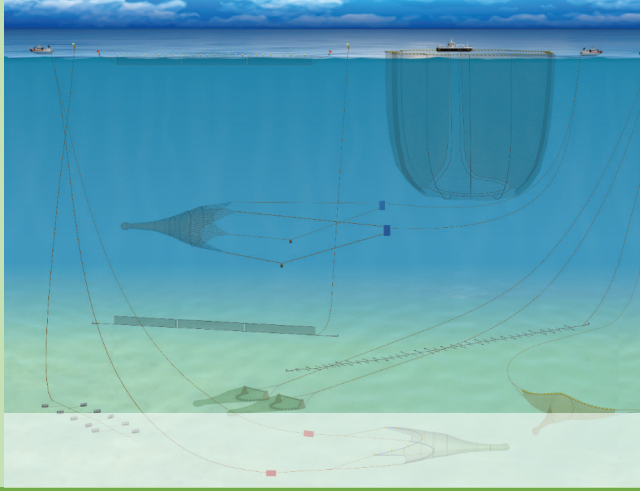
Food and Agriculture Organization of the United Nations



Suppl. 2

VOLUNTARY GUIDELINES ON THE MARKING OF FISHING GEAR

Manual for the marking of fishing gear

Cover photograph: © Seafish

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Manual for the marking of fishing gear

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 2023

Required citation:
Einarsson, H., He, P. & Lansley, J. 2023. *Voluntary Guidelines on the Marking of Fishing Gear – Manual for the marking of fishing gear. Suppl. 2*. Rome, FAO. https://doi.org/10.4060/cc4251en

ISBN 978-92-5-137616-4

Preparation of the document

This document is a technical manual for the marking of fishing gear for the purpose of identifying ownership, which has been prepared by FAO in consultation with relevant experts.

The matter of gear marking was first raised by FAO Members at the Eighteenth Session of the FAO Committee on Fisheries (COFI) in 1989, followed by an Expert Consultation on the Marking of Fishing Gear in 1991. Subsequently, the FAO Code of Conduct for Responsible Fisheries, endorsed in 1995, required fishing gear to be appropriately marked to ensure the identification of the gear owner; such markings also had to take into account uniform and internationally recognizable gear marking systems. FAO then facilitated another expert consultation on the marking of fishing gear in 2016, which lead to the finalization of the Voluntary Guidelines on the Marking of Fishing Gear in 2019.

Several legally binding international instruments already outline explicit requirements for the marking of fishing gear and its improved management. These instruments include the United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, and the IMO's MARPOL Annex 5. The FAO Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing prescribes that inspections should include an examination of fishing gear, in order to ensure its markings correspond to those authorized for the vessel. As part of follow-up action to the Thirty-third Session of COFI, which endorsed the Voluntary Guidelines on the Marking of Fishing Gear, the European Union provided funding for the drafting of the manual through a series of activities. These included implementing an online survey on the global status of fishing gear marking, and holding three online regional workshops on the marking of fishing gear and related matters. With funding provided by the European Union as a follow-up action to the 33rd FAO Committee on Fisheries which included support for the implementation of the Voluntary Guidelines on the Marking of Fishing Gear, FAO also tested different gear markers and marking methods in the course of 2021–2022, the results of which were discussed at a hybrid workshop held in Ancona, Italy, in June 2022. The outputs of these surveys, workshops and trials have contributed to the present document.

This manual was developed in line with the gear marking technologies and practices in use at the time of publishing. In response to growing demand – and particularly in the wake of the publication of the FAO *Voluntary Guidelines on the Marking of Fishing Gear* – many new gear marking technologies are being developed, tested and implemented. As such, it is recommended that new gear marking technologies and practices are monitored closely, and this manual should be updated as appropriate before the technologies described within it become obsolete.

Abstract

This manual is a supplement to the *Voluntary Guidelines on the Marking of Fishing Gear* (VGMFG; FAO, 2019), and provides practical instructions on marking methods for the main types of fishing gear in order to identify ownership. The marking of fishing gear contributes to sustainable fisheries, improving the state of the marine and freshwater environments by combatting, minimizing, and eliminating abandoned, lost or otherwise discarded fishing gear (ALDFG); it also facilitates the identification and recovery of such gear. In addition, fishing gear marking supports fisheries management and can be used as a tool in the identification of illegal, unreported and unregulated (IUU) fishing activities. This manual is intended to assist fisheries managers, fishing gear manufacturers and the fisheries sector to meet the relevant international, regional or national obligations for gear marking. More specifically, it enables all stakeholders to comply with the specific gear marking requirements outlined in the FAO Code of Conduct for Responsible Fisheries, as well as in other international instruments and agreements. Organizations or parties concerned with, or actively addressing the issue of ALDFG may also find the information in this publication useful.

Contents

Table

Figures

Acknowledgements

The activities and process which led to the finalization of this manual were led managed by Jon Lansley Fishery Officer of the Technology and Operations Team (NFIFO) of the Food and Agriculture Organization (FAO), while Mr Haraldur Arnar Einarsson FAO Consultant led the development of the manual with the assistance of Dr Pingguo He of the University of Massachusetts Dartmouth. Many of the illustrations of fishing gears are taken from the Classification and illustrated definition of fishing gears (FAO, 2021). Several illustrations have also kindly been provided by Seafish, and any other sources as indicated. Some illustrations have been modified for the purposes of this manual. Many figures showing examples of gear marking were provided by participants of the workshop held in Ancona, Italy, in June 2022. Drawings showing examples of labelling marks were produced by Mr Haraldur Einarsson.

