

Dr. Angsuman Chanda

Genus *Penaeus*
(*Penaeoidea: Penaeidae*)
from Indian water

Taxonomy and Fishery



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Chanda, Angsuman: Genus *Penaeus* (*Penaeoidea*: *Penaeidae*) from Indian water. Taxonomy and Fishery, Hamburg, Anchor Academic Publishing 2016

PDF-eBook-ISBN: 978-3-96067-579-2

Druck/Herstellung: Anchor Academic Publishing, Hamburg, 2016

Bibliografische Information der Deutschen Nationalbibliothek:

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de> abrufbar.

Bibliographical Information of the German National Library:

The German National Library lists this publication in the German National Bibliography. Detailed bibliographic data can be found at: <http://dnb.d-nb.de>

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<http://www.diplomica-verlag.de>, Hamburg 2016
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This book is dedicated to my

Loving Daughters

Lina & Aranya

Resume

Present study is an attempt to up to date the taxonomic information of the prawns of the genus *Penaeus* Fabricius, 1798 under family *Penaeidae* Rafinesque – Schmaltz, 1815, found in Indian water. Species composition, their distribution in Indian water & elsewhere and interest to fishery is the added character of the work. Family *Penaeidae* is represented by 25 genera (Chanda, 2016) of which 17 genera are found in Indian water. During present study, Indian water represents 12 species under genus *Penaeus* Fabricius, 1798. The results presented here provide an insight to the macro-faunal diversity of the study area, and have established a baseline for future studies of the group.

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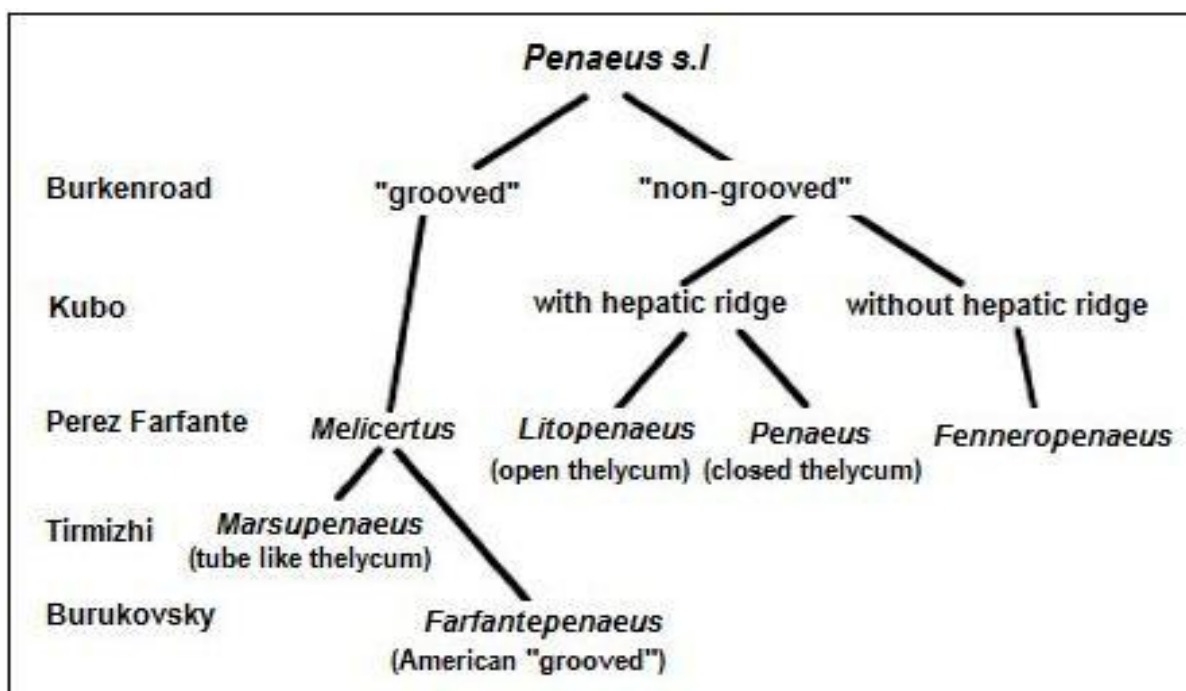
Genus *Penaeus* (*Penaeoidea*: *Penaeidae*) from Indian water: Taxonomy and Fishery

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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' is 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.

Family *Penaeidae* comprises 17 genera and 79 species of Indian water. The genus *Penaeus* comprises the most commercially important species among the penaeid prawn found in Indian water. During the present study 12 species under genus *Penaeus* has been recorded from Indian water. After the work of Burkenroad (1934) and Kubo (1949), the genus *Penaeus* has been revised in several times by Perez Farfante (1959), Tirmizi (1971), Burukovsky (1972) and Perez Farfante & Kensley (1997) and classified into six established genera. The chronological history of the development of six genera has been given below.



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 revised one and others have 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 of the species under genus *Penaeus*, found in Indian water.

Chapter 1

Materials & methods:

The present study is mainly based on the specimens collected by the author from different commercial fish landing centers throughout the Indian coastline. 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 the 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 and also their diagnosis, species composition with distribution, taxonomic remarks have been furnished. A key to the genera has been provided. The genera and species have been arranged alphabetically for convenience. A separate key to the genera created after breaking the genus *Parapenaeopsis* Alcock, 1901 has been provided. 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.

