Researching an Appropriate and Effective Gear Marker Protocol for Multiday Boat Fisheries in Sri Lanka

Progress Report

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Research done by

pelagikos pvt ltd

in collaboration with

Fishing Operations Division

Department of Fisheries and Aquatic Resources

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Contents

Summary

Incorporating a fishing boat's identification number in or on fishing gear is increasingly being used as a tool to identify the ownership of the fishing gear, in particular to address the issues associated with abandoned, lost and discarded fishing gears (ALDFG). The **Fishing Gear Marking Regulations No. 1 of 2015**[1] is the national regulation for mandatory marking of fishing gear. The Indian Ocean Tuna Commission's (IOTC) **Resolution 19/04 "Concerning the IOTC record of vessels authorized to operate in the IOTC Area**"[2] also emphasizes using gear markers to identify fishing gears. In response to a request from the Fishing Operations Division (FOD) of the Department of Fisheries and Aquatic Resources (DFAR) in 2022, pelagikos initiated a research programme to identify the most appropriate type of gear markers for Sri Lanka's multiday fishing vessels using longlines and gillnets. The research was conducted using a variety of materials and paints that were thought most likely to be resistant to long-term exposure to the marine environment.

Net Float: The first type of marker tested was embossing the registration number of the vessel with laser cutter into a net float. The embossed number as then painted black. This prototype gear marker was deemed too expensive per unit cost, to be viable on a large scale.

Cloth Tag: The next type of gear marker tested was a cloth tag. Cloth tags with the vessel number printed on the outside were deployed on multiday longline fishing boats and proved to be successful during deployment on short trips. 500 tags were then deployed from Beruwala harbor on 20 vessels, including vessels using gillnets (GN). The results showed that cloth tags are not suitable for GN fishing operations, because the tags were damaged due to entangling in the nets. Printing the boat number inside the tag increases the durability of the tag.

Buoys: Painting buoys with marine paints was the next step in the gear marker research programme. This work started in 2024 with one LL vessel and one GN vessel. The results indicated that painting the vessel number on buoys can be used for both types of fishing activities on multi-day fishing vessels, but it was more suited to gillnet vessels than longline vessels due to the types of buoys used in each operation. To check the cost and quantity of paints per vessel and to check the practical possibility of painting buoy before departure, buoys of one GN vessel were painted with several types of painting and several types of coatings, as part of the second pilot research phase. The aim was to estimate the cost per vessel required to paint all the buoys of one vessel, plus labour charges. Painting buoys is one of the best options for marking gillnet gear, but it is no practical to assign this task to third party labour in a harbour under the DFAR.

Plastic Tags: In 2025 a third type of gear marker using plastic security tags was tested, with the vessel's number printed on the tags. The origins of this idea came from the need to identify restricted gear licences such as sirukku and laila nets in Puttalam District.

[1] https://www.fao.org/faolex/results/details/en/c/LEX-FAOC169344
[2] https://iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_1904.pdf

Plastic security tags were successful on LL fishing operations, but not suitable for GN operations, because again the tags got entangled with gillnet.

Fiberglass tags: Fiberglass tags were identified as the most durable option, with high resistance to water exposure and harsh marine conditions. The cost of the tags is considered reasonable when their durability is taken into account. The primary raw material used for the production of fiberglass tags is locally manufactured fiberglass sheets, while the vessel registration numbers are imprinted using Computerized Numerical Control (CNC) cutting or laser cutting technology. At present, four manufacturers located in Negombo, Chilaw, and Beruwala are engaged in the production of fiberglass tags. This initiative can also be recognized as a valuable employment opportunity for local communities in coastal areas.

Lessons Learnt: The Table below shows a comparison between the different kinds of gear marking options tested between 2022 and 2026 on longline and gillnet multiday fishing vessels.

Table: Comparison between various types of options under key requirements of gear marker

Criteria	Embossed Float	Cloth Tag	Lacquer / Marine Paint[3]	Plastic Security Tags	Fiberglass tags
Unit Cost LKR	700.00	215.00	5.00 – 52.00	12.00	220.00 – 270.00
Gear type	LL | GN	LL	LL | GN	LL	LL/GN
Material Durability	High	High if attached in the water	High	High	Very high
Print Durability	High	High, if printed inside the tag	High	High	Very high
Visibility	High	High	High	Low	High with yellow color
Strength	High	High	High	Medium	high
Feasibility	Low (Cost)	Medium (Printing)	Medium (Labour)	High	Medium (Labor)

Based on the results of the completed sea trials, fiberglass gear markers were identified as the most appropriate type of gear marker for both longline and gillnet fishing gear. Accordingly, in early April 2026, the Department of Fisheries and Aquatic Resources (DFAR) commenced the marking of 50 vessels at Negombo Fisheries Harbour and 25 vessels each at the fisheries harbours of Wennappuwa, Dikkowita, Beruwala, Gandara, Mirissa, and Cod Bay, covering both longline and gillnet vessels.

