



# A new distributional record of bramble shark *Echinorhinus brucus* (Bonnaterre, 1788) from the seamount of Lakshadweep Islands with description on skeletal rings

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Original Article

## Abstract

A female bramble shark *Echinorhinus brucus* (1175mm TL) was caught in the bottom set perch line operated by the fishing boat "Museum" belonging to the Department of Fisheries, UT of Lakshadweep during its regular exploratory survey on the seamount of Kavaratti Island in the month of May 2011. The area of operation was at Lat.10°33.08' N; Long.72° 39.3' E off Kavaratti at the depth of 66 -165m during night fishing. Despite the fact that, this species was reported from various landing centres of India and although its distribution range includes the Lakshadweep seas the present paper is the first report that confirms its distribution in the seamounts of the Lakshadweep Islands. The paper also describes the skeletal rings of the lateral line in this species for the first time.

**Keywords:** *Echinorhinus brucus*, skeletal ring, Lakshadweep Island.

## Introduction

Bramble sharks (Squaliformes; Echinorhinidae) are rare and poorly known. Its forage was reported from 11m to 900 m depth (Compagno, 1984). The genus *Echinorhinus* Blainville 1816, consists of two species, i.e., *E. brucus* and *E. cookie*

(Garrick, 1960; Miller and Lea, 1972; Eschmeyer *et al.*, 1983; Ebert, 2013). *E. brucus* and *E. cookie* were erratically classified as synonyms (Fowler, 1941; Bigelow and Schroeder, 1948), till the description of *E. cookie* by Garrick, (1960), who distinguished it from *E. brucus* by the presence of smaller dermal denticles in *E. cookie*. Garrick (1960) had also briefly described the skeletal rings of the lateral line of *E. cookie*. However, there has been no report so far on the lateral line skeletal rings of *E. brucus*. Although there are several reports on the occurrence of this species in Indian waters from both west coast (Smith, 1961; Silas *et al.*, 1969; Silas, 1969; Silas and Selvaraj, 1972; Nair and Thulasidas, 1984; Thangavelu *et al.*, 2009; Akhilesh *et al.*, 2013) and east coast of India (Nair and Lalmohan, 1971), no specific description is available to distinguish the *E. brucus* from *E. cookie*. In this paper we have presented a description of *E. brucus* from Lakshadweep Island, along with description of the skeletal rings of the lateral line, in comparison with existing records of *E. cookie* and *E. brucus* from different locations.

## Material and methods

An immature female specimen of 1175 mm TL weighing 7.85 kg was caught from the seamount of Kavaratti (Lat. 10° 33.7'N; Long. 72° 39.23'E), Lakshadweep Islands, at a depth of 60-165m. This specimen was caught by the Department

fishing boat 'Museum' during the operation of bottom set perch line, which is modified for operating on seamount at night. All morphometric measurements and meristic counts for the fresh specimen were taken following Compagno (1984). Dermal denticle, teeth and skeletal rings of lateral line were taken and cleaned with 5% potassium hydroxide solution (Ramachandran and Philip, 2009). The images of these body parts were documented using Olympus stereo zoom microscope. The specimen is deposited in the *Marine Museum*, Department of Fisheries, UT of Lakshadweep, Kavaratti.

## Results and discussion

### Systematic position

Phylum Chordata; Class Chondrichthyes; Subclass Elasmobranchii; Order Squaliformes Compagno, 1973 - dogfish shark; Family Echinorhinidae Gill, 1862 - Bramble sharks; Genus *Echinorhinus* Blainville, 1816 -Bramble sharks; Species *Echinorhinus brucus* (Bonnaterre, 1788) Bramble shark.

### Synonyms

*Echinorhinus mccoysi* Whitley, 1931; *Echinorhinus obesus* Smith, 1838 *Squalus spinosus* Gmelin, 1789; *Squalus brucus* Bonnaterre, 1788; *Echinorhinus spinosus* (Gmelin, 1979).

