

## Lobster and Deep Sea Shrimp Resources and Biology

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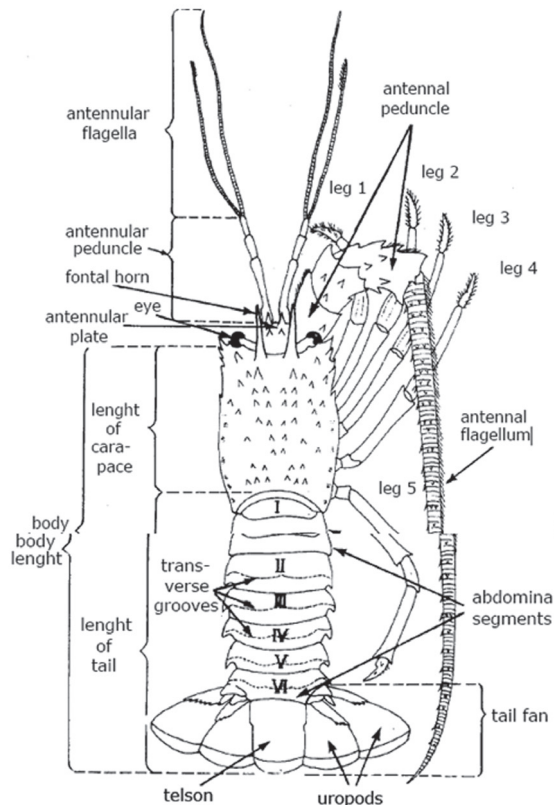
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Shellfish systematics is the most unique one in Fisheries Science in view of its importance and implications in diversity. The systematic zoology is the science that discovers names, determines relationships, classifies and studies the evolution of living organisms. It is an important branch in biology and is considered to be one of the major subdivisions of biology having a broader base than genetics, biochemistry and physiology. The shellfish includes two highly diversified phyla i.e. phylum **Arthropoda** and phylum **Mollusca**. These two groups are named as shellfishes because of the presence of **exoskeleton made of chitin in arthropods** and **shells made of calcium in molluscs**. These two major phyla are **invertebrates**. They show enormous diversity in their morphology, in the habitats they occupy and in their biology. Phylum Arthropoda includes economically important groups such as lobsters, shrimps, crabs. Taxonomical study reveals numerous interesting phenomena in shellfish phylogeny and the study is most indispensable for the correct identification of candidate species for conservation and management of our fishery resources and aquaculture practices. On the whole taxonomic study on shellfishes furnishes the urgently needed information about species and it cultivates a way of thinking and approaching of all biological problems, which are much needed for the balance and well being of shellfish biology as a whole.

### Lobster Resources

Lobsters are among the most prized of fisheries resources and of significant commercial interest in many countries. Because of their high value and esteemed culinary worth, much attention has been paid to lobsters in biological, fisheries, and systematic literature. They have a great demand in the domestic market as a delicacy and is a foreign exchange earner for the country.



general shape (dorsal view) of a spiny lobster  
(*Panulirus* sp. No rostrum, no pincers)

**Key to species of *Panulirus* recorded off the Indian coast and the island groups, Andaman Nicobar Island and the Lakshadweep Islands**

