upto or beyond cardiac region; a median tuft of hairs absent behind thelycum……..16

16. Longitudinal suture extending upto cardiac region; orbital spine prominent ……..……...*Parapenaeopsis* Alcock, 1901.

---- Longitudinal suture extending beyond cardiac region; orbital spine reduced like an angle…….....*Helleropenaeopsis* Chanda, 2016.

Genus *Alcockpenaeopsis* Chanda, 2016.

A. Chanda (2016) created the genus *Alcockpenaeopsis* by splitting *Parapenaeopsis* Alcock (1901).

Diagnosis of the genus

Genus *Alcockpenaeopsis* can be distinguished from others congenera by the following characters: distolateral projections of petasma longer than distomedian projections, tapering distally with a long distomedian spine; anterior thelycal plate wider than length, rounded anterior margin with two ventromedian parallel ridges, medially fused with quadrate posterior plate. This genus has only one species viz. *Alcockpenaeopsis uncta* (Alcock, 1905), found in the ocean adjacent to Indian subcontinent.

Type Species: By present designation, *Parapenaeopsis uncta* Alcock, 1905, Ann. Mag. nat. Hist., 16(7): 508-532.

Type Locality: Ganjam, Odisha coat, East coast of India.

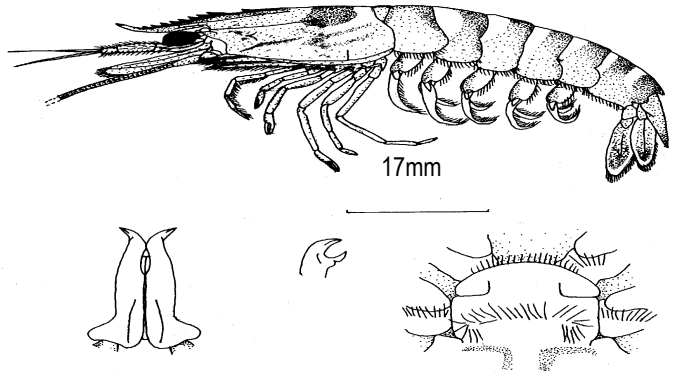


Figure 2. *Alcockpenaeopsis uncta* (Alcock, 1905).

Remarks: The genus ***Alcockpenaeopsis*** represents only one species, ***Alcockpenaeopsis uncta*** **(Alcock, 1905)** is found in Pulicot Lake, Andhra Pradesh, East Coast during the study.

Genus *Batepenaeopsis* Chanda, 2016

A. Chanda (2016) created the genus *Batepenaeopsis* by splitting *Parapenaeopsis* Alcock (1901).

Diagnosis of the genus: Body slender; integument thin, minutely setose; rostrum straight, variable in length, toothed throughout the dorsal margin; epigastric tooth absent; orbital spine distinct, well developed antennal spine with prominent posterior antennal carina occupying two-third distance between antennal and hepatic spine; hepatic spine prominent; pterygostomian angle blunt; hepatic sulcus convex, accompanied with prominent carina, starting behind hepatic spine, extending anteroventrally below pterygostomian angle; longitudinal suture long extending upto cardiac region; transverse suture prominent; antennular flagella shorter than its peduncle; cicatrix absent on sixth abdominal somite; telson unarmed; epipod absent on all pereopod; petasma symmetrical, semiclosed, distomedian projections of median lobe short, lateral lobe slender, distolateral projections directed proximolaterally; appendix masculina with two parts, proximal stalk, distal part horse shoe shaped; anterior plate of thelycum semicircular, concave in ventral view with rounded anterior margin; posterior margin with a short median notch; posterior plate trapezoidal, anterior margin slightly concave, posterior margin straight with two posterolateral horns.

Type Species: By present designation, *Parapenaeopsis acclivirostris* Alcock, 1905, Ann. Mag. nat. Hist., 16(7): 508-532.

Type Locality: Persian Gulf.

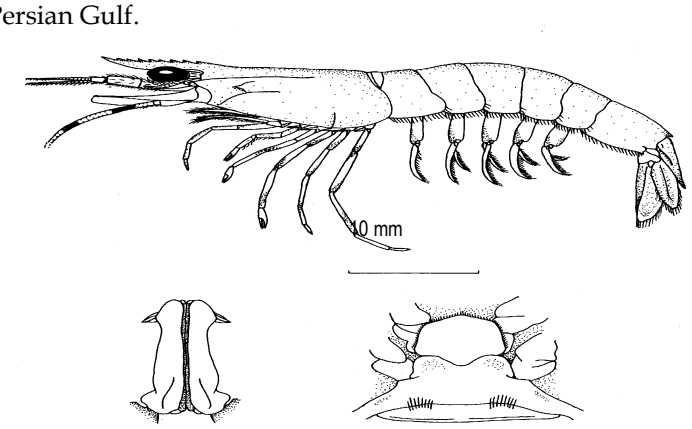


Figure 3. *Batepenaeopsis acclivirostris* (Alcock, 1905).

***A. Lateral view of the species, B. Patasma, C. Thelycum*.**

Key to the species under genus *Batepenaeopsis* Chanda, 2016 found in Andhra Coast

1. Dorsal carination on abdominal somite starts from third somite, anterior plate of thelycum with a posterior extension …….....*B. acclivirostris* (Alcock, 1905).

---- Dorsal carination on abdominal somite starts from fourth somite, anterior plate of thelycum without posterior extension ……*B. tennella* (Bate, 1888).

Remarks: These two species has been collected from Visakhapattnam, Andhra Coast.

Genus *Helleropenaeopsis* Chanda, 2016.

A. Chanda (2016) created the genus *Helleropenaeopsis* by splitting *Parapenaeopsis* Alcock (1901).

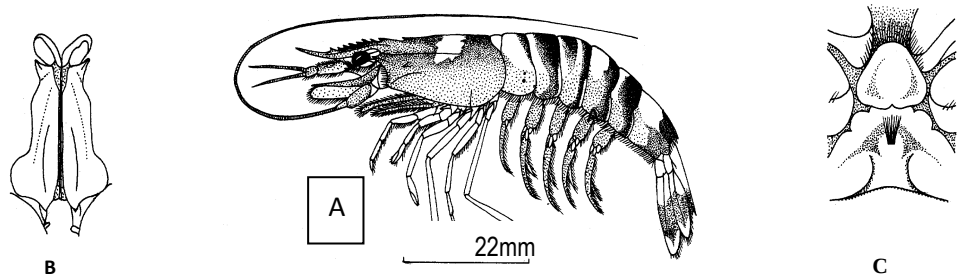


Figure 4. *Helleropenaeopsis sculptilis* (Heller, 1862); A-lateral view, B-petasma, C thelycum

(A) Lateral view of the speices. (B) Petasma. (C) Thelycum.