### Diagnosis

Body chubby and elongate (Fig.1); anal fin absent; dorsal fin without spine and located far rear, very close to caudal fin origin; head compressed, flat dorsoventrally, the profile of head is wedge shaped and bluntly pointed, head slightly depressed towards front and dorsal profile more or less straight from behind the head to just ahead of first dorsal and with a slight hump; short snout with blunted tip; Mouth crescent, its width (57% in HL) is greater than snout length (36.4% in HL); labial grooves at angles of mouth not well developed, Labial furrows short, labial folds thin and do not have papillose. Eyes moderately large, nasal closer to eye than to tip of snout and eye diameter is 12.5% in HL (Table 1); nostrils large and transverse, incurrent median aperture is larger, oval in shape and lateral excurrent aperture is smaller and circle, each

nostril divided by a longer pointed flap from the front margin and a shorter flap from the rear margin (Fig. 2); there are five gills, covered with thicker flaps, pseudobranch large, first gill arches of both side have three gill rakers (2+1) and the second gill arches had five gill rakers (3+1+1), the gill rakers are smooth, lump like fleshy structure (Fig. 3); spiracles are very small and situated behind the eye. Spiral valves in the intestine had 13 turns.

Pectoral fin short; two dorsal fins, both are short with more or less truncated free margins; dorsal fin spine absent; origin

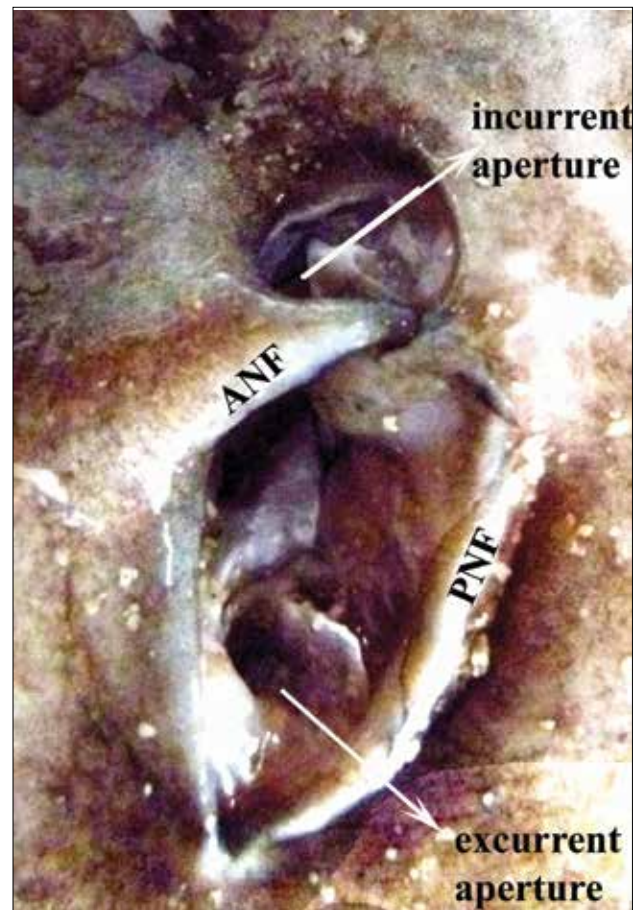


Fig. 2. Dorsal view of nostril (ANF- anterior nasal flap; PNF- posterior nasal flap)