Technical support for this initiative was provided by Pelagikos (Pvt) Ltd under the co-financing arrangement of the Oceans5/BRT Project.

[3] According to a boat owner of LL EEZ vessel, they are painting 25 buoys in his EEZ LL with 25 ml lacquer (Chinese lacquer 50 ml = 240 LKR). Then for 1 ml it will be 5 LKR. If we use marine paint it will be 52 LKR per buoy. (Marine paint 1 L = 5,220 LKR and assuming 1ml per buoy)

1.0 Introduction

Incorporating a fishing boat's identification number in or on fishing gear is increasingly being used as a tool to identify the ownership of the fishing gear, in particular to address the issues associated with abandoned, lost and discarded fishing gears (ALDFG). **Fishing Gear Marking Regulations No. 1 of 2015**[4], is the national regulation for marking the fishing gear. In 2019, the European Union (EU) forward a proposal for a resolution on the marking of fishing gear following the adoption of the FAO's Voluntary Guidelines on the Marking of Fishing Gear[5]. But the proposal did not pass as a Resolution but Indian Ocean Tuna Commission (IOTC) tasked the IOTC Secretariat to develop standards for the marking scheme by taking into account the FAO Voluntary Guidelines on the Marking of Fishing Gear. The "**Resolution 19/04 on Concerning the IOTC record of vessels authorized to operate in the IOTC Area**"[6] emphasizes that "*Each Contracting Party and Cooperating Non-Contracting Party (CPC) with the IOTC shall ensure that: Each gear used by its fishing vessels authorised to fish in the IOTC area of competence is marked appropriately*"

In 2022, the Fishing Operations Division (FOD) of the Department of Fisheries and Aquatic Resources (DFAR) requested `plegikos` to design a gear marker after trying several designs themselves. Thereafter `plegikos` initiated a series of mini research projects to test different kinds of gear markers using a variety of materials, including paints that are resistant to marine environment since 2022. The objective of the research was to address each of the following four key points

1) The total price of the gear marker needs to be an affordable price for fishermen
2) It must not disturb the fishing activities
3) The design needs to be simple, so fishermen can make them themselves
4) Materials which are used to make the gear marker need to resistant with harsh conditions of the marine environment

2.0 Various options for gear marker

2.1 Boat Number embossed on floats

The first outcome of the research project is shown in the image (right), which was to emboss the registration number of the vessel with a laser cutter to a float and embedded black color paint. The gear marking technique looks excellent. The floats can be found easily. But the total cost was high (700 LKR) per float which cannot be afford by the boat owner.

[4] https://www.fao.org/faolex/results/details/en/c/LEX-FAOC169344
[5] https://openknowledge.fao.org/handle/20.500.14283/cc2889en
[6] https://iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_1904.pdf

Another problem was this option was that laser cutting is not widely available and unlikely to be available to all boat owners in all harbours. Therefore, it is likely to become a complicated process for the DFAR, fishery harbours and boat owners if they are asked to produce gear markers for whole fishing fleet, using this gear marker option.

2.2. Cloth Tags

Phase I: The deployment of gear markers made out of cloth tags was initiated in 2022. After several trials and errors, the final design is shown below.