Diagnosis of the genus

This new genus can be distinguished from the other congenera 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. *Helleropenaeopsis 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: *Penaeus sculptilis* Heller, 1862a, Verh. Zool. Bot. Ges. Wien. , 12 : 519-528.

Type Locality: Java Sea, Indonesia.

Key to the species under genus *Helleropenaeopsis* Chanda, 2016 found in Andhra Coast.

1. Orbital spine present; telson armed with 3-5 pairs of lateral movable spine .....*Helleropenaeopsis hardwickii* (Miers, 1878).

---- Orbital spine absent; telson unarmed …… *Helleropenaeopsis sculptilis* (Heller, 1862).2.

Remarks: These species has been collected from Lawsem's Bay Visakhapattnam, Ramakrishna Beach, Visakhapattnam, Mungergudi, Machelipattnam, Ramachandrapuram of Andhra Pradesh Coast.

Genus *Kishinouyepenaeopsis* Chanda, 2016.

A. Chanda (2016) created the genus *Kishinouyepenaeopsis* by splitting *Parapenaeopsis* Alcock (1901).

Diagnosis of the genus

This new genus can be distinguished from other congenera 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. *Kishinouyepenaeopsis cornuta* (Kishinouye, 1900) and *Kishinouyepenaeopsis 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.

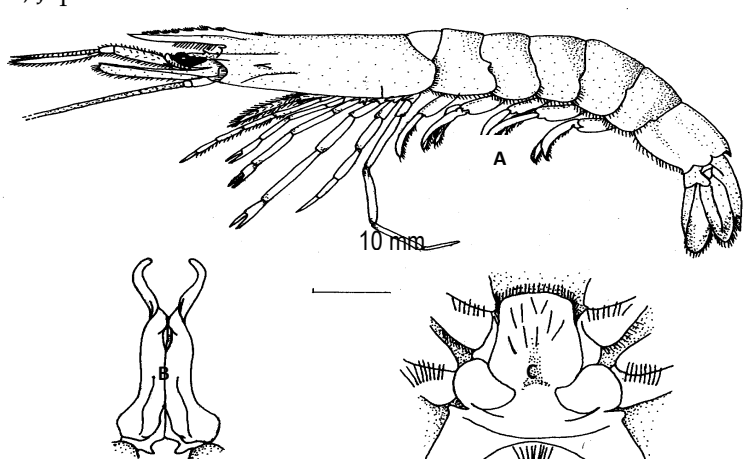


Figure 5. *Kishinouyepenaeopsis cornuta* (Kishinouye, 1900); A-lateral view, B-petasma, C-thelycum

Key to the species under genus *Kishinouyepenaeopsis* Chanda, 2016 found in Andhra Coast.

1. Basal spine present on 3rd pereopod; telson unarmed; distolateral projections of petasma lacking dorsal spiniform processes……*Kishinouyepenaeopsis maxillipedo* (Alcock, 1905).

---- Basal spine absent on 3rd pereopod; telson armed with 2-4 pairs of distolateral spine; distolateral projections of petasma with dorsal spiniform processes……... ……..*Kishinouyepenaeopsis cornuta* (Kishinouye, 1900).

Remarks: These Species has been collected from Muthukuru F.L.C., Nellore, Lowsom's Bay Visakhapattnam, Ramachandrapuram, E. Godavari, Pulicot Lake, Andhra Pradesh Coast during the present study.

Genus *Megokris* Pérez Farfante & Kensley, 1997

The genus *Megokris* was established by Perez-Farfante and Kensley (1997) by breaking *Trachypenaeus* Alcock, 1901. Alcock (1901) reported the genus for the first time from India as a subgenus of genus *Penaeus.* A brief history with special reference to Indian contributions has been given below.

1901 *Peneus (Trachypeneus)* Alcock, *Descr. Cat. Indian Deep. Sea Crust*.,: 15.

1905 *Trachypeneus* Alcock, *Ann. Mag. nat. Hist*., 16(7): 522.

1969 *Trachypenaeus* George, *Bull. Cent. Mar. Fish. Res. Inst*. No. 14:5-48; 1979, Cont. Mar. Sci., dedicated to Dr. C.V. Kurian, 21-59; Muthu, 1971, *Indian J. Fish*., 15:145-154.

1997 *Megokris* Perez Farfante and Kensley, *Mem. Mus. nat. d'Hist. nat*., 175:1-233.

Type Species: *Penaeus granulosus* Haswell, 1879, *Proc. Linn. Soc*. N.S.W., 4:41.

Type Locality: Australia, Darney Island, Torres Strait.

Diagnosis of the genus

Body covered with thick setae, pubescent; rostrum short, never extend beyond antennular peduncle; armed with dorsal teeth only; epigastric tooth separated from penultimate tooth by a distinct gap. Orbital spine, antennal spine and hepatic spine prominent; pterygostomian spine and carina absent; cervical sulcus, hepatic sulcus prominent; postocular, orbitoantennal sulcus absent; antennal, gastroorbital, gastrofrontal, hepatic carina absent; hepatic sulcus anterior to hepatic spine; longitudinal suture and transverse suture present; cicatrix absent on sixth abdominal somite; antennal flagella shorter than carapace; basial spine present on first and second pereopod; telson armed with lateral movable spine; petasma symmetrical, semiclosed, variable in shape; appendix masculina subquadrangular with rounded corners; thelycum closed, with plate on sternite XIV deeply excavate anteriorly, median protuberance of the anterior thelycal plate broadly extend posteriorly.

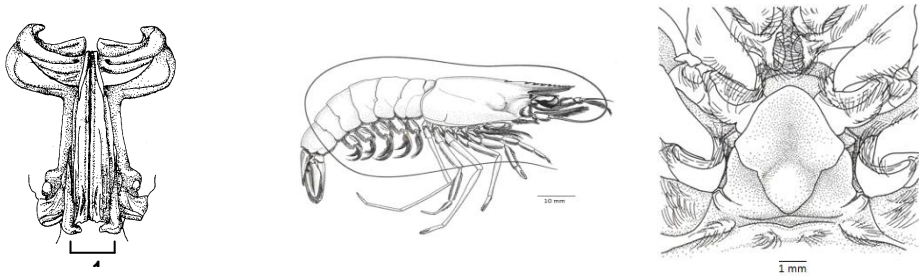
Key to the species found in India

1. Telson armed with one pair of movable spine, epipod present only on pereopod third; distolateral projection of petasma broad, tip curving forward; anterior plate of thelycum distally rounded……..…….……. *M. granulosus* (Haswell, 1879)

---- Telson armed with four pairs of movable spine; epipod present on pereopod first, second and third; distolateral projection of petasma narrow horn-like, curving laterally; anterior plate of thelycum distally pointed ….…….. *M. sedili* (Hall, 1961)

Remarks

Present study reveals that *Megokris* is represented in Andhra Coast by two species and these were collected from Mungergudi, Machelipattnam, Andhra Pradesh.



