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Biology, methods of fishing and economic importance of cephalopods in southeast coastal, Gulf of Mannar

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Abstract
The Gulf of Mannar Biosphere Reserve is located on the south eastern tip of India and is near Sri Lanka. The Gulf of Mannar is has a hugely marine ecosystem, which includes coral reefs, salt marshes, algae communities, mangroves, and sea grasses, among many others. Cephalopods are key components of marine trophic webs, where they constitute major food resources for a large variety of predators including fish, other cephalopods, marine mammals, and seabirds. Description of Squids, Cuttlefish and Octopi. This study are revealed the biology, methods of fishing and economic importance of cephalopods.

Keywords: cephalopods, gulf of mannar, southeast coastal, biology, economic importance

Introduction
The cephalopods (squids, cuttlefish and octopi) are exclusively marine molluscs. These are commercially important and are fished in large quantities in several countries. The average annual world catch of cephalopods during the period 2013 - 2016 was 901 thousand tones which is about 30% of the average total world mollusc production of 2,971 thousand tones for the same period. Represented by over 650 species (Choe, 1966) [2], cephalopods occur in all the oceans of the world, and are distributed from shallow inshore areas to deep oceanic waters. They widely range in size from tiny sepiolids to giants like Architeuthis sp, which grow to a size of over 60 feet in total length. They provide food for man and form part of the diet of animals such as whales, seals, oceanic birds and certain valuable food fishes. Cephalopods are caught in seas around India in fair quantities, but largely incidentally in nets that are operated for other commercial fishes, almost all through the year. Several species have been reported but to mention a few of the commonly occuring cephalopods are Sepia pharaonis Ehrenberg, S. aculeata (Ferussac & d'Orbigny), S. thurstoni Adam & Rees, S. brevimana Steenstrup and Sepiella inermis (Ferussac & d'Orbigny) among cuttlefish, Sepioteuthis arctipinnis Gould, Loligo duvauceli d'Orbigny, Loligo hardwickii, Loliolus investigatoris Goodrich and Euprymna stenodactyla Grant among squids and Octopus dollfusi Robson, O. rugosus (Bosc), O. globosus Appellof, O. herdmani Hoyle and O. hongkongemis Hoyle among octopi (Rao, 1958; Silas, 1968) (Plate 1). Very little is known about the fishery and biology of Indian cephalopods. Hornell (1917, 1922 and 1951c) [6] has given a general account of the fishery of Palk Bay squids and octopus in Ramand district in Tamil Nadu (Table 1).

Table 1: List of commercially exploited squid from Indian Seas.

Species	Common Name	Distribution
Loligo duvauceli	Indian Squid	All along Indian coast
Loligo singhalensis	Long barrel Squid	Mandapam coast
Loligo uyii	Little Squid	Madras & Visakhapatnam
Loliolus investigatoris	Investigator Squid	All along Indian coast
Doryteuthis sp.	Needle Squid	Southwest coast
Sepioteuthis lessoniana	Palkbay Squid	Palk bay & Gulf of Mannar
Symplectoteuthis oualaniensis	Oceanic Squid	Oceanic Inadian EEZ
Thysanoteuthis rhombus	Diamond Squid	Oceanic Inadian EEZ

Plate – 1

Fig 1: Octopus

Fig 2: Cuttlefish

Fig 3: Squid

Description of Cephalopods

Squids

Squids belong to the order Teuthoidea (Decapoda) which includes the majority of cephalopods, possessing a stream-lined soft body with a pair of fins varying in shape, size and disposition. The distinct head in front is with ten circumoral arms provided with toothed suckers or claws or both. An internal shell known as pen or gladius, when present is imbedded in the dorsal mantle skin. The gladius of squids is almost transparent, thin and chitinous in nature. It varies in shape in different species. Squids exhibit enormous power of swimming and their swift progression through water is effected by the combined action of the mantle and the specialized structure called siphon or funnel situated on the ventral side. Such fast moving squids are distributed from shallow to varying depths of all oceans. Sepioteuthis Arctipinnis is a common Indo-Pacific species. In India this is widely distributed but large concentrations are confined to the south-eastern coast especially the Palk Bay and Gulf of Mannar. The mantle is elongate, conico-cylindrical in outline, tapering to a blunt point behind; anterodorsally the mantle extends over the nuchal region into a round point, and antero ventrally below the funnel it bears a deep eraargination; fins, attached on either side traversing almost all along the entire length, are large, thick and muscular. Loligo Duvauceli is a common Indo-Malayan species occurring from South Africa to Formosa (Voss, 1963) [13]. In India it is commonly found on the east and west coasts L. duvauceli is a smaller species readily distinguishable from Sepioteuthis arctipinnis. They are caught all-round the year in varying amounts their abundance appears to be from May to September in the Palk Bay. The peak of the season appears to be from June to August when large heaps of them are regularly seen in the markets along with other squids and cuttlefish.

