

# Fishery and biology of pharaoh cuttlefish

## *Sepia pharaonis*

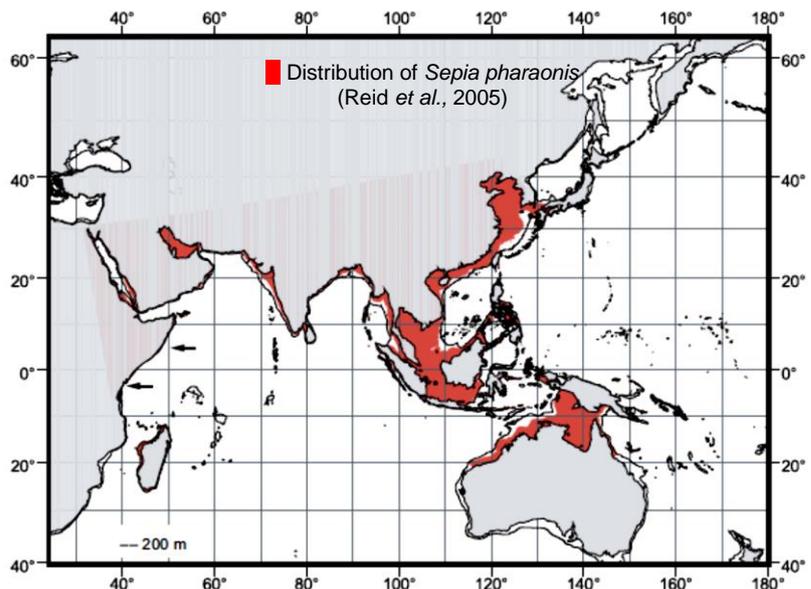
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### Distribution

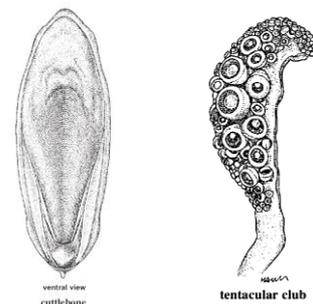
The pharaoh cuttlefish *Sepia pharaonis* Ehrenberg, 1831, is one of the most important species exploited along the Arabian Sea. It is a neritic demersal species endemic to the tropical waters of the Indo-Pacific region including Red Sea, Arabian Sea, Andaman Sea to South China Sea, East China Sea, Japan and Eastern Indonesia to Southern Australia including Gulf of Carpentaria.

Phylogenetic analyses of *S. pharaonis* in its distributional range revealed five distinct clades within the *S. pharaonis* species complex. Accordingly, the Clade C of the *S. pharaonis* population confined to Arabian Sea, Bay of Bengal and Andaman Sea (Andaman Sea coast of Thailand) is exploited in the Eastern Arabian Sea. Commercial catches of *S. pharaonis* are reported from coastal waters up to a depth of 130 m. The species is known to undertake seasonal migrations between the continental shelf waters and shallow coastal waters for feeding and spawning (Reid *et al.* 2005).



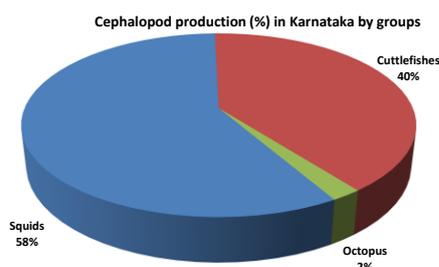
### Distinguishing characters

In *Sepia pharaonis*, the tentacular clubs are with suckers of unequal size. Five to six suckers in the middle row of manus are greatly enlarged. The mantle, head and arms are with transverse stripes. Cuttlebone broad, thick and with a mid-ventral groove flattening anteriorly in striated area; striae '^' shaped; inner cone forms a conspicuous yellowish flat ledge; a sharp thick spine present.



## Cuttlefish fishery in Karnataka

Along the Indian coast, cephalopods constitute a fishery of commercial significance, where the production exhibited a quantum leap in the past few decades. The cephalopods fishery production reached 1,90,322t in 2012 from 94t in 1961. During 2010-12, the exploited cuttlefishes formed 43-46% of total cephalopod catches, fluctuating between 71,922 and 88,320t in India. In the State of Karnataka, the cephalopod fishery is characterized by considerable inter-annual variability in production. Cephalopods were landed as by-catch in shrimp trawl in the eighties. They emerged as valuable targeted resource, during the past two decades, due to the tremendous export potential. The group comprising of squids, cuttlefishes and octopus are currently exploited commercially in the State and their production increased from 246t in 1985 to 26,051t in 2012 contributing 13.7% to the national cephalopod production. While the



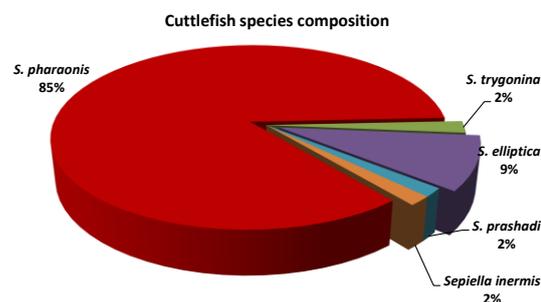
cephalopod production constitutes only 5.5% (2012) to the total marine landings in quantity, it contributed about one quarter to the proceeds from marine fish production for the State. The cephalopod fishery was centered around the neritic squids when the fishing efforts were focused on the post-monsoon congregations in inshore waters and the ensuing recruits. Later, the increased demand coupled with expansion in fishing grounds lead to the increase in the share of cuttlefishes and octopus in the cephalopod production. The

major share of cuttlefish catches was formed of *Sepia pharaonis*. Catches of *S. pharaonis* in the State have increased substantially from 3t in 1980 to 8,996t in 2012.