Abbreviations and acronyms

aFADs	anchored fish aggregating devices
ALDFG	abandoned, lost or otherwise discarded fishing gear
COFI	Committee on Fisheries of the Food and Agriculture Organization of the United Nations
dFADs	drifting fish aggregating devices
EU	European Union
FAD	fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
GPS	Global Positioning System
ICAR	Central Institute of Fisheries Technology
ID	Identifier
IMO	International Maritime Organization
IOTC	Indian Ocean Tuna Commission
IRCS	international radio call sign
ISO3	International Organization for Standardization Country Alpha-3 Code
ISSCFG	International Standard Statistical Classification of Fishing Gear
IUU	illegal, unreported and unregulated fishing
kHz	kilohertz
MARPOL	International Convention for the Prevention of Pollution from Ships
MHz	megahertz
MMSI	Maritime Mobile Service Identity (MMSI) Number
NFIFO	FAO Technology and Operations Team
QR Code	Quick Response code
RFID	radio-frequency identification device
RFMO	regional fisheries management organization
SDGs	Sustainable Development Goals
UHF	ultra-high frequency
UNCLOS	United Nations Convention on the Law of the Sea
UVI	unique vessel identifier
VGMFG	Voluntary Guidelines on the Marking of Fishing Gear

1. INTRODUCTION

1.1. Background

Modern fishing gears used in capture fisheries are primarily made of synthetic materials (mainly plastics), which are generally more durable, accessible, and economical. As a result of their durability, plastic materials can cause long-term plastic pollution in the ocean and inland waters if the gear becomes abandoned, lost, or otherwise discarded fishing gear (ALDFG). The latter is one of the deadliest forms of debris in the ocean and inland waters, as it may continue to catch fish, entangle birds, marine animals, and other endangered, threatened and protected (ETP) species. Gear marking is considered an important tool to reduce ALDFG, assist in fishing capacity control, reduce gear conflicts, aid safe navigation, and fight illegal, unreported, and unregulated (IUU) fishing.

The Food and Agriculture Organization of the United Nations (FAO) started developing guidelines for the marking of fishing gear in the early 1990s. At the Thirty-third Session of the Committee on Fisheries (COFI) in July 2018, FAO Members endorsed the Voluntary Guidelines on the Marking of Fishing Gear (VGMFG), which was published in 2019. The VGMFG state that a system of fishing gear marking should be implemented for all gear types unless the relevant authority deems otherwise because of a risk assessment or other appropriate mechanism. The VGMFG stress that a system of fishing gear marking should be considered and implemented as part of a broad range of fisheries management measures which support sustainable fisheries and healthy oceans, including the reduction, minimization and elimination of ALDFG. The VGMFG envisages that the marking of fishing gear should be a condition for fishing authorisations or license when appropriate. The VGMFG stipulates that gear marking systems should facilitate the reporting of gears lost or abandoned; reporting of fishing gear found; recovery of ALDFG; and where possible the safe and environmentally sound disposal of end-of-life fishing gear.

While the VGMFG provide guiding principles for the design and implementation of systems for the marking of fishing gear, they also mandate FAO to facilitate the implementation of these Voluntary Guidelines by producing

> technical documents regarding types of gear marks for identification of the owner; suggestions for the location of the mark in relation to gear type; guidance for the marking of fishing gear to indicate the position and to mark the presence of the gear in the water column, and any other subject relevant for the implementation of gear marking systems (FAO, 2019).

The need for a uniform marking scheme across management boundaries and on the high seas resulted in the 1967 Convention on the Conduct of Fishing Operations in the North Atlantic. This convention has acted as the basis for several pieces of fishing gear marking legislation, as well as recommendations for many nations and regions; it is also recommended by FAO in its document *Fishing Operations, Technical Guidelines for Responsible Fisheries, 1* (FAO, 1996).

National laws and regulations, as well as international agreements and conventions related to the marking of fishing gear, usually require the location of the gear to be identified; they may also stipulate the marking of surface buoys for the purpose of owner identification. Nonetheless, it is still uncommon for the fishing gear itself (e.g. nets, lines, pots) to require marking, though there is a trend in that direction. For example, the FAO Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing prescribes that inspections should include an examination of fishing gear to ensure its markings correspond to those authorized for the vessel (FAO, 2016). Marking for fishing gears should be designed in accordance with any applicable legal requirements in force.

This document contributes to these requirements by providing a technical manual to aid the implementation of the marking of fishing gear for the purpose of identifying ownership.

1.2. Scope

This manual provides practical guidance on how to mark the most common fishing gears and fish aggregating devices (FADs), drawing on currently available marking techniques and approaches in order to identify ownership and ascertain the legality of gear.

Consistent with the VGMFG and following MARPOL Annex V, fishing gear is defined as

> any physical device or part thereof or combination of items that may be placed on or in the water or on the seabed with the intended purpose of capturing or controlling for subsequent capture or harvesting marine organisms (FAO, 2019: IMO, 2022).

Consistent with the VGMFG, fish aggregating device (FAD) is defined as

> a permanent, semi-permanent or temporary object, structure or device of any material, man-made or natural, which is deployed, and/or tracked, and used to aggregate fish for subsequent capture. A FAD can be either an anchored FAD (aFAD) or a drifting FAD (dFAD) (FAO, 2019).

This manual does not include technical guidance for the marking of fishing gear to indicate the position, or mark the presence of the gear in the water column. General requirements for marking the position of unattended gears should follow Annex IV of the *FAO Technical Guidelines for Responsible Fisheries, 1. Fishing Operations* (FAO, 2016).

The marking of fishing gears will provide better monitoring of fishing activity, but it requires a gear marking registration system complete with a database to store and retrieve relevant information. As the world's fisheries are very diverse, ranging from almost no regulation to highly controlled fisheries, this diversity will obviously be reflected in different gear marking systems. However, providing guidance for the development of gear marking systems is beyond the scope of this manual.

For most fisheries worldwide, the marking of fishing gear has not been formally practised. Before implementing any marking, marks should be tested to ensure they are easy to use and attach to fishing gears, and do not affect the operation of gears or create any danger for operators. The marks need to be affordable and last the lifetime of the fishing gear. The labelling should also be easy to read over the gear's entire lifetime. Recommendations for a methodology for testing fishing gear marks is provided in Appendix II.