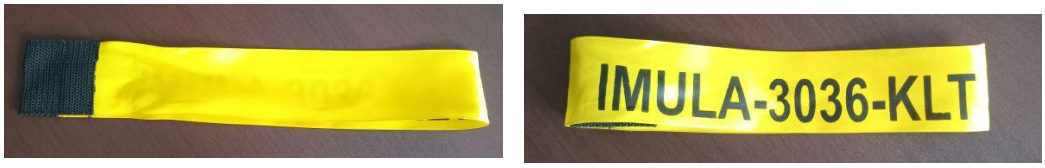


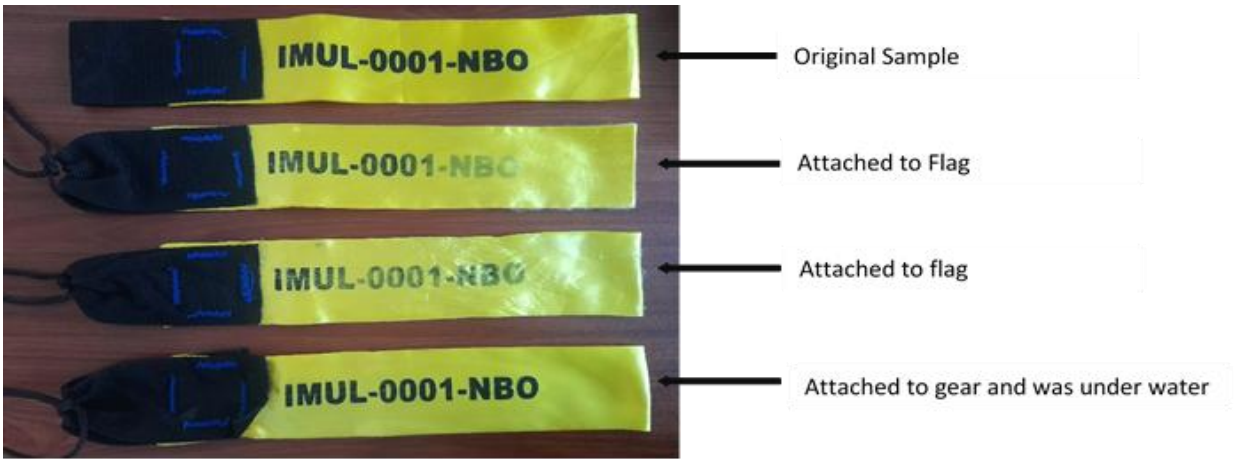
Figure 1: Cloth tag designed as a gear marker with registration number printed inside

The cloth tag is prepared using one strip of cloth ribbon. The strip is folded then gathered by a type of cloth material used for handles of the school bags. The vessel registration number was printed on inside the strip. The total cost of manufacturing the cloth tag was 215 LKR.

During the pilot phase of this research project, cloth tags (with boat numbers printed on the outside) were distributed to seven Crew-based Observers from Negombo and Chilaw, to be tested during their next fishing trip. Some cloth tags were fixed with the gear which was submerged in marine water, some tags were attached to the flag.

Figure 2: Photographs showing cloth tags attached to buoy and flag of LL vessels

Feedback was received from two vessels. Both vessels were targeted yellowfin tuna using longline. The trip duration of the first vessel was 65 days. The crew attached the cloth tag to both gear with water and to flags. The image (right) below shows the results.



The trip duration of the 2nd vessel was 48 days. The crew attached the cloth tags only to the flag. The images (right) show the results. The reason of the color fading was continuous exposure to harsh sunlight / weather condition. The partial succession of the phase I moved the pilot project to phase II following a request from the FOD, DFAR.

Phase II: At the request of the FOD, DFAR in 2023, 500 cloth tags were given to Beruwala harbor. Tags were attached to 20 multiday vessels (10 – longline | 10- gillnet). Comments from the skippers in four vessels were gathered by harbor officers in Beruwala harbor through questionnaire. All the four vessels used gillnet. Three of the vessels attached the cloth tag to the gear. The minimum number of trip days was 19 and the maximum were 48 days. The cloth tags that were attached to the gear were heavily damaged, because the tags entangled with the gear during the setting and hauling process. The yellow colored material was completely damaged and crushed and the print had totally been removed by abrasion. Based on this deployment is was decided that cloth tags were not suitable as a gillnet fishing gear marker.

Figure 3: The material of the cloth tag was crushed and damaged, the print is totally gone away

The cloth tag attached to the flag of the GN vessel was not damaged in the same way, but exposure to sunlight and harsh weather conditions caused the cloth tag to fade after just one deployment (Figure 4).