Cuttlefish

Cuttlefishes belong to the order Sepioidea. Like squids, they possess welldefined head and ten arms. They have a broad and flattened body with narrow fins running along the sides to the full length of the body. The arms are comparatively short and provided with subequal suckers mostly arranged in four transverse rows. The two long, slender tentacles are retractile into special pockets and used at the time of capturing the prey. The characteristic internal shell or the cuttlebone is calcified and differs in shape and size in difl'erent species. They are only three of species of cuttlefish viz., Sepia pharaonis. Sepia aculeata and Sepiella inermis which occur widely in India. The body of the cuttlefish is stout and oval in outline and widest at the anterior end. In front, the mantle is produced middorsally into a triangular lobe and midventrally slightly emarginated. These cuttlefish are usually captured in small numbers in many places like Visakhapatnam, Cuddalore, Nagapattinam, Kilakarai and Rameswaram. Good quantities are caught with hand-line and scoop nets at Cape Comorin, Colachel and Vizhinjam. The cuttlebone of this species is commercially important and large quantities are collected from the beaches during November and December at Rameswaram and during March and April at Thiruppalakudi and Tondi in Ramanathapuram district. Considerable quantities are also collected from Kerala coast. Despite its availability in good abundance S. pharaonis seems to be commercially a less utilized species.

Octopi

Octopi belonging to the Order Octopoda, possess a short rounded body and a distinct head fringed with eight arms, which are provided with a broad interbrachial membrane. The saccular mantle lacks fins. The suckers, arranged in two rows, are without stalks and horny rings. The animals are solitary in habit and mostly live in shallows crawling on the bottom, often hiding themselves in the crevices among rocks. Crabs and bivalves form their favourite food and smaller shrimps and fishes are also preyed upon by them. Several octopi are known to occur in Indian seas. Octopus herdmani Hoyle, O. globosus Appelofi". And O. dollfusi are the common shallow water forms of the Palk Pay and the Gulf of Mannar. No information is available on the biology of these octopi. They are called pey kanavai in Tamil. Octopi are well-known sea food in Japan and the people of countries like Spain, Italy and Philippines also relish octopi (Araya, 1967), Octopus is not much liked as food in India, excepting by those who are accustomed to eating it. A number of octopi are caught in specially devised shell traps exclusively for bait in hook and line fishery especially along the Palk Bay. A smaller species of Octopus locally called sangu kanavai is largely caught in this bait fishery.

Methods of Fishing

The squids, cuttlefish and octopi are captured by various means. In general they are caught incidentally along with other. Food fishes in shore seines, trawl nets, boat seines and cast nets. In special methods a knowledge of the behaviour of

the particular form is also made use of for capture. The shoaling behaviour and the shoreward migration during the spawning of squids and cuttlefish are exploited in fishing. In the inshore waters of Palk Bay a special type of shore seines called ola valai is used for the capture of squids exclusively Sepioteuthis arctipinnis from April to June and to minor extent from October to November. The ola valai (olai. palm leaf; valai, net) is utilized for squid fishing during the peak of the season i.e.. May to June in Rameswarara Island, Mandapam, Devipatnam and Tondi along Palk Bay and in certain places like Rameswarara, Pamban, Mandapam, Pudumadam, Periapatnam, Kilakarai and Muthupettai along the Gulf of Mannar. The ola valai consists of a close-meshed rectangular bag about 8 m X 2 m and wing ropes of about 270 in length. The latter bear strips of palm-leaf along the length in three or four close-set rows near the wings and in a double or single row in the rest of the length. The mode of operation is like that of any shore seine. Leaving one of the wing ropes ashore, the net is set from a rowing boat in a semicircular way, with the opening of the net facing the shore, thereby encircling a school of squids that may be present. The other end of the wing rope is brought back to the shore and subsequently the net is hauled. The palm-leaf strips of the wing ropes are intended to entice the squids into the bunt of the net. Throughout April and May when shoals of squids appear Rameswarara, Mandapam, Tondi and Devipatnam the ola valai are operated regularly and large quantities are landed. Squids are obtained in Gulf of Mannar in shore seine catches throughout the year in small numbers. During the peak of the season special squid jiggers were used previously for capturmg squids and the larger species of cuttlefishes in the Palk Bay region as described by Hornell (1917) [6], In this method a special Y-shaped pole called machan with a bar across the bifurcated branching of the pole is erected in shallow coastal areas. The machan is used as a look-out post by the fisherman who sits on the cross bar with a long jigger consisting of 5 to 6 hooks arranged sin grapnell fashion. The hook-end of the jigger is hidden under a heap of leaves arranged near the machan as a lure for the squids. When female squids and males in pursuit of them approach the leaves for depositing eggs, they are lifted off water with a jerk movement of the jigger. This once extensively used method is not practiced now. At the present time squid jigging is followed in a modified way. When shoals are seen, fishermen especially at Devipatnam, Thiruppalakudi and Rameswarara go in canoes or catamarans equipped with jigger. The jigger consists of a 35 to 40 cms long sturdy wire furnished at one end with three or four strong hooks. The other end is tightly tied to a slender pole which serves as the handle. When squids move within the reach of the jigger fishermen cautiously hook them individually with a quick jerk of the jigger and haul them into the boat. In this manner a large number of them are caught in a day. Occasionally large species of cuttlefishes like Sepia pharaonis are also captured by this method when they are encountered. The squid Loligo dmauceli and the cuttlefish Sepia aculeata are usually captured in shore seines and boat seines only in small numbers. Until the introduction of trawl fishing on the south-east coast and other parts of the country it was generally considered that they were less abundant. Now, with the use of mechanised vessels and extension of fishing to the offshore areas much higher yields of Sepia aculeata and Loligo duvauceli are regularly obtained. The season for these species lasts from March to August. Although available extensively throughout India, they are fished to a greater extent from the Palk Bay and Gulf of Mannar close to Mandapam and Rameswaram. Baited hooks and scoop nets are employed to catch Sepia pharaonis occasionally at Vizhinjam, Colachel and Cape Comorin. Fishermen reach the fishing ground in catamaran trolling a hand-line consisting of baited hooks which serve as snare. The cuttlefish thus attracted by the bait are dragged near the catamaran by slowly raising the line and taken with scoop net. In this way considerable number of them are procured. The octopi are captured by employing various methods. The techniques range from hunting with spear to fishing with traps.

