



Research Note

Drift Gillnets made of Sapphire® and Polyamide in Gujarat, India

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Drift gillnets are used mainly in high seas to catch large pelagic species like seerfish, tuna, sailfish, swordfish and shark and fleet length of up to 10 000 m are reported (Thomas, 2010). In drift gillnetting, the net is freely allowed to drift in water along with the vessel. A total of 20 257 mechanized gillnetters are operated in the Indian waters (CMFRI, 2012).

Large mesh gillnets were successfully introduced along the east coast of India as part of Bay of Bengal Programme (Pajot, 1993). Chaidee et al. (2007) effectively used drift gillnets for marine resource surveys in Bay of Bengal. Large mesh drift gillnetting was introduced in Lakshadweep water by Pravin et al. (2009). Large mesh gillnets are widely operated in Gujarat (Pravin et al., 1998; Thomas et al., 2005). Conventionally, Polyamide (PA) multifilament was used for fabrication of large mesh gillnets in India which was gradually replaced by high density polyethylene (HDPE) in few states like Andhra Pradesh, Tamil Nadu and Gujarat (Pillai, 1989; Pravin et al., 1998; Rao et al., 2002; Thomas & Hridayanathan, 2002). Pillai (1989) and Pravin et al. (1998) reported that, HDPE was widely used as gillnet material in Gujarat. Material substitution of large mesh nylon gillnets by HDPE gillnets in Kerala has been attempted by Thomas & Hridayanathan (2002). Sapphire®, a modified form of HDPE was reported to be used for fabrication of trawl nets (Councilman et al., 2011; Edwin et al., 2014). Recently the material was found to be used for large mesh gillnets in India.

There are 28 400 fishing crafts in Gujarat state, of which 2 964 are mechanized gillnetters (CMFRI, 2012). These vessels operate gillnets made of PA and HDPE. In some areas of Gujarat like Mangrol, gillnets made of Sapphire® netting (Garware-Wall Ropes Ltd., Pune, India) have been introduced recently. There are no reports from India, regarding the use of Sapphire® for fabrication of gillnets. The aim of the study was to document the design and structural details of large mesh drift gillnets made of Sapphire® and compare it with the conventional polyamide multifilament gillnets used in the state.

Data was collected during January - February 2013 from the Mangrol fishing harbour using structured questionnaire covering details of fishing vessel and fishing gear. The details were recorded as per Sreekrishna & Shenoy (2001) and Thomas & Hridayanathan (2002). Design details were depicted as per Nedelec (1975).

Detailed specification of large mesh drift gillnets made of Sapphire® and PA are given in Table 1 and their designs are given in Fig. 1 and 2 respectively. Both Sapphire® and PA gillnets were made of 170 mm mesh size webbing. However, Sapphire® gillnet webbing was of thicker twine (1.7 mm Ø, 380x10x3) than PA webbing (1.25 mm Ø, 210x6x3). The lower breaking strength of netting is compensated by the use of thicker twines (Beverton et al., 1993). A major difference between the two nets was that Sapphire® gillnets were rigged with foot rope and sinkers while PA gillnet did not have foot rope and sinkers. This is to adjust the lower specific gravity of Sapphire® material (Councilman et al., 2011). Pajot (1980), used disc shaped concrete sinkers, of approximately 250 g in large mesh drift gillnet made of PE multifilament. According to Chaidee et al.

Received 26 April 2014; Revised 12 November 2014; Accepted 14 November 2014

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(2007) sinkers in large mesh drift gillnets help the net expand fully while in operation.

PA gillnets generally are rigged without foot rope for better entangling when targeting fast swimming large pelagics (Thomas & Hridayanathan, 2006). In Sapphire® nets lower hanging coefficient is used for rigging to have better entangling effect, (Table 1).