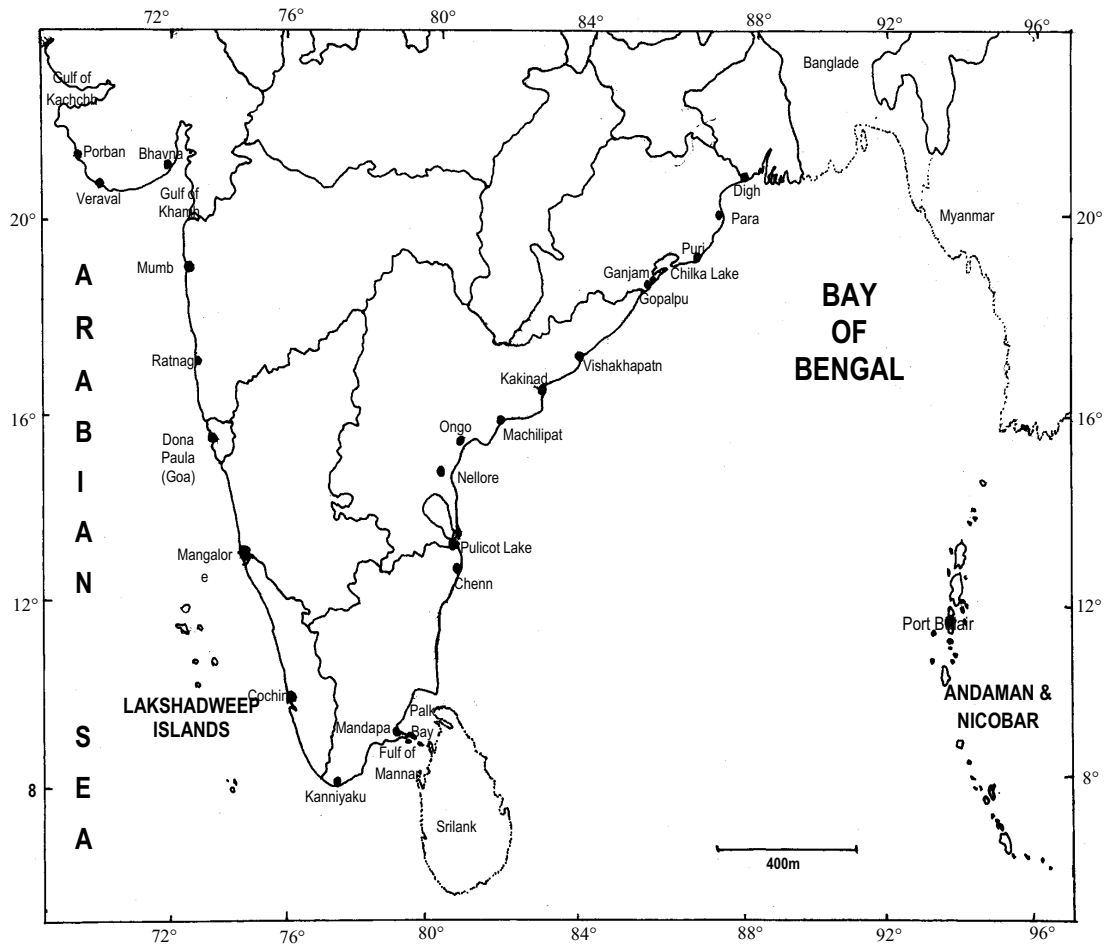


Fig. 1: Study area & collection spots along Indian Coast

Morphology and terminology:

An important morphological feature of Penaeods in taxonomic differentiation has already been – commented on in a number of previous literature e. g. Kubo (1949), Dall (1957) , Perez Fartante (1969) etc. In this contribution a general scheme of the terminology used is adopted by the combination of Dall et al. (1990) and Perez Fartante & Kensiey's (1997) works.

Features of systematic importance, the rostrum, the carapace with all its characters, the carination, sutures , length of legs, abdominal somites with carination and cicatrix, the telson,

antennules, antennae, gills and secondary sexual characters e.g. Male petasma, appendix masculine and female thelycum etc. were diagrammed and defined as follows.

