Taxonomy and Biology of Cultivable Species of Shrimps, Crabs and Lobsters

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Aquaculture has beenan age old practice in several countries and is said to have begun in China. World aquaculture production rose from 5.8 million tonnes to 70.5 million tonnes during 2013. In 2012 farmed crustaceans accounted for 9.7% (6.4 million tonnes) of food fish aquaculture production by volume which includes 3.91 million tonnes from mariculture (FAO, 2014). Several species of penaeid shrimps, brachyuran crabs, spiny and scyllarid lobsters are cultivated in several parts of the worldand these organisms also support commercial fishery. Important criteria for the successful cultivation of any organism/species arethorough knowledge of its morphological characters for accurate identification and their biology.

Family-Penaeidae

***Penaeus monodon*– Giant Tiger shrimp**

Rostrum straight, toothed on both ventral (generally 3 teeth) and dorsal sides. Sub-hepatic ridge oblique. Petasma symmetrical and consists of two simple lobes united at the upper edge by hook-lets. Thelycumsub-oval in shape, posterior process triangular. Pale yellow and dark brown bands on the abdomen. Uropods with pale yellow to pink median transverse bands.

***Fenneropenaeus (Penaeus) indicus* – Indian White shrimp**

Rostral teeth on ventral (3 to 6) and dorsal side. Body white or cream in colour. Adrostral crest ending just before epigastric tooth. In males distal segment of third maxilliped as long as the second segment and bear long tufts of hair at the tip. Subhepatic ridge in the branchial region lacking. Fifth pereiopod without exopod.

***Fenneropenaeus (Penaeus) merguiensis* – Banana shrimp**

The rostral crest is elevated and somewhat triangular in shape. Teeth on rostrum present both on ventral (3 to 5) and dorsal side. Adrostral carina not reaching as far as epigastric tooth. Body colour paleyellow or white. In males the distal segment of third maxilliped half as long as the second segment and bears hair at the tip.

***Penaeus semisulcatus* – Greeen Tiger shrimp**

Rostrum curved. Rostrum and abdomen are banded green or grey and white. Mostly the antennae are also banded white and brown. Rostral teeth on ventral (generally 3 teeth) and dorsal side. Adrostral grooves extending

just beyond epigastric tooth. Subhepatic ridge is horizontal. Small exopod present on fifth pereiopod (absent in *P. monodon*).

***Melicertus latisulcatus* – Western King shrimp**

Rostrum with dorsal and one ventral teeth. Adrorstral crest extends almost to the posterior margin of carapace. Telson with three pairs of movable lateral spines. Vertical black bar on pleuron. Anterior process of thelycum horn like and strongly bifurcate.

***Marsupenaeus japonicus*– Kuruma shrimp**

Rostrum with dorsal and one ventral teeth. Adrostral crest extends up to near to the posterior margin of the carapace. Carapace with three continuous bands and the band on the last abdominal segment interrupted. Telson with three pairs of movable lateral spines. Thelycum closed infolding laterally forming anteriorly open pocket functioning as seminal receptacle. Distomedian projection of petasma curved forming hood.

***Metapenaeus dobsoni* – Kadal shrimp**

Rostrum extends little beyond the tip of the antennular peducncle. Distomedian projection of petasma with a short filament on ventral surface and another on dorsal surface. Thelycum is long grooved and tongue shaped and ensheathed in a horse-shoe like process formed by lateral plates. Merus of fifth pereiopod in adult males with one or two large triangular teeth.

***Litopenaeus vannamei* – Whiteleg shrimp**

Rostrum with teeth both on ventral and dorsal side, moderately long extending beyond the antennular peduncle in young but shorter in adults. In mature males the petasma is symmetrical, semi open and in mature females the thelycum is open. The species is translucent white. They may have a bluish hue near the margin of the telson and uropods. Legs are white in colour.

Biology of penaeid shrimps

They have two phases in their life cycle – estuarine and marine. The post larvae migrate to the estuaries, where they grow to juveniles/adults and return to the sea. Here they mature and spawn and the cycle is repeated. The eggs, larvae and post larvae have pelagic existence and the juveniles/sub-adults and adults are benthic. Several species like *Penaeus monodon, Fenneropenaeus indicus, Metapenaeus dobsoni, Metapenaeus monoceros, Metapenaeus brevicornis* support important fishery in the estuarine systems in India - Hoogly-Matlah in WB, Mahanadi & Chilka Lake in Orissa, Godavari & Krishna in AP, Vellar & Killai backwaters and Pulicat Lake in TN, Cochin backwaters & Vembanad Lake in Kerala; Narmada-Tapthi and Little Rann of Kutch in Gujarat. Penaeid shrimps are carnivorous, females are usually larger than males and have high fecundity which depends on the species, size of the female and ovary weight. They spawn throughout the year, peak seasons varying between years. Their life span is usually 3+ years. The maturity stages in penaeid shrimps are classified as immature (IM), early maturing (EM), late maturing (LM), mature (M) and spent (SP). Stages of maturity can be ascertained externally through the exoskeleton. *Penaeus monodon* attains maximum length of 300 mm. In the backwaters and estuaries they grow to 120 to 130 mm. From inshore waters they are caught in various types of seine nets and from deeper waters in trawls. It is an important candidate species for culture because of its hardiness, fast growth, large size and high market price. *F. indicus* grow to 230 mm in total length and *F. merguiensis* up to 320 mm. *P. semisulcatus* grows to 250 mm total length. It is the most dominant penaeid shrimp species