1. Abdominal segment 2-5 with the transverse grooves.....2 Abdominal segments 2-5 without transverse grooves or with indistinct grooves in juveniles only.....4
2. Margin of transverse abdominal grooves with squamae varying from well developed and even in size to minute and irregular in size. Overall colour ranges from brownish-red in specimens with large squamae to olive green in specimens with minute squamae .....***P.homarus***
3. Abdominal segment 2-5 with the transverse grooves.....2 Abdominal segments 2-5 without transverse grooves or with indistinct grooves in juveniles only.....4
4. Margin of transverse abdominal grooves with squamae varying from well developed and even in size to minute and irregular in size. Overall colour ranges from brownish-red in specimens with large squamae to olive green in specimens with minute squamae .....***P.homarus***  
Margin of transverse abdominal grooves with no trace of squamae.....3
5. Antennular plate (between the stridulating organs) with 2pairs (4) of subequal principle spines, fused at their bases. Supraorbital horns rounded in cross section. Overall colour olive-black.....***P.pencilatus***  
Antennular plate with 1 pair (2) of equal principle spines; supraorbital horns flattened bilaterally. Overall colour purplish-red with abdomen covered with conspicuous white spots.....***P.longipes***  
Antennular plate with 1 pair of equal spines; white bands on each abdominal segment. Legs with white spots. Colour Olive green.....***P.polyphagus***
6. Conspicuous transverse white band posteriorly on each abdominal segment. Legs with longitudinal white stripes, juveniles have white antennae. Overall colour black and green.....***P.versicolor***  
No transverse white band on abdominal segments but above each pleural spur is a conspicuous white spots. Legs with irregular transverse mottling, no longitudinal stripes. Overall colour bluish green.....***P.ornatus***

***Panulirus homarus homarus* (Linnaeus, 1758)**

**Biology:** Maximum total length 31cm, carapace length 12cm. Average total length 20 to 25cm Major fisheries are on the southeast and southwest coast of India. The commercial fishery at Muttom, Kanyakumari district was found to be largely supported by 1<sup>st</sup> and 2<sup>nd</sup> year animals. At a given carapace length females are heavier than males. Females attain functional maturity at a carapace

length (CL) of 55mm. Males attain maturity at 63mm CL on the basis of allometric growth of III walking leg. Peak breeding season is from November to December.

### Genus *Puerulus* Ortmann, 1897

#### Key to species (after Berry, 1969)

1. Two teeth between frontal horns and the cervical groove
  - 1a. Median keel of carapace with 5 post-cervical and 2 or 3 intestinal teeth. Fifth pereopod of male not chelate..... *P.sewelli*

**Biology:** Maximum total body length 20cm, maximum carapace length about 8cm. Average total length about 15 cm. The species was commercially exploited along the southwest and southeast coast of India. A catch rate of 200-300kg/hr was reported from vessels opening off Mandapam. January to April is the peak period of abundance. During 1998-2000, 524t were landed at Sakthikulangara, Kollam, and Kerala. The sizes of *P.sewelli* ranged from 76-80mm to 176-180 TL in Males and from 81-85mm to 176-180mm in females. 26% of females were found in mature/berried stage. Due to coincidence of peak breeding and the fishery, the breeding population has been heavily exploited. The species has been overexploited and the current landing is around 2 tonnes/ annum from Quilon Bank.

### Family: Scyllaridae Latreille, 1825

#### Key to Identification of the family

Antennal flagellum reduced to a single, flat plate which forms the sixth and final segment of the antenna. The shovel-like appearance of the antennae is responsible for the name shovel-nosed lobster

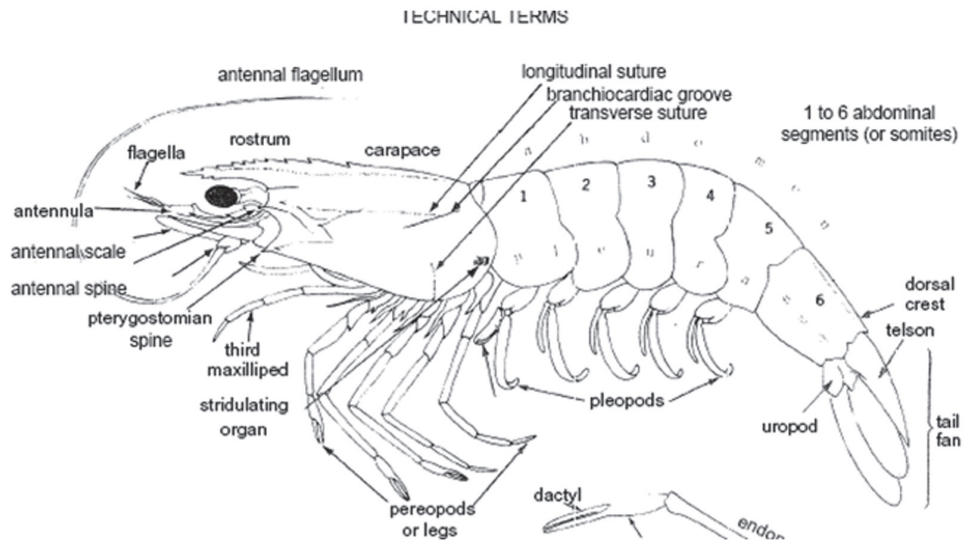
#### *Thenus unimaculatus* Burton & Davie, 2007