Petasma **Thelycum**

Figure 6. *Megokris granulosus* (Haswell, 1879).

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 speical reference to Indian contributions has been given below.

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

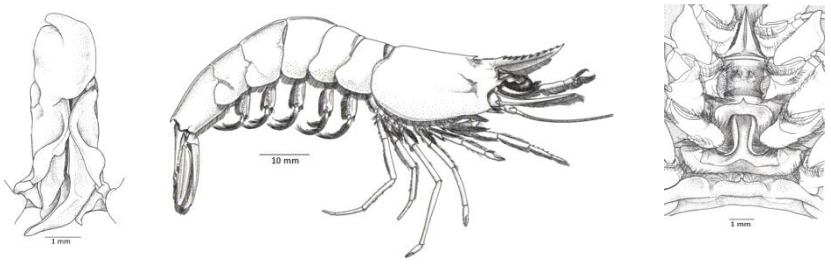
1905a *Metapenaeopsis* Bouvier, C.r.hebd. Séanc. Acad. Sci., Paris, 140: 381; Nataraj, 1942, Curr. Sc., 11(12): 468; Kunju, 1960, J. mar. biol. Ass. India, 2(1): 82-84; George, 1967, Proc Symp. Crustacea. Mar. biol. Ass. India, Pt. I: 337-346.

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, Comples Rendus de L'Academie des Sciences, Paris. 140: 980-988.

Type Locality: Cape Verde Islands.



Petasma **Thelycum**

Figure 7. Metapenaeopsis *pubescens* Bouvier, 1905.

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 pterygostomian 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; basial 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) Radhakrishnan et al. (2012) and Chanda (2014a) added another three species viz., *M. toloensis* Hall, 1962; *M. novaeguineae* (Haswell, 1879) and *M. palmensis* (Haswell, 1879) to this list. As such, at present Indian water represents 12 species under the genus *Metapenaeopsis* and west coast of India represents 7 species. A detailed taxonomic account of the species found in west coast along has been given below.

Key to the species found in India

1. Stridulating organ present on posterior branchiostegite of carapace ……..…..….. 2
---- Stridulating organ absent on posterior branchiostegite of carapace …… 6
2. Stridulating ridge upto 11 in number ……..... 4
---- Stridulating ridge more than 11 in number ……..... 3

3. Stridulating band curved …..……..... *M. palmensis* (Haswell, 1879)
---- Stridulating band straight …….……..... *M. stridulans* (Alcock, 1905)
4. Third abdominal somite with convex or flat dorsal carina .....……. 5
---- Third abdominal somite with sulcate dorsal carina …… ……..... *M. toloensis* Hall, 1962
5. Dorsal carina on third abdominal somite flat; anterior thelycal plate as wide as long …….....*M. barbata* (De Haan, 1844).
---- Dorsal carina on third abdominal somite convex; anterior thelycal plate much wider than long ……..…….....*M. novaeguineae* (Haswell, 1879).
6. Parapenaeid spine on ventral surface of first antennular segment small or vestigial …….....…….....7
---- Parapenaeid spine on ventral surface of first antennular segment prominent.. …….....…….....10
7. Third abdominal somite with strong dorsal carina …….....…. 8
---- Third abdominal somite without dorsal carina.…… *M. commensalis* (Borradaile, 1898).
8. Third abdominal carina without sulcus; left distoventral projection of petasma without terminal process …….....*M. hilarula* (De Man, 1911).

---- Third abdominal carina with distinct sulcus; left distoventral projection of petasma with terminal process …….....…….....9

9. Anterior edge of anterior thelycal plate on sternite XIII almost straight with flat triangular spine at anterolateral corners; distomedian lobule of petasma long, distally broad …….....*M. gallensis* (Pearson, 1905)
---- Anterior edge of anterior thelycal plate on sternite XIII with four rounded teeth, two median ones being incurved; distomedian lobule of petasma small, …….....….....*M. mogiensis* (Rathbun, 1902)
10. Rostrum as long as or longer than antennular peduncle; centre of the anterior thelycal plate sulcate …….....…….....11
---- Rostrum not reaching tip of antennular peduncle; centre of the anterior thelycal plate not sulcate …….....*M. coniger* (Wood-Mason, 1891).
11. Posterior extension of thelycal plate with indistinct median sulcus and angular posterolateral corners …….....*M. andamanensis* (Wood-Mason, 1891).
---- Posterior extension of thelycal plate with distinct median sulcus and rounded posterolateral corners ……..……..…….....….....*M. philippii* (Bate, 1881).

Remarks: Distribution of these seven species in Andhra Coast has been tabulated bellow:

Name of species	Distribution in Andhra Coast
***Metapenaeopsis barbata* (De Haan, 1844)**	Visakhapattnam
***Metapenaeopsis coniger* (Wood-Mason, 1891)**	Lowsom's Bay, Visakhapattnam,
***Metapenaeopsis mogiensis* (Rathbun, 1902)**	Chilagalapudi, Kakinada, Pulicot Lake.
***Metapenaeopsis novaeguineae* (Haswell, 1879)**	Kakinada Bay
***Metapenaeopsis palmensis* (Haswell, 1879)**	Bhimapattnam, Pulicot Lake.
***Metapenaeopsis stridulans* Alcock, 1905**	Lowsom's Bay, Visakhapattnam, Muthukuru F.L.C., Nellore
***Metapenaeopsis toloensis* Hall, 1962**	Machelipattanam

Genus Metapenaeus Wood-Mason

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 (1904) 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; 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.

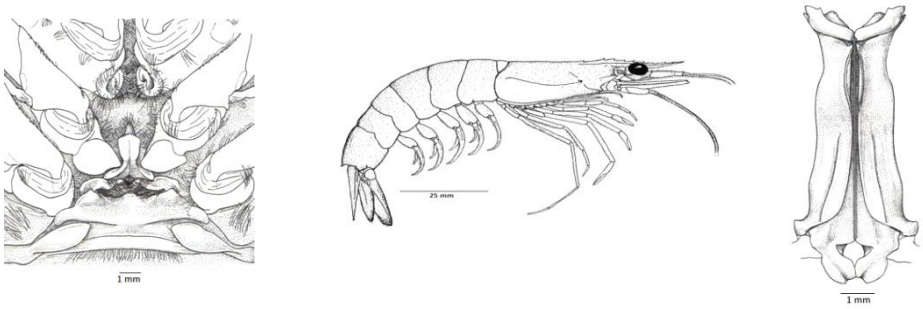
1901 *Peneus (Metapeneus)* Alcock, Descr. Cat. Indian deep-sea Crust., : 14.