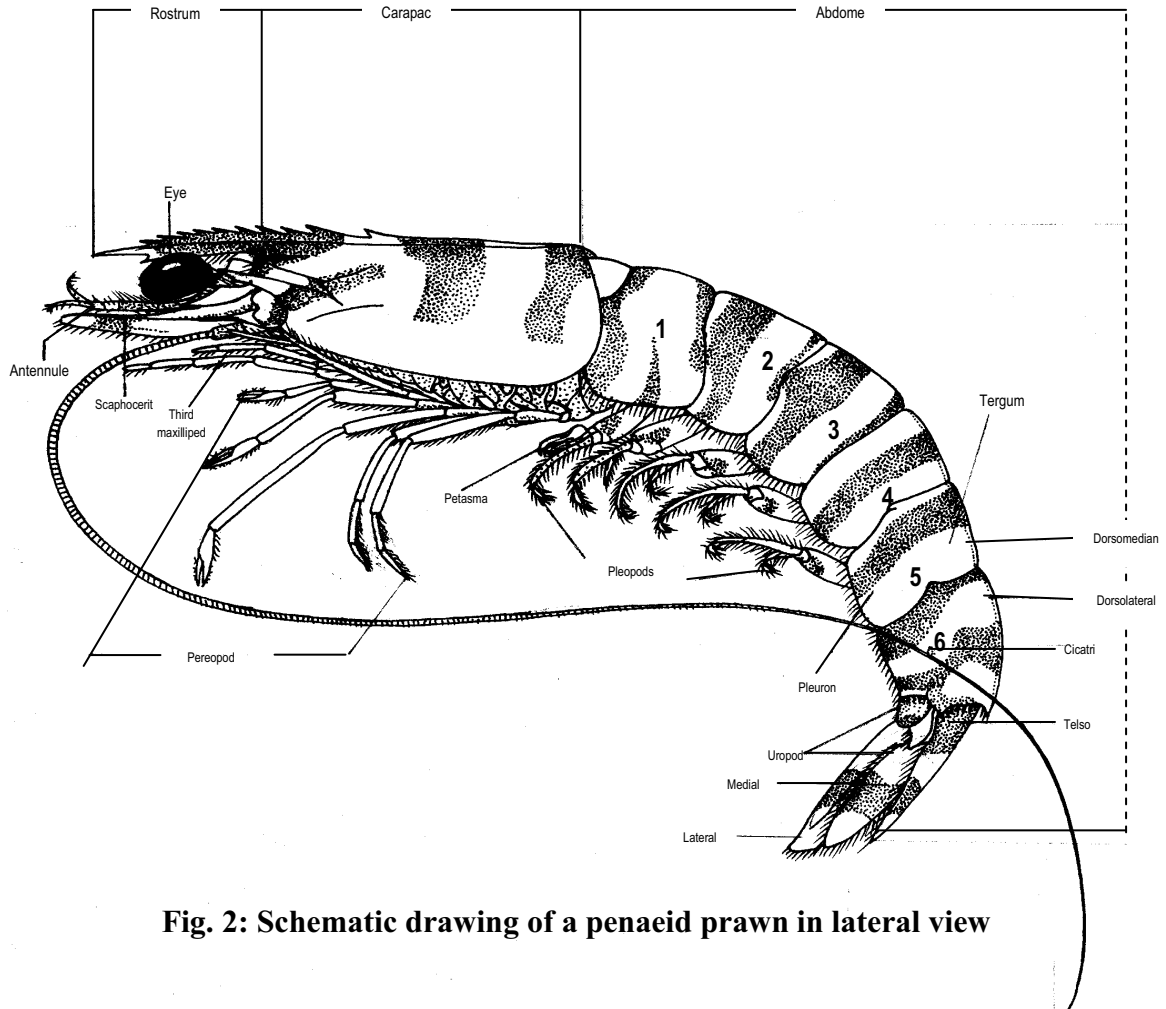


Fig. 2: Schematic drawing of a penaeid prawn in lateral view

A. ROSTRUM (Fig. 2):

Anteromedian projection of the carapace between two eyes is known as rostrum.

a. Regions of carapace:

- 1. Frontal region:** Anterior area of the carapace lying between the orbits and bounded posteriorly by the gastric region.
- 2. Orbital region:** Paired areas on the carapace just posterior to the eyes.

3. **Gastric region:** Principal median area of the carapace bounded anteriorly by the frontal and orbital regions and posteriorly by the cardiac region and laterally by the branchial and hepatic region.
4. **Antennal region:** Area on the lateral face of the carapace posterior to and encompassing the antennal spine (fig. 3:5A).
5. **Cardiac region:** Area on the middorsal portion of the carapace posterior to gastric region and superior to hepatic and frontal to branchiocardiac region (Fig. 3:A1)
6. **Hepatic region:** Paired antero lateral areas of the carapace bounded anteriorly by the antennal region, posteriorly by the branchial region and medially by the gastric region.
7. **Pterygostomian region:** Anteroventral area of the carapace. (Fig. 3:A26).
8. **Branchio – cardiac region:** Post dorsal area of carapace bounded anteriorly by cardiac region and ventrally by branchial region.

B. CARAPACE (Fig. 2):

a. Spine on Carapace:

1. **Orbital spine:** Spine projecting from the ventral extremity of the orbital margin (Fig. 3:A16).
2. **Post orbital spine:** Spine situated near the orbital margin posterior to the antennal spine (Fig. 3:A17).
3. **Antennal spine:** Spine situated on the anterior margin of the carapace just ventral to the orbital margin (Fig. 3:A18).
4. **Parapenaeid spine:** Spine projecting from the distomedial margin of the first antennular segment (fig. 4:18).
5. **Pterygostomian spine:** Marginal spine arising from the anteroventral angle or border of the carapace (fig. 3A23).

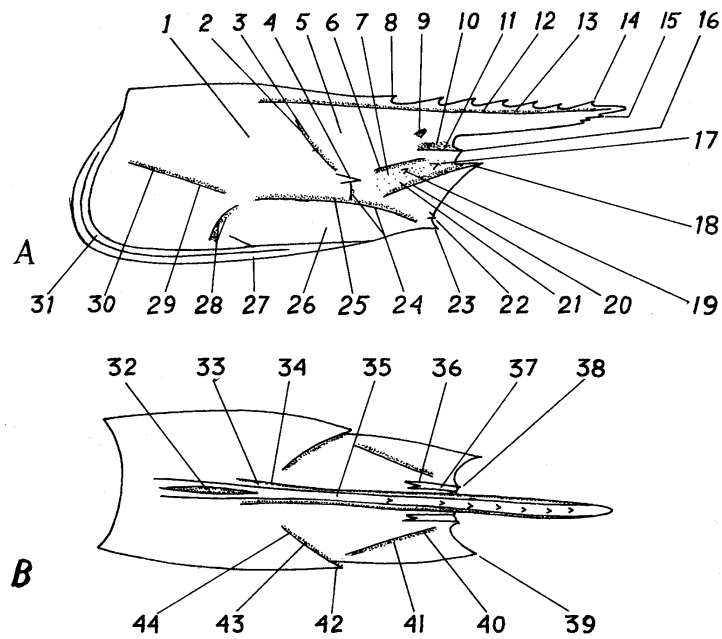


Fig. 3: Features of Carapace

A. Lateral View : (1) Cardiac region. (2) Cervical carina; (3) Cervical sulcus; (4) Hepatic spine, (5) Gastric region, (6) Gastroorbital carina; (7) Orbitoantennal sulcus; (8) Epigastric tooth; (9) Postocular sulcus; (10) Gastrofrontal sulcus; (11) Gastrofrontal tooth; (12) Adrostral carina; (13) Adrostral sulcus; (14) Last rostral tooth; (15) Last ventral rostral tooth; (16) Orbital spine; (17) Postorbital spine; (18) Antennal spine; (19) Postantennal spine; (20) Antennal carina; (21) Orbitoantennal sulcus; (22) Branchiostegal spine; (23) Pterygostomian spine; (24) Hepatic carina; (25) Hepatic sulcus; (26) Pterygostomian region; (27) Marginal region; (28) Inferior carina and sulcus; (29) Branchiocardiac carina; (30) Branchiocardiac sulcus. (31) Pterygostomian sulcus.