**Biology:** Maximum total body length about 25cm; often appears as bycatch in trawl; also caught in gillnets. At Kollam, Kerala peak fishery was observed from November to February. Total length varied between 61-230 mm in males and 46-250mm in females. Length at recruitment (Lr) was 48mm. Absolute fecundity varied from 14750 to 33250 mature eggs (Radhakrishnan *et al.*, 2013).

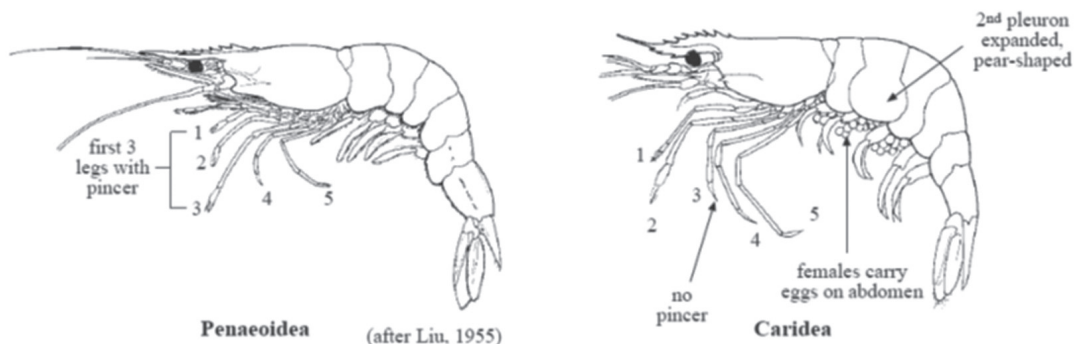
### Shrimp Resources

Shrimp resources are available both from inshore and from offshore waters. As the fish resource from inshore waters remained static during the last two decades, fishing pattern underwent several changes in the previous decade, leading to the exploitation of deep sea resources either with deployment of large sized vessels or modified medium/small sized vessels. Deepwater shrimps appear to have a world-wide distribution in tropical waters. They have been caught in surveys using baited traps in depths between 200 m and 800 m off continents and at 200- 500 m depth in the Indian Ocean.

Deep sea decapod crustaceans constitute one of the dominant high price groups of invertebrates in the marine fishery sector of Kerala although the structure and organization of their community



are not well known as that of coastal penaeid prawns. In view of the increasingly prominent role played by deep sea prawns and prawn products in the economy of the country, the taxonomic identity of various species exploited from the deep sea fishing grounds off Kerala is an essential prerequisite for the sustainable development and management of deep sea prawn wealth of Kerala. The deep sea prawns landed at various harbours of Kerala is an assemblage of wide array of species representing various families, the prominent being *Pandalidae*, *Aristeidae*, *Solenoceridae* and *Penaeidae* while family *Oplophoridae* contributes to only a minor portion of the deep sea trawl catches in Kerala.



