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Some observations on the beaked sea snake *Enhydrina schistosa* (Daudin, 1803) in the mudbank area, off Alapuzha, Kerala, southwest coast of India

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Short Communication

Abstract

Hook-nosed sea snake or beaked snake, *Enhydrina schistosa* were caught during experimental fishing operations in the mudbank region along central Kerala Coast at depths ranging from 6 to 12 m. The sea snakes were found to form aggregations of 5 to 6 numbers and were able to tolerate highly turbid waters. The catfish *Arius jella* and the puffer fish *Lagocephalus inermis* were the dominant prey items. mudbanks are unusually calm areas which form along the Kerala coast during the monsoon. The inshore waters including the mudbanks are intense fishing areas of non mechanized crafts during the monsoon. The presence of venomous sea snakes is precarious and there is a need to give awareness programme for the fishers about this danger.

Keywords: *sea snake, Enhydrina schistosa, behaviour, mudbank, aggregation, food items*

Introduction

The beaked sea snake *Enhydrina schistosa* (Daudin, 1803) is found all along the Indian coast. The species is commonly known as hook nosed sea snake, common sea snake and *valakadiyan* (meaning – one who bites net) sea snake. It is reported that the holotype specimen was collected from Tranquebar (Tharangambadi) in Tamil Nadu and is presently kept in the British Museum of Natural History (1946.1.10.7), London (Wall, 1909). About 22 species of sea snakes belonging to 3 families and 3 sub-families are reported from Indian waters (Das, 2003). Distribution and diversity of sea snakes along the east coast of India are extensively studied by various authors (Wall, 1909; Wall, 1918: Smith, 1926; Ahmed, 1975; Murthy, 1977; Murthy and Rao, 1988; Tripathy, 2006; Lobo, 2006; Karthikeyan and Balasubramanian, 2007; Damotharan *et al.*, 2010; Venkatraman *et al.*, 2015). But the studies are limited along west coast of India (Lobo *et al.*, 2005; Padate, *et al.*, 2009). All the sea snakes in India are protected under Indian Wildlife Protection Act 1972 and most of the fishermen are unaware of this fact. *E. schistosa* is commonly caught in the shrimp trawls operated off Kerala coast. Bijukumar *et al.* (2007) reported the presence of four species of sea snakes in Kerala coast and one more species reported by Palot and Radhakrishnan (2010). Most fishermen in this area throw the

snakes back into the sea in live condition as soon as they are caught in the net by holding the flattened portion of tail in the upright position. Some fishermen kill the snake by hitting the head portion of the snake on the deck of the boat.

Along the Kerala coast, during every monsoon, some areas remain calm, in spite of strong winds and waves. These areas are known as mudbank and have been occurring every year. The ecology of mudbanks have not been investigated in detail during the present century. Hence a targeted programme was undertaken to study the ecological changes and hydrography and fishery of mudbanks by Central Marine Fisheries Research Institute (CMFRI) during 2014. As a part of the major study, some interesting observations made in sea snake *E. schistosa* obtained from mudbank and non-mudbank regions of central Kerala are reported.

Material and methods

During the period April to August 2014, weekly cruises were undertaken and experimental fishing using shrimp trawl was done from F.R.V. *Silver Pompano*, of CMFRI, in the near shore area at 6 m where mudbanks usually occur and at a deeper region (12 m depth) off Alappuzha coast, central Kerala (9˚25″ N and 76˚17″ E).

Trawling was done for one hour and all the catch obtained was weighed and the species were recorded. A representative sample from the catch was taken and all fauna and flora obtained were studied in detail. The length from tip of the snout to tip of tail of the sea snakes (n=84) was taken. All the dead sea snakes (n=84) were dissected and their gut contents were sorted and identified up to species level (Rasmussen, 2000) to infer its food items.

Results

Morphological characters

The beaked sea snake *E. schistosa* was identified based on the morphological characters (Rasmussen, 2000). The body was vertically flattened with a relatively small head (Fig.1). Dark cross bands were present on the body widest on the upper side and tapering on the flanks. The specimens had beak-like projection on the snout at the front of upper jaw, by which gains its common name as 'beaked' sea snake. The species could be easily distinguished from all other sea snakes by an extremely long and narrow mental scale that is largely concealed in a deep notch between the lower jaws (Fig. 2). The other morphological features are described in the Table 1.