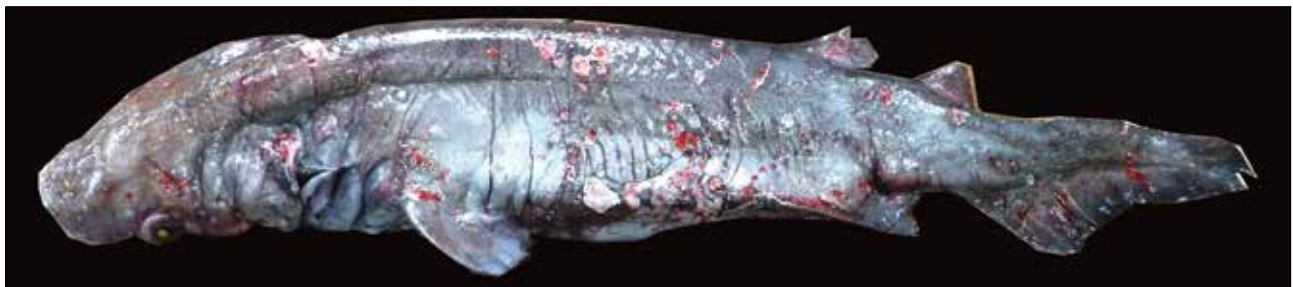


Fig. 1 – *Echinorhinus brucus*. Fresh specimen (117.5cm TL)

of first dorsal slightly behind origin of pelvic fins and that of second dorsal behind posterior end of base of pelvic; pelvic fin pair, relatively larger; caudal fin tapered, subcaudal deep but without subterminal notch and caudal margin had slightly concave tip.

### Colour

Dark gray above, paler gray or white below with metallic reflections; narrow folding on the lateral side of the body; fins

dark gray with blackish tip. The specimen becomes blackish after preservation at -40°C for a week.

Lateral line is partially closed for most of its length and external appearance is a conspicuous white furrow, which starts from above the third gill opening. Skeletal rings are a kind of functional modification for the support of open lateral line canal (Garrick, 1960). The edge of the lateral line furrow is pointed with spines and it is directed towards backwards. The

Table 1. Proportion of various morphometric characters of *E. brucus* in Total length, Standard length and head length.

Morphometry	In cm	In TL	In SL	In HL
Total length	117.5			
Standard length	89.5	76.2		
Anal length	73.0	62.1	81.6	
Head length	28.0	23.8	31.3	
Eye diameter	3.5	3.0	3.9	12.5
Snout to eye	10.2	8.7	11.4	36.4
Interorbital width	14.5	12.3	16.2	51.8
Predorsal length	70.5	60.0	78.8	251.8
Pectoral fin length	11.2	9.5	12.5	40.0
Ventral fin length	12.4	10.5	13.8	44.2
Caudal peduncle width	8.5	7.2	9.5	30.4
Ist dorsal fin height	6.0	5.1	6.7	21.4
Base of pectoral fin	9.0	7.7	10.1	32.1
Ventral fin base	12.9	11.0	14.4	46.1
IInd Dorsal fin height	6.0	5.1	6.7	21.4
Ist dorsal fin base	5.7	4.9	6.4	20.4
IInd dorsal fin base	4.8	4.1	5.4	17.1
Body depth	18.5	15.7	20.7	66.1
Interdorsalfin width	7.0	6.0	7.8	25.0
Liver length	56.0	47.7	62.6	200.0
Caudal fin length	28.0	23.8	31.3	100.0
Snout to Ist/IInd /IIIrd/IVth/Vth Gill slits	26/29/ 32/34/35	22.1/24.7/27.2/ 28.9/29.8	29.1/32.4/ 35.8/38/39.1	92.9/103/ 114/121/125
Mouth width	16.0	13.6	17.9	57.1
Snout to posterior margin of jaw	11.0	9.4	12.3	39.3
Spiracle to eye	5.8	4.9	6.5	20.7
Spiracle to jaw	5.0	4.3	5.6	17.9
Nostril width	2.5	2.1	2.8	8.9
Internostril width (between inner end)	6.0	5.1	6.7	21.4
Internostril width (from outer end)	11.0	9.4	12.3	39.3
Snout to Ist dorsal base	70.5	60.0	78.8	251.8
Snout to IInd dorsal	81.5	69.4	91.1	291.1
Snout to base of pectoral fin	35.5	30.2	39.7	126.8
Snout to pelvic fin	66.0	56.2	73.7	235.7
Lateral line length	80.0	68.1	89.4	285.7

