Studies on Polypropylene Gill Nets

* K. V. MOHAN RAJAN, *P. GEORGE MATHAI, R. S. MANOHAR DOSS AND PUTHRA PRAVIN

Research Centre of Central Institute of Fisheries Technology. Veraval - 362 265

Comparative studies on the fishing efficiency of Nylon and Polypropylene gill nets were carried out to ascertain the suitability of Polypropylene twine for fabrication of gill nets. It was found that Polypropylene was as good as Nylon in terms of overall catch landed and more efficient for the quality fish seer. The Polypropylene proved to be a cost effective alternative to Nylon for gill nets.

The selection of an appropriate material for fabrication of a fishing gear is very important. Von Brandt (1972) opined that the efficiency of a fishing gear could be increased several times by the use of right type of gear material. The fish catching power of the material is of critical importance in gill nets. It is easier to measure fish catching power in gill nets since the nets to be compared can be fished at the same time and under same conditions. Comparison has been made chiefly with Nylon since superiority of this fibre is already established (Carter & West, 1964). There have been only a few studies on comparative effectiveness of different materials for gill nets. Studies on selectivity of gillnets for Hilsa and Promfrets were carried out by Panicker *et al.* (1978). Kunjipalu *et al.* (1984) studied the effectiveness of coloured webbings on the catch of Hilsa and Pomfret. Pajot (1980) and Radhalakshmi & Gopalan Nayar (1985) attempted to study the effectiveness of HDPE twine and tape twisted twines for large meshed gill nets and mackerel gill nets respectively. Subramania Pillai *et al.* (1989) have reported about the results of studies on the suitablity of HDPE materials for gill nets. Due to the high cost of Nylon twine the gill nets are becoming economically unviable and the fishermen are on the lookout for an alternate cheaper material as a method of investment reduction. An oil derivative, Polypropylene (pp) was invented in 1954 in Milan and now is being manufactured and utilized in several countries for fabricating fishing gear. But in India, its production and use have been only recent.

Studies were carried out at Veraval Research Centre of CIFT with gill nets prepared out of Polypropylene material using Nylon gill nets as control in order to identify whether polypropylene can be introduced as a cost effective alternative to Nylon. The results of these studies are presented in this paper.

Materials and Methods

Gill nets were fabricated with Polypropylene twine of 800/1/2 with an outer twist of 340 and inner twist of 660. Each unit was of 500 meshes in length and 50 meshes in depth, stretched mesh size being 120 mm. The nets were mounted with 50% hanging on 6 mm diameter head and foot ropes. Experimental fishing was carried out with these nets using gill nets of identical specification prepared from Nylon multifilament twine of 210/2/3 as control. Nylon twine of 210/2/3 which is of 0.6 mm thickness is the nearest comparable to pp 800/1/2 with a thickness of 0.7 mm. But the main criterion for selection of gill nets of these two materials for

* Present address: Central Institute of Fisheries Technology Cochin-682 029

comparison is the wet knot breaking strength which does not show significant difference between the two (5.25 kg for Nylon, 4.5 kg for pp). Detailed specifications of gill nets used in the study are furnished in Table 1.

Table 1. *Specifications of gill nets*

a) Particulars of webbing

Items	Main Webbing 1	Main webbing 2
Material	Nylon	Polypropylene
Type of knot	Double Trawl	Double Trawl
Colour	White	White
Twine size	210/2/3	800/1/2
Breaking load, N	74	84
Stretched mesh, mm	120	120
Upper edge meshes, No.	500	500
Lower edge meshes, No.	500	500
Meshes depth-wise, No.	50	50
Coefficient of hanging		
a) Horizontal	0.50	0.50
b). Vertical	0.86	0.86

b) Particulars of lines and ropes

Line ropes	Material	Colour	Size	Breaking load, N	Length, m
Head rope	HDPE	Yellow	6 mm dia	4000	30
Foot rope	HDPE	Yellow	6 mm dia	4000	30
Float Line	HDPE	Yellow	6 mm dia	4000	-
Rope flag end	HDPE	Yellow	12 mm dia	15400	-
Rope boat end	HDPE	Yellow	18 mm dia	34600	-

c) Particulars of other accessories

Item	Floats	Marker floats	Master floats	Sinkers	Master sinker
Number	5/unit	1/3 units	1/fleet with flag	4/unit	2/fleet
Material	Foam plastic	Thermocole	Thermocole & plastic	Cement	Stone
Shape	Disc	Rectangular blocks	-	Flat circular	Irregular
Diameter	150 mm	-	-	7.5 cm	-
Wt in air	40g		-	500 g	20-25 kg
Extra buoyancy	160 g			-	-

The fishing experiments were carried out from a 9.75 m OAL fishing vessel fitted with 37.5 HP 3 YDAM Ruston Engine.

On an average 20 units of pp gill nets with 10 units of Nylon gill nets as control were operated every day at depths ranging from 25-40 m for a period of 3 h and the catch data was recorded. Fishing experiments were conducted during the fishing season 1987-89.