Figure 4: cloth tag attached to the flag of the gillnet

2.3 Painting

Continuing to explore and research the best option of marking fishing gear for gillnet vessels, the next research project used marine paints to put the number of the boat on the buoys in 2024. Commercially available marine paints are mostly suitable for substrates such as metal and, concrete. They also use for steel structures, gutters, fences, wrought iron, machinery, trailers in marine and industrial environments. To test the effectiveness and durability of marine paints as gear markers, several buoy from longline (LL) and gillnet (GN) vessels departing from Negombo and Beruwala fishery harbours were painted with marine paint and checked for the durability after one trip. The initial result was positive. The painted buoys looked same as they were before deployment.

a b

Figure 5a: buoy painted on LL vessels | 5b: buoy painted on GN vessel

After the initial deployment and retrieval, it was decided to paint all buoys for one gill net vessel departed from Beruwala to find out the total cost and the quantity of paint per vessel. The plan was to find the cost to paint all the buoy of one vessel and allocate one external person from the harbor to do the painting for vessel. The buosy of a gillnet vessel were painted on February 2025 with following different paint materials (Table 1). Stickers with the boat number printed on them were also pasted on the buoy to check the durability. The paint types used were, marine paint, boat yard paint and permanent marker. The coating types used were epoxy resin, water base paint coat and marine paint hardener. Key findings from this deployment of gear markers was that permanent marker pen with epoxy resin was not successful, because the resin made the marker pen spread everywhere. After completing two trips (around 60 days) data were again collected to check condition of the paints.

Table 1: Different types of painting with different types of coatings

1	Marine paint + Epoxy resin	Boat yard paint + Epoxy resin	Permenant marker + Epoxsy resin
2	Marine paint + water base paint coat	Boat yard paint + water base paint coat	Permenant marker + water base paint coat
3	Marine paint + marine paint hardner	Boat yard paint + marine paint hardner	Permenant marker + marine paint hardner

The following images show how painted buoy look like after 02 trips (60 days). Figure (6a) shows that the three paint types with marine hardener looks same as they were before deployment. Figure (6b) shows that marine paint with epoxy resin looked also same as they were before deployment. But the paint with permanent marker with coating faded after the deployment (6c). Although painting buoy is one of the best options for last long gear marker on gillnets, practically it was not possible to paint all the buoy before departure by using external person in the harbour.

a **b** **c**

Figure6a: three paint types with epoxy resin on it before deployment 6b: three paint types and sticker with water base paint coat before deployment, 6c: three paint types with marine hardener coating before deployment

a *b*

Figure 7a: three types of painting with marine hardener coating after deployment, 7b: three types of painting with epoxy resin coating and water base paint coat (faded one)

Field observation on buoy painting

An observation made while collecting field data was that some EEZ vessels in Negombo using both LL and GN are painting buoy to locate their net pieces if they get lost in the sea. Boat owners are using one normal Chinese lacquer paint (50 ml), without any dilution to paint 50 buoys of LL. According to the boat owners, the painted numbers last for as long as six to seven years.

2.4 Security tags as gear marker

Another option for marking the gear was use of plastic security tags, in 2025. The idea came after discussing options to identify individual nets for which limited numbers of licenses are issued in Puttalam Fisheries District such as laila and surukku. The plastic security tags were fabricated with Dio Seals pvt ltd

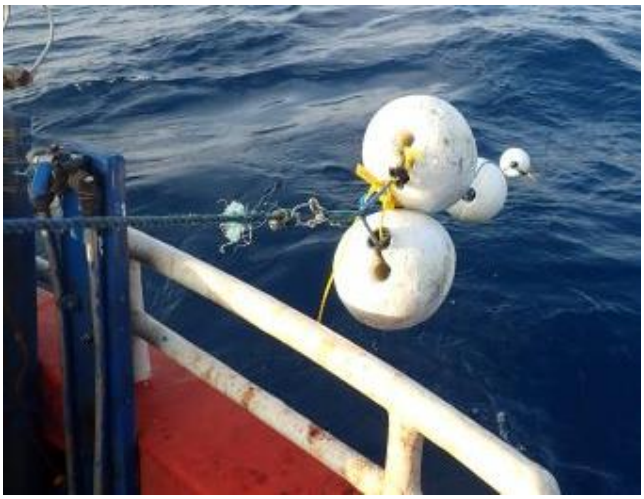
1000 security tags were printed with the DFAR Name and deployed on multiday fishing boats operating within and beyond Sri Lanka's exclusive economic zone (EEZ) using longline and gillnet departing from Negombo and Beruwala harbor. The results in Table 2 below were obtained after deployments from March 2025 to June 2025.