B. Dorsal View : (32) Postrostral or median sulcus; (33) Adrostral sulcus; (34) Adrostral carina; (35) Postrostral carina; (36) Gastrofrontal carina; (37) Gastrofrontal sulcus; (38) Orbital spine; (39) Antennal spine; (40) Gastroorbital carina; (41) Orbitoantennal sulcus; (42) Hepatic spine; (43) Cervical sulcus; (44) Cervical carina.

6. Branchiostegal spine: Short spine on or near the anterior margin of the carapace ventral to the antennal spine and dorsal to the anteroventral angle of the carapace (Fig.3:A22).

7. Hepatic spine: Lateral spine situated near the anterior margin of the hepatic region of the carapace (Fig. 3:A4).

b. Tubercle:

Any blunt pointed ridge on carapace or on any part of body.

c. Carination on carapace:

Any ridge or keel on the exoskeleton is known as carina.

1. **Adrostral carina:** Ridge flanking the rostrum, sometimes nearly reaching the posterior margin of carapace (Fig. 3:A12).
2. **Postrostral carina:** Dorsomedian ridge extending posteriorly from the base of the rostrum, sometimes nearly reaching the posterior margin of the carapace (Fig. 3:B35).
3. **Gastrofrontal carina:** Short longitudinal ridge extending posteriorly from the ventral extremity of the orbital margin (Fig. 3: B36).
4. **Antennal carina:** Ridge extending posteriorly along dorsal extremity of antennal region, often continuous with antennal spine (Fig. 3: A20).
Gastroorbital carina: Short longitudinal ridge extending anterodorsally from the cervical sulcus towards the orbital region (fig.3: A20).
5. **Gastroorbital carina:** Short longitudinal ridge extending anterodorsally from the cervical sulcus towards the orbital region (Fig. 3:B40).
6. **Hepatic carina:** Longitudinal (often obliquely) disposed ridge of variable length lying ventral to the hepatic region, sometimes extending almost to the anterior margin of the carapace (Fig. 3:A2A).
7. **Cervical carina:** Medially transverse and laterally oblique ridge extending from the anterior limit of the hepatic region towards mid dorsal line of the carapace (Fig.3:A2).
8. **Branchiocardiac carina:** Ridge extending along posterodorsal limit of branchiocardiac region (Fig. 3:A29).
9. **Submarginal carina:** An almost longitudinal ridge extending between ridge and membranous part of the branchiocardiac region.

d. Sulcus on carapace:

Any groove on carapace or any part on exoskeleton is termed sulcus.

1. **Adrostral sulcus:** Groove flanking the rostrum medial to the adrostral carina, sometimes nearly reaching the posterior margin of carapace (Fig. 3:A13).
 2. **Postacular sulcus:** A short oblique groove on frontal region (Fig. 3:A9).
 3. **Gastrofrontal sulcus:** Short longitudinal depression accompanying the gastrofrontal carina dorsally (Fig. 3:B37).
 4. **Orbitoantennal sulcus:** Longitudinal or oblique depression between the orbital margin and the hepatic spine (Fig.3A7).
 5. **Hepatic sulcus:** Groove ventral to the hepatic region extending posteriorly, sometimes from near the anterior margin of the carapace (Fig.3:A25).
 6. **Cervical sulcus:** Medially transverse and laterally oblique groove of the carapace extending from near the anterior limit of the hepatic region towards the midline of the carapace (Fig.3:A3).
 7. **Branchiocardiac sulcus:** Groove extending along dorsal limit of branchiocardiac region, running parallel to branchiocardiac carina (Fig.3:A30).
 8. **Postrostral dorsomedium sulcus:** Dorso-medium groove on the postrostral carina of the carapace (Fig. 3:B32).
- e. **Stridulating organ:** Short transverse ridge lined longitudinally or curved upward at the posterolateral part of the carapace.
- f. **Suture on carapace:** Weakly sclerotized line or seam on the carapace.
 1. **Longitudinal sutures:** Fine longitudinal line extending posteriorly just above the base of the antennular spine.
 2. **Transverse suture:** Fine short vertical line extending dorsally from the ventral margin of the carapace.

C. ABDOMEN (Fig. 2):

The part of the body posterior to the cephalothorax, consisting of six body segments or somites plus the telson.

- 1. Dorsomedium carina:** Ridge extending along the middorsal line of the abdominal somites (Fig. 2).
- 2. Dorsomedian sulcus:** Median groove on the dorsomedian carina of the abdominal somites.
- 3. Dorsolateral sulcus:** Longitudinal groove sometimes present close to the dorsomedian line of the sixth abdominal somite. (Fig. 2).
- 4. Cicatrix:** Longitudinally disposed ridge often present on lateral part of sixth or sometimes on fifth abdominal somite (Fig.2).

D. TELSON (Fig. 4: N,O):

Terminal unit of the abdomen bearing the anus is known as telson.

- 1. Fixed spine:** Spine fixed on distolateral margin of telson (Fig.. 4:N).
- 2. Movable spine:** Spine present on distolateral margin of telson capable of movement (Fig.4:O).
- 3. Spinules:** Minute setae present on dorsolateral side of telson.

E. APPENDAGES (Fig. 4):

There are nineteen pairs of appendages on the entire body of penaeid prawn: five cephalic, eight thoracic and six abdominal.

a. Cephalic:

- 1. Antennule:** More medial of the two paired, usually flagellate appendages projecting from the anterior end of the cephalothorax.
- 2. Antennular peduncle:** Three basal segments of the antennules, from which the flagella arise distally.

