Shark Long Line Gear of India

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Sharks are mainly harvested with long lines which is less expensive compared to other methods of fishing. Though this is a common gear operated along the coast, the gear in every region has its own peculiarities in construction and rigging. This communication furnishes detailed description of the gear operated in different centres. Suggestions are also offered to improve the gear and methods for enhancing production.

The production of shark in India is estimated to be 33151 tons (Anon 1986) forming 1.92% of the total marine landings. The total estimated yield of elasmobranchs from EEZ is 1.7 lakh tons (George *et al.*,1977) of which shark constitute roughly 64%. According to Arif Musthaffa (1986) there existed 4000 tons of dog fish around Andamans. A recent survey revealed the availability of 300 to 400 tons of spiny dog fish (*Centrophorus* sp.) in the upper continental slope of Andamans. It would be inferred that only 30% of the estimated yield is harvested at present. This showed that sharks are not fully exploited.

The shark meat is in great demand for human consumption. Besides this almost all parts of this have been utilised by the industry. Shark hide, fin, liver oil, teeth as well as cartilage are made use of for the manufacture of specialised products. Squalene an extract from the liver oil of deep sea sharks is utilized in pharmaceutical and cosmetic industry. The above facts emphasize the necessity for increasing production in order to fulfill the growing demand.

In the context of diminishing returns and high cost of fuel mechanised boats engaged in active fishing are in frantic search for an alternative fishing method which requires less fuel. Since sharks are mainly harvested by low energy methods, like lines and gill nets, these gear offer opportunities to many idle mechanised vessels to resort to such diversified methods of fishing.

Bal & Rao (1984) have given an account of the elasmobranchs landed in India. The advantages of adopting long lining have been discussed by some workers. Sheshappa and Torbjorn (1985) showed that the energy yield of long lining for sharks is almost 3 times than that of trawling. According to Gulbrandsen (1986) in order to catch 1 kg of fish by passive gear, the fuel required is 0.15–0.25 kg whereas in the case of trawling, the fuel consumption is 0.80 kg. Mohan Rajan (1982) reported that the boats resorted to long lining had better returns.

Through this communication an attempt is made to appraise the present status of shark long line fishing, its methods of exploitation, as well as future prospects. It is hoped that the informations furnished here will familiarise the industry with present status of long line technology for sharks.

The earliest account of fishing gear for shark is that of Hornell (1938) dealing with the fishing techniques of Madras presidency. Sorely (1948) described the fishing gear of Bombay presidency in detail. Fishing techniques of Coromondal coast, Gulf of Mannar and Palk bay were documented by Thyagarajan and Thomas (1962). John (1946) furnished a detailed description of the shark

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fishing industry of west coast. Fishing gear of Karnataka coast was dealt in detail by George (1981). Similar attempt was made by Satyanarayanappa *et al.* (1988). Mohan Rajan (1982) described the economics of shark long lining.

Gear and craft

The exploitation of shark is mainly undertaken by long lines and gill nets along coastal waters. Sharks are also obtained as by-catch by trawls and seines. But in the offshore waters long line formed the main gear for its exploitation. Based on the earlier studies as well as the survey conducted, a detailed account of the long line gear operated along the Indian coast is presented in Table 1.

Long lines can be grouped into three main categories.

1. Drift lines operated for small sharks and other predatory fishes in coastal waters.

2. Drift or set lines operated for medium sharks in offshore waters and

3. Set or drift long lines operated in deeper waters for large sharks.

Table 1 shows that there had been changes in respect of material used in the course of time and these developments were not identical in all regions.

The cotton twine/rope hitherto used as main line was substituted by nylon or HDPE twine/ropes. There are also reports of utilising used nylon ropes as main line.

The material and construction pattern of snoods had undergone changes from time to time. Apart from this the snoods used in different regions were differing from each other in one aspect or other.

In the lines operated for small sharks (hook size 3 and above) all along west coast the snoods used were of cotton of 2 or 3 ply construction, as prevalent in Munambam. Polyamide monofilament snood is in vogue at Tuticorin and Danarayappetta. In the upper east coast, nylon or HDPE twine is used as snood material.