supporting commercial fishery along Gulf of Mannar and Palk Bay on the southeast coast. The maximum size of *M. dobsoni* recorded is 130 mm. *Litopenaeus vannamei* native of East Pacific coast is an introduced penaeid shrimp in India. It grows to a maximum length of 230 mm.

Family- Portunidae

***Scylla serrata* – Giant mud crab**

Carapace smooth having strong transverse ridges; H shaped gastric ridges deep. Teeth on frontal margin sharp. Nine anterolateral carapace spines of same size projecting obliquely outwards. Carpus of chelipeds with two distinct spines on distal half of outer margin. Colour green to browny black depending on the habitat, outer surface of palm green and often with marbled pattern; last legs marbled both in males and females.

***Scylla olivacea* – Orange mud crab**

Frontal margin usually with rounded teeth. Carpus of cheliped with only one reduced spine. Carapace smooth, more evenly convex with very low transverse ridges. H-shaped gastric groove shallow. The median pair of the frontal lobes more rounded and projecting slightly forwards of the lateral ones.

Biology of mud crabs

S. serrata is usually found in mangrove areas with high salinity, and also in offshore waters where they spawn, can tolerate reduced salinity also whereas *S. olivacea* prefer low saline water. They are found in low intertidal muddy bottom. The megalopa or postlarval stage migrates to the estuaries and backwaters attain maturity and go to the inshore waters for spawning. Immature and mature males have slender triangular abdominal flaps. Immature females have a broad and triangular abdominal flap and mature females a semi-circular flap. They have five zoeal stages and one megalopa stage which metamorphose to the crab instar (seed). They are carnivorous and prefer small molluscs, trash fish and other crustaceans as food.

***Portunus pelagicus*– Blue Swimmer Crab**

Carapace with reticulated markings. Front with four teeth. Inner margin of merus of cheliped with three spines. Nine teeth on anterolateral margin of carapace. Males with blue markings and females with dull green.

***Portunus sanguinolentus*– Three Spotted Crab**

Carapace with three brown or purple spots on the posterior half of the carapace, having white border. Nine teeth on anterolateral margin of carapace.

***Charybdis feriatus*– Crucifix Crab**

Five teeth on each anterolateral margins. Longitudinal stripes of brown and white colour with distinct white cross mark on the median part of the gastric region, hence also called commonly as crucifix crabs. The pleopods or swimming appendages are banded white and brown. They grow to very large size.

Biology

They are marine crabs. *P. pelagicus*is found at a depth of up to 50 m and is caught in trawl and gill nets. They show sexual dimorphism, males being bright blue in colour and females are dull green. The males grow larger

and their chelate legs are longer. They have five zoeal stages and metamorphose to the megalopa followed by the juveniles/seed stage. *Charybdis feriatus*are found at a depth of up to 60 m and are caught mostly in bottom trawl. They have six zoeal stages (stage I to stage VI) which metamorphose to the megalopa stage. They have good market in East Asia where it commands substantially higher premium prices than *Portunus* spp. *P. sanguinolentus* are caught at a depth of 30 m. All the three species prefer sandy to sandy muddy substrates.

Family Palinuridae

***Panulirus homarus*–Scalloped spiny lobster**

Anterior margin of carapace with two frontal horns, Antennular plate bearing four equal well separated large spines, Each abdominal segment with a transverse groove, Body greenish in colour with numerous white spots, Transverse bands absent, Antennules banded white and green, Legswith white spots and stripes.

***Panulirus ornatus*- Ornate spiny lobster**

Antennular plate with one pair of principal spines anteriorly and a second pair half the size of first. Abdominal segment smooth without transverse grooves. Each abdominal segment with dark pale spot on the outer margin. Abdomen greenish or brownish grey. Legs with alternate bands of black and white bands.

***Panulirus polyphagus*- Mud spiny lobster**

Broad antennular plate with one pair of principal spines. Abdominal segments without transverse grooves, having white transverse bands. Legs irregularly blotched creamy white.