In all the cruises, about 2 to 5 specimens were regularly caught at 12 m depth in each haul and these were usually released

Fig. 1. Beaked sea snake *Enhydrina schistosa*

Fig. 2. Long and narrow mental scale present in lower jaw

Table 1. Morphometric features of beaked sea snake *Enhydrina schistose*a (n=84)

Morphological characters	Range
Total length	40 – 118.2 cm
Rostral	Downward projection of lower margin of the shield
Praefrontals	Contact with 2nd supra labials
Preoculars	One shield
Postoculars	One or two shields
Supralabials	7 - 9
Costals (scale rows)	
Anterior (neck)	40 - 58
Body	42 - 64
Posterior (subcaudals)	30 - 52
Ventrals	240 - 328
Body bands	38 - 51
Scales	Sub-imbricate or imbricate
Maxillary teeth	3
Colour	Variable. Generally dorsal bluish-grey; ventral yellowish. Adult with dorsal bluish band

back to the sea in live condition. The numbers were always higher at 6 m depth. On 5th June, 2014 about 20 numbers of beaked sea snakes were caught in the shrimp trawl operated in the same location (Fig. 3) at 6-15 m depth. The length of the specimens caught ranged between 40.0 and 118.2 cm. Adjacent to this area, carcass of about 4 to 6 dead beaked sea snakes were observed almost every day at Punnapara coast of Alappuzha, when the mudbanks are formed during monsoon. During the present study, very long specimens reaching 118.2 cm were recorded. The species is reported to grow to a maximum length of 140 cm (Rasmussen, 2000). Along with sea snakes, other resources such as anchovies, shrimps, silver bellies and sardines were also commonly noticed.

Fig.3. *Enhydrina schistosa* in the catch obtained in shrimp trawl

The substratum in this area was muddy indicating that beaked sea snakes preferred to live in shallow muddy bottom.

Observation on food items

Fish was the main food item in all the stomachs analysed (n=84). It was observed that stomach of snakes caught at 6 m depth, consisted of catfishes whereas at 12 m depth, puffer fishes were found more. The catfishes were identified as *Arius jella* (n=34) and the puffer fish was *Lagocephalus inermis* (n=22). Incidentally, the beaked sea snakes abundance was high (n=20) in the mudbank area on 5th June, 2014, where the school of *Arius jella* had been observed. It was observed that the beaked sea snakes always ingested the head portion of the prey (fish) at first (Fig. 4).

The food and feeding habits and reproduction of the *E. schistosa* has been studied in Malaysia, Australia and Sri Lanka. Juvenile (21-30 cm) of *E. schistosa* in Malaysian waters were reported to feed on catfish (Tachysuridae),

Fig.3. *Enhydrina schistosa* in the catch obtained in the shrimp trawl

and puffers (Tetraodontidae) which account for over 90% of the food eaten (Voris *et al.*, 1978). Eels and gobies were also a preferred food (Voris and Voris, 1983). The prey items in the stomach of beaked sea snakes collected from International Indian Ocean Expedition were Sciaenids (Voris, 1972). The dietary component of *E. schistosa* from Goa, India consisted of *A. jella* and *Thryssa dussumieri* (Padate *et al.*, 2009). The present study also revealed that *A. jella* is the most preferred food for beaked sea snake. The reproductive biology of *E. schistosa* in the Puttlam Lagoon, northwestern Sri Lanka, indicated a possible season of birth between June and August (De Silva *et al.*, 2011). Gestation occurred from November to February and females gave birth in January - March in Malaysia (Voris and Jayne, 1979). Matured ova were observed in some of the females in the present study.

Sea snake venom and risks

These beaked sea snakes are responsible for 90% of fishermen death around the world (Warrell, 1994; Chippaux, 1998). It has been reported that about 45,900 snake bite deaths (including terrestrial snake bite) occur in India (Mohapatra *et al.*, 2011; Warrell *et al.*, 2013). Of this most of the fishermen deaths have been reported from Andhra Pradesh. About 1.5 milligrams of venom of *E. schistosa* is rated four to eight times as toxic as cobra venom and it can cause death to humans. It has been reported that the snake bite is primarily myotoxic envenoming. First signs and symptoms occur in the skeletal musculature. The secondary effects are rhabdomyolysis, myoglobinuria (dark urine), acute renal failure, hyperkalaemia (cardiac dysrhythmias) (White, 1995). Sea snake antivenom (CSL) is available and main aim of antivenom treatment is neutralization of the venom. Sea snake antivenom, made by CSL Limited, Parkville Australia, is bivalent antivenom raised against the venom of *E. schistosa* and *Notechis scutatus*. Antivenom has been reported to be effective up to 2 days after the bite. Pre-treatment with Low-Dose Adrenalin, Promethazine and Hydrocortisone are safe and reduce the risk of acute severe reactions to snake anti-venom.

Considering the highly toxic nature of the sea snake venom, it is recommended that awareness programme on sea snake bite should be placed in the fishing harbours along the west coast of India.

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