2. RECOMMENDED INFORMATION ON MARKS

The world fisheries are diverse, influenced as they are by different environmental factors, technological development, level of management and development level of the national economy. Fisheries also vary greatly within each nation or region. Some nations employ advanced technologies for fishing and adopt strict management measures, while others are at lower levels of development, operating artisanal or small-scale fisheries with minimal technologies and or management. The diversity of the world´s fisheries therefore requires adaptable systems for the marking of fishing gears, and each nation or region should develop and apply a system that is best suited to its fisheries, particular needs and available resources. However, regardless of these diverse differences in fisheries, the objectives of marking fishing gear remain the same – to identify and trace the owner or operator, whether the gear is being used in normal fishing conditions or after it has become ALDFG. The marking of fishing gears should provide a simple, pragmatic, affordable and verifiable means of identifying the ownership of the fishing gear and its link with the vessel(s) and/or operators undertaking the fishing operations.

For the purposes of this manual, a fishing gear ''mark'' refers to an identifier that allows the identification of the person/owner or entity responsible for the fishing gear. The marks may take the form of tags, labels, printing or inscriptions, or they may be attached to a component of the fishing gear.

Some fishing gear has a relatively short lifetime and is unlikely to be used second-hand. Other fishing gears, such as trawls and purse seines, can be sold, possibly switching ownership from one country to another. Changes in ownership may result in the need for the fishing gear to be re-marked. If a vessel is sold with fishing gear, labelling with a unique vessel identifier (UVI) (Davies *et al.*, 2022) may avoid the need for re-labelling, even when the vessel and fishing gear are sold to a different country. A UVI is an identifier that is never re-used and remains with a vessel for its lifetime, even with changes of name, flag and ownership.

The different types of information that can be included on fishing gear marks are listed in Table 1, while further explanation regarding the importance and necessity of such information is provided below.

Table 1. Types of information that can be included on fishing gear marks

Information	**Description**
Country code	• Three alphabetic letters (ISO3) detailing the flag state of the vessel, i.e. the state under whose laws the fishing vessel is registered.
Ownership identifiers – unique vessel identifiers (UVI)	• Global identifiers: IMO number (where available), international radio call sign (IRCS) and Maritime Mobile Service Identity (MMSI) number. • Regional identifiers: Where relevant, the name of a regional fisheries management organization (RFMO) with which the vessel is registered and authorized to operate (e.g. IOTC) and if applicable the RFMO registration number assigned to the vessel. • National identifiers such as the registration or vessel licence number. Additionally/alternatively it may be appropriate to use company name, fishing licence/permit number, fisher name or contact detail of the operator (especially for gears not operated from a vessel).
Date	• Monitoring the age of the fishing gear or the first year of use. • Indicating its legal use for a particular year.
Gear code	• Gear code: If found after being lost, this provides information on the type of fishing gear, even if only part of the gear is found. • The gear code also provides assurance that markers issued for the gear type are attached to correct type of gear. • Unique Gear Sequential number for fishers to check if using many unit, or alternatively where licensing requires units of gears to be sequentially numbered.
Contact details	• Contact information (email, website or phone number) for a representative of the vessel owner or operator.

2.1. Country code

As the methods of marking may vary greatly between nations, the information on the mark may be meaningless for anyone finding the gear in another country. Labelling any fishing gear with a country code is therefore strongly recommended. The ISO3 alphabetic-code (available at www.fao.org/nocs/en) is strongly recommended as a standard for labelling. Regardless of how the gear is marked, three alphabetic letters representing the country of origin (flag state of the vessel operating the gear) should be visible.

2.2. Ownership identifiers

Fishing gear marks should provide a UVI that can be read with the human eye even when using an electronic technique to mark the gear. This approach is required to ensure that ALDFG can be traced to the owner without the need for specialized equipment. Currently, the International Maritime Organization (IMO) number is the only globally recognized UVI for fishing vessels.

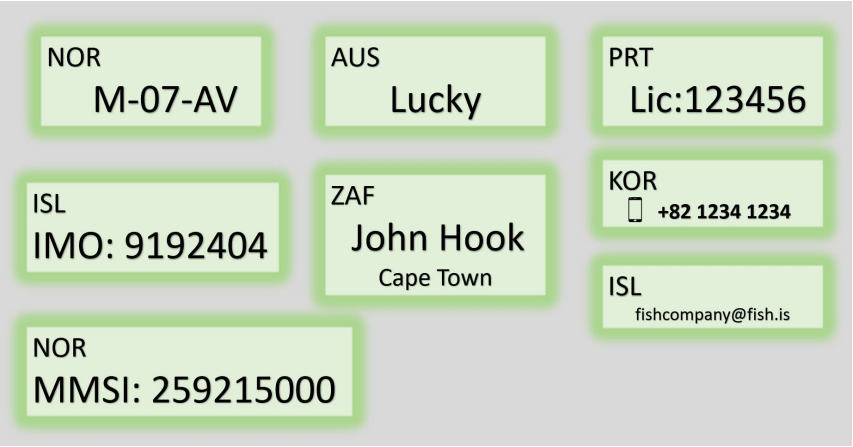
Global identifiers. Where available the IMO number should be used, although this is currently not available to all fishing vessels. Since 2013, the IMO ship identification scheme has included fishing vessels of 100 gross tons and above. In 2017, the scope was extended further, on a voluntary basis, to include fishing vessels of non-steel hull construction as well as smaller motorized inboard fishing vessels down to 12 m in length overall authorised to operate in areas beyond the national jurisdiction of the flag state (IMO, 2017).

Alternative forms of global identifiers include international radio call sign (IRCS) and Maritime Mobile Service Identity (MMSI) number. The former are allocated by the national telecommunications authority to all vessels with radio equipment on board, as part of the radio licensing process. An IRCS is a commonly used identifier that can change over a vessel's lifetime, for example when a vessel changes flag. MMSI numbers are nine-digit numbers which are used to identify a vessel in non-voice radio communications, including automatic identification system (AIS) and digital selective calling (DSC). The MMSI is issued by the national telecommunications authority and the first three digits designate the vessel's flag state.

