

Demersal fishes of Gulf of Mannar and Palk Bay

Remya L., Vinothkumar R., M. Rajkumar and S. Thirumaliselvan

Introduction

India has an extensive coastline length of 8,129 km, continental shelf area of about 0.5 million km² and the area available for fish production in the country is vast with 2.02 million km² of EEZ. Gulf of Mannar (GoM) is situated in the Indian Ocean, between south east of India and West of Sri Lanka from Rameswaram (79° 14' East Longitude and 9°14' North Latitude) and Tuticorin (78° 9' East Longitude 8°48' North Latitude) on the south-eastern coast of the country (Tamil Nadu). The Gulf is 80–170 miles (130–275 km) wide and 100 miles (160 km) long with a chain of 21 islands stretching from Mandapam to Tuticorin. The Island system and coral reefs spread over this region offer shelter for a variety of marine fauna and flora. The Palk Bay (PB) region lies between 9° 17' N and 100° 18' N latitudes is practically calm except at the on set of northeast monsoon when turbulent condition prevails. The Palk Bay has landmarks between the Point Calimere and Rameshwaram Island as northern and southern borders, respectively. The eastern part of the bay is connected with Srilanka whereas the western part of the bay is the border of the Indian subcontinent (Fig.1). Both mechanised trawlers and non-mechanised vessels carry out the fishing throughout the year in both of these ecosystems. But the shore seine fishing is seasonal in certain areas particularly in the southern region, When the Gulf of Mannar covering its southern portion becomes rough during April to September, the shore seine operations shift to Palk Bay and when the Palk Bay become rough during October-March, the units migrate to Gulf of Mannar. The fish species that are distributed from the sea floor to 5 m depth above are called demersal fishes and those who are distributed from a depth around 5 m above the sea floor to the surface is called pelagic. The major commercially significant demersal fish groups in the GoM and PB is presented in the Figure 2.



Fig 1. Schematic representation of Gulf of Mannar and Palk Bay

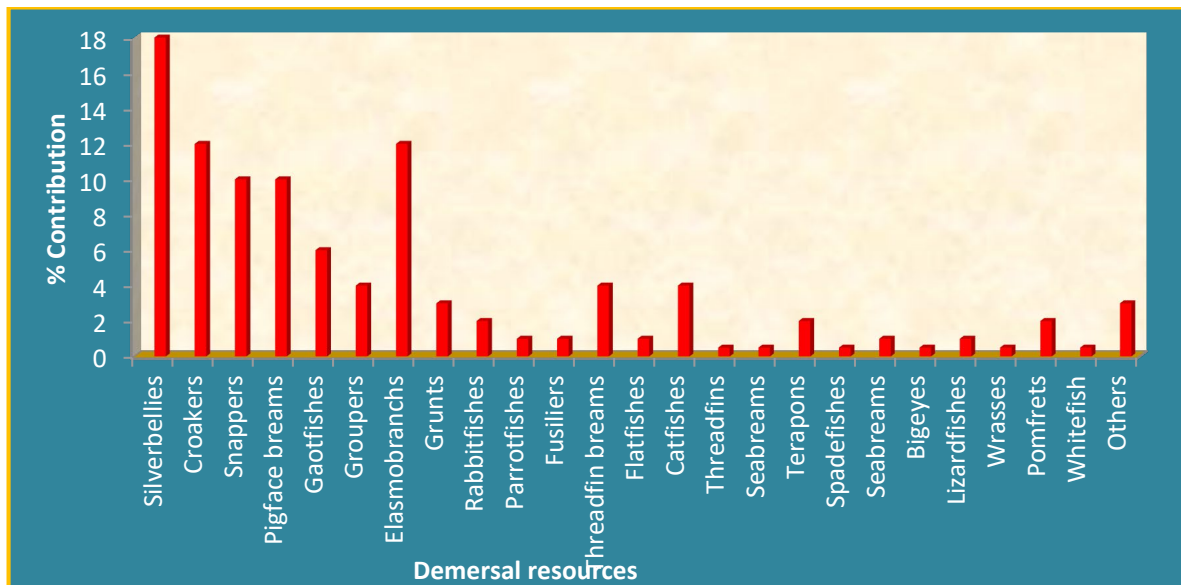


Fig.2. Different resources in the demersal finfish landing from Gulf of Mannar and Palk Bay (Mandapam, unpublished data ICAR-CMFRI)

The major teleost demersal fishes being caught from Mandapam vicinity of PB and GoM are Silverbellies, Croakers, Goatfishes, Emperors, Snappers and Groupers. Hence details of only these major resources are discussed here. In addition to it many other resources such as Threadfin breams, Flatfishes Rabbitfishes, Pomfrets, Whitefish, Terapons, Catfish as well make significant landing either throughout the year or seasonally in the Mandapam waters.