Both types of nets are operated from mechanized wooden gillnetters of 12-18 m L_{OA} fitted with 120 hp engine. Earlier, the depth of operations of large mesh gillnets were limited to 100 m in India (Thomas, 2001) but at present it ranges from 100-1500 m. Similar observation was reported by Akhilesh et al. (2012). Gillnetters are equipped with electronic instruments like GPS, Echosounder and VHF transceivers. The main fishing season is from September to March and peak catch was observed during January. One end of the net was tied to the vessel and the net was freely allowed to drift along with the boat for 4-6 h during night. Indicator lights are attached to the two ends of the net during night operation. Duration of fishing voyage which was about two weeks in late 1990s, now extends up to 20-30 days (Edwin et al., 2014).

The targeted species of large mesh gillnets are tunas (*Thunnus albacares*, *Katsuwonus pelamis*, *Auxis thazard*, *Thunnus tonggol*), seerfish (*Scomberomorus commersonii*), cobia (*Rachycentron canadum*), sharks (*Carcharinus* spp., *Rhizoprionodon* spp., *Alopias* spp. and *Scoliodon* spp.) and bill fishes (*Istiopax indica* and *Istiophorous platypeterus*). Studies with the large mesh gillnets showed that, it is an effective fishing method for exploiting large pelagic fish species found in the high seas (Pravin et al., 2009).

Use of Sapphire® as gillnet material gives advantages like better abrasion and knot stability than other gear materials (Councilman et al., 2011). Fishermen opined that, Sapphire® was more durable than PA and HDPE and that being lighter than PA, Sapphire® net can be operated very easily. (Nielson et al., 1983) reported that braided twines of sapphire® netting gave better durability and abrasion resistance than twisted twine of nylon in trawl nets.

Though many advantages were cited by the fishers for the Sapphire® netting, data on comparative fishing performance with net made of other materials are lacking. In this context, the information provided on design, structural parameters and operation of large mesh pelagic drift gillnets made

Table 1. Details of Sapphire®/ Polyamide drift gillnets operated in Mangrol, Gujarat

Main webbing	Sapphire®	Polyamide (PA)
Mesh size (mm)	170	170
Twine type	Twisted monofilament	Multifilament twine
Twine specification/Diameter (mm)	1.7 (380Dx10x3)	1.25 (210Dx6x3)
Colour of webbing	Dark blue with yellow	White
Hanging coefficient (E)	0.42-0.55	0.50-0.60
No of meshes in length/unit	840-1000	352-730
No. of meshes in depth	100-120	85-100
Head rope material	Polypropylene	Polypropylene
Head rope size (mm)	8	6
Foot rope size (mm)	8	Nil
Float material	Thermocol piece	PVC
Float size (mm)	285x220 (LxB)	100x50
Sinker material/ weight (g)	Cement disc~250g	Nil
Sinker size (mm)	100x25	Nil
Total fleet length (m)	6000-8000	3000-5000