Regional identifiers. If a vessel is registered for fishing in an area managed by an RFMO (Terje *et al.*, 2020), it may be relevant to mark the fishing gear with the abbreviation of the RFMO, and where available with the registration or licence/permit number assigned to the vessel by that RFMO.

National identifiers. Globally, it may not be possible to attribute an international or regional identifier to the majority of fishing vessels, especially when taking into account small-scale vessels operating within national waters. In these cases, it may be possible to use a national identifier such as a registration or vessel licence number. Where these are not available it may be appropriate to use a company name, fishing licence/permit number, fisher name or even the contact details of the operator. To facilitate tracking, all national identifiers should be preceded with the country code. Examples of some simple gear marks are provided in Figure 1.

Figure 1. Examples of simple labelling on fishing gear markings



Note: Three-letter ISO country code in the upper left-hand corner, together with various examples of unique names and identification number.
Source: Elaborated by author.

2.3. Date

Where there is a time limit for licencing of fishing gears (i.e. annual licensing), the year/date may be very important. In most cases, the year of first use or when the gear was marked may be sufficient. However, depending on the operation and type of fishing gear, the month with the year may provide better information. While including a date on fishing gear may be useful for fishers, it also provides valuable information for those who retrieve fishing gear after it becomes ALDFG. From the management perspective, the date could be an essential marking related to a specific, licensed fishery. Another method for replacing a year marking could be using a tag of a particular colour or letters representing a year, followed by a registering system within the country.

2.4. Gear code

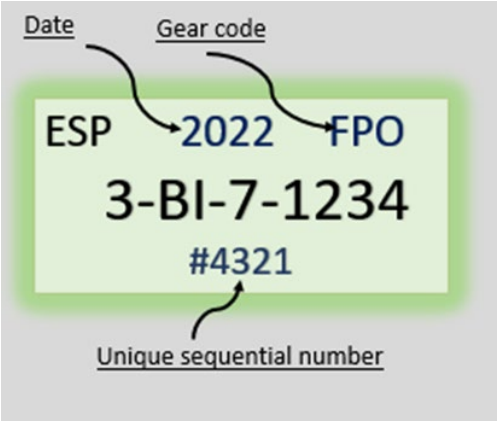
Marking fishing gear in normal fishing conditions with a gear code is important to ascertain its legality and authorization to fish. It also helps identify the type of fishing gear and its origin in the event that only part of the gear becomes ALDFG. For example, gear components such as ropes entangled in animals may be found far from where the fishing gear was being operated. In this case, were the rope labelled with a gear code, this would provide essential information for identifying the fishing gear type from which the rope was a component.

When the gear code is included in the gear marking, the use of the codes provided by the International Standard Statistical Classification of Fishing Gear (ISSCFG) is recommended (Appendix I).

In a regulated fishery, it may be relevant to add additional information to the gear code such as the regulated specifications for that fishing gear, e.g. gear size, mesh size, bycatch reduction devices or similar.

A marking system using a unique sequential number for each unit of fishing gear could be useful in some fisheries. The sequential number could support management measures for a licensed fishery with capacity control, such as pot or gillnet fisheries. Sequential numbers of fishing gear would provide information on how many gear units are in use and how many are missing or lost.

Figure 2. Simple labelling for fishing gear



Note: includes additional details like date (in year format), gear code and unique sequential reference number.
Source: Elaborated by author.

2.5. Contact details

In some cases, the contact information of a representative of the operator – such as a phone number, email, or website – may be useful to facilitate the reporting, retrieval or subsequent returning of recovered ALDFG.

3. EXAMPLES OF MARKS FOR THE IDENTIFICATION OF OWNERSHIP

All types of marking should use readable alphabetic letters and numbers and provide anyone who recovers or finds the mark with basic information such as ownership, without the need for special tools or instruments.

3.1. Printing and inscription

The most straightforward method is to mark a fishing gear with written or printed information with alphabetic letters and numbers. The easiest way to write or print requires marking information on a suitable surface of some fishing gear components such as floats. One practical approach to marking could be to use paint or spray paint and a stencil on gear components. Alternatively, mark information can be written or printed on wood, metal or

plastic tags, which are then attached to the gear. Permanent and waterproof ink is necessary for the marking to last the lifetime of the fishing gear. However, for some fishing gears or parts thereof, marks may need to be replaced or the letters rewritten as and when marks become faded or worn. This is particularly the case when marks have been applied on areas subjected to friction or exposed to strong sunlight. To prolong the life of the marking, a protective cover with transparent materials such as plastic film, Plexiglas, or clear lacquer may be added to the writing or printing.

Examples:

- A piece of wood with information written on it, possibly coated with lacquer, and attached to the fishing gear.
- Floats with printed or written information, e.g. floats on gillnets, purse seine, the headline on the trawl, etc. (Figure 3).

Figure 3. Surface marker buoys/floats with clear letters showing the vessel ID

- A plastic tag with printed or written information fastened to the fishing gear (Figure 4).

Figure 4. Printing on a plastic mark

- Animal identification tags. Livestock tags are usually made of plastic but are available in various metals. These may be ordered blank or with information pre-printed as desired (Figure 5).

Figure 5: An animal ID tag used for marking a gillnet

Note: The animal ID tag is plastic, easy to fasten and provides printed letters.

Advantages:

- an inexpensive method to tag fishing gear;
- no devices are needed to read the tags; and
- an accessible method in all regions of the world.

Disadvantages:

- attached tags create the possibility of entanglement, especially in gears such as gillnets: this may constitute a safety risk when setting or retrieving the gear;
- tags may fall off when not securely fastened, or become loose or broken over time;
- the writing or printed information may fade or wear away before the end of fishing gear life;
- livestock tags are not fully proven to be suitable as fishing gear tags because of the differences in environmental and operating conditions.