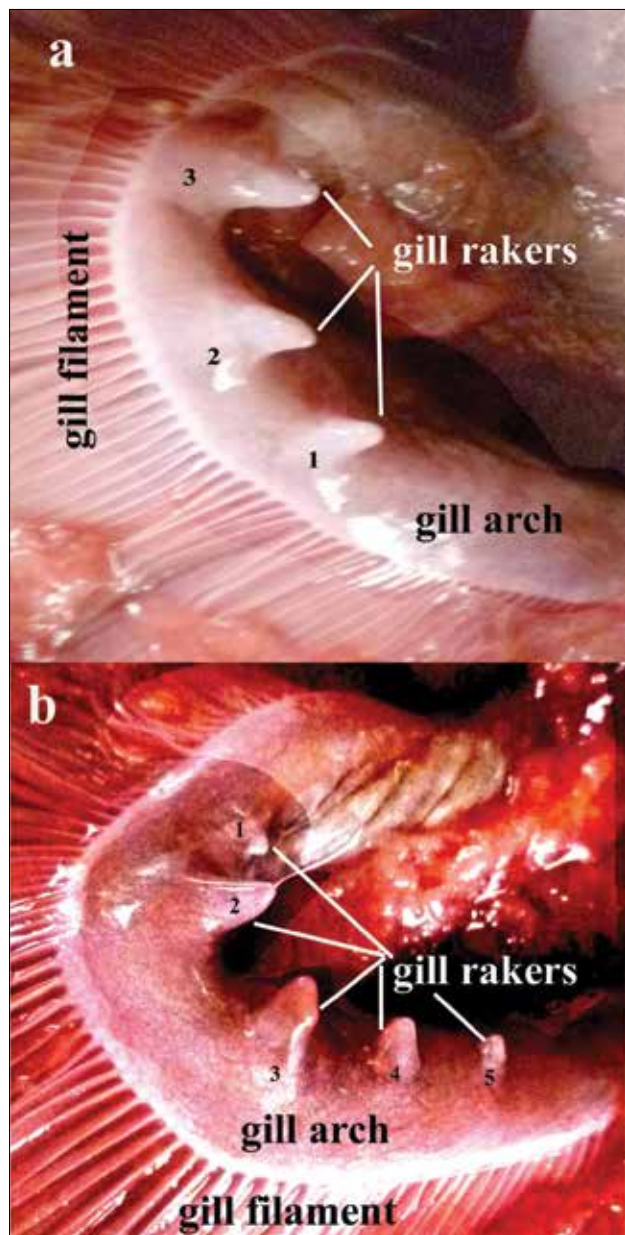


Fig. 3. Lateral view of first gill arch (a) and second gill arch (b)

skeletal elements of the lateral line furrow are ring like, upper edge pendant on the lower edge. However each skeletal ring had a larger process posteriodorsally and a smaller process anteriodorsally situated and also had a widely pointed posteroventral process and narrow longer ventral process to enhance the aptitude of convergence of the ring with the muscle enclosed the lateral line canal (Fig.4a). Garrick (1960) observed that the skeletal rings of *E. cookie* are not discrete unit (Fig.4b) however, they are regularly placed as incomplete spines in side the furrow to support its wall, in the present specimen they are numerous complete single units, articulated posteriorly with each other throughout the lateral

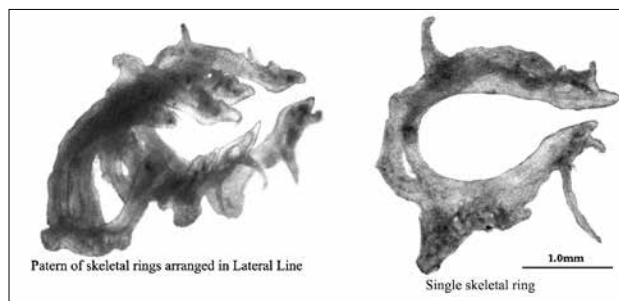


Fig. 4a- Microphotograph of skeletal elements of Lateral line of *E. brucus* (Present specimen)