Silverbellies

The Silverbellies comes under the family Leiognathidae of order Perciformes are small to medium sized laterally compressed oblong or round bodied fishes with a bland silvery colouration. Silverbellies are also known as ponyfishes/slipmouths/ toothponies/ slimies due to the presence of highly extensible mouths, and the presence of a mechanism for locking the spines in the dorsal and anal fins. They also possess a luminous organ in their throats, which projects light through the animal's underside. These fishes harbour bioluminescent bacteria in their throats, which emits light through antero-ventral surface of the fishes. They inhabit the bottom shallow coastal waters and brackish waters in the Indian, West Pacific and Western Central Atlantic oceans. They are exploited by bottom trawls, shore-seines, gillnets, ring-seines, bagnets, etc. These fishes are most commonly marketed as dried salted and in some place they utilized for fishmeal production to feed poultry, especially in Tamil Nadu.

Formerly the ponyfishes were classified into three genera viz., *Leiognathus*, *Secuter* and *Gazza* based on the direction of protrusibility of mouth, which extend either upward, horizontal, or downward when open (James, 1983). Whereas the modern classification have 9 genera viz., *Aurigequula*, *Equulites*, *Eubleekeria*, *Gazza*, *Karalla*, *Leiognathus*, *Nuchequula*, *Photopectoralis* and *Secutor*. The genus *Leiognathus*, *Eubleekeria*, *Aurigequula*, *Equulites*, *Karalla*, *Nuchequula* and *Photopectoralis* is characterised with horizontal or pointing downward mouth when protracted (Fig.3) associated with absence of caniniform teeth, consumes 59.75% plankton in their diet. Whereas the mouth bare of canine tooth is oblique, pointing upward when protracted and more number of gill rakers for genus *Secutor*, is associated with planktonic diet (81.46%). The presence of caniniform teeth and horizontal extension of mouth when protracted are characteristics of the genus *Gazza*, which prefers equal percentages of plankton and benthos.

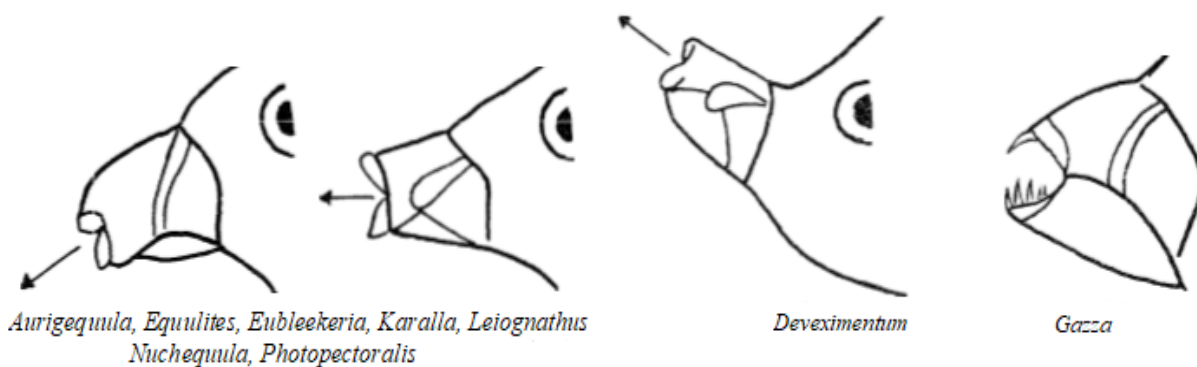


Fig.3 Protrucible snouts of various genera of silverbellies

Croakers

Croakers or drums are so called due to the repetitive throbbing or drumming sounds they make. They are identified externally based on the mouth position and pattern of pores on the snout (Fig. 4). They are primarily coastal fishes live inshore over sandy or muddy bottoms. Sciaenids are benthic carnivores, feeding on invertebrates and smaller fish. Many croakers use estuarine environments seasonally as nursery grounds during their juvenile phase and as feeding grounds during young adult phase, others are year-round inhabitants of estuaries and coastal lagoons. Seasonally, some species occur in relatively limited geographic areas with large quantities, and move into estuaries or along shorelines; hence local artisanal and subsistence fisheries also exploit them. Croakers often represent a major component of near-shore bottom trawl catches and bycatches. Most croakers are valuable foodfishes, especially the larger species. Gas bladders of bigger sciaenids are used to produce isinglass for industrial use and as an esteemed oriental delicacy. Overfishing (including bycatch) and changing coastal environmental conditions have reduced many local stocks.