3.2. Welding

Welding a metal plate with pre-cut letters and/or numbers, or welding letters and/or numbers directly onto metal gear parts is a well-known and effective marking method (Figure 6). It is straightforward to weld a serial number or owner identification onto a smooth area such as the trawl door of an otter trawl, or a beam on a beam trawl. Some countries have mandatory requirements to mark the metal anchors used for gillnets, traps and longlines, and beams in a beam trawl. Small metal identification plates may be securely welded to the metal components of fishing gears.

Figure 5. An example of a marking on a trawl door

Note: This example features a cut-out of letters and serial number on a steal plate, which is then welded to the trawl door.

Examples:

- trawl doors welded with identification marks;
- anchors for passive gears, such as bottom set gillnets, welded with identification marks; and
- beams of beam trawls welded with identification marks.

Advantages:

- difficult to hide the origin of the fishing gear component, or to remove in the event of theft; and
- likely to last the lifetime of the fishing gear.

Disadvantages:

- limited to fishing gear components with a suitable metal surface;
- requires welding skills and equipment; and
- small letters/numbers are challenging to weld when space is limited.

3.3. Stamped or engraved

Metal stamping is an inexpensive method for marking metal components of fishing gear with the desired information. In certain longline fisheries fishing hooks are marked with codes corresponding to the vessel that deploys them. Metal stamping can be used in many situations and is a feasible method for marking almost any type of fishing gear. Using a hot metal stamp on wood, leather or plastic is a cheap and efficient method that may be easy to implement. Similarly, wood, plastics or metals can be engraved with the required information. Engraving tends to provide more precise markings, while painting or electroplating the surface in a bright colour prior to engraving can make reading easier.

Examples:

- metal stamped hooks with codes;
- metal stamped tags or engraved bird rings, which can be ordered in many sizes and easily clipped on to a rope (Figure 7);

Figure 6. Examples of bird rings being used to mark fishing gear

Note: Coloured aluminium bird rings with engraved letters used to mark a pot, and on the headline of a trawl.

- metal stamped tags used as a ring to attach to rope, or attached to fishing gear such as traps;
- metal cylinder stamped/engraved for threading on a thicker rope; and
- metal stamped/engraved components in fishing gear such as purse seine rings.

Advantages:

- robust and easy to implement;
- relatively cheap method, and easy for anyone to perform;
- likely to last for a long time, longer than written or printed marks; and
- metal rings (bird rings) are likely to last the lifetime of the fishing gear and do not add more plastic to the fishing gear.

Disadvantages:

- metal bands or rings could lead to entanglements, especially in gears like gillnets.
- metal rings on ropes could break off or get stuck in rope hauliers if not the correct size (not tested), thus posing safety issues; and
- could be unreadable if not stamped deep enough into the material.

3.4. Colour-coded

Twine or thread may be spliced into a fishing rope to create a colour code at the manufacturing stage, in order to distinguish between gear categories. This may be used by fishers based in specific management areas, and for gear from different fishing companies and suppliers. In some cases, specific fisheries may require gears such as nets to use a colour that differs from other nearby fisheries, to facilitate identification. Consideration must be given to the colours used with respect to their comparable visibility, as well as their possible fading over time or after extensive use. This method is unlikely to identify individual owners but could identify a collective of fishers in a specific area, or material from a specific manufacturer.

Examples:

- Tracer threads of different colours may identify the manufacturer but are unlikely to identify a fishery or the owner (Figure 8).

Figure 7. Colour-coded yarn identifying the manufacturer

Source: Hampiðjan group, Fishing Catalogue. https://viewer.ipaper.io/hampidjan/hampidjan-fishing-catalouge/?page=182

- Splicing the main rope with special twine (in a given colour) provides a code attributable to a particular fishery (Figure 9).

Figure 8. Splicing a rope with coloured twine to create a code

Source: DFO-Canada, Gear Marking Eastern Canada for non-tended fixed gear fisheries, crab trap fisheries and lobster trap fisheries Mandatory Colour Scheme. 2020. https://www.dfo-mpo.gc.ca/fisheries-peches/commercial-commerciale/doc/colour-notice-avis-couleur-eng.pdf

- Colouring the fishing gear with a specific owner code (Figure 10).

Figure 9. Gillnet coloured with a specific owner code

- Single colour used to construct a fishing gear, or a particular coloured rope/twine used to indicate ownership (Figure 11).

Figure 10. Single colours used to identify ownership of gillnets

- Coloured gear components used to identify owner, company or region (Figure 12)

- **Figure 11.** Coloured plastic containers used to identify ownership

*Note***:** A small FAD with light attraction.

Advantages:

- inexpensive and straightforward;
- splicing extra thread or twine with a rope to create a code is an excellent method to mark a fishery or a defined area within a fishery;
- colour-coding the products of companies that manufacture fishing gear material can, in many cases, help identify the origin of the gear after it becomes ALDFG; and
- helps owners know their own fishing gear and prevent theft.

Disadvantages:

- colours can fade over time;
- some manufacturers of fishing gear twine/ropes copy the colour code(s) of well-known products;
- the method is unsuitable for tracking individual owners in large fisheries; and
- colour codes need to be registered and known or managed by the government.

3.5. Knots or mark ropes

In certain fisheries it may be appropriate for fishers to mark their fishing gear with a special knot, or use marked rope at a specific place on the gear. This practice could be used or combined with colour-coded ropes to indicate fishing gear ownership in small fisheries, or to identify gears between regions.

Examples:

- Fishers may use knots for marking fishing gear (Figure 13 and Figure 14).

Figure 12. Special knots used to attach floats to a fishing gear to identify ownership

Figure 13. Special knots used to assemble gillnets to identify ownership

*Note***:** For gillnets, combinations of single, double and triple knots can be used for the selvedge to identify ownership.