Results and Discussions

The catch details are furnished in Table 2. The catch data from experimental fishing operations with pp and Nylon gill nets were analysed statistically. A total of 97 comparative fishing experiments were carried out and data pertaining to 40 viable experiments were taken for comparison. The 't' values calculated along with their degrees of freedom are given in Table 3. There is no significant difference in catch per unit area of pp nets and Nylon nets as far as total catch and some species of fishes landed like cat fish, silver bar, sharks, pomfrets and hilsa are concerned. But the catch of seer is significantly ($p < 0.05$) higher in pp nets compared to Nylon nets. Carter and West (1964) also reported that there was no statistically significant difference in fish catching power between pp and Nylon nets. Honda & Osada (1964) also reported that no appreciable difference in catchability or ease of handling could be noted during fishing tests when compared to 'Amilan'. Report by Carrothers as quoted by Klust (1964) on trials of pp and Nylon Salmon gill nets in Canada noted that pp nets were easy to handle and their knot stability was superior to that of Nylon.

Table 2. *Catch details*

	Polypropylene gill net			Nylon (control) gill net		
	Number	Weight kg	CPUA kg/1000m²	Number	Weight kg	CPUA kg/1000m²
Cat fish	62	125.70	0.772	41	103.75	1.180
Silver bar	17	8.35	0.051	18	9.45	0.108
Sharks	21	8.70	0.053	43	18.40	0.209
Seer	11	8.55	0.053	1	0.50	0.005
Pomfret	18	6.23	0.038	12	3.05	0.035
Hilsa	37	19.45	0.119	22	6.98	0.079
Other fishes	127	30.02	0.184	188	24.87	0.286
Total	293	207.00	1.27	325	167.00	1.902

Table 3. *Paired 't' values and degrees of freedom*

	't'	Degrees of freedom
Total	0.4506	55
Cat fish	0.8670	55
Silver bar	1.0373	55
Shark	1.9505	55
Seer	2.5477*	55
Pomfret	0.5020	55
Hilsa	1.4599	55

* Significant at 5% level

Polypropylene has several advantageous physical and chemical properties. Specific gravity of pp is 0.91 being the lowest among synthetics compared to 1.14 of Nylon (Honda & Osada, 1964). Water absorption is nil and consequently there is no loss of strength through wetting. pp stretches much less than Nylon and load extension increase is almost linear. This is very different from

Nylon which has a great extension at low load; but with increasing load gives a constantly decreasing percentage of strength. pp on the other hand has higher creep values under continued load (Klust, 1964). Other advantages of pp include good resistance to chemical and microbial deterioration.

pp gives a better handling grip than Nylon during fishing operations. Since there is no water absorption and material is light, the handling of the gear becomes easy. But the material tends to be voluminous. The pp netting material is cheaper than Nylon at present. The analysis of catch data has shown that it is as efficient as Nylon in terms of overall catch landed and more so in the case of seer *(Scomberomorus* sp.) Taking the physical and chemical properties also into consideration polypropylene can be recommended as a cheaper substitute for Nylon.

The authors are thankful to M/s. Gujarat Filaments, Baroda for supply of the raw material for the study, free of cost. We are thankful to Shri M. R. Nair, Director, Central Institute of Fisheries Technology, Cochin for according permission to publish this paper and to Shri P. A. Panicker, Head of Division, Fishing Technology and Projeot Leader for constant guidance during the study. The technical assistance rendered by Shri J. B. Paradva and K. U. Dholia are also acknowledged. Thanks are also due to Shri H. Krishna Iyer, Principal Scientist for the statistical analysis of the data.

References

Carter, C. L. B. & West, K. (1964) in *Modern Fishing Gear of the world,* Vol. 1, p.57, Fishing News (Books) Ltd., London

Honda, K. & Osada, S. (1964) In *Modern Fishing Gear of the world, Vol. 1,* p.55, Fishing News (Books) Ltd., London

Klust, G. (1964)in *Modern Fishing Gear of the World, Vol. 1,* p. 50, Fishing News (Books), Ltd., London

Kunjipalu, K. K., Boopendranath, M. R., Kuttappan, A. C. Subramania Pillai, N., Gopalakrishnan, K. & Kesavan Nair, A. K. (1984) *Fish. Technol.* **21,** 51

Pajot, G. (1980) *Improvement of Large Mesh Drift Nets for Small Scale Fisheries in Bangladesh.* BOBP/WP/5.

Panicker, P. A., Sivan, T. M., Mhalathkar, H. N. & George Mathai P. (1978) *Fish. Technol.* **15,** 61

Radhalakshmi, K. & Gopalan Nayar, S. (1985) in *Harvest and Post-harvest Technology of Fish.* Society of Fisheries Technologists (India), Cochin, p.262

Subramania Pillai, N., Boopendranath, M. R. & Kunjipalu, K. K. (1989) *Fish. Technol.* **26.** 1

Von Brandt, A. (1972) *Fish Catching Methods of the World.* Fishing News (Books) Ltd., London, pp. 240