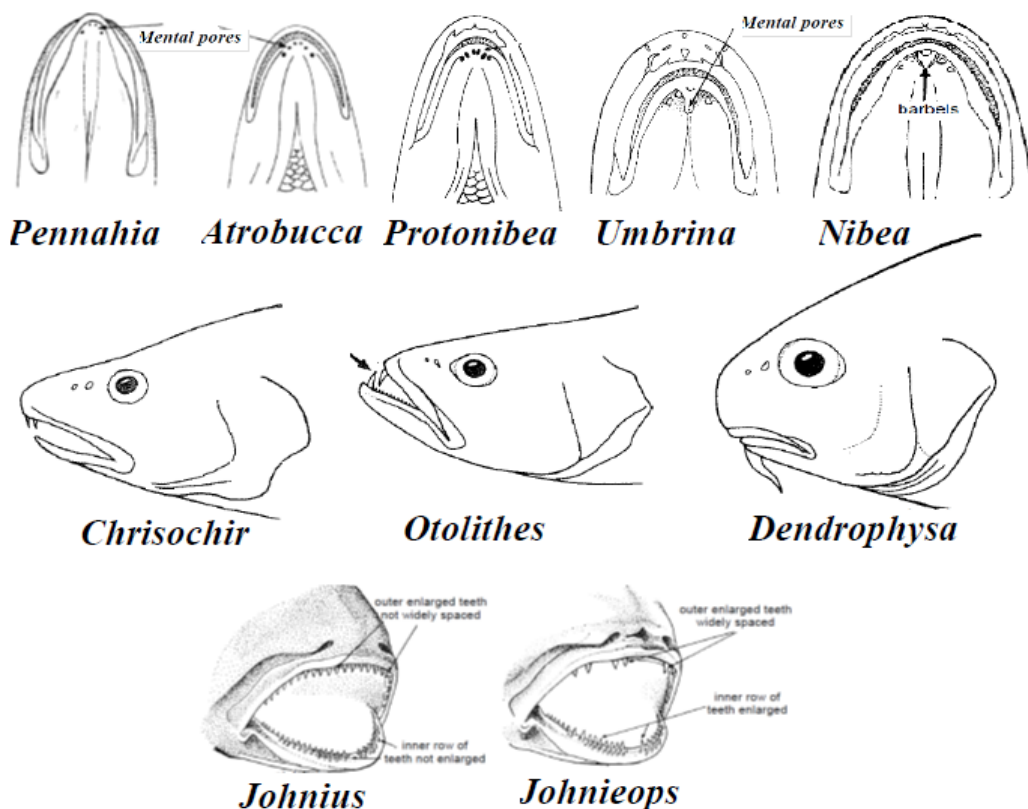


Fig.4 Cephalic and mouth variation in different genera of croakers

Goatfishes

Goatfishes are small to moderate-sized fishes of the family mullidae (order: Perciformes) with two long unbranched barbels on chin. Some species have distinctive dark, yellow, orange or brown bands or stripes on vertical fins and tail. Most goatfishes live in shallow water on open sand or mud bottoms, at least for feeding (though the species of *Parupeneus* and *Mulloidides* are often seen on coral reefs). Their barbels, which have chemosensory receptors, are actively moved over or into the sediment to locate food organisms. These fishes often root with their snouts into the sediment for their food. They are carnivorous, feeding on a wide variety of small animals, particularly small crustaceans and worms. A few species prey on small fishes. The Mullidae consists of 6 genera, distinguished primarily by dentition (Fig.5). Genus *Mulloidichthys* have very small teeth in 3 rows anteriorly and 2 on side of jaws and absence of vomer or palatine teeth.