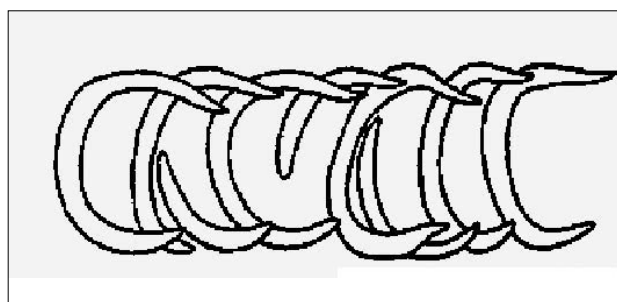


Fig. 4b- Schematic diagram of skeletal rings of Lateral line of *E. cookie* (from Garrick, 1960)

line and supporting its wall by virtue of dorsal and ventral processes.

### Dermal denticles

Skin with mucus and smooth except dermal denticles were present; skin with numerous tuberculated large denticles (> 5mm), each dermal denticle had a basal shield of oval to round in shape, a sharp pointed spine is present at the centre of the basal shield, which is slightly curved (Fig.5b and c); there are two or three denticles are close and fused together (Fig.5a); numerous smaller sized tubercular scales (~1.0 mm) are present densely and some smaller denticles are grown on the base of the larger denticles (Fig.5c), the base of the smaller denticles are stellate (Fig. 5d) such juvenile denticles was reported in both *E. brucus* and *E. cookie* (Garrick, 1960).

### Dentition

Teeth single-serial, similar in both jaws. There were 20 numbers of teeth on upper jaw and 21 on lower jaw; narrow inter-space between teeth; each tooth with a median cusp which is obliquely directed outwards, followed by a small cusplet below (Fig. 6a & b); one or two cusplets are present along inner margin of tooth; the root of teeth had a transverse groove and a tiny central foramen above the groove (Fig. 6b).

The morphometric characters of the present specimen corroborate the specimen reported from west coast of India

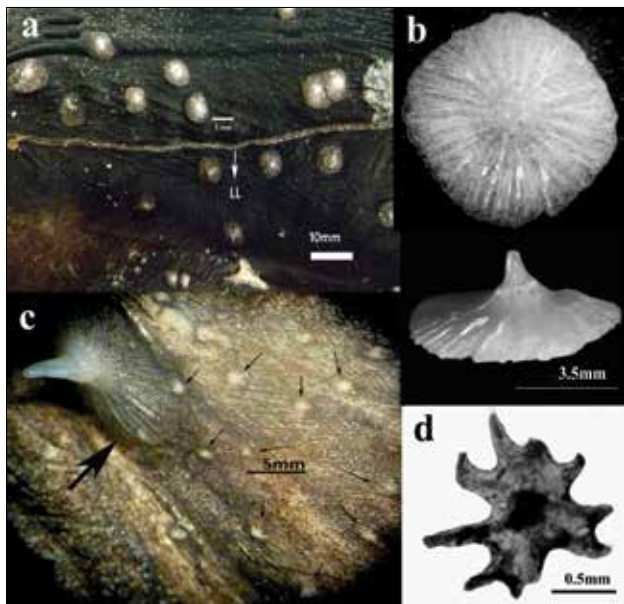


Fig. 5. Distribution of dermal denticles (~5mm dia) along with Lateral line (a); Dorsal and lateral view of larger dermal denticles (b); distribution of smaller dermal denticles indicated by smaller black arrow and it grown on the base of bigger dermal denticle indicated by larger black arrow (c); individual smaller dermal denticle (d)