3. **Antennular flagellum:** Multiarticulate paired filaments (sometimes flattened and lamellate) of the antennules.
4. **Prosariema:** Variable in shape, thin, sometimes scalelike process arising from the medial base of the first antennular segment and extending distally.
5. **Distolateral spine:** Lateral spine of first antennular segment at the distal end.
6. **Stylocerite:** Pointed scale arising from the lateral base of the first segment of the antennular peduncle.
7. **Antenna:** More lateral of the two paired, usually flagellate appendages projecting distally from the anterior end of the cephalothorax (Fig. 4:A).
8. **Antennal flagellum:** Multiarticulate, whiplike, terminal part of the antenna (Fig. 4:A 10).
9. **Antennal peduncle:** Five basal segments of the antenna, from which the flagellum arises distally.
10. **Scaphocertie:** Laterally rigid lamellate exopod of the antenna; the antennal scale (Fig. 4A).
11. **Mandible:** One of the heavily calcified jaws lying beneath (in ventral view) the other mouth parts (Fig. 4: C).
12. **Mandibular pulp:** One to three segmented endopod attached laterally to serve masticatory work of the mandible (Fig. 4: D).
13. **Maxilla:** Paired mouth part appendages of the fourth and fifth cephalic somites.

b. Thoracic:

1. **Maxilliped:** One of a pair of three sets of thoracic appendages, arising posterior to the primary mouth parts. The two anterior pairs are often modified

for feeding, while the third pair is often pediform, resembling the pereopods (Fig. 4: G,H).

2. **Pereopod:** One of the five posterior paired appendages or legs of the cephalothorax (Fig. 2).
3. **Arthrobranchia:** Branchia (gill) attached to the joint area between the body and the first podomere of the leg (Fig. 4:H22).
4. **Podobranchia:** Gill borne on the basal segment (coxa) of a thoracic appendage (Fig. 4: I12).
5. **Pleurobranchia:** Gill attached to the body wall, dorsal to the articulation of the appendage (Fig. 4H21).
6. **Podomere:** Any one of the segments of an appendage.
7. **Epipode:** Lateral exite of the coxa of a thoracic appendage, sometimes branchial in function (Fig. 4: I8).
8. **Exopod:** Lateral ramus of biramus appendages, arising from the basis or from the protopodite is known as exopod (Fig. 4: I9).
9. **Protopodite:** A limb has a basal portion, which is attached to the body, consisting of two segments, the proximal coxa and the distalbasis (Fig. 4: KI5).
10. **Basial spine:** Spine projecting from basis of a thoracic appendage.
11. **Ischium:** Third podomere from the proximal end of a typically 7 – segmented appendage (Fig. 4: J5).
12. **Ischial spine:** Spine projecting from ischium or third segment of thoracic appendage.
13. **Merus:** Fourth segment from the proximal end of a typically 7- segmented appendage (Fig. 4: J4).

14. Carpus: Fifth podomere from the proximal end of a typically 7- segmented appendage (Fig. 4: J3).

15. Palm: Portion of the chela proximal to the propodal finger.

16. Propodus: Sixth or penultimate segment of a typically 7 segmented appendage (Fig. 4: I2).

17. Dactyl: Terminal podomere of a typically 7 – segmented appendage (Fig. 4:I1).

18. Chela: Appendage ending in chela.

c. Abdominal:

1. Pleopod: One of the biramous paired appendages typically arising ventrally from each of the anterior five abdominal somites. In the prawns, they are primarily swimming organs (Fig. 2).

2. Uropod: Paired biramous appendage attached to the sixth abdominal somite, usually combining with the telson to form a tailfan (Fig. 2).