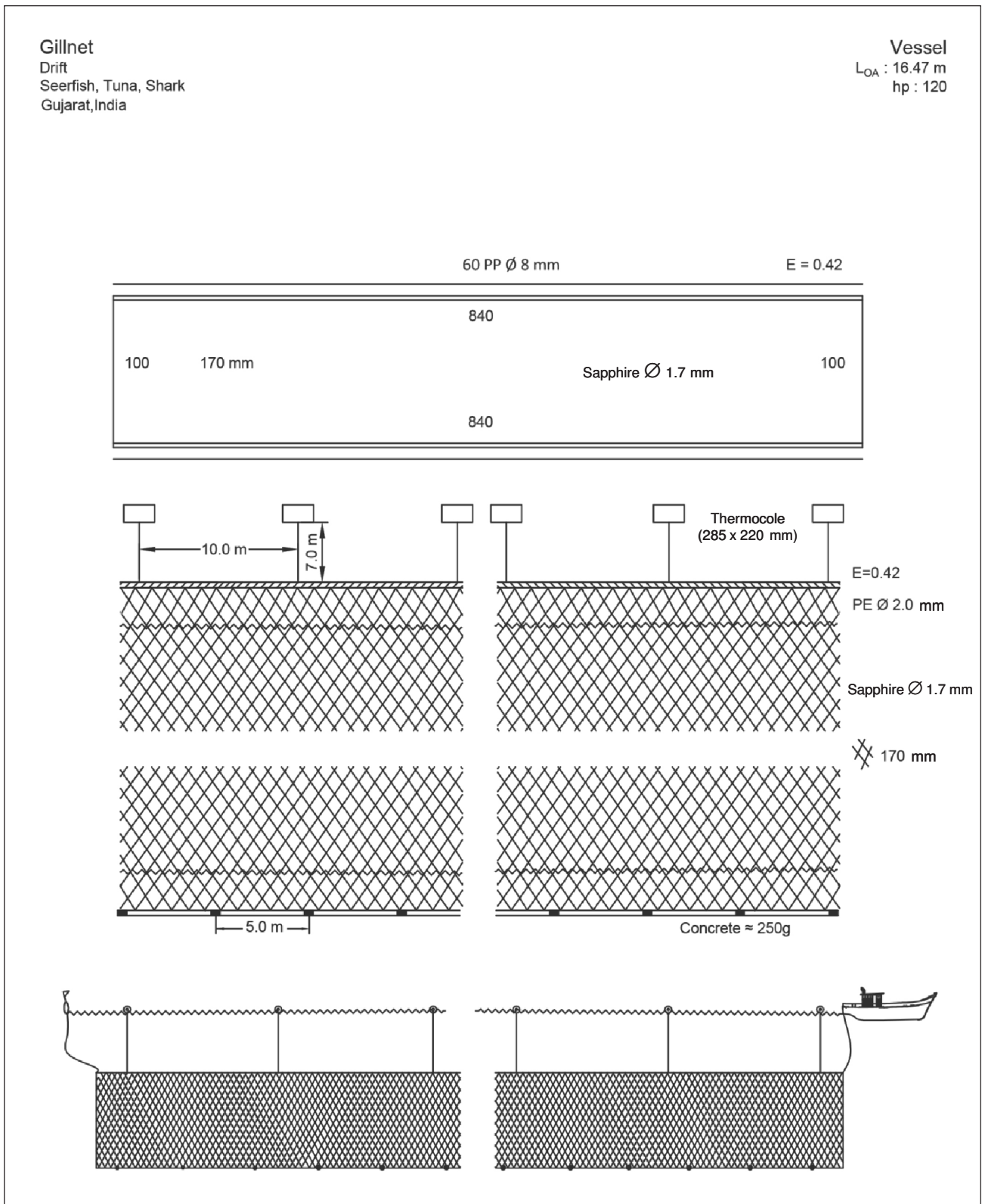


Fig. 1. Design of a typical Sapphire® drift gillnet

Gillnet
Drift
Tuna, Shark
Gujarat, India

Vessel
LOA : 16.47 m
hp : 120

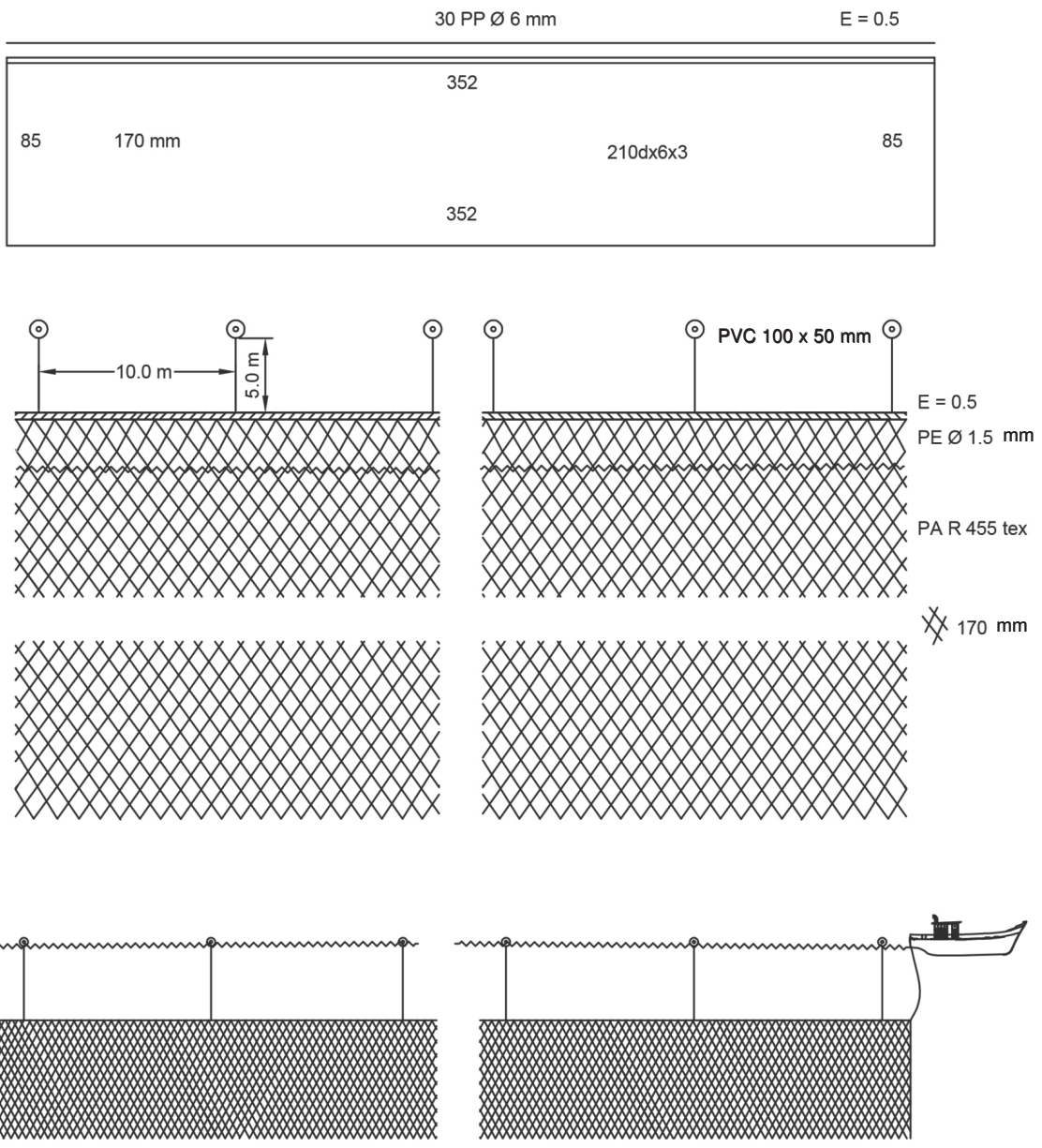


Fig. 2. Design of a typical Polyamide drift gillnet

of Sapphire® netting would serve as baseline data for future studies. Performance evaluation in relation to other materials as well as cost effectiveness and durability need to be worked out for recommending sapphire as a suitable material for large mesh drift gillnets.

Acknowledgment

The authors gratefully acknowledge the support from the National Fund for Basic, Strategic and Frontier Application Research in Agriculture (NFBSFARA), for funding this study. They also thank, Director, CIFT for the facilities provided and for his kind encouragement and guidance during the course of the study. Help and technical assistance from Shri. H. V Pungera, Senior Technical Assistant, Veraval Research Center of CIFT is greatly acknowledged.