## Key to the deepsea prawns of Penaeidae, Pandalidae and Oplophoridae

### Penaeidae

1. Inner border of the antennular peduncle with a setose scale; Podaobranchiae absent.....2  
 No setose scale on the inner border of the antennular peduncle; podobranchiae present; pleurobranchia on 10-13 segments reduced to mere papillae.....***Aristeus alcocki***
2. Exopodite of the external maxillipeds large, absence of a brachio-cardiac sulcus in the branchiostegal region.....3
3. Symmetrical petasma; no basal spine at 3<sup>rd</sup> maxilliped.....4
4. A long fissure on either side of the carapace throughout the entire length; rostrum not glabrous and less than 1/3<sup>rd</sup> the length of carapace.....***Parapenaeus investigatoris***  
 No fissure on carapace wall; rostrum glabrous, as long as carapace.....***Penaeopsis jerryi***

### Pandalidae

1. Carapace hard and rigid with longitudinal carinae; 2<sup>nd</sup> pair of pereopods unequal.....***Heterocarpus***.....3  
 Carapace smooth without a longitudinal carinae; 2<sup>nd</sup> pair of pereopods Carapace equal...2
2. 3<sup>rd</sup> abdominal somite unarmed or with fixed postero-medial tooth; terminal segment of 2<sup>nd</sup> maxilliped broader than long, attached strip like to penultimate segment with its longer side.....***Plesionika***.....5
3. 3<sup>rd</sup> abdominal tergum without spines, length of 6<sup>th</sup> abdominal segment less than 5<sup>th</sup>...4  
 3<sup>rd</sup> abdominal tergum ends in a sharp spine dorsally; 6<sup>th</sup> segment more than double the length 5<sup>th</sup> ..... ***Heterocarpus woodmasoni***

### Oplophoridae

1. Rostrum with atleast as many dorsal as ventral teeth; abdomen with 4<sup>th</sup> and 5<sup>th</sup> somites usually armed with posteromesial tooth; left mandible with incisor process not tapering sharply toward opposable margin, armed with 9-14 subacute teeth.....  
***Acanthephyra***
2. Abdomen with 6<sup>th</sup> somite shorter than 5<sup>th</sup> (not including posteromesial spine); telson simply pointed posteriorly, not terminating in spinose endpiece; 3<sup>rd</sup> maxilliped and 1<sup>st</sup> pereopod with broadly compressed rigid exopods.....***Oplophorus***
3. Carapace with strong carina extending from branchiostegal spine to branchial region; abdomen with posterior margin of 3<sup>rd</sup> somite not distinctly excavate either side of posteromedian tooth.... ***Acanthephyra fimbriata***

## **Penaeid shrimps**

### ***Aristeus alcocki* Ramadan 1938**

**Diagnostic characters:** Large size red abdominal rings. Rostrum in female long and slender upper margin curved downwards till distal end of 2<sup>nd</sup> segment of antennular peduncle. Rostrum in males much shorter and seldom surpassing tip of antennular peduncle, armed with three teeth above orbit; **and no teeth on ventral side, lacks hepatic spine, upper antennular flagellum very short, Eyestalk with a tubercle.** Petasma simple, membranous, right and left halves united with each other along the whole length of dorsomedian with a papilla-like projection directed posteromedially. Thelycum represented by a shield shaped plate directed anteroventrally bordered by an oblique ridge on either side.

**Colour:** Pink with reddish bands on the posterior border of all abdominal segments.

**Fishery & Biology:** The catches were mainly composed of females and their size ranged from 78 mm to 188 mm in total length. The size distribution showed unimodal pattern with majority in size groups 146-165 mm. The males, which were very poorly represented in the catches were relatively smaller in size and their total length varied from 67 mm to 110 mm.

**Distribution:** Indian Ocean; Arabian Sea and Bay of Bengal, at depth of 350-450 m off Quillon and Alleppey.

### ***Solenocera hextii* Wood-Mason & Alcock, 1891**

**Family :** Solenoceridae

**Diagnostic characters:** Flatenned rostrum with 7 teeth on dorsal side and no teeth on ventral side of the rostrum. Postrostral carina sharp but not laminose. Antennular flagella with red and white bands. The spines on the cervical groove situated ventral to the posteriormost rostral tooth which is well developed. The characteristic 'L' shaped groove on either side of the branchiostegal region is also clearly defined.