Advantages:

- Inexpensive and straightforward method.

Disadvantage:

- The system needs to be known to others or the authority in order to identify the owner.
- Unsuitable for tracking individual owners in large fisheries.

3.6. Internal tracer thread in ropes

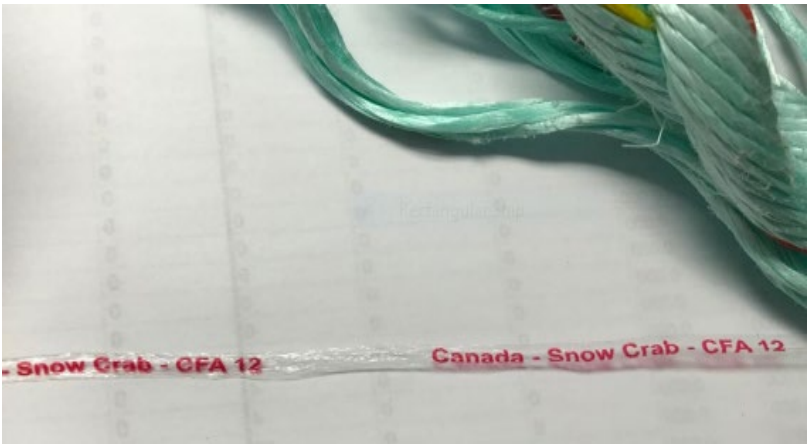
Tracer threads are narrow marker tapes that hold repeated printed information. Marker tapes can be integrated into braided and twisted ropes in various ways; some rope manufacturers put printed tape inside the core of

the rope. This method is beneficial for identifying parts of fishing gear where other marks are not available.

Examples:

- Ropes made for sports like climbing or sailboats are often marked with internal tracer thread to provide information about manufacture and production year, for safety reasons.
- Using a tracer thread as an alternative method to colour coding in Canada snow crab fisheries (Figure 15).

Figure 14. Internal tracer in rope used for identification



Source: Government of Canada. Notices to Fish Harvesters. Gear marking requirements for non-tended fixed gear fisheries in eastern Canada (2019-12-20). Annex 3. https://www.qc.dfo-mpo.gc.ca/en/node/787

Advantages:

- the inner marking is likely to last the lifetime of the fishing gear;
- the printed information will likely be readable for the lifetime of the fishing gear; and
- specific information about the owner or the fishery/region can be printed on the tape.

Disadvantages:

- the marking is not visible from the outside, and therefore may not be found;
- it is challenging to have a unique mark for each customer for the ropes. This method is restricted to marking the producer or specific customers, and date of the product.

3.7. Barcode or QR code

In place of writing or printing an alphabetic text or numbers, it is possible to use a barcode or QR code (Figure 16), which can be read by a smartphone. A QR code can hold much more information than that printed in a small area. Lots of websites will help users generate a barcode or QR code, usually for free. Both codes can hold information to track an item to the owner or fishery. A barcode or QR code can also direct the user to a web page or database, providing more detailed information about the gear, and/or allowing the submission of information relating to the recovered gear.

Figure 15. An example of a barcode and a QR code

Source: Elaborated by author.

Examples:

- Can be used instead of, or with, written and printed letters or numbers.

Figure 17 presents two simple methods of labelling marks on fishing gear with QR-codes that can be read with a smartphone.

Figure 16. Fishing gear marks with QR codes

Source: Elaborated by author.

Advantages:

- QR codes can store more information in an area smaller than a stamp;
- a smartphone with a camera and a free app can read the code; and
- it can be printed on any smooth surface on any part of the fishing gear, or tags of any kind.

Disadvantages:

- It can only be translated to readable text with electronic devices and should therefore only be used as an additional solution to a readable ID.
- If part of the code is missing for any reason, it may not be possible to read any of the information. By contrast, it may be possible to guess alphabetic letters or numbers even if some are partly missing.

3.8. Radio-frequency identification device (RFID) tags

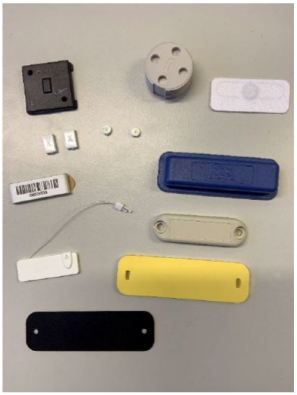
Radio-frequency identification device (RFID) tags can be embedded with extensive user-definable information and produced at reasonable costs. If the tag is of the passive type, using low frequency from 30 to 300 kHz, the reader must be in close contact with the tag, as 125 and 134 kHz are used for RFID. High frequency includes frequencies from 3 to 30 MHz, though commonly only 13.56 MHz is used for RFID. However, it is possible to use tags using ultra-high-frequency (UHF) band ranging from 300 to 1000 MHz, in which only 433 MHz and 860–960 MHz are used for RFID; this makes it possible to read the tag from several metres away. Active RFID tags with a built-in

battery typically operate in the UHF band and can be read up to 100 m away. They can last between 3 and 10 years. Active RFID systems have increased tag abilities with GPS receivers, or depth or temperature sensors. Using additional sensors with RFID technologies allows users to monitor the fishing gear's use in greater detail, including the location of its use or time in the water. Such information may be helpful for fisheries with advanced management systems that need closer monitoring, and RFID tags with in-built flexibility are widely available. The size and shape of the tag should be compatible with the intended fishing gear type. Tags can be as small as a grain of rice, but active RFIDs would be larger because of their internal power (battery). Tags used with fishing gears should be protected with waterproof, hardcover plastic or metal housings (Figure 18). Tags can be inserted into fishing gear components at the manufacturing stage, like inside ropes or plastic floats, or attached to fishing gears such as pots.

Examples:

- RFID tags have been used with static gears such as pots with positive results (Grabia *et al*., 2019).