3. Medial ramus of uropod: Inner branch of uropod (fig. 2).

4. Lateral ramus of uropod: Outer branch of uropod (fig. 2).

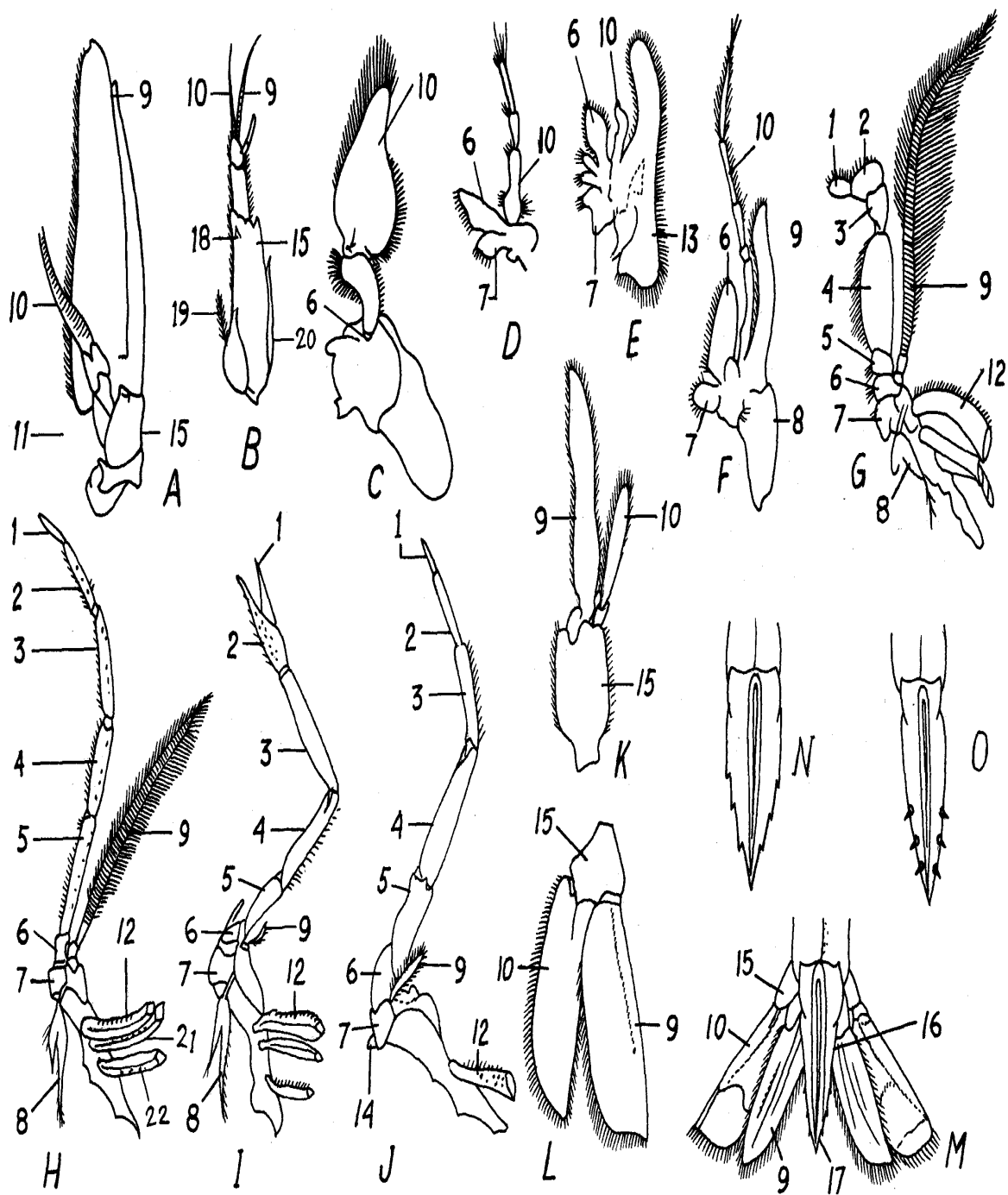


Fig. 4: Appendages of penaeid prawn

(A) Antenna (Second antenna); (B) Antennule (First antenna); (C) Mandible; (D) First maxilla; (E) Second maxilla; (F) First maxilliped; (G) Second maxilliped; (H) Thirds maxilliped; (I) First pereopod' (J) Fifth pereopod; (K) Third pleopod; (L) Uropod; (M) Telson with Uropod; (N) Telson with fixed spine; (O) Telson with movable spine.

(1) Dactyl; (2) Propodus; (3) Carpus; (4) Merus; (5) Ischium; (6) Basis; (7) Coxa; (8) Epipod; (9) Exopod; (10) Endopod; (11) Opening of the antennal gland; (12) Branchia, Gill; (13) Scaphognathite; (14) Male genital aperture; (15) Protopodite; (16) Telson; (17) Spinules; (18) Parapenaeid spine; (19) Prosartema; (20)

F. EXOSKELETAL RING OF AN ABDOMINAL SOMITE:

1. **Tergum:** Arched dorsal part of each of the anterior five abdominal somites (Fig. 2).
2. **Sternum:** Ventral surface of the cephalothorax or abdomen.
3. **Pleuron:** One of the lateral flaps on each of the anterior five abdominal somites (Fig. 2).

G. EYE (Fig. 5):

1. **Eyestalk:** Peduncle or unfaceted part of the eye supporting the cornea (Fig. 5).
2. **Cornea:** Faceted, usually pigmented portion of the eye (Fig. 5).
3. **Ocular plate:** Median cephalic plate bearing the eyestalks laterally (Fig. 5).
4. **Ocular sac:** Scale like structure located on basal segment of eyestalk.
5. **Optic calathus:** Terminal article of the eyestalk supporting, often embracing the cornea of the eye (Fig. 5).

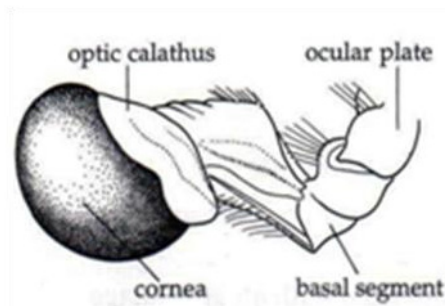


Fig. 5: Features of Eye (After Pérez Farfante & Kensley, 1997)

H. SECONDARY SEXUAL STRUCTURE:

- a. **Petasma:** The male genital structure consisting of the much enlarged and coupled endopods of the first pair of pleopods (Fig. 6).
 1. **Median lobe:** One of the paired dorsal parts often folded of the petasma (Fig. 6).

2. **Dorsomedian lobule:** Dorsal part of the median lobe of the petasma (Fig. 6).
3. **Ventromedian lobule:** Lateral part of the median lobe of the petasma (Fig. 6).
4. **Distomedian projection:** Distal, relatively narrow extension of the dorsomedian lobule of the petasma (Fig. 6).
5. **Lateral lobe:** One of the paired lateral parts often folded of the petasma (Fig. 6).
6. **Dorsolateral lobule:** Dorsal part of the lateral lobe of the petasma (Fig. 6).
7. **Ventrolateral lobule:** Ventral part of the lateral lobe of the petasma (Fig. 6).
8. **Ventral costa:** Ridge extending along the ventromedian margin of the ventrolateral lobule of the petasma (Fig. 6).
9. **Distoventral projection:** Outer distal flap articulating with distal extremity of ventrolateral lobule of petasma.