**Colour:** Pink to red

**Distribution:** Found all along the east and west coast of India at depths between 250 to 547 m.

### ***Metapenaeopsis andamanensis* (Wood-Mason, 1891)**

**Family:** *Penaeidae*

**Diagnostic characters:** Rostrum more or less horizontal and straight with 6 to 7 teeth on dorsal side and no teeth on the ventral side. Lower antennular flagellum longer than the upper, much longer than the entire antennular peduncle but 0.7 times the carapace length. 3<sup>rd</sup> pereopod surpass the rostrum by the length of the entire chela. Assymetrical petasma. 3rd maxilliped and 1st pereopod with a basal spine, distal fixed pair of spines on telson.

**Colour:** Pale pink to red

**Fishery & Biology:** The total length of males varied from 67 mm to 115 mm and that of females from 68 mm to 130 mm.

**Distribution:** A penaeid prawn commonly encountered in the trawl catches at all depths ranges upto 400 m and was obtained from all areas.

***Penaeopsis jeryii* Perez Farfante, 1979**

**Family:** *Penaeidae*

**Diagnostic characters:** Dagger shaped rostrum with teeth on dorsal side of the rostrum. Specimen appears to be pale red in color with white bands on the body. Cervical groove very prominent, antennal scale as long as rostrum. Thelycum trilobed and sub elliptical in structure.

**Fishery & Biology:** Size range of female specimens ranged from 74-115 mm and males ranged from 70-110 mm.

**Distribution:** All along the southwest coast of India particularly off Cochin, Quillon and Alleppey at depth of 275-350 m

**Caridean / Non-Penaeid shrimps**

***Heterocarpus woodmasoni* Alcock, 1901**

**Family :** *Pandalidae*

**Diagnostic characters:** Carapace with 2 longitudinal crests on each side, extending over full length of carapace – post antennal crest and branchiostegal crest. A conspicuous elevated, sharp tooth at middle of dorsal crest of 3rd abdominal segment, telson bears 5 pairs of dorsolateral spinules besides those at the tip.

**Fishery & biology:** Size in the catches ranged from 72 to 135 mm in total length but dominated by 111-120 mm size groups in both the sexes. The fertilized eggs on the pleopods and the head-roe are light orange and this colour stands out in contrast with the pink colour of the prawn. The berry becomes greyish in advanced stages of development.

**Distribution:** Andamans, Southwest of India off Cochin and Alleppey at depths of 250-400 m.

***Heterocarpus chani* Li, 2006**

**Diagnostic characters:** The teeth on the dorsal crest and the rostrum together vary from 8 to 10. Teeth on the rostrum proper varying from 2 to 4 and 13-15 on ventral side. The dactyli of the 3 posterior legs short, median carination of the 3<sup>rd</sup> abdominal tergum is quite prominent. Carapace with 2 longitudinal crests on each side, extending over full length of carapace- post-ocular crest and branchiostegal crest. Post antennal crest very short.

**Fishery & biology:** The size of the individual prawn varied from 67 to 140 mm in total length and the catches were represented by all groups of the females. Males are mostly in 90-100 mm size groups. The colour of the berry is light **orange** and turns dirty grey as embryo develops.

**Distribution:** Southeast and Southwest coast off Cochin, off Alleppey at depths of 250-400 m. immature specimens were found in greater numbers in shallow waters while the bigger prawns seemed to prefer deeper grounds beyond 350 m.

