Effect of Sailkite in Improving Trawl Gear Performance

M. R. BOOPENDRANATH, N. SUBRAMONIA PILLAI and K. K. KUNJIPALU*
Veraval Research Centre of Central Institute Fisheries Technology, Veraval - 362 265
and
K. KRISHNA RAO
Central Institute of Fisheries Technology, Cochin - 682 029

Effectiveness of sailkite has been evaluated in two trawl designs, namely, a 25 m high opening trawl and a 32 m large mesh demersal trawl, rigged with sailkite through full scale comparative field trials. A 25 m high opening trawl showed significant increase in total catch by 54.4% ribbon fish *(Trichiurus* spp.) alone by 138.3% with a reduction in miscellaneous catch, comprising mostly small sciaenids and juvenile fish, by 13.2% while 32 m large mesh demersal trawl showed an improvement in total catch by 9%, ribbon fish by 17.2% and miscellaneous catch by 7.7%. The difference in fishing performance between the two gear arrangements has been attributed to changed net mouth configuration because of higher head line lift and also the possible herding effect on the fish in the vicinity of trawl mouth, due to addition of sailkite.

Sailkite is a canvas sheering device attached to the net just behind the head rope, to lift the net during trawling. Benyami (1979 a,b,c) by his flume tank studies on model nets and Garner (1977) through actual field trials have shown that sailkite can feasibly be used to improve the fishing height of trawls. Hi Soo Han *et al.* (1981) mentioned that canvas sheering device could fully open the mouth of a stow net and improve the catch per unit effort by 38.9%.

Following reports of tank studies on sailkite, fishermen in New Zealand has been reportedly using this technique in commercial fishing operations. It has been tested using a high opening trawl by FAO Masterfisherman Capt. Lyzwa, in Burma, who used a net sonde to observe fishing height and reported both increase in vertical opening and enhanced catches (Dr. Benyami, M., personal communication). South China Sea Fisheries Institute has recently developed a head line lifting device known as flexible hydrofoil float made of canvas and introduced into commercial fishing fleet with success (Anon 1984).

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

In the present study, effectiveness of sailkite technique in improving the performance of two different trawl designs of proven efficiency, developed at Veraval Research Centre of the Institute, has been evaluated using full scale comparative field trials.

Materials and Methods

A 25 m high opening trawl with eight panels and a 2 seam 32 m large mesh demersal trawl described by Kunjipalu *et al.* (1979, 1984) respectively, were used for the experiments, retaining the same rigging features and full complement of floats. Flat rectangular otter boards of wood and steel construction and size 1524×762 mm, weighing 100 kg each, described by Kuriyan *et al.* (1964), were used for the operations. Fishing trials were conducted from the research vessel, Fishtech No. 8 of 15.2 m LOA, fitted with a 165 hp engine, during 1982-84 at a depth range of 30–45 m, during day time. The two types of gear arrangements, namely, with and without sailkite, were operated alternately, maintaining the same depth, duration, direction of tow and engine revolutions, during each of the paired comparative hauls. Horizontal spread between the boards was estimated using the

Table 1. *Details of comparative fishing operations*

Particulars	25 m high opening trawl		32 m large mesh demersal trawl	
	with sailkite	without sailkite	with sailkite	without sailkite
1. Fishing ground	Off Veraval 20° 23′–34′ and 20° 34′–51′ N. Lat 69° 44′–51′ and 70° 15′–21′ E. Long. within 30 to 50 m depth			
2. Number of hauls	46	46	32	32
3. Towing time	66 h 05 min	66 h 05 min	47 h 30 min	47 h 30 min
4. Towing speed	2.5 knots at 1250/1300 r.p.m. engine output			
5. Average horizontal spread between otter boards (m)	15.14	16.13	18.66	18.91
6. Mean warp tension (kg)	657.11	650.72	654.75	651.5
7. Total catch (kg)	6440.5	4170.5	2106.8	1933.4

method suggested by Benyami (1959) and Deshpande (1960) and tension on the warps was measured by a mechanical tension meter described by Satyanarayana & Nair (1965). Operational details are presented in Table 1.

Sailkite was prepared from a rectangular piece of thick canvas, of 2.7×1.35 m size and natural white in colour. The outer edge was shaped to follow the catenary of the head line approximately and provided with aluminium eyelets for tying tightly along the head rope in the centre of the square (Fig. 1.).