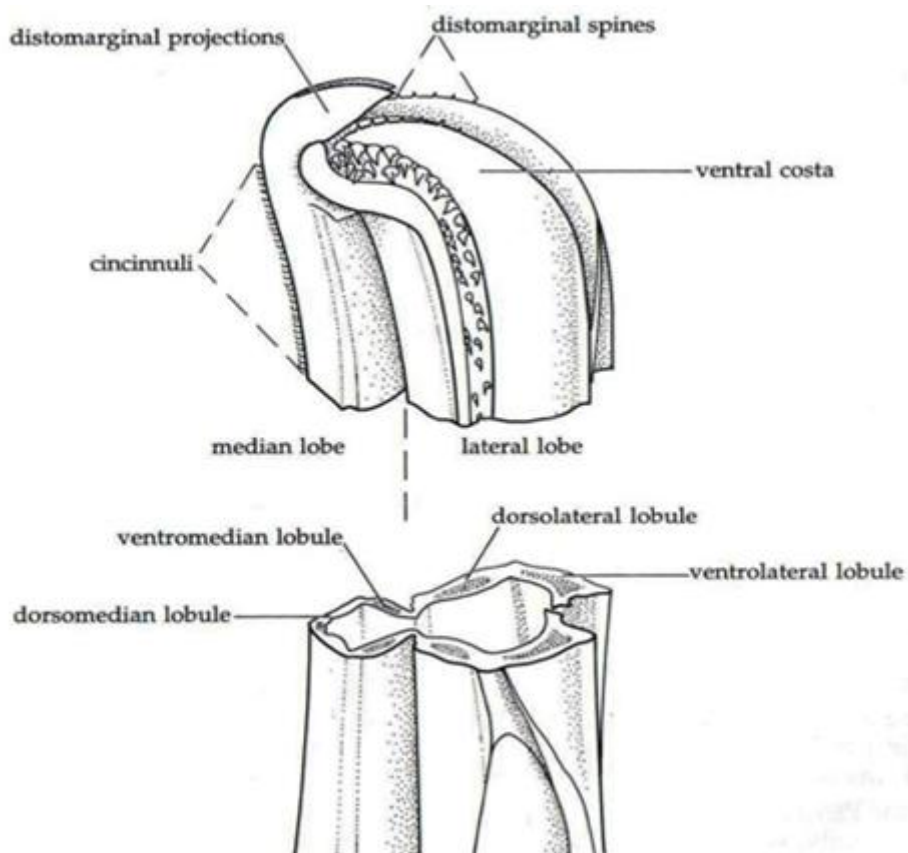


Fig. 6: Features of petasma (After Perez fattante & Kensley, 1997)

Type of Petasma:

- I. **Open:** Lateral lobes flexible, partially or entirely extended laterally, with the ventral costae not or barely turned ventrally.
 - II. **Semi – open:** Lateral lobes flexible but folded, with the ventral costae distinctly turned ventro-medially, delimiting relatively ample space extending from proximal to distal ends.
 - III. **Closed:** Lateral lobes heavily sclerotized, sometimes making structure virtually rigid, with the ventral costae situated ventromedially, almost abutting and delimiting a small, sometimes extremely so, space; lateral lobe usually produced distally into lateral spouts or horns.
 - IV. **Semi – closed:** Lateral lobes rather flexible, markedly folded, supported by strong ribs, with the ventral costae approaching rather closely, delimiting moderately large space, narrowly open distally where usually overlapped by well developed distomedian projection.
- b. Thelycum:** The female genitalia consisting of modifications of the posterior two or sometimes three thoracic sternites serving for the storage or transfer of the sperms to spermatophores (fig. 7).

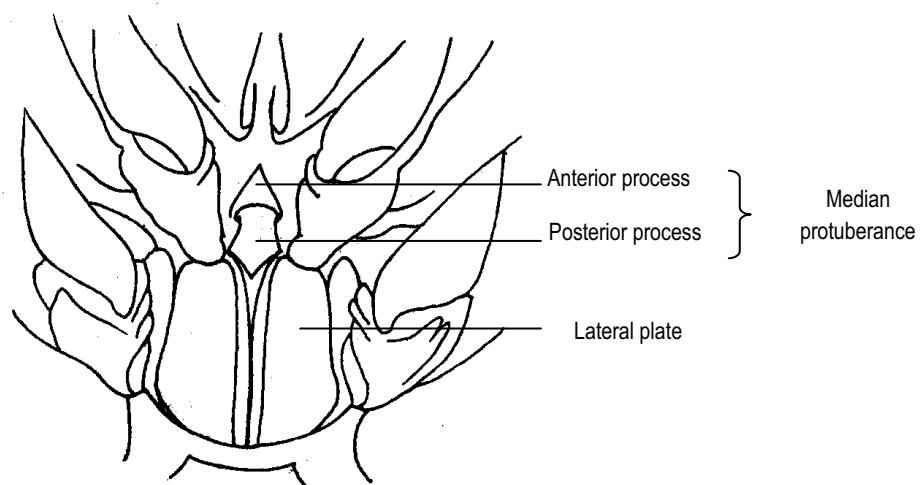


Fig. 7: Features of thelycum

1. Lateral plate: One of the paired, adjacent flaps sometimes present on sternite XIV in female thelycum (Fig. 7).

2. Median protuberance: Conspicuous elevation, sometimes plate like (termed anterior plate), arising from the posteromedian part of the sternite XIII (Fig. 7).

- i. Anterior process:** Anterior part of an elongate median protuberance lying on XIII thoracic sternite.
- ii. Posterior process:** Posterior part of an elongate median protuberance lying on XIII thoracic sternite.

3. Seminal receptacle: Paired or unpaired bulbous or tubular sacs associated with the thelycum for the storage of sperm, situated immediately dorsal to plates of sternite XIV, sometimes XIII and XII.

Types of thelycum:

- I. Open:** One in which the seminal receptacles are absent.
- II. Closed:** One in which the seminal receptacles are present.

c. Appendix masculine: Lappet, sometimes scalelike, at the medial base of the endopod of the second pleopod in males (Fig. 8).