References

- Akhilesh, K. V., Ganga, U., Pillai, N. G. K., Vivekanandan, E., Bineesh, K. K., Rajool Shanis, C. P. and Manjebayakath, H. (2011) Deep sea fishing for Chondrichthian resources and sustainability concerns—a case study from Southwest coast of India. *Indian J. Geo-Mar. Sci.* 40(3) pp 347-355
- Beverton, Raymond J. H., Holt, Sidney J. (1993) On the Dynamics of Exploited fish populations. *Fish. Fish.* Vol. 11. 538 p
- Chaidee, P., Darumas, N., Chamasont, O., Sada, M. N., Jayasinghe, R. P. K., Chinthaka, K. S. D., Sein, A. W., Nalla, J. and Thapanand-Chaidee, T. (2007) Marine Resource Surveys by Drift gillnet in the Bay of Bengal. pp 149-166
- CMFRI (2012) Marine Fisheries Census 2010 Part I India, Department of Animal Husbandry, Dairying and Fisheries and Central Marine Fisheries Research Institute, Cochin 98 p
- Councilman, C. J. Walstrum, Matt Rhodes and Jacobs. J. (2011) MDNR-NOAA Trawl Standardization Study. NOAA Technical Memorandum NOS NCCOS 126. NOAA National Centers for Coastal Ocean Science, Center for Coastal Environmental Health and Biomolecular Research, Cooperative Oxford Laboratory, Oxford, MD. 17 p
- Edwin L., Pravin, P., Madhu, V. R., Thomas, S. N., Ramesan, M. P., Baiju, M. V., Ravi, R., Das, D. P. H., Boopendranath M. R and Meenakumari. B (2014) Mechanised Marine Fishing Systems: India. 225 p, Central Institute of Fisheries Technology, Cochin
- Jayaprakash, A. A. and Pillai, N. G. K. and Elayathu, M. N. K. (2002) Drift gill net fishery for large pelagics at Cochin - A case study on by-catch of pelagic sharks. In: *Management of Scombroid Fisheries* (Pillai, N. G. K., Menon, N. G., Pillai, P. P. and Ganga, U., Eds), pp 155-164, Central Marine Fisheries Research Institute, Cochin
- Nedelec, C. (1975) *FAO Catalogue of Small Scale Fishing Gear*, Fishing News (Books) Ltd., Farnham, Surrey, England, 191 p
- Nielsen, L. and Johnson D. (1983) *Fisheries Techniques*, 468 p American Fisheries Society, Southern Printing Company, Blacksburg, Virginia
- Pajot, G. (1980) Improvement of large mesh drift net for small scale fisheries of Sri Lanka, *BOBP News No.9p*
- Pajot, G. (1993) Large pelagic fishing in India, *BOBP News No. 51*, pp 18-20
- Pillai, N. S., Boopendranath, M. R. and Kunjipalu, K. K. (1989) Studies on the suitability of HDPE material for Gillnets, *Fish. Technol.* 26: 1-3
- Pravin, P., Remesan, M. P. and George Mathai, P. (1998) Gillnet fishing in Gujarat. In: *Advances and Priorities in Fisheries Technology*, (Balachandran, K. K., Iyer, T. S. G., Madhavan, P., Joseph, J., Perigreen, P. A., Raghunath, M. R. and Varghese, M. D., Eds), pp 170-176, Society of Fisheries Technologists (India), Cochin
- Pravin, P., Saly N. Thomas, P. George Mathai, B. Meenakumari and M. P. Remesan (2009) Studies on Drift Gillnet Fishing at Agatti Island (Lakshadweep). *Fish. Technol.* 46: 7-14
- Rao, S. V. S, Rajeshwari, G. and Raghuprakash, R. (2002) Studies on the gillnets of Andhra Pradesh, *Fish. Technol.* 39: 15-19
- Sreekrishna, Y. and Shenoy, L. (2001) *Fishing Gear and Craft Technology*, 242 p, Directorate of Information and Publication of Agriculture. Indian Council of Agricultural Research, New Delhi
- Thomas, S. N. (2001) Gillnets of Kerala: A study on technologies and operational aspects, Ph.D Thesis, 333 p, Cochin University of Science and Technology, Cochin
- Thomas, S. N. and Hridayanathan, C. (2002) Substitution of polyamide multifilament by polyethylene twisted monofilament in large mesh gillnets. *Fish Technol.* 39: 100-106
- Thomas, S. N. and Hridayanathan, C. (2006) Design and general characteristics of marine gillnets of Kerala. *Fish. Technol.* 43: 17-36
- Thomas, S. N., Meenakumari, B., Pravin, P. and George Mathai, P. (2005) *Gillnets in Marine Fisheries of India*, 45 p, Monograph, ATIC, Central Institute of Fisheries Technology, Cochin
- Thomas S.N. (2010) Gillnet Fishing in India, in *Coastal Fishery Resources of India In: Conservation and Sustainable Utilization* (Meenakumari, B., Boopendranath, M.R., Edwain, L., Sankar, T.V., Gopal, N. and Ninan, G., Eds), pp 314-326, Society of Fisheries Technologists (India), Cochin