Figure 17. Examples of RFID tags and reader



Source: Tore Syversen, Jørgen Vollstad, Ståle Walderhaug. 2019. Merking av fiskeredskap Oversikt over teknologi og tilgjengelige løsninger. SINTEF Nord. https://hdl.handle.net/11250/2787955

Note: RFID tags can be small as a grain of rice and set into almost any form. They can be fastened almost anywhere, on or inside all types of fishing gear. The figure

shows some watertight plastic cases with RFID tags inside and one type of RFID reader.

Advantages:

- inexpensive and widely available;
- small and easily fastened to almost any fishing gear component; and
- easy to read with a specific device or in some cases with a smartphone (reading distance and type of devices varies with tag types).

Disadvantages:

- some registering systems with a database are needed to track the item;
- require a specific device to read the RFID tag, e.g. a smartphone or a special reader connected to a smartphone or computer; and
- need to be waterproof or housed in a waterproof case.

3.9. Acoustic transponders

Similar to RFID tags using radio frequencies, acoustic transponders use acoustic signals to communicate underwater, providing vessels with an appropriate hydrophone to receive information about the tagged fishing gear.

When the transponder receives a given frequency from a hydrophone it answers by pinging back some identification information. As acoustic transponders are only useful underwater, additional written/printed alphabetic or numeric letters are required. An acoustic and RFID tag composition would provide for both underwater and out of water identification, however this technology is still being developed.

Examples:

- Examples of trials and some use in Norway (www.pingme.no) and Canada (www.notus.ca/gearfinder-700).

Advantages:

- when using static gear without location marking (e.g. a buoy), it will give vessels sailing over the gear its marking information (e.g. owner identification) and location; and

- helps finding the fishing gear if lost or previously abandoned.

Disadvantages:

- relatively expensive;
- needs hardware and/or software for detection and reading; and
- still in development.

4. SUGGESTED POSITION OF MARKS FOR DIFFERENT GEAR TYPES

Fishing gears should be marked in accordance with any relevant regulations or as recommended by the Voluntary Guidelines on the Marking of Fishing Gear. All gears and electronic marking devices should be marked clearly with readable letters or codes that are traceable to their origin or owners. However, the details, complexity or exemption may vary according to the fishery, type and quantity of gear in use, as well as the nature of the gear as determined by a risk assessment. For example, the European Commission Implementing Regulation (EU) No 404/2011 of 8 April 2011 sets out minimum requirements for the marking of fishing gear. Fishing gears left unattended for a period are generally more likely to be lost than attended gears, while gears actively operated by fishers are generally less likely to be lost. Large-scale fishing gears have a different level of loss risk than small-scale gears. Some components of a fishing gear have a higher risk of loss than others. It is therefore essential to consider where each gear should be marked or tagged so that lost gear components may be traced to the owner. Similarly, it is important to mark or attach tags in such a way that others may be able to find the marking or tags quickly, especially in large-scale fishing gears. The suggested locations for marking different fishing gear types will help achieve this objective.

The fishing gear types described below follow the revised International Standard Statistical Classification of Fishing Gear (Appendix I) and (He *et al*., 2021).

4.1. Surrounding nets

Surrounding nets (01) include purse seines (PS 01.1) and surrounding nets without a purse line (LA 01.2), such as Lampara nets. They are not left unattended at any stage of the fishing operation; there is therefore usually a

low risk of loss. Large-scale purse seines are costly fishing gears and last for a long time. Surrounding nets are usually made of heavy netting materials. If a portion of surrounding nets is lost, webbing usually sinks to the bottom, potentially causing damage to benthic habitats. Given the size and cost of these nets, repairs are usually conducted on land. They present no significant navigational hazard if proper lights and shapes are displayed, as the gear is attached to the vessel during the entire operation. Fish aggregating devices (FADs) are often used with purse seines (FAD marking requirements are provided in the last section of this chapter).

Desirable marking positions:

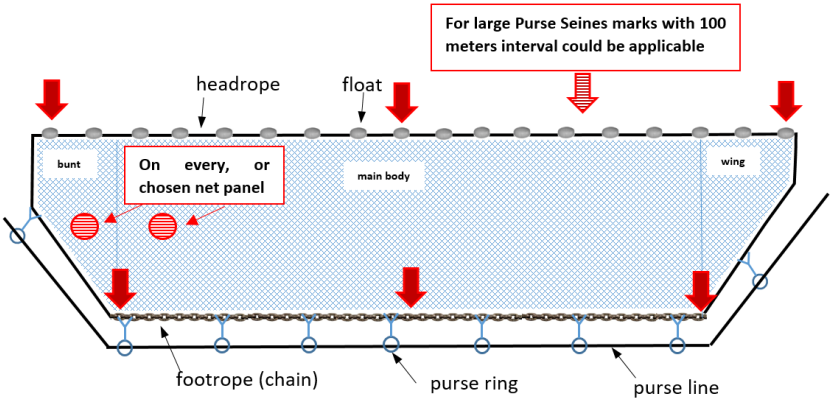
- at the ends of the headrope and footrope (chain);
- at the centre of the headrope and footrope; and
- on the buoys and supplementary buoys if used.

Possible additional marking positions:

- on large gears (> 300 m), every 100 metres on the headrope and footrope;
- marks on every or selected netting panels.

Marking points

Figure 18. Marking points for surrounding nets



Note: The drawing has been adjusted for the purposes of this manual and the surrounding net is not to scale. Red arrows indicate good points for marking; striped arrows and marks provide alternative points. Examples of float and chain marks are provided.

Source (purse seine image): Adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. *Classification and illustrated definition of fishing gears*. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.

Mark types

The main marks:

- The headrope is marked with written/printed/stencilled letters on the floats, preferably where it is unlikely to suffer heavy abrasion during the course of fishing operations.
- The spar buoys are marked with written/printed/stencilled letters on a flag and light.
- The footrope is marked with a metal ring, or other attached material with written/printed/stencilled letters.