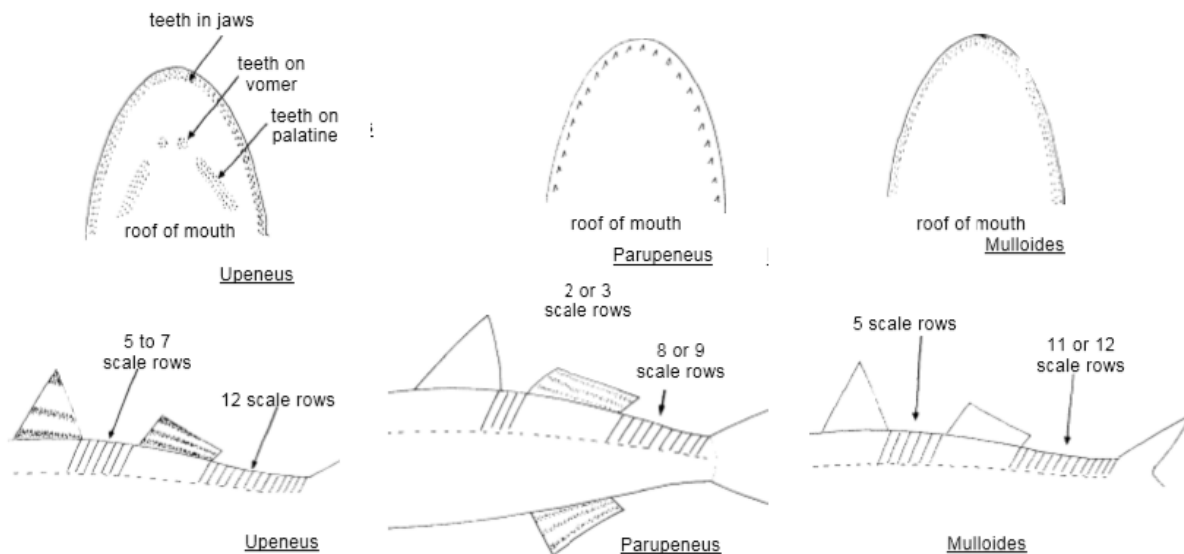


Fig. 5 Dentition, inter dorsal scale pattern and bands on fins of different genera of goatfishes

Snappers

Snappers occur worldwide in warm seas, juveniles of some species enter estuaries and the lower reaches of rivers and a few western Pacific species of *Lutjanus* are inhabitants of fresh waters. They occur from shallow inshore areas to depths of about 550 m, mainly over reefs or rocky outcrops. Snappers are mostly nocturnal predators feeding on fishes, crustaceans (especially crabs, shrimps, stomatopods, lobsters), molluscs (gastropods, cephalopods), and pelagic urochordates. Plankton is particularly important in the diets of those species with reduced dentition and numerous well-developed gill rakers. They are gonochoristic (sexes separate), reaching sexual maturity at about 40 to 50% of maximum length. Populations in continental waters have extended spawning throughout the summer, whereas those occurring around islands spawn throughout the year with peaks in spring and autumn. Snappers are batch spawners, with individual females usually spawning several times in a reproductive season.

The pelagic larvae avoid surface waters during the day, but display a more even vertical distribution at night. Long-living, slow-growing fishes with relatively low rates of natural mortality and with considerable vulnerability to overfishing. The species that reach large sizes are important recreational fishes in some areas. Some species have been reported to be occasionally ciguatoxic in certain areas. They are caught with bottom longlines, handlines,

traps, a variety of nets, and trawls. Distinct characters of various genera of snappers are illustrated in figure 6.