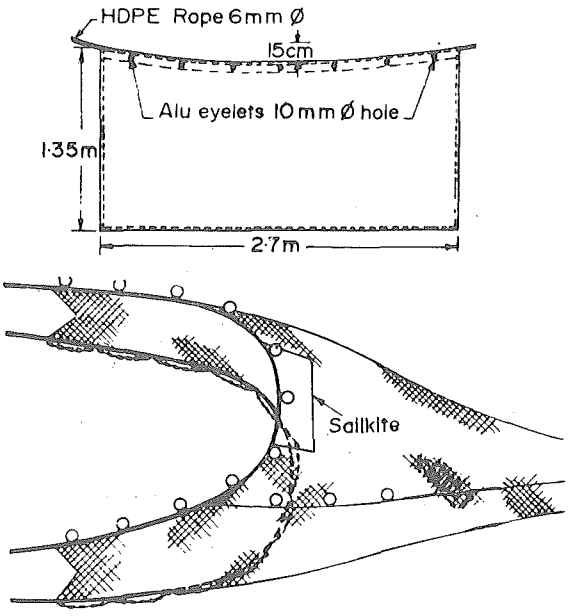

Fig. 1. Construction and method of attachment of sailkite to the trawl.

Results and Discussion

(a) 25 *m high opening trawl*

Details of catch rates and catch composition is presented in Table 2a and the results of statistical analysis using Student t test, for total catch and component groups in Table 3a.

Introduction of sailkite in the rigging has improved the efficiency of the gear by 54.4%, in terms of total catch, which was found to be significant at the probability of 0.01. Highly significant improvement by 138.3% was observed in the case of ribbon fish (*Trichiurus* spp.) coupled with a reduction in the miscellaneous catch by 13.2%. Reduction in miscellaneous catch was brought about by the reduced catch of bottom living sciaenids and juvenile fish.

Horizontal opening between otter boards decreased by 6.5% and tension on the warps increased by 0.98%, with the addition of sailkite, which were significant at 0.05 probability level.

Table 2. *Catch details and composition of catch*

a) 25 *m high opening trawl*

Variety of fishes	With sailkite Catch in kg/h	Percentage	Without sailkite Catch in kg/h	Pereentage
Ribbon fish	66.25	68.0	27.80	44.0
Eel	2.68	2.8	1.64	2.6
Lacatarius sp	1.28	1.3	0.83	1.3
Squid	0.61	0.6	0.39	0.6
Other fishes	26.64	27.3	32.47	51.5
Total	97.46	100.0	63.13	100.0

b) 32 *m large mesh demersal trawl*

Ribbon fish	6.19	14.0	5.28	13.0
Lactarius sp.	6.20	14.0	4.05	10.0
Squid	3.18	7.2	2.03	5.0
Other fishes	28.78	64.8	29.34	72.0
Total	44.35	100.0	40.70	100.0

Table 3. *Results of statistical analysis of total catch and catch components using Student t test*

a) 25 m high opening trawl

Variety of fish	Mean values (kg/h) With sailkite	without sailkite	Difference	Calculated 't'
Ribborn fish	66.25	27.80	38.45	2.93**
Miscellaneous catch	31.21	35.33	-4.12	1.63
Total	97.46	63.13	34.33	2.77**

Degrees of freedom, n–1 : 45

b) 32 m large mesh demersal trawl

Ribbon fish	6.19	5.28	0.91	0.37
Miscellaneous catch	38.16	35.42	2.74	0.67
Total	44.35	40.70	3.65	0 75

Degrees of freedom, n–1 : 31

** Significant at the probability of 0.01

(b) 32 *m large mesh demersal trawl*

Catch details and composition of catch is presented in Table 2b and results of statistical analysis in Table 3 b.

Improvement in the total catch by 9% ribbon fish by 17.2% and miscellaneous catch by 7.7% was noted with kite but the differences were not significant statistically. Ribbon fish landings were low because of poor availability in the fishing ground, during the period of field trials. Improvement is contributed by *Lactarius* sp. and squid.