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, pterygostomian 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



Thelycum **Petusma**

Figure 8. ***Metapenaeus affinis*** **(H. Milne Edwards, 1837).**

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.

Key to the species found in India

1. Anterior thelycal plate present on sternite XIII .....…….. 2

---- Anterior thelycal plate absent on sternite XIII……. *M. stebbingi* Nobili, 1904.

2. Rostrum short, not exceeding second segment of antennular peduncle; epigastric tooth close to penultimate tooth on rostrum .....……..... 3

---- Rostrum moderate, exceeding second segment of antennular peduncle; epigastric tooth conspicuously separated from penultimate tooth on rostrum ……..……..... 4

3. 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).

4. Entire body pubescent .....……..... 5

---- Pubescence restricted on some regions of carapace and abdomen .....……8

5. 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 ……..... 6

6. 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 ……..... 7

7. 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).

8. Adrostral sulcus extending posteriorly upto the level of epigastric tooth……..9

---- Adrostral sulcus extending posteriorly beyond epigastric tooth ……..... 10

9. Branchiocardiac carina distinct upto half the length of carapace there after indistinct upto hepatic spine; telson without lateral movable spine, with a row of minute spines; no median boss on thelycum …….....*M. eboracensis* Dall, 1957

---- Branchiocardiac carina indistinct; telson with 3 pairs of movable lateral spines; thelycum with a median boss....……..... *M. intermedius* (Kishinouye, 1900).

10. Postrostral carina ending near posterior margin of carapace; anterior plate of thelycum flask-shaped, its anterior margin with three apical tubercles; distomedian projection of petasma laminose …….....*M. moyebi* (Kishinouye, 1896)

---- Postrostral carina ending before posterior margin of carapace; anterior plate of thelycum not flask-shaped, no tubercle on anterior margin; distomedian projection of petasma not laminose.....…..... 11

11. Branchiocardiac carina distinct, not reaching hepatic spine; thelycal plate on sternite XIV posteriorly bound by a pair of anteromedially curved transverse protuberances …….....*M. krishnatrii* Silas and Muthu, 1974

---- Branchiocardiac carina reaching hepatic spine; no transverse protuberance at posterior border of thelycal plate on sternite XIV.....……..……..... 12

12. Anterior plate of the thelycum is narrow posteriorly and wider anteriorly; distomedian projection of median lobe of petasma petaloid…..... *M. elegans* DeMan, 1907.

----Anterior plate of thelycum broader posteriorly and narrow anteriorly; distomedian projection of median lobe of petasma crescent-shaped or slender ….....…..…..... 13

13. Distomedian projection of median lobe of petasma crescent-shaped, placed transversely, its distal end broad; posterior extension of anterior median plate on sternite XIII not bounded laterally by a plate on either side.....*M. kutchensis* George, George and Rao, 1963.

---- Distomedian projection of median lobe of petasma slender, directed anterolaterally with distal end broad and trilobed; posterior extension of anterior median plate on sternite XIII bounded laterally by a pair of oval flat plate on either side …….....*M. alcocki* George and Rao, 1966.

Remarks: The present study reveals that there are nine species of *Metapenaeus* in Andhra Pradesh region.

Distribution of these species has been tabulated bellow

Name of the species	Distribution in Andhra Coast
***Metapenaeus affinis* (H. Milne Edwards, 1837)**	Vishakapattnam
***Metapenaeus brevicornis* (Milne Edwards, 1837)**	Lawsom's Bay Vishakapatnnam, Narsapur, West Godavari, Mungergudi, Machlipattanam.
***Metapenaeus dobsoni* (Miers, 1878)**	Muthukuru, F.L.C., Nellore, Kaligiri Reservoir, Pulicot Lake.
***Metapenaeus eboracensis* Dall, 1957**	Muthukuru F.L.C., Nellore.
***Metapenaeus elegans* De Man, 1907**	Mypadu, Nellore.
***Metapenaeus ensis* (De Haan, 1850)**	Vishakapattnam.
***Metapenaeus lysianassa* (De Man, 1888)**	Vishakapattnam.
***Metapenaeus monoceros* (Fabricius, 1798)**	Lawsom's Bay, Visakhapatannam, Pithapuram, Kakinada, Kaligiri Reservoir, Bhimapattnam, Narsapur, W. Godavori, Chilogalapudi, Kakinada, Gelanchundi, Machlipattnam.
***Metapenaeus moyebi* (Kishinouye, 1896)**	Kaligiri Reservoir.

Genus *Parapenaeopsis* Alcock, 1901.

Parapenaeopsis was separated from *Penaeus* by Alcock (1901) as a subgenus of the genus *Penaeus*. A brief history of the genus with special reference to the Indian contributions has been given below.

1837 *Penaeus* H. Milne Edwards, Hist. Nat. Crust., 2: 411 [Part].

1888 *Penaeus* Bate, Rep. Sci. Res. 'Challenger', 24: 1-942; Kishinouye, 1900, J. Fish. Bureau Tokyo, 8(1): 1-29.

1901 *Peneus (Parapeneopsis)* Alcock, Descr. Cat. Indian Deep-Sea Crust: 14; 1906, Cat. Indian Dec. Crust., 3 (1) : 34.

1905 *Metapeneus* Alcock, Ann. Mag. nat. Hist., (7) 16 (95): 516 [Part].

Parapenaeopsis [amendment of *Parapeneopsis* Alcock1901, under the plenary powers by the International Commission on Zoological Nomenclature, 1969]. Placed on the official list of Generic Names in Zoology, International Commission on Zoological Nomenclature, 1969, Opinion 864, Name No. 1820, Bull. Zool. Nom., 25 (4/5): 139; De Man, 1911, Siboga Exped., 39a: 92; George, 1969. Bull. Cent. Mar. Fish. Res. Inst. No. 14 : 5-48; 1979, Contributions to Marine Sciences, dedicated to Dr. C.V. Kurian, 21-59; Muthu, 1971, Indian J. Fish., 15 : 145-154; Dall et al., 1990, Adv. Mar. Biol., 27 : 1-489; Pérez Farfante and Kensley, 1997, Mem. Mus. nat. d'Hist. nat., 175: 1-223.

Diagnosis of the genus

Genus *Parapenaeopsis* differs from the remaining four genera by following characters: distolateral projections of petasma longer than distomedian projections and directed anterolaterally; anterior plate of thelycum square shaped with a stem-like posterior process, posterior plate deeply notched anteromedially. *Parapenaeopsis* includes 3 species found in the ocean adjacent to Indian subcontinent. Three species found in India viz., *Parapenaeopsis stylifera* (H. Milne Edwards, 1837), *Parapenaeopsis nana* Alcock, 1905. and *Parapenaeopsis longirostris* Chanda and Bhattacharya, 2004.