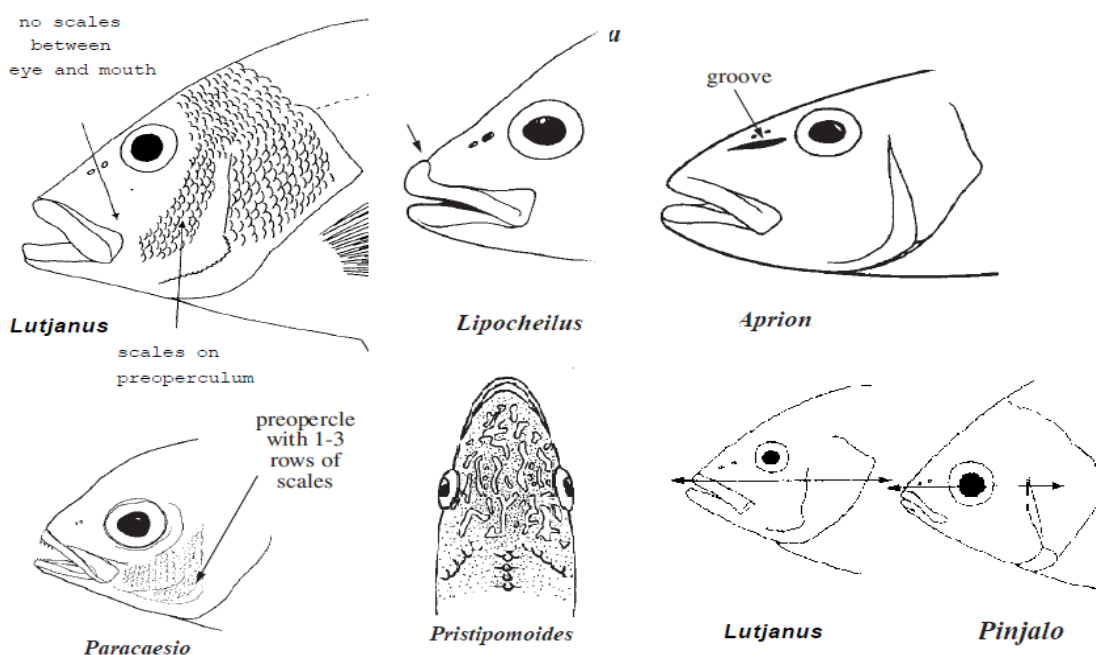


Fig.6 Different genera of snappers

Groupers

Groupers found in the tropical and subtropical waters of all oceans. Most species occur on coral reefs, but some live in estuaries or on rocky reefs. Groupers are generally associated with hard (rocky) bottoms, although juveniles are found in seagrass beds, and adults of a few species prefer sandy or silty areas. Some species occur in depths of 100 to 200 m (occasionally to 500 m) however, the majority inhabits depths less than 100 m, and juveniles are often found in tidepools. As the major predators of the coral-reef ecosystem, most groupers feed on a variety of fishes, larger crustaceans, and cephalopods. A few groupers (e.g., *Paranthias* spp. and *Epinephelus undulosus*) have long, numerous gill rakers and are thus adapted for plankton feeding. Most groupers are ambush predators, hiding amongst the coral and rocks until an unwary fish or crustacean goes by, then catching their prey with a quick rush and snap of their jaws. The distinguishing morphological differences of groupers is presented in the figure 7.

Except for occasional spawning aggregations, most species are solitary fishes. This site specificity and the relatively slow growth rate of groupers make them particularly vulnerable to over-fishing. Groupers are protogynous hermaphrodites and in a mature female, numerous oocytes are arrayed in lamellae surrounding a central lumen, with spermatogenic tissue in small dormant crypts on the periphery of the lamellae. After spawning as a female for one or more years, the grouper changes sex and thereafter functions as a male. At sexual transition, the oocytes degenerate, the spermatogonia proliferate, and the ovary is transformed into a functional testis. Evidence of the ovarian origin of the testes is the remnants of oocytes and the ovarian lumen, which can be seen in cross-sections of the testes.