## Fishing gears

*Sepia pharaonis* is a neritic demersal species, targeted almost throughout the year, excluding the mechanized fishing ban period, by bottom trawl in the commercial trawling ground of MDF. Other gears that exploit cuttlefishes in the region are hooks & lines associated with Fish Aggregating Devices (FADs).

The commercial trawl fleet of Karnataka consists of two types of fleets, the single-day fleet (SDF) comprising of smaller trawlers (<9m overall length) and the multi-day fleet (MDF) of medium sized (<20m overall length) trawlers. SDF undertake daily fishing operations in the inshore waters up to 25m depth zone whereas, MDF carry out longer voyages and operate beyond 25 m. Cuttlefishes are targeted by MDF, catching more than 98% of the resource.



## Trawling ground

Commercial fishing ground extends from 10°30'N-75°45'E in South to 17°20'N-72°42'E in the North. This included the area lying in the depth zone of the *Bassas-de-Pedro Bank/ Padua Bank* (13°07'N-72°25'E) and around the Netrani Islands, (14°08'N-74°47'E) which are known for their abundance in cephalopods, yielding higher catch rates. Depth of operation of MDF increased over the years from 50m in 1986 to 70m in 1991. In 1995, the trawling depth increased beyond 70m when cephalopods were targeted reaching 100 m and continued to increase further, reaching depths of 150m since 2001.

## Fishing season

Subsequent to the fishing ban in the monsoon season, the commercial fishing operations in the region commences from August. The major fishing season for cuttlefish is during May-November, when monthly catches (1.67-13.02 kg/h) in trawl are several times higher than those in December-April (0.03-0.85 kg/h). In the post-monsoon season, higher catch rates (4.16-13.02 kg/h) in cuttlefish landings occurs in the

beginning of the fishing season, from August to October. The cuttlefish become progressively less abundant from December onwards.

### Size distribution

The monthly length distribution of *S. pharaonis* in the commercial fishery range from 4 to 41 cm in Dorsal Mantle Length (DML) with size groups 12-25 cm dominating the trawl catch. Smaller size group in the range of 4-8 cm are represented from January to June. Monthly length distribution of males and females shows a bimodal distribution from October to March, with larger size groups evident during the post-monsoon months. Females are less numerous than males among the larger individuals above size group 27cm and are not present above size group 35 cm. Recruitment to the fishery occurs in two spells with a major one in May/June before the onset of monsoon and subsequently in January/February. The proportion of smaller individuals in the fishery is above 50% in January and in May/June, consequent to the recruitments. Two distinct age groups or cohorts are apparent in the population.

### Food and feeding

*Sepia pharaonis* is an active predators, and their gut generally contain macerated and partly digested fishes, scales, eye balls, otoliths and bones of fishes and appendages of crustaceans, prawns, crabs and stomatopods. Cannibalism is observed in these animals mainly during the post-monsoon period.

### Reproduction

Cuttlefishes are gonochoristic. Left ventral arm is hectocotylyzed in males which are less broader than females that are more muscular and robust. The conspicuous stripes across the dorsal side of mantle, fins, head and arms are more prominent in males than in females. Peak spawning of *S. pharaonis* is reported in October/November ( $L_{m50\%}$ -214mm) and in February/March ( $L_{m50\%}$ -121mm) (Sasikumar 2011) along the west coast.

### Maturity stages

Stages	Female	Male
Immature- Stage I	Ovary very small, occupying the posterior mantle as a whitish patch in cuttlefish. Nidamental glands appear as very fine transparent strip, small in size, accessory nidamental gland not apparent. Oviduct not visible.	Testis small and triangular. Needham's sac small with not visible vas deferens. Spermatophores absent.
Maturing/ Developing- Stage II	Ovary occupies nearly half of posterior body cavity. Individual ova visible. Ovary with uniform sized developing white oocytes. This stage is very brief. Nidamental glands larger, thicker, pearl-shaped; accessory nidamental gland small and creamy white in cuttlefish.	Needham's sac with visible vas deferens and few spermatophores. Testis larger and thicker. Hectocotylyzation is apparent.
Mature - Stage III	Ovary very prominent with plenty of translucent eggs in oviducts and occupies entire posterior mantle cavity. Oviduct with mature ova. Nidamental glands large, thick, white, with distant anterior pore; yellowish to orange accessory nidamental glands. Proximal oviduct with smooth transparent mature eggs, distal part of ovary with striated eggs and small eggs.	Needham's sac completely packed with plenty of well-developed spermatophores; spermatophores occur in the penis. Testis large and fully developed.
Spawning/ spent-Stage IV	Decrease in gonad volume/ degenerating eggs in oviduct/ or ova absent. Nidamental glands flaccid or diminished. Ovary with few striated loose eggs and few medium to small eggs attached to the connective tissue core of the ovary, nidamental glands flabby, accessory nidamental glands orange red.	Spermatophores in gonoduct. Needham's sac flaccid with degenerating spermatophores. Testis small.





FAD based cuttlefish catch - Mangalore