(Table 2) (Silas and Selvaraj, 1972) to a certain extent, however, it differs from that of different locations of Indian Ocean (Smith, 1961; Silas *et al.*, 1969; Nair and Lal Mohan, 1971; Nair and Thulasidas, 1984), Pacific Ocean and Atlantic Ocean (Bigelow and Schroeder, 1948; Schwartz, 1993; Caille and Olsen 2000; Ebert, 2013). The lateral line originates above third gill opening in the present specimen; in some records lateral line originates above first gill opening (Bigelow and Schroeder, 1948; Smith, 1961; Silas *et al.*, 1969), whereas it was also started above fourth gill opening (Nair and Lal Mohan, 1971). This difference may be due to age as well as the locality of the specimen reported (Silas and Selvaraj, 1972). The dermal denticles of *E.brucus* reported from Pacific Ocean, Atlantic Ocean (Bigelow and Schroeder, 1948) and Indian Ocean (Silas *et al.*, 1969) are closely arranged, while in the present specimen the larger dermal denticles are sparsely arranged throughout the body surface (Fig. 3.a); however in some area two or three dermal spines are joined together, which corroborate with the record of Nair and Lal Mohan (1971). There are small dermal spines (Fig. 3.d) of 1mm diameter were closely arranged on the surface in between the larger spines of ~5mm diameter (Fig. 3.b), as in *E. cookie* (Taniuchi and Yanagisawa, 1983). These small denticles distributed as batches in certain areas of body surface and a few grown on the base of the larger dermal denticles (Fig.3.c), may grow larger and form joined plates. Moreover the dermal spines are almost absent in the ventral surface of snout and below

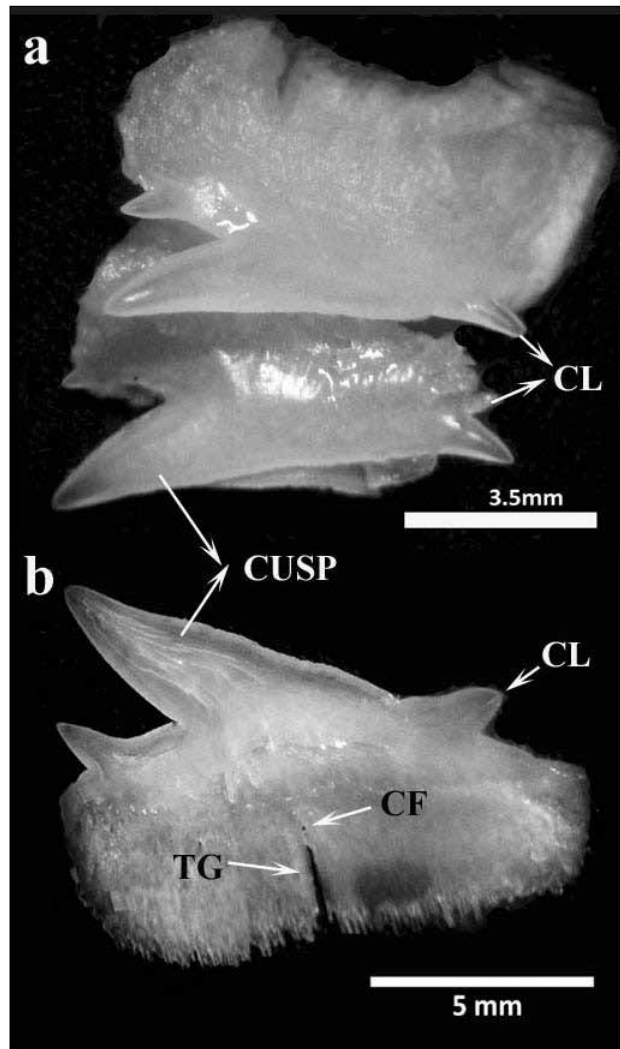


Fig. 6. Teeth of upper jaw (a) and lower jaw (b); CF- Central foramen, TG- Transverse Groove, CL- Cusplets

mouth same pattern of distribution was reported in *E. cookie* (Taniuchi and Yanagisawa, 1983).