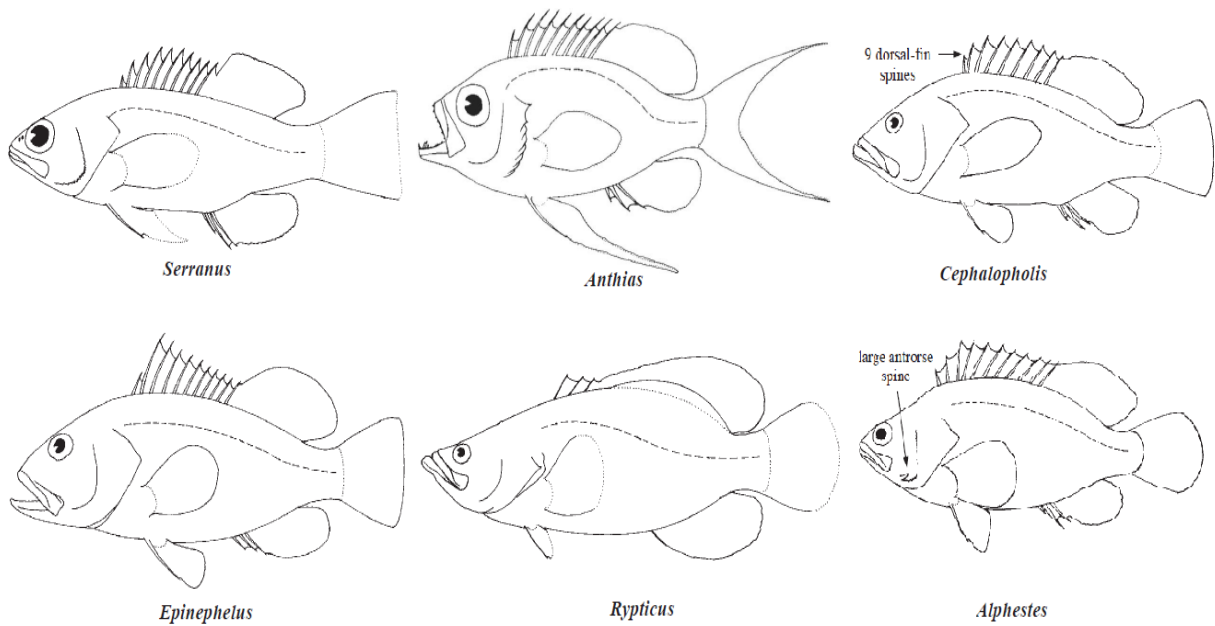


Fig. 7. Morphological differences in various genera of groupers

Pigface breams

Pigface breams or emperors are protogynous perchlike fishes with a large head and deep suborbital space (Fig. 8). These coastal fishes are abundant in the tropical Indo-West Pacific and West Africa caught primarily by handline, traps, and trawls. *Lethrinus* spp. exhibit protogynous hermaphroditism and predominantly inhabit back-reef seagrass beds at the juvenile life stage thereby utilizing the beds as a potential nursery habitat that produces relatively more adult recruits per unit area than other juvenile habitats. Afterwards, juveniles move to coral reef habitats at maturity, and adults often form large aggregations for pelagic spawning at outer reefs. The diet consists of echinoderms, crustaceans, molluscs, fishes, and polychaetes.