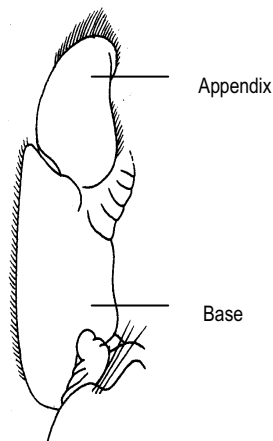


Fig. 8: Appendix masculina

Chapter 2

Systematic Account

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.

Prawns of the genus *Penaeus* belong to family *Penaeidae* under super family *Penaeioidea*. 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.
 Genus : *Penaeus* Fabricius, 1798

A. Superfamily PENAEOIDEA

Diagnostic characters: Small to large sized, with a body length from 2.5 to about 35 cm. All 5 pairs of legs well developed, with first 3 pairs of legs forming a pincer, none of the pincers particularly large. Abdomen with posterior part of pleura (lateral plates) covering anterior part of succeeding pleura. With large copulatory organ, on first pair of pleopods in males (petasma), and on posterior thoracic sternites in females (thelycum). Eggs are released directly into the water and not retained by the females on the abdomen.

Most of the commercial species of prawn in India belongs to the family Penaeidae and Palaemonidae. Penaeidae belongs to superfamily Penaeoidea under suborder Dendrobranchiata and Palaemonidae belongs to infra- order Caridea under suborder Pleocyemata. These two commercial groups of prawns may be distinguished by the following table:

Table 1: Distinguishing features of Penaeidae and Palaemonidae

Features	Penaeidae	Palaemonidae
First three pairs of pereopods	Chelate and similar in size	First two pairs chelate, 3 rd never chelate, first pair larger than others.
Pleuron of 2 nd abdominal somite	Only overlapping 3 rd somite	Overlapping both 1 st and 3 rd somite.

Dorsal abdominal carina	Present	Absent
Shape of the body	Laterally compressed	Cylindrical
Position of egg	Eggs are released directly into the water and not retained by the females on the abdomen.	Females carry the eggs on the abdomen until hatching.

Key to the families of Penaeoidea occurring in the area

1. Either rostrum very short and armed with 1 or 2 upper teeth only, or upper antennular flagellum very short and attached to the base of distal antennular segment.....
.....*Aristeidae*
___ Rostrum always armed with more than 3 upper teeth, and both upper and lower antennular flagella of similar length and attached to the tip of antennular peduncle.....2
2. Pleopods (abdominal appendages) with 1 branch only; abdomen often with many distinct furrows and grooves..... *Sicyoniidae*
___ Pleopods (abdominal appendages) with 2 branches; abdomen without or with very few distinct grooves..... 3
3. Cervical groove prominent and extending to about dorsal carapace; either postorbital or postantennal spine present.....*Solenoceridae*
___ Distinct part of cervical groove far from dorsal carapace; postorbital and postantennal spine absent.....*Penaeidae*

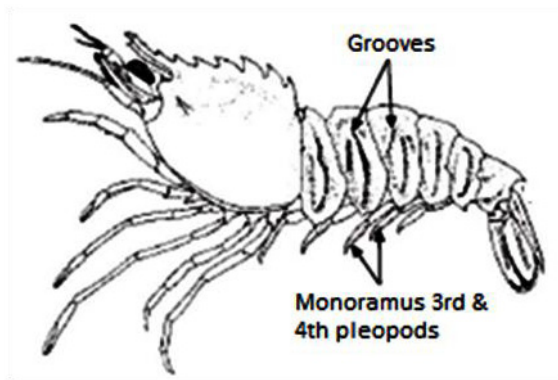


Fig. 9: Sicyoniidae

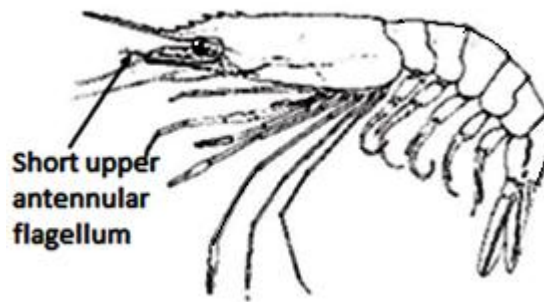


Fig. 10: Aristeidae

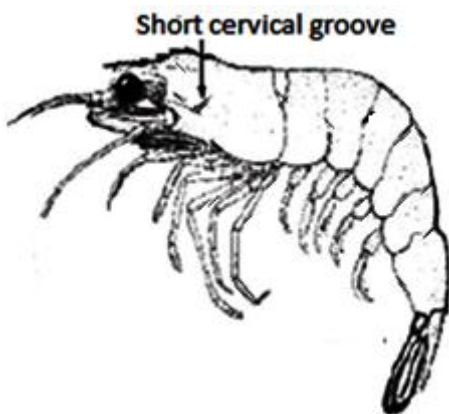


Fig. 11: Solenoceridae

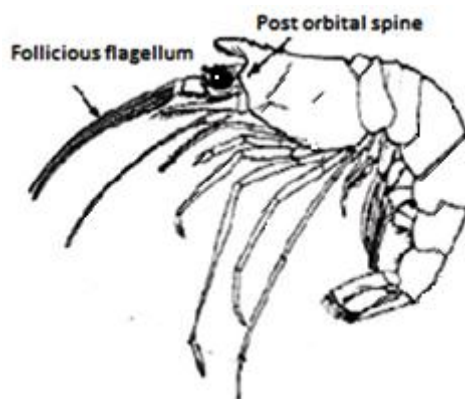


Fig. 12: Penaeidae

(Fig. 9 to 12 after Fischer, W. and Bianchi, G. 1983)

1. 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.

Key to the genera found in India

1. Rostrum not reaching distal end of first antennular segment 2
 - Rostrum extend up to or beyond distal end of first antennular segment3
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 present7
 - Longitudinal suture absent; transverse suture absent 10
- 7. Body thickset, densely pubescent, integument thick; hepatic carina absent8
 - 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; thelycum close 11