Economic Importance of Cephalopods

Most of the squid's cuttlefish and octopi are valued as food and bait in many parts of the world. Especially people of Japan, Korea, Mediterranean countries, Philippines, Malaysia. Indonesia and Taiwan extensively utilize cephalopods as food. In India only squids are relished to a large extent among the cephalopods. The meat of cephalopods is clean, attractive and has good flavour. It is also highly nutritive. The basic organic constituents of the squid meat and utility of the meat as human food from the point of view of digestibility and nutrition have been extensively studied by Japanese workers (Takahashi, 1960; Tanikawa and Suno, 1952) [11, 12]. As a result it is considered that the squid meat may be a perfect source of protein. Generally the percentage yield of the edible portion of squid at 80 % of which the mantle forms 50% and arms 30%. The protein content of the squid is nearly 20 % wet weight which is in favourable comparison with commercially important fishes. The calorific value of the Japanese squid when seasoned is estimated at 117 cal / 100 g and the main constituents are crude protein 17'3 %, fat 1-83% and carbohydrates 7-11% wet wt (Dracowich and Kelly, 1963). The meat of cephalopods is prepared in many ways for food. Fresh meat is cut into slices and treated with spices and fried, or cooked into curries, cutlets or soup. In most of the preparations the white meat is sliced to frying' size and well pounded before being cooked to render the flesh soft. In the Philippines the meat of squids and octopus is first boiled in vinegar with crushed garlic and then fried with oil and spices (Voss, 1963) [13].

Cephalopods are used as bait. Cephalopods are utilized as biological material in neuro-physiological researches pertaining to the conduction of nerve impulses (Walford, 1958) [14]. Squids are used as manure. The cuttlebones of cuttlefish are commercially valuable because of their calcium content. They are used in the preparation of abrasives and dentrifices (Dees, 1961) [9]. They are used in poultry and bird cages as a source of calcium and as grinding stone for beaks. Certain medicinal properties are also attributed to the bones and ink of cuttlefish. The ink has been used by artists as a natural 'sepia' pigment in olden times. The pulvurized cuttlebones are used for rendering smooth the surface of wood-work and motor vehicles before they are painted. They are also used in jewellery making for moulding purposes. Certain by-products such as oil and liver extract are also

produced from squids, especially in Japan. The squid liver extract is used as human food and the same in condensed or dehydrated form serves as feed for live-stock (Takahashi, 1965) [11]. The viscera of squids is supposed to be ideal material as domestic poultry feed (Kawata et. al., 1955) [8]. Cephalopods form an indirect source of another commercially much valued commodity, ambergris, which is widely used as a fixative in perfumery (Idyll, 1958) [7]. Ambergris is supposed to be formed directly from the sperm whales faeces adhering round horny beaks of squids.

Conclusion

India's coastal marine fisheries are open access. An inter-ministerial empowered committee looks after management and development of fisheries in the EEZ. Management varies by state and includes some seasonal or area closures and gear restrictions for trawls. In India, the fisheries research is coordinated by the Indian Council of Agricultural Research (ICAR), an autonomous organization under the Ministry of Agriculture, the Agricultural Universities, and institutes under the Ministry of Agriculture (FAO India profile, 2012) [5]. The conflict between the resources used by humans and the marine concertion is ubiquitous and increasing throughout the world. Ecosystem based management is not in practice, but there is a high emphasis by management on conservation and protecting marine biodiversity.

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