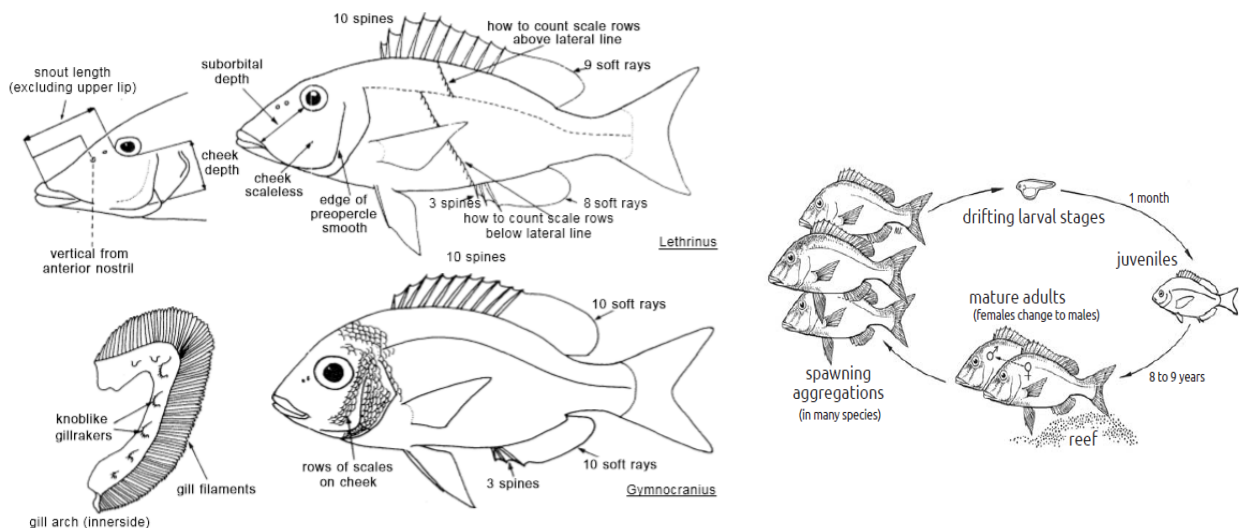


Fig. 8 Morphological characters of emperors

Life history of emperors

Elasmobranch

The name elasmobranch represents any of numerous cartilaginous of the Class Chondrichthyes, having 5 to 7 gill slits on each side, dermal denticles for scales and a small respiratory opening called a spiracle behind each eye (Fig.10 and 11). The class is divided into two subclasses; Elasmobranchii (sharks, rays, skates, and sawfish) and Holocephali (chimaeras). The pectoral fins of Elasmobranchs are often greatly enlarged. Their upper jaws are also fused with their skull and instead of the replaceable rows of teeth they have 3 pairs of large grinding tooth plates. Hearing is often the first sense to detect prey at long distances and it is used in conjunction with a special sensory organ called the lateral line which is a line of pressure detectors that runs down each side of their body. These detect changes in water pressure that might result from struggling prey. Around their snout and mouth are more special sense organs known as the ‘Ampullae of Lorenzini’ which detect electric fields given off by prey

The feeding habit ranges filter feeding of plankton to highly predatory carnivorous feeding. All Elasmobranchs exhibit internal fertilization when reproducing hence occurs as either male or female. Female sharks have no obvious external reproductive structures, whilst males have two extensions of the pelvic fin known as claspers. These claspers are used by males during reproduction to internally fertilize the female sharks. Some sharks and all skates lay egg cases on the sea bed or wrapped around seaweed called oviparity

The elasmobranch resources available in the PB and GoM are given in the Fig.9. Various ray species are *Rhinoptera javanica*, *Pateobatis jenkinsii*, *P. fai*, *P. bleekeri*, *Maculabatis gerrardi*, *Aetobatus ocellatus*, *Brevitrygon imbricata*, *Himantura uarnak*, *H. undulata*, *Urogymnus granulatus*, *U. asperrimus*, *Neotrygon indica*, *Pastinachus sephen*, *Taeniurospis meyeri* and *Gymnurapocilura*. The only shark landing regularly in the PB water is *Chiloscyllium indicum*. Different guitar fishes being caught from the GoM and PB are *Rhina ancylostoma*, *Rhinobatos annandalei*, *Glaucostegus granulatus*, *Rhynchobatus australiae*, *Rhynchobatus djiddensis* and *Pristis zijsron*. One of the common electric rays landing in the PB waters is *Torpedo marmorata*.

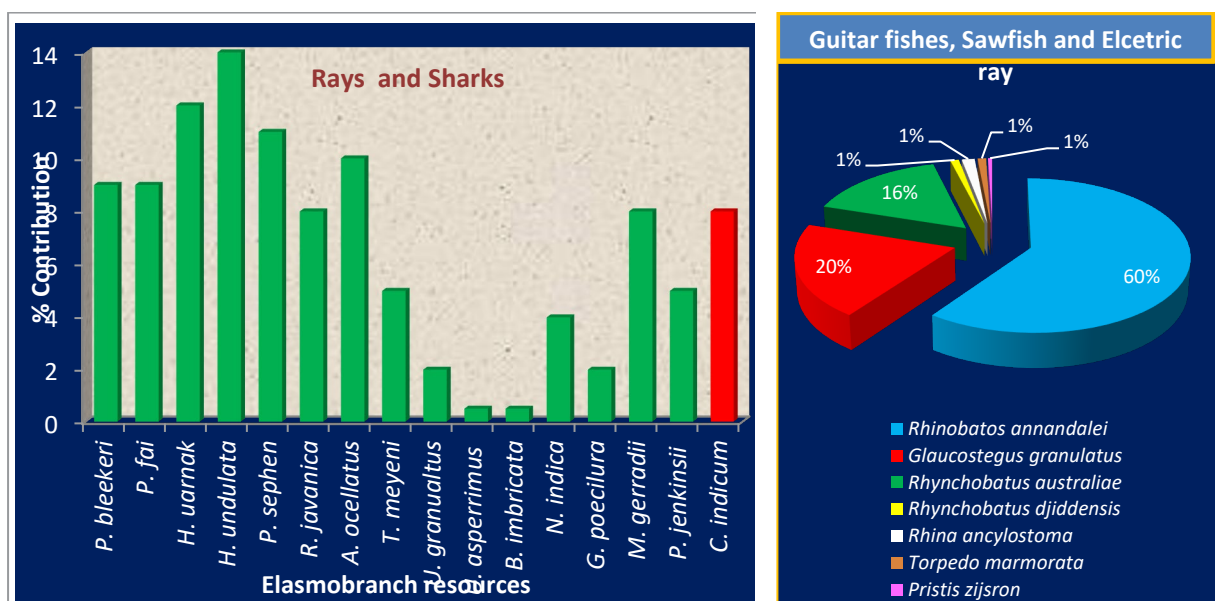


Fig.9. Various elasmobranch resources present in the GoM and PB (Mandapam, unpublished data ICAR-CMFRI)