P. stylifera has three subspecies *P. stylifera stylifera* sensu stricto, *Parapenaeopsis stylifera coromandelica* Alcock, 1906; *Parapenaeopsis stylifera cochinensis* George, 1975.

Type Species: By original designation, *Penaeus* styliferus H. Milne Edwards, 1837, Hist. Nat. Crust., 2: 418.
Type Locality: Mumbai coast, Maharastra, West coast of India.

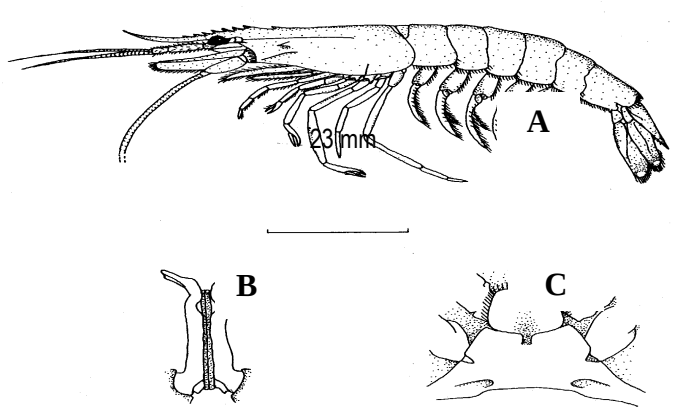


Figure 9. *Parapenaeopsis stylifera stylifera* (H. Milne Edwards, 1837): A: Lateral view, B: Patasma, C: Thelycum
(A) Lateral view of the species. (B) Petasma. (C) Thelycum.

Key to the species and subspecies under genus *Parapenaeopsis* Alcock, 1901 found in Andhra Coast:

1. Telson with lateral spine…….. 2
---- Telson without lateral spine ……. *Parapenaeopsis nana* Alcock, 1905
2. Telson with 4 pairs of lateral spine …… *Parapenaeopsis stylifera stylifera* (Milne Edwards, 1837).
---- Telson with 1-2 pairs of lateral spine ……*Parapenaeopsis stylifera coromandelica* Alcock, 1906.

Remarks: Distribution of these species has been tabulated bellow:

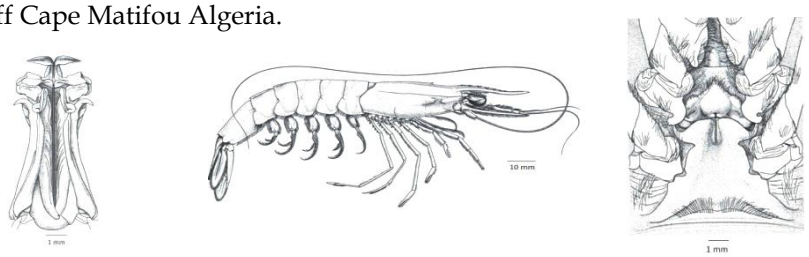
Name of species	Distribution in Andhra Coast
***Parapenaeopsis nana* Alcock, 1905**	Visakhapattanam.
***Parapenaeopsis stylifera coromandelica* Alcock, 1906**	Pulicot Lake.
***Parapenaeopsis stylifera stylifera* (Milne Edwards, 1837)**	Muthukuru F.L.C. Nellore.

Genus *Parapenaeus* Smith, 1885

The genus *Parapenaeus* was created by Smith (1885) *Penaeus longirostris* as its type. Alcock (1901) first recorded the genus from Indian water. A brief generic history with special reference to Indian contributions has been given below.

1846 *Peneus* Lucas, Hist. Nat. Anim. Artic., Pt. 1: 46.
1885 *Parapenaeus* Smith, Proc. U.S. natn. Mus., 8(11/12): 170; 1885b, Rep. U.S. Commnr. Fish: 685; George, 1969, Bull. Cent. Mar. Fish. Res. Inst., No. 14: 5-48; Dall et al., 1990, Adv. Mar. Biol., 27: 87; Pérez Farfante and Kensley, 1997, Mem. Mus. nat. Hist. nat. Paris, 175: 1-233.
Placed on the official list of Generic Names in Zoology, International Commission of Zoological Nomenclature, 1961, Op. 611, Name No. 1443, Bull. Zool. Nom., 18(5): 306.
1901 *Peneus (Parapeneus)* Alcock, Descr. Cat. Indian Deep-Sea Crust: 14.
1905 *Parapeneus* Alcock, Ann. Mag. nat. Hist. (7) 16 (95): 519; 1906, Cat. Indian Dec. Crust, (3), Macr., Fas.I: 30.

Type Species: *Penaeus longirostris* Lucas, 1846, Explor. Sci. l'Algérie, Zool. 2. Hist. Nat. Anim. Artic., Pt. 1: 46.
Type Locality: Off Cape Matifou Algeria.



Petasma **Thelycum**

Figure 10. ***Parapenaeus investigatoris*** **Alcock and Anderson, 1899.**

Diagnosis of the Genus
Body glabrous; rostrum armed with dorsal teeth only; epigastric tooth situated at a considerable distance from penultimate tooth; carapace with well marked antennal and hepatic spine; orbital spine pointed; pterygostomian or branchiostegal spine present (absent in *P. longipes* Alcock, 1905); postocular and cervical sulcus lacking; hepatic sulcus indistinct, hepatic carina anteriorly well marked; longitudinal suture long; transverse suture situated at level of second pereopod; sixth abdominal somite having no cicatricx; telson armed with fixed spine; antennule with parapenaeid spine, flagella unequal, sexually dimorphic, longer in male than female; lower one longer in female; basial and ischial spines on first pereopod only; somite XIII with pleurobranchia and posterior arthrobranchia only; minute exopods on all pereopods; petasma symmetrical, semiclosed, with numerous processes and folds; dorsomedian lobule bearing one subdistal process, dorsolateral lobule bearing one distal process, ventrolateral lobule with two terminal process; appendix masculina subovoidal; thelycum with single plate raised in two pairs of lateral prominence disposed longitudinally, both pairs separated by a median groove; median protuberance of stermite XIII strongly developed, more or less excavate posteromedially.

Key to the species found in India

1. Branchiostegal spine present …… *P. investigatoris* Alcock and Anderson, 1899.

---- Branchiostegal spine absent ……..……. *P. longipes* Alcock, 1905

Remarks
Parapenaeus is a well defined genus with all the known species having a unique characteristics appearance. Most of the species of this genus occur on the outer region of continental shelves and on the continental slopes (Dall et al., 1990). The Indo-West Pacific *Parapenaeus* have been revised by Crosnier (1986) and much of the confusion regarding identification had removed. Total number of species in this group is 17, out of which Indian water represents only four species (Chanda, 2015). During the present investigation only 2 species viz., *P. investigatoris* Alcock and Anderson, 1899 and *P. longipes* Alcock, 1905 has been collected from Andhra coast of India. These species has been collected from Pulicot Lake and Visakhapattnam coast.