Snoods prepared partly either of twisted G.I. wire or stainless steel wire and synthetic fibres were prevalent among the lines operated for medium size sharks (hook No. 1–3) in east coast. But such snoods are not used in west coast.

Four different types of snoods are identified in respect of lines operated for large sharks (hook No. 0/1 to 0/4).

1. Ponnani type
2. Kakinada type
3. Thootur type
4. Alleppey type

In the Ponnani type, the snood is made of cotton twine and in this case the snood twine after securing on to the hook is wound back on the snood itself nearly two third of its length, so as to reduce the wear and tear caused due to abrasion by sharks, while hauling. This type is mainly observed in Elathur and Ponnani.

In the Kakinada type, the snood consisted of two sections of which the section proximal to main line is made of synthetic twines while the distal section is of twisted G.I. wire/ stainless steel wire. In certain cases a swivel is used in between the two sections of the snood.

The Thootur type as observed in Kanyakumari district is prepared by twisting flexible S.S. wire of 30 to 38 SWG. In this case the portion of main line adjacent to the snood is also made of twisted flexible steel wire. These snoods are provided with swivels (Mohan Rajan, 1982).

In the Alleppey type the stainless steel snood wire is seized by tanned cotton twine in order to reduce the visibility of the steel wire while in water.

It was observed that the length as well as the interval between the snoods are not the same in all regions, as evident from Table 1.

In the Kakinada type, operated along Andhra coast, the distance between snoods is more, in comparison with those of other regions. It is presumed that this arrangement will enable to cover more area. This

Table 1. *Construction details of shark long lines*

Centre	Type and size of hook	Snood Material	Snood Length	Distance between two snoods (m)	Main line material & specication	No. of hooks operated	Depth of operation (m)	Bait	Catch	Craft type OAL H.P.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Munambam	Round bent, Flat tinned, No. 8	Cotton 20/12/2	0.15	2.50	Cotton 20/10/3	2000	20 to 30	Small fishes, squids	Shark and catfish	Dug out, without engine
Chellanam	No. 6, 7 & 8	Cotton	0.25	3.00	,,	1500 to	20 to 35	,,	,,	,,
Malpe	No. 4 & 5	Cotton	0.67	4.57	,,	1200	30 to 40	Squid & sardine	,,	8.9 m OAL
Tuticorin	,,	Polyamide mono-filament 1 mm dia	0.78	2.30	Cotton	600	20 to 40	Sardine sole, squid etc.	,,	Plank built boat OAL
Danarayapeta	No. 6	,,	1.80	4.60	Nylon multi-filament twine 2 mm dia	1000	50 to 60	Squid and small fish salted		,,
Dummulapeta	Round bent, Flat, tinned No. 6 & 7	High density polye-thelene twisted mono-filament 1 mm dia	1.70	3.80	,,	750 to 300	40 to 50	Squid and small fishes salted	,,	Plank built boat 7.0 m OAL

Table 1 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Puri	,, No. 1	High density polye-thylene twisted mono-filamnet 1.5 mm dia and 12 No. of G.I. wire 27 SWG twisted	5.40 + 0.90	18.00	,, 3 mm dia	600 to 1000		Cut pieces of seer ray & sardine	,,	Nava
Thootur	,, No. 0/1	32 No. of stainless steel wire 38 SWG twisted together	0.45	23.00	Nylon multi-filament twine or high density poly-thelene mono-filament 10 to 12 mm dia	100 to		Cut pieces of of tuna turtte dolphin caranx kalava	,,	Mecha-nised boat 8–11 m OAL
Katoor	Round bent, flat, tinned No. 0/3	30 Nos. of stainless steel wire 38 SWG twisted together	0.55	21.60	Nylon multi-filament twine 4 mm dia	100 to 120	90 to 120	Cut pieces of dolphin tuna and whole mackerel	Shark	Dug out with outboard engine