Possible additional marking:

- QR codes or barcodes on the floats;
- RFID mark in the marked floats, ideally readable from a distance; and
- small RFID mark on panels.

Comments

Exemplary marking includes marking all floats with human-readable letters showing the owner's country code and identity. Ideally, RFID marks should be readable from a distance. All panels with RFID marks should include the age of the netting panel to ensure timely maintenance and/or trace it to the owner if lost.

4.2. Seine nets

Seine nets (02) includes beach seines (SB 02.1) and boat seines (SV 02.2). They can be marked in similar ways. Beach seines are unlikely to be lost and do not usually present significant dangers to navigation as they are operated close to the beach. However, boat seines often cover a larger area of the sea bed in the initial stage of the setting; nets and their components are therefore more likely to be lost because of bottom obstructions. Webbing panels may be buoyant and could present dangers to navigation and entanglement when they become ALDFG.

Desirable marking positions:

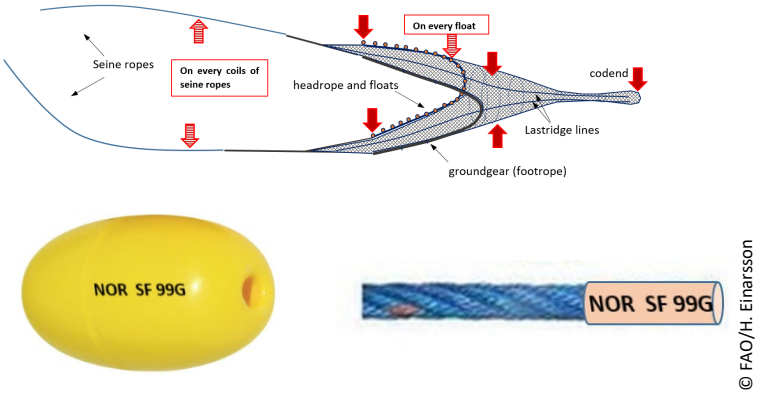
- at each end of the headrope, ideally on the first float next to the end of the headline;
- at the codend, if present, near to the end;
- on each main netting panel;
- on the Dahn buoy, if in use; and
- on the anchor, if in use (Danish Seine).

Possible additional marking positions:

- on every float attached to the headrope; and
- on each coil of rope.

Marking points

Figure 19. Marking points for seine nets



Note: The drawing has been adjusted for the purposes of this manual and the seine net is not to scale. Red arrows indicate good marking points; striped arrows and marks provide alternative points. Examples of float and rope marks are provided.

Source (seine net): Adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. Classification and illustrated definition of fishing gears. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.

Mark types

The main marks:

- headline marks with written/printed/stencilled letters on the floats;
- codend marks with a metal plate or other attached material with written/printed/stencilled letters or codes;
- small marks with written/printed/stencilled letters on main panels;
- flags and light on the Dahn buoy, marked with written/printed/stencilled letters; and
- letters welded onto the anchor or marked with written/printed/stencilled letters.

Possible additional marking:

- QR code or barcodes on the floats;
- RFID mark in the marked floats;
- small RFID mark on netting panels and codend, if present;
- internal tracer thread inside all seine ropes, lastridge lines, and footrope; and
- metal ring pressed on the seine rope with stamped, engraved or welded ID.

Comments

Operating a beach seine is different to operating a boat seine in many ways, notably in terms of the gear's scale and its area of operation. Generally, using fewer marks on a beach seine is acceptable. Including a mark at each end of the headline (first float), and possibly in the centre, may be sufficient for many beach seines.

4.3. Trawls

There are many types of trawls, all of which have a similar shape but may be operated differently. Trawls (03) include beam trawls (TBB 03.11), single boat bottom otter trawls (OTB 03.12), twin bottom otter trawls (OTT 03.13), multiple bottom otter trawls (OTP 03.14), bottom pair trawls (PTP 03.15), single boat midwater otter trawls (OTM 03.21), midwater pair trawls (PTM 03.22), and semi pelagic trawls (TSP 03.3). As trawls come in many sizes and types, they may require different marking methods. Beam trawls are

usually very rugged in construction. Sometimes beam trawls are very heavily weighted with chains. Bottom trawls do not generally present a hazard to navigation. However, they may present a potential obstacle for future fishing operations if they become ALDFG. The webbing of both bottom and midwater trawls may float to the surface if they are apart from the frames and weighted components, as it is usually positively buoyant in seawater. As a result, they may pose a significant navigational and entanglement hazard if lost. When a gear is in contact with the bottom, there is a risk of losing sections of netting panels and other components, which may cause an impact on the benthic habitat. Codends of all trawls have a risk of loss, especially when catch is excessively large.

Desirable marking positions:

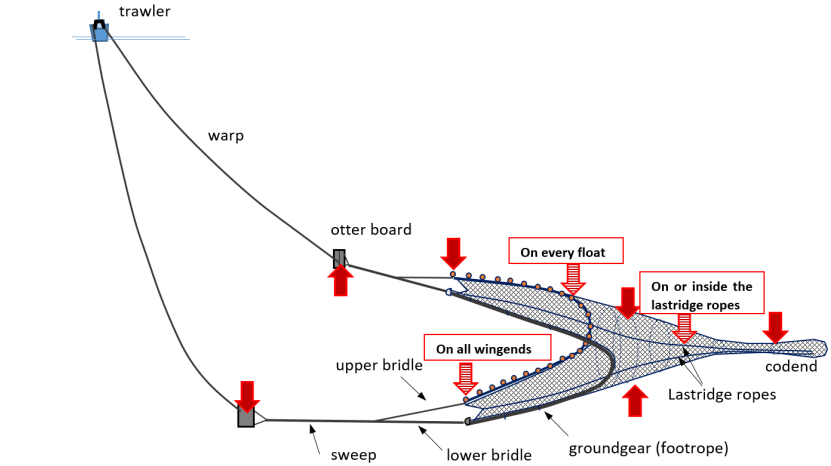