The specimens reported from Northern Atlantic Ocean had the dentition of 20 - 26 in upper jaw and 22 - 26 in lower jaw (Bigelow and Schroeder, 1948). Schwartz (1993) reported 11 teeth in upper jaw and 8-10 in lower jaw from western Atlantic Ocean. In the present specimen, it was 20 in the upper and 21 in the lower jaw, whereas it was 21 on both jaws from the East coast of India (Nair and Lal Mohan, 1971). Silas and Selvaraj (1972) also reported 18-20 in upper jaw and 20 in lower jaw from west coast of India. However Ebert (2013) reported that the tooth count in *E. brucus* ranged between 20 and 26 in upper jaw and 21 and 26 in lower jaw.

The spiral valve in the intestine had 13 turns in the present specimen, whereas Ebert (2013) reported 12-16 turns. The gill

Table 2. Comparison of various morphometric characters of the present specimen of *E. brucus* (in percent of total length of the present specimen) with the specimen (mean value of two specimens of 150 and 162cm TL, followed by an embryo of 30 cm TL) reported by Silas and Selvaraj (1972).

Morphometric characters	Present specimen (n=1)	Silas and Selvaraj (1972); n=2 (adult)	Silas and Selvaraj (1972); n=1 (embryo)
Eye diameter	3.0	3.0	4.7
Snout to eye	8.7	7.5	8.7
Snout to 1st gill opening	22.1	20.8	14.3
Snout to Vth gill opening	29.8	27.0	30.0
Interorbital width	12.3	9.0	11.0
Mouth width	13.6	10.9	10.3
Internostril width	5.1	5.6	4.7
Snout to 1st dorsal length	60.0	61	54.7
Snout to 11nd dorsal	69.4	69.2	62.7
1st dorsal fin height	5.1	4.7	4.3
11nd Dorsal fin height	5.1	5.1	4.0
1st dorsal fin base	4.9	5.3	5.0
11nd dorsal fin base	4.1	4.9	5.0
Body depth	15.7	15.3	14.3
Interdorsalfin width	6.0	4.8	3.7
Snout to base of pectoral fin	30.2	27	30
Snout to pelvic fin	56.2	58.0	52

rakers of first gill arch in the present specimen was three Nair and Lal Mohan (1971) also reported three in the first gill arch but Schwartz (1993) reported five gill rakers in the first gill arch from North Carolina, Silas and Selvaraj (1972) observed 4 - 5 gill rakers from west coast of India.

A big specimen (326 cm TL; Wt. 250 kg) caught from Argentina waters (Caille and Olsen, 2000) has the maximum size hitherto reported, even though, it can grow up to 450 cm (Ebert, 2013). Most of the reports stated that *E. brucus* occur in the continental slopes (Silas *et al.*, 1969), however, Nair and Thulasidas (1984) reported the occurrence of this species from 120 to 160 m depths. The present specimen was reported from 66-165 m depths of seamount off Kavaratti along with the catches of *Plectropomus pessuliferus* (roving coral grouper) and *Lutjanus sp.*, in different branch lines of the bottom set line operated during the same night confirming its nocturnal vertical migration for forage from the deeper water (Compagno, 1984).

The liver of this shark contains approximately 80 % oil (Silas, 1969), which has high value in the international market. Due to non-conventional nature in Indian scenario, it would not fetch value in the local market. Generally the bramble sharks were caught as by catch in bottom trawls (Compagno, 1984). Though they don't have commercial fishery in India, fishermen of Kanyakumari district caught them by bottom set shark line from the deeper waters of west coast of India and

landed in Fishing Harbours of Kerala (Akhilesh *et al.*, 2013). However it was reported from Maldives (Adam *et al.*, 1998) and this species is extending its range of distribution to Lakshadweep Islands. Hence a detailed study on distribution, abundance, population dynamics and biology of this species in the Lakshadweep water would be useful for the sustainable harvesting and management of such non-conventional deep-sea resources.

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