Horizontal opening between otter boards and warp tension did not show any significant difference statistically. Efficiency of 25 m high opening trawl, a proven design especially for ribbon fish (Kunjipalu *et al.* 1984), can be significantly improved further, by the addition of sailkite in the rigging, both in terms of total catch and catch of off bottom fishes like ribbon fish. In 32 m large mesh trawl, the effect of sailkite was less pronounced which could be attributed to the changed aspect assumed by the square of this two-panelled net during operation, compared to the eight-panelled high opening trawl. Further observations using sailkites of larger area are required to confirm its effectiveness in the case of 32 m large mesh demersal trawl.

Improvement in the catch in both the trawls, could be attributed to higher vertical opening and the improved herding effect on the fish in the vicinity of trawl mouth due to attachment of kite. The latter however requires confirmation through direct observational methods. Blaxter & Parrish (1964) have discussed the herding effect by the peripheral parts of the trawl mouth under visual conditions and trawling speeds of less than three knots, as is the case here.

The changes in the net mouth configuration with reduced horizontal opening consequent to higher vertical lift generated by the sailkite; with possibly lessened ground contact would have contributed to reduced catch of sciaenids and juveniles fishes found close to the bottom. Dickson (1959) has reported that a common line of escape from the path of the net is below ground rope,

when ground contact is inadequate. Effectiveness of a sa.lkite and related canvas sheering devices depends on the design and construction of the gear especially the aspect assumed by square of the trawl, during operation, relative to water flow. A sailkite is ineffective in trawls with squares which are horizontal in action and also where there is excess webbing in the square (Benyani, 1979 a, b). In other case, use of sailkite is indicated either as an additions or substitution to the conventional head line lifting devices. The advantages of sailkite are that it is inexpensive, simple to fabricate, install and handle. It can be wound into a net drum without any detrimental effects. Sailkite can be used at any depth and stowage is easy as it can be folded and kept.

The authors are thankful to Shri M. R. Nair, Director, Central Institute of Fisheries Technology, Cochin for his permission to publish this paper, to Shri P. A. Panicker, Scientist-in-Charge (Gear Division) for his keen interest in the study and to Shri K. K. Solanki, Scientist-in-Charge, Veraval Research Centre, for providing the facilities. They are also thankful to Shri M. S. Fernando, Skipper and his crew and technical assistants, Shri J. B. Paradva and Shri K. U. Dholia, for their co-operation during the investigations. The first author is grateful to Dr. M.Ben Yami, Fisheries Industries Division, FAO, for providing information on his pioneering tank studies on sailkite and also available details of its use in commercial fishing.

References

Anon (1984) *Fishg. News Int.* **23**, 23

Ben-Yami, M. (1959) *in Modern Fishing Gear of the World* (Kristjonsson, H. Ed.) vol. 1, p. 213, Fishing News (Books) Ltd., London

Benyami, M. (1979a) *Australian Fisheries* **38**, 24

Ben-Yami, M. (1979b) *Second Note on Model tests of a Sailkite*, Fisheries Industries Division, FAO

Ben-Yami, M. (1979c) *Fishg, News Inst.* **18**, 26

Blaxter, J.H.S. & Parrish, B.B. (1964) in *Modern Fishing Gear of the World*, 2, p. 529, Fishing News (Books) Ltd., London

Deshpande, S.D. (1960) *Indian J. Fish.* **7**, 458

Dickson, W. (1959) in *Modern Fishing Gear of the World* p. 166, Fishing News (Books) Ltd., London

Hi Soo Han, Byong Moo Kang, Tae Hyun, JO, Bong Chae KIM & Jee Won Chang (1981) *Bull. Fish. Res. Dev. Agency* **27**, 119

Garner John (1977) in *Modern Deep Sea Trawling Gear* 2nd end. p. 73, Fishing News Books Ltd., England

Kunjipalu, K.K., Kuttappan, A.C. & George Mathai, P. (1979) *Fish, Technol.* **16**, 19

Kunjipalu, K.K., Boopendranath, M.R., Gopalakrishnan, K. & Kuttappan, A.C. (1984) *Fish. Technol.* **21**, 86

Kuriyan, G.K., Satyanarayana, A.V.V. & Nair, R.S. (1964) *Proc. Indo. Pacif. Fish. Coun.* **11**, 204

Satyanarayana, A.V.V. & Nair, R.S. (1965) *Res. Ind.* **10**, 229