Table 2: Data collected by deploying security tags

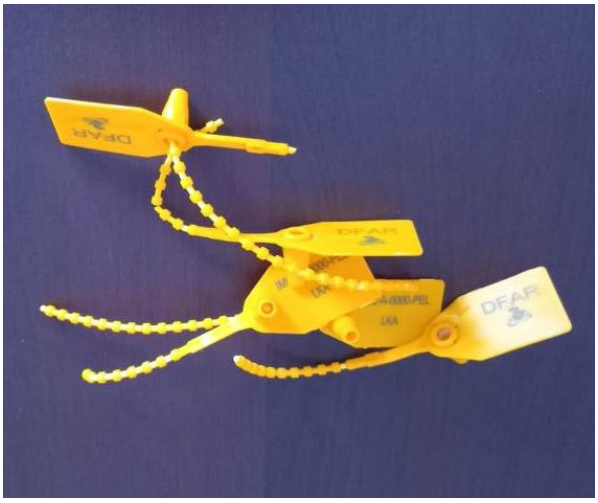
Vessel type	No. trips	No. Days	No. Tags	Result
EEZ – GN	07	34	10	Color didn't fade, print didn't fade, some tags were broken after 47 days (09 trips)
EEZ - LL	02	14	60	Color didn't fade, print didn't fade, tag was not broken
BEEZ - LL	01	73	50	Tags were not broken
BEEZ GN V.1 (6", 24 ply)	01	46	45	Color didn't fade, print didn't fade, tags were broken
BEEZ GN V.2 (6", 24 ply)	01	33	20	Color didn't fade, print didn't fade, tag was not broken, but tags are entangling with the nets.

The security tags were good option for longline fishing boats but not durable on gillnet. Several tags were broken during the very 1st deployment of the beyond EEZ fising vessels using gillnet due to entanglement with the gear and the weight of the gillnets. Another problem raised was the size of the tag deployed was not visible at a distance.

a



b



C

Figure8a: Wire tags before deployment 8b: deployed wire tags in longline EEZ vessel 8c: broken wire tags from BEEZ GN vessel

2.5 Fiberglass gear tags

Gear markers made of fiberglass were identified as the most suitable and final solution for marking Sri Lankan fishing gear. Fiberglass tags, recognized for their durability, were developed by Niroshan Printers, Ganemulla, Sri Lanka. One of the Harbour Officers of Negombo High Seas Unit introduced the new design, while pelagikos pvt ltd provided technical and financial support for the distribution of fiberglass tags among other harbours under the Oceans5/ BRT project.

The fiberglass tags are manufactured using fiberglass sheets, with fiber pigments applied to produce the surface colors (white or yellow). Registration number of the vessel was engraved on the surface using Computerized Numerical Control (CNC) or laser cutting techniques (Figure 9).

Figure 9: Gear marker made of fiberglass

The first set of fiberglass gear markers was deployed on five multiday longline vessels operating beyond the EEZ, all of which were based at the Negombo High Seas Fishery Harbor. Feed backs of the fishermen and the condition of the gear marker will be recorded by the harbor officer at the arrival of the vessel.

2.5 Summary comparison between different gear marker options

The Table below shows a comparison between the different types of gear market options trialed on multiday Sri Lankan boasts in the EEZ and beyond EEZ fisheries.

Table 3: Comparison between various types of options under key requirements of gear marker

Criteria	Embossed Float	Cloth Tag	Lacquer / Marine Paint[7]	Plastic Security Tags	Fiberglass tags
Unit Cost LKR	700.00	215.00	5.00 – 52.00	12.00	220.00 – 270.00
Gear type	LL | GN	LL	LL | GN	LL	LL/GN
Material Durability	High	High if attached in the water	High	High	Very high
Print Durability	High	High, if printed inside the tag	High	High	Very high
Visibility	High	High	High	Low	High with yellow color
Strength	High	High	High	Medium	high
Feasibility	Low (Cost)	Medium (Printing)	Medium (Labour)	High	Medium (Labor)

3.0 Conclusion and Recommendations.

Based on the current results of the sea trials completed most appropriate type of gear marker for both longline and the gillnet is gear marker made by the fiberglass. Currently there are four manufacturing places around the country (Negombo, Chilaw, Kalutara). In the beginning of April 2026 DFAR commenced to mark 50 vessels in Negombo harbor and 25 vessels of each Wennappuwa, Dikkowita, Beruwala, Gandara, Mirissa and cod bay fishery harbours including both longline and gillnets. The technical support given by `pelagikos pvt ltd` under the co finance of Oceans5/BRT project.

[7] According to a boat owner of LL EEZ vessel, they are painting 25 buoys in his EEZ LL with 25 ml lacquer (Chinese lacquer 50 ml = 240 LKR). Then for 1 ml it will be 5 LKR. If we use marine paint it will be 52 LKR per buoy. (Marine paint 1 L = 5,220 LKR and assuming 1ml per buoy)