***Plesionika quasigrandis* (Bate, 1888)**

***Pandalidae***

**Diagnostic characters:** Rostrum upturned at the tip. Rostrum is armed with 46 teeth on the dorsal side and 31 teeth on the ventral side., very long slender legs, Telson is double the length of the 5<sup>th</sup> abdominal somite. Lower antennular flagellum longer than the upper and about 5.4 times the carapace length. 3<sup>rd</sup> maxilliped extends beyond the antennal scale by the length of its dactylus. Second pereopod exceeds the tip of antennal scale by its chela and 1/8 length of carpus. Minute tubercle on the dorsal surface of the carapace at about 1/6<sup>th</sup> of its length from the hinder edge which corresponds in position to the small blunt median spine which is present in all the specimens.

**Colour:** Body pale red in colour

**Fishery & biology:** The size of this prawn in the catches ranged from 63 to 125 mm but the size groups 95-110 mm in both sexes predominated. Berry is greenish-blue in colour with ovoid shape of fertilized eggs.

**Distribution:** In Indian waters this species is known to occur in south-east and south-west coast of India abundantly noticed from Quilon and Mangalore regions from the depth of 250-400 m.

***Plesionika semilaevis* Spence Bate, 1888**

**Diagnostic characters:** Rostrum very long pointed with 7-9 dorsal teeth including 2-5 teeth on carapace posterior to the level of orbital margin while ventral margin of the rostrum is armed with 34-56 teeth.

**Fishery & biology:** The size of this prawn in the catches ranged from 71 to 120 mm in males and 80 to 130 mm in females. The modal lengths for males and females were at 90-95 mm and 96-100 mm respectively. Berry is deep blue in colour in the early stages and to light grey in advances stages of development.

**Distribution:** In Indian waters this species is known to occur along the south-west coast particularly through out the Kerala coast abundantly noticed from Quilon and Alleppey regions from the depth of 200-450 m.

**Family : Ophlophoridae**

***Ophlophorus gracilirostris* Alcock, 1901**

**Diagnostic characters:** Carapace with dorsal carina extending to the posterior margin. Rostrum very long almost equal in length to the carapace. Branchiostegal spine quite distinct, with a well-defined keel, spine on the 3<sup>rd</sup> abdominal tergum very much longer than those on the 4<sup>th</sup> and 5<sup>th</sup>. In the male the anterior border of the first abdominal somite is bilobed with the posterior lobe more pronounced and angular.

**Distribution:** Arabian Sea, Bay of Bengal, Andaman Sea and Hawaii Islands, Southwest of Cochin, off Alleppey 300-450 m



***Acanthephyra fimbriate* Alcock & Anderson, 1894**

**Diagnostic Characters:** The carapace is without a straight ridge or carina running on the entire length of the lateral surface i.e., from the hind margin of the orbit to the posterior edge of the carapace. Rostrum long, upcurved with 5 to 6 teeth on the dorsal side and only one tooth on the ventral side of rostrum. Dorsal carina of 3rd to 6th abdominal somites ending in pointed spines. Sometimes the posterior spine on the sixth somite may be absent. Telson generally more or less truncated at the tip and laterally it is armed with spines. Eyes are well pigmented. Incisor process of the mandible is provided with teeth throughout the entire length of its cutting edge. Pereopods are not abnormally broad and flattened. Exopods of the third maxilliped and all pereopods are neither foliaceous nor rigid.

**Distribution:** Southeast and Southwest coast of India

***Acanthephyra sanguinea* Wood-Mason, 1892**

**Diagnostic Characters:** Rostrum longer than carapace with 7 dorsal and 5 ventral teeth, extending much beyond the tip of the antennal scale. Branchiostegal spine small, forming a small projection on frontal border of carapace and without a carina. Surface of carapace finely pitted as in all the species of the purpurea group. Dorsal carinae of 3<sup>rd</sup> to 6<sup>th</sup> abdominal somites ending in pointed spines, that of 3<sup>rd</sup> somite the longest and of 4<sup>th</sup> and 5<sup>th</sup> of equal size and smallest. Four pairs of dorsolateral spines present on the telson.

**Distribution:** Southeast and Southwest coast of India

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