***Panulirus versicolor*- Painted spiny lobster**

Antennular plate with two unequal and separated spines. Abdominal segments without transverse grooves. Blue black patches and white lines on carapace and abdominal segments. Legs, antennules longitudinally striped. Bases of antennae bright pink.

Biology of spiny lobsters

Panulirus homarus is an important lobster fishery resource in India particularly around Kerala and Tamil Nadu. They are found up to a depth of 90 m and are caught in gill nets, trawls, trammel nets and traps. They use rocky reefs for shelter. *P. ornatus* is found at a depth of 10 to 50 m in sandy and muddy substrates. It is the largest of the *Panulirus* species and can attain a total body length of about 50 cm. The size of lobsters in the fishery ranges from 113 to 233mm TL in males and 128-452 mm TL in females with 41% falling in the size range of 181-190 mm TL, which are juveniles. *Panulirus versicolor* is also a coastal species found up to a depth of 15 m. *Panulirus polyphagus* inhabits coastal waters on muddy and rocky substrates to a depth of 40 m and occasionally seen at 90 m. This species is the most important commercial species contributing to nearly three-fourth of the total lobster catch of the country. Major fisheries are on the northwest coast of India. Size in the fishery range from 75 to 385 mm total length (TL) those between 160 and 230 mm TL forming the mainstay of the fishery in Maharashtra. *P. ornatus* and *P. polyphagus* move to deeper waters for breeding. Phyllosoma larvae are planktonic and are carried away by currents. The last stage before becoming juveniles is the peurulus which swims towards the shore for settlement. Spiny lobsters are susceptible to diseases when held at high stocking density or due to stress or injury. Common diseases are white tail, tail fan necrosis and shell disease.

Giant Tiger shrimp

Indian White shrimp

Banana shrimp

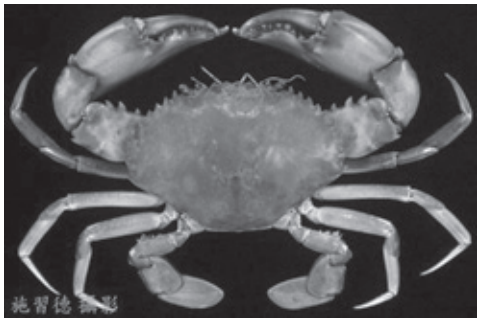
Greeen Tiger shrimp

Western King shrimp

Kuruma shrimp

Kadal shrimp

Whiteleg shrimp



Orange mud crab

Blue Swimmer Crab

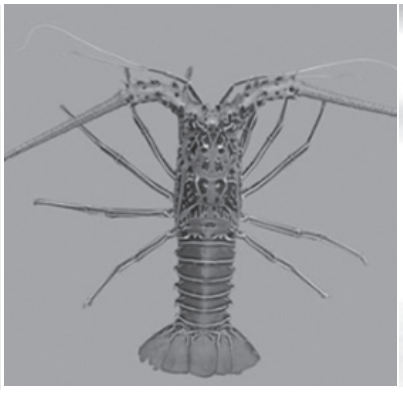
Three Spotted Crab

Crucifix Crab

Scalloped spiny lobster

Ornate spiny lobster

Mud spiny lobster



Painted spiny lobster

Slipper lobster/sand lobster

Hunchback locust lobster

Family Scyllaridae

***Thenus unimaculatus*– Slipper lobster/sand lobster**

Body dorsoventrallyflattended, pale brown in colour.Three spines on the antero lateral border of carapace and a notch in middle of each segment. Fifth abdominal segment with a spine on the dorsal side. Tubercles present on the body.Variable purple to black pigmentation (blotch or large or narrow streak) on the inner surface of merus of second and sometimes third legs.

Biology

It forms a fishery in trawlers along the Saurashtra coast, Kollam and Chennai. They burrow in sand and generally feed on molluscs. The phyllosoma stages (I-IV) are completed in 7, 5, 7 and 7 days respectively and the nisto stage in 4 days.The lobsters are usually caught at a depth of 50 m. They form bycatch in trawls and are also caught in gillnets.

***Petractus rugosus* (H. Milne Edwards, 1837) – Hunchback locust lobster**

Rostral teeth reduced to tubercle. Median teeth on carapace before the cervical groove blunt and inconspicuous. Gastric tooth most conspicuous. Surface of carapace uneven and tubercles are high. The dorsal surface of the body is grayish or purplish brown with darker spots. The first abdominal somite shows dorsally often a dark blue colour. The abdomen shows a distinct median longitudinal carina on somites 2 to 5, that of somite 3 is the highest; in each somite there is a wide transverse groove.

Biology

They are found at depths of 20 to 60 m. They attain a total length of 2.5 to 6cm. They have ornamental potential and presently forma component inthe low value bycatch in trawl.