Genus *Penaeopsis* Bate, 1881
Genus *Penaeopsis* has been described by Bate (1881) and its type species has been designated by Bouvier (1905) from Gulf of Mexico (Péréz Farfante, 1980). The genus was placed on the official list of Generic Names in Zoology, International Commission on Zoological Nomenclature in 1969 [Opinion 864, Name No. 1821, Bull. Zool. Nom., 25 (4/5): 139]. It has been recorded for the first time from India by Alcock (1901) as *Parapenaeus*, a subgenus of the genus *Penaeus*. A brief history of the genus with special reference to Indian contributions has been given below.

1881 *Penaeopsis* Bate 1881, Ann. Mag. nat. Hist., 8(5): 182; 1888, Rep. Scient. Results Voy. Challenger, 24: 273; Bouvier, 1905a, c.r. hedb. Séanc. Acad. Sci., Paris, 140: 981; 1908b, Bull. Inst. Océanogr., Monaco, 119: 5; Ramadan, 1938, John. Murray. Exped. Ser. Rep. 5(3): 35-76; Kurian, 1964, Curr. Sci., 33(7): 216-217; George, 1967 Proc. Symp.

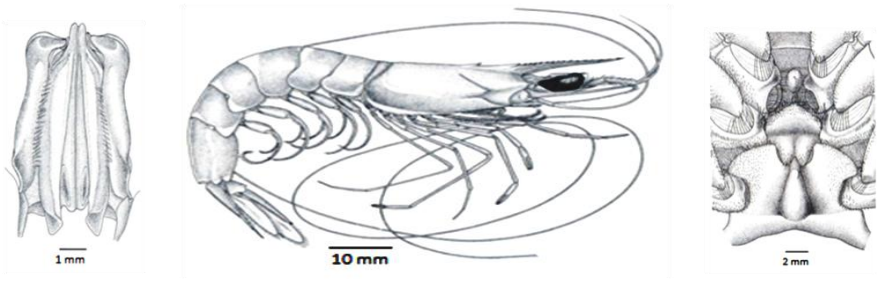
On Crustacea. Mar. biol. Ass. India, Pt.I: 342; Péréz-Farfante, 1980a, Fish. Bull., U.S., 77(4): 722; Dall et al., 1990, Adv. Mar. Biol., 27: 91; Perez Farfante & Kensley, 1997, Mem. Mus. nat. d'Hist. nat., 175: 1-233.

1901 *Penaeus (Parapenaeus)* Alcock, Descr. Cat. Indian Deep-Sea Crust., : 14 [Part].

1905 *Parapenaeus* Alcock, Ann. Mag. nat. Hist.; (7) 16: 519 [Part]; 1906, Cat. Indian Dec. Crust., 3(1): 30 [Part].

Type Species: By designation Bouvier, 1905, *Penaeopsis serratus* Bate, 1881, Ann. Mag. nat. Hist., 8(5): 183, C.r.hebd. Séanc. Acad. Sci., Paris, 140: 981.

Type Locality: Off Barbados, "Gulf of Maxico".



Petusma **Thelycum**

Figure 11. *Penaeopsis rectacuta* (Bate, 1881). [After Perez Farfante and Kensley, 1997]

Diagnosis of the Genus

Body glabrous, some of the areas microscopically setose; rostrum armed with dorsal teeth only; epigastric tooth exceptionally separated from first rostral tooth; carapace with rounded orbital angle, antennal, hepatic and pterygostomian spine prominent; postocular sulcus absent; gastrofrontal carina, gastroorbital carina and orbitoantennal sulcus absent; cervical sulcus prominent, hepatic sulcus and carina distinct, anterior to hepatic spine, curved downwards upto pterygostomian angle; branchiocardiac carina variably developed; transverse and longitudinal sutures absent; sixth abdominal segment bearing long, interrupted cicatrices; telson armed with a pair of moderately long, fixed, posterolateral spines preceded by two or three pairs of small, movable spines; antennule with a long parapenaeid spine, flagella long; ventral flagella sexually dimorphic, in male shorter than dorsal, has a proximal, rigid part with flattened, strongly arched loop; in female straight, longer than dorsal; basial spine on first pereopod, lacking on third maxilliped second and third pereopod; petasma symmetrical, semiclosed, with lateral lobes not produced distally into spout like projections; appendix masculina wider than long; thelycum closed, with single plate of sternite XIV occupying entire sternite, bearing variably developed median prominence; median protuberance of sternite XIII well developed.

Remarks

Majority of the species of this genus are deep sea in habitat. Out of six known species three has been found in Indian water (Chanda, 2016) viz., *Penaeopsis eduardoi* Péréz Farfante, 1977; *P. jerryi* Péréz Farfante, 1979; and *P. rectacuta* (Bate, 1881). West Coast of India represents 2 species viz., *P. jerryi* Péréz Farfante, 1979; and *P. rectacuta* (Bate, 1881). Following key could seperat them easily. Andhra coast represent only *Penaeopsis rectacuta* (Bate, 1881) and has been collected from Gelanchundi, Machlipattnam and Pulicot Lake during the present study. Following key will separate the species from rest of the Indian records.

Key to the species found in India

1. Telson with 2 pairs of movable spines in addition to the subapical fixed spines; pterygostomial spine present at the anteroventral corner of carapace. …… *Penaeopsis eduardoi* Pérez Farfante, 1977.

---- Telson with 3 pairs of movable spines in addition to the subapical fixed spines; pterygostomial spine present above the anteroventral corner of the carapace. ……..... 2

2. Hepatic spine at about the same level as the antennal spine; posterior thelycal plate on the last thoracic somite ovoid……..…….*Penaeopsis jerryi* Péréz Farfante, 1979.

---- Hepatic spine below the level of antennal spine; posterior thelycal plate on the last thoracic somite trapezoida….……..…*Penaeopsis rectacuta* (Bate, 1881).

Genus *Penaeus* Fabricius, 1798

Genus *Penaeus* was originally created by Fabricius (1798) while describing species, *Penaeus monodon* from Indian Ocean. Type species was subsequently designated by Latreille in 1810. This type material was lost and Holthuis (1949) designated the neotype for the said species from Bay of Jakarta, Indonesia. The genus was first recorded from India by Alcock (1901). A brief history of the genus with special reference to Indian contributions has been given below.

1798 *Penaeus* Fabricius, Suppl. Entomol. Syst.,: 408 [Part]; Latreille, 1810, Consid. Génér. Crust. Arach. Ins., : 102, 422; Chopra, 1939, J. Bombay Nat. Hist. Soc., 41 : 221-34; Menon, 1956. Proc. Indo-Pacific Fish. Coun., 6 : 345-47; George, 1969, Bull. Cent. Mar. Fish. Res. Inst., No. 14 : 5-48; George, 1979, In Contributions to Marine Science, 21-59. Placed on the Official List of Generic Names in Zoology, 1928, Smithson. Misc. Collns. 73 (5): 25.