Table 1 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Ponnani	,, No. 0/1 to 0/3	Cotton 10/9/3x3	0.60	15.00	Cotton 10/10/ 3 x 3	100 to 120	80 to 100	Whole mackerel, pieces of seer, catfish	,,	,,
Uppada (Kakinada)	,, No. 0/3	Nylon multi-filament twine 3 mm dia and 30 Nos. stainless steel wire 38 SWG twisted	7.40 + 1.10	17.00	High density poly-thelene twisted mono-filament 4 mm dia	100	200 to	Cut pieces of dolphin and tuna		Mecha-nised boat 15–20 H.P.
Dummulupeta	,, No. 0/3	Nylon multi-filament twine 8 mm dia and stainless steel 38 SWG twisted 6–8 mm dia	9.00	30.00	High density poly-thene mono-filament twisted 10 mm dia	100	200 to 300	Cut pieces of dolphin	,,	Mecha-nised boat

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Ullal	Round bent, Flat, tinned, No. 1	Cotton 20/30/3	0.50	5.48	Cotton 10/35/3	600	20 to 35	Pieces of mackerel eel and squid	Sharks and catfish	Dug out 9.9 m OAL
Danarayapeta	,,	High density poly-thelene twisted mono-filament 4 mm dia and 12 No. of G.I. wire 27 SWG twisted	3.50 + 0.40	14.00	High density poly-thelene twisted mono-filament	600 to 600		Squid and dolphin meat	Sharks	Nava
Dummulupeta	,,	Nylon multi filament twine 5 mm dia & 9 No. of G.I. wire 27 SWG twisted	2.35	5.05	Nylon multi filament twine	1000		Squid & small fish	,,	,,
Adaripeta	Round	Nylon multi-filament twine 2 mm dia	5.40	18.00	High density poly-thylene twisted mono-filament 4 mm dia	600 to 1000		Cut piece of of dolphin and mackerel	Sharks	Nava or catamaran

type of rigging is most suited when the concentration of fish is sparse. Conversely, the interval between snoods can be reduced when there is good concentration of fish.

Hooks with revolving chain as reported by George (1981) and John (1946) are not in practice now-a-days. Round bent flat hooks are the main type used in long lining. These hooks are mostly imported Special shaped hooks like circle hooks (Michael, 1988 and Dong, 1983) and EZ backhook (Asmund, 1987) are yet to be tried in Indian waters.

Crafts operated include catamaran plank built boat, dug out (Beppu tony) and mechanised boats. Outboard motors are frequently used by which the fishermen could reach deeper and distant waters. Mechanised boats are being introduced to long line fishing at Thootur, Cochin and along Andhra coast.

Bait studies

Different types of fish are used as bait for sharks. In the case of large hooks used for sharks, pieces of tuna, dolfin, turtle and even beef are utilized as bait. In general fresh fish is mainly preferred as baits. There are reports of using salted fish as bait along Andhra coast. Since the bait constitute one of the main factor in line fishing, its availability is important, for the success of this type of fishing. Perhaps the non-availability of bait might have caused the plight of long lining in Gujarat coast. Inspite of the fact that the availability of proper bait determines the fate of this fishing, much studies have not been undertaken in this country neigther on the selectivity or on the optimum size of bait. In this context the studies undertaken by Balasubramanyan (1964 a,b), Deshpande *et al.* (1970) and Kartha *et al.* (1973) are worth mentioning. In view of scarcity for natural bait, studies are underway in Norway for processing artificial imitation bait (Arnoff, 1988), Gustafond (personal communication) has been experimenting on the optimum size of baits. The above studies are worth undertaking in India also.

Suggestions

The observations so far made showed that simultaneous development has taken place both in respect of hooks and materials used for line fishing. Natural fibres were replaced by more durable and efficient synthetic material. In the case of hooks higher efficiency was achieved with the development of cirele hooks and EZ back hooks as reported from elsewhere. These hooks are worth introducing in India.

Since the lines used were heavier more man power is required to handle the gear. The use of monoline in long line (Anon, 1988) and drift line (Asmund, 1987) is yet another development aimed at reducing the weight of gear. It is high time to adopt such measures as this will help to handle the gear effortlessly.

The long line fishing is depending on fresh bait. In view of the difficulties encountered in obtaining the required type and quantum of bait, intensive studies are needed not only to develop artificial bait, but also to determine the optimum size of bait.

While mechanised handling including autolining are common in advanced countries, use of such devices like line hauler should be tested and popularised so as to reduce the manual labour in this type of fishing.

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