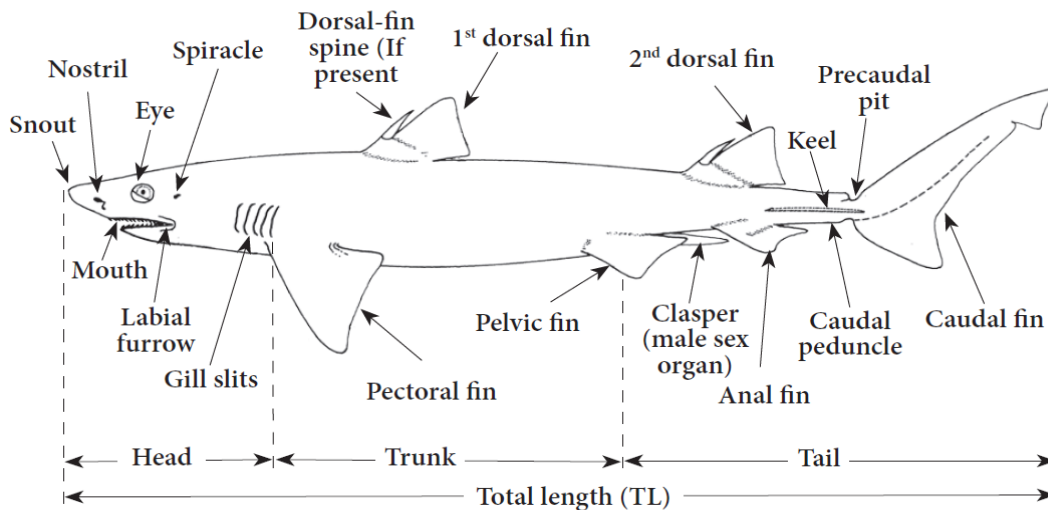


Fig.10 Technical terms and principal measurements used for shark

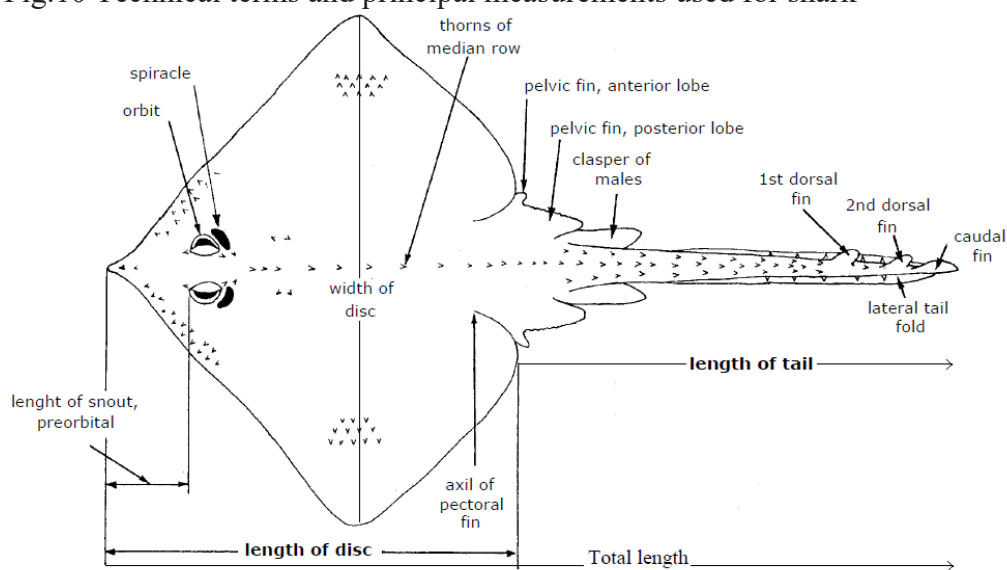


Fig.10 Technical terms and principal measurements used for rays, skates, sawfishes and guitarfishes

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