1901 *Peneus* Alcock, Descr. Cat. Ind. Deep-Sea Crust: 13 [Part]: 1905, Ann. Mag. nat. Hist., (7) 16: 513 [Part]; 1906, Cat. Indian Dec. Crust., 3 (1): 7 [Part].

1969 *Penaeus (Penaeus)* Pérez Farfante, Fish. Bull., U.S., 67(3): 461; Pérez Farfante & Kensley, 1997, Mém. Mus. nat. d'Hist. nat., 175: 233.

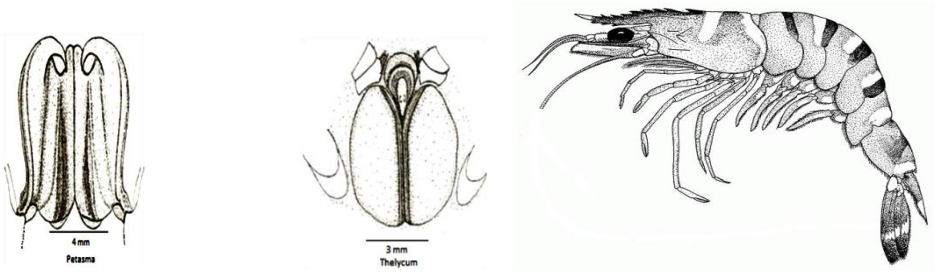


Figure 12. *Penaeus monodon* (After Freitas, 2004 and Fischer, W. and Bianchi, G. 1983).

Type Species: By subsequent designation of Latreille, 1810, *Penaeus monodon* Fabricius, 1798, Suppl. Entomol. Syst.: 408; neotype for *Penaeus monodon*, Rijksmus. Nat. Hist., Leiden, designated by Holthuis, 1949, Proc. K. Ned. Akad. Wet, 52 (9): 10.

Type Locality: Bay of Jakarta, Indonesia.

Diagnosis of the Genus

Body glabrous; rostrum with dorsal and ventral teeth; carapace with antennal and hepatic spines prominent, orbital and pterygostomian spine absent; postocular sulcus absent; cervical sulcus shallow; postrostral carina reaching almost posterior margin of carapace; adrostral carina and sulcus extending upto or beyond the level of epigastric tooth; gastrofrontal carina absent; gastroorbital carina short, orbitoantennal sulcus well marked, extending anteriorly not more than two-third of distance from hepatic spine to orbital margin; cervical and hepatic carinae well defined, cervical sulcus shallow; branchiocardiac carina lacking; longitudinal and transverse sutures absent; sixth abdominal somite bearing three lateral cicatrices, lacking dorsolateral sulcus; telson unarmed; antennule lacking parapenaeid spine; antennular flagella shorter than carapace; basial spine present on first and second pereopods; exopod on fifth pereopod absent in *P. monodon*, but present in others; petasma symmetrical, semiclosed with short distomedian projections, ventral costae narrowly gaping or contiguous, long and strongly curved distally; thelycum closed, with a pair of lateral plates of sternite XIV meeting along midline, shielding median saclike seminal receptacle.

Remarks

Genus *Penaeus* has twenty nine species of which twelve are found in India. Andhra coast represents nine species under the genus during the study. A key to identify the species has been given below.

Key to the species under genus Penaeus found in India

1. Adrostral sulcus and carina short, maximum extend up to the level of epigastric tooth; gastrofrontal carina absent 2

----Adrostral sulcus and carina long, extend beyond the level of epigastric tooth; gastrofrontal carina present 8

2. Hepatic carina absent or ill developed 3

----Hepatic carina prominent 7

3. Blade of rostrum high; adrostral carina and sulcus ending between epigastric tooth and penultimate rostral tooth; prominent ischial spine present on first pereopod ...…….4

----Blade of rostrum low; adrostral carina and sulcus ending just below the level of epigastric tooth or little beyond it; ischial spine absent on first pereopod ……..……. 5

4. Inner margins of lateral plates of thelycum without papillae; epigastric tooth separated from rest of dorsal rostral teeth by a long gap; third maxilliped extend upto the middle of second segment of autennular peduncle …….. *P. konkoni* (Chanda and Bhattacharya, 2003)

----Inner margins of lateral plates of thelycum with papillae; epigastric tooth separated from rest of dorsal rostral teeth by a short gap; third maxilliped extend upto the tip of antennular peduncle…… ……..…. *P. marguiensis* De Man, 1888.

5. The 3rd maxilliped in adult male has dactylus as long as or slightly shorter than the propodus, dactylus narrower than propodus..... *Penaeus silasi* Muthu and Motoh, 1979.

---- The 3rd maxilliped in adult male has dactylus longer than the propodus, dactylus broder than propodus 6

6. Gastroorbital carina located close to hepatic spine; distomedian projections of petasma overhanging distal margin of costae; tubercles present on the outer surface of lateral lobe of petasma……..…… *P. indicus* H. Milne Edwards, 1837.

----Gastroorbital carina not close to hepatic spine, occupy a middle position between hepatic spine and orbital margin; distomedian projections of petasma not overhanging but slightly extend over distal margin of costae; tubercle absent on the outer surface of lateral lobe of petasma …. ……..……..... *P. penicillatus* Alcock, 1905.

7. Rostrum fairly sigmoidal; adrostral carina and sulcus extend upto epigastric tooth; fifth pereopod without exopod; antennular flagella equal; distomedian projection of petasma slightly hanging over ventral costae ……..……. *P. monodon* Fabricius, 1798.

----Rostrum more or less straight; adrostral carina and sulcus extend beyond epigastric tooth; fifth pereopod with exopod; antennular flagella subequal; distomedian projection of petasma reaching costae, not hanging over ventral costae...…….. ……..*P. semisulcatus* De Haan, 1844.

8. Gastrofrontal sulcus markedly bifurcated posteriorly; thelycum with single sternal plate on somite XIV…….*P. japonicus* Bate, 1888.

----Gastrofrontal sulcus not markedly bifurcated posteriorly; thelycum with pair of lateral sternal plate on somite XIV……9

9. Telson with movable spine ……..10

----Telson without movable spine …….…….…….11

10. Presence of sulcus on post-rostral carina, a tooth on ventral side of rostrum ……...…… *P. latisulcatus* Kishinouye, 1900.

----Absence of sulcus on post-rostral carina, two teeth on ventral side of rostrum ……...……*P. marginatus* Randall, 1840.

11. Anterior thelycal plate like a protuberance, longer than lateral plates……...…… ……*P. canaliculatus* Olivier, 1811.

----Anterior thelycal plate chisel shaped, shorter than lateral plates ……... ……. *P. similis* (Chanda and Bhattacharya, 2002)

Genus *Trachysalambria* Burkenroad, 1934

In 1934, Burkenroad established subgenus *Trachysalambria* under genus *Trachypeneus* Alcock, 1905 with *Penaeus curvirostris* Stimpson, 1860 as type. The subgenus was elevated as a distinct genus *Trachysalambria* Burkenroad, 1934, by Pérez Farfante and Kensley (1997). This genus was first recorded from India by Alcock (1901) as a subgenus of *Penaeus*.

Distribution of the species has been represented in the following table:

Name of species	Distribution in Andhra Coast
***Penaeus monodon* Fabricius, 1798**	Mypadu, Nellore, Pithapuram, Kakinada, Kothapattnam, Ongole, Mungergudi & Gelanchundi, Machlipattnam.
***Penaeus semisulcatus* De Haan, 1844**	Antarvedi, E. Godavori, Narsapur, W. Godavori,
***Penaeus indicus* H. Milne Edwards, 1837**	Kakinada
***Penaeus merguiensis* De Man, 1888**	Visakhapattnam
***Penaeus penicillatus* Alcock, 1905**	Mypadu, Nellore
***Penaeus japonicus* Bate, 1888**	Visakhapattnam
***Penaeus canaliculatus* Olivier, 1811**	Visakhapattnam
***Penaeus latisulcatus* Kishinouye, 1900**	Antervedi, E. Godavari
***Penaeus marginatus* Randall, 1840**	Visakhapattnam

A brief history of the genus with special reference to Indian contributions has been given below.

1860 *Paeaeus* Stimpson, Proc. Acad. nat. Sci. Philad., 12:44

1901 *Penaeus* (*Trachypeneus*) Alcock, Descr. Cat. Indian Deep-Sea Crust., 15[Part].

1905 *Trachypeneus* Alcock, Ann. Mag. nat. Hist., (7) 16:522 [part]; 1906, Cat. Indian decapod Crustacea in the Collection of the Indian Museum Part III. Macrura. Fascicle I.: 1-55.

1906 *Metapenaeus* Nobili, Ann. Sci. nat. Zool. Paris, (9) 4: 20 [Part].

1934 *Trachypeneus* (*Trachysalambria*) Burkenroad, Bull. Bingham Oceanogr. Coll., 4(7): 49 [Division I, Section 2]; Menon, 1956, Proc. Indo – Pacific Fish. Coun., 6:345-47; George, 1969, Bull. Cent. Mar. Fish. Res. Inst., 14:5-48; 1972, Indian J. Mar. Sci., 1:89-92; 1979, In 'Contributions to Marine Sciences', dedicated to Dr. C.V. Kurian, 21-59; Kurian and Sebastian, 1993, Hindustan Publishing Corporation (India): 1-280.

1997 *Trachysalambria* Pérez-Farfante and Kensley, Mem, Mus. natl. Hist. nat. France, 175:1-233.

Type Species: *Penaeus curvirostris* Stimpson, 1860, Proc. Acad. nat. Sci. Philad., [12]: 44.

Type Locality: Port "Simoda", [Shimoda Ko], Japan.

Diagnosis of the Genus

Body densely setose; rostrum relatively short with dorsal teeth only, extending beyond the base of second antennular segment but not beyond the third segment; epigastric tooth distinctly separated from first rostral tooth; carapace with orbital, antennal and hepatic spines prominent; pterygostomian angle usually blunt, always lacking spine; postocular sulcus absent; orbitoantennal sulcus shallow; cervical sulcus weak, short, moderately long or absent; hepatic sulcus marked or indistinct; branchiocardiac carina extremely weak or lacking; longitudinal suture short, faint, almost indistinct, ending anterior to hepatic spine; transverse suture may be short and well marked or indistinct; abdomen with sixth somite lacking cicatrix; telson with 1-4, usually 3, pairs of movable lateral spines; antennule lacking parapenaeid spine; antennular flagella shorter than carapace; basial spine lacking on third maxilliped, present on first pereopod and usually on second; ischial spine present or absent on first pereopod; epipod present on first to third pereopods, on second and third, or on third only; petasma symmetrical, semiclosed, with lateral lobes produced distally into usually large, hornlike or winglike projections, extending either horizontally or curving downward; thelycum closed, with plate on sternite XIV broad anterior margin bracket shaped ({) anterior sternal plate on sternite XIII like an inverted heart shaped, anterior angle raised, posterior broad margin divided into two half with a deep cleft, each half with two short lobule posteriorly.

Remarks

In Indian water only two species viz. *T. aspera* (Alcock, 1905) and *T. curvirostris* (Stimpson, 1860) are found and Andhra coast represents both the species which can be distinguished by the following key.

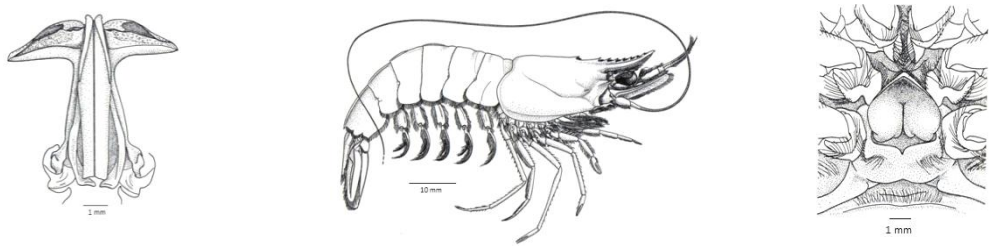
Key to the species

1. Rostrum straight, postrostral carina low, distolateral projection of petasma straight, directed laterally, anterior plate of thelycum anteriorly semicircular; telson with two pairs of lateral movable spine …… ……..…….....*T. aspera* (Alcock, 1905).

---- Rostrum slightly upcurved, postrostral carina high, distolateral projection of petasma directed laterally slightly curved downwards, anterior plate of thelycum anteriorly, angular; telson with three pairs of lateral movable spine……..*T. curvirostris* (Stimpson, 1860).

Distribution of the species has been represented in the following table:

Name of species	Distribution in Andhra Coast
***Trachysalambria aspera* (Alcock, 1905)**	Bhimapattanam, Pulicot Lake
***Trachysalambria curvirostris* (Stimpson, 1860)**	Lowsim's Bay Visakhapattanam



Petasma **Thelycum**

Figure 13. ***Trachysalambria curvirostris*** **(Stimpson, 1860).**

CONCLUSION

Taxonomy is paramount for describing biodiversity of a geographical region. Proper identification of species and populations can be effected by several tools, and this is necessary for fishery management plans and reporting. Present study is certainly been a handy document for future researchers and fishery biologist to study the group in Andhra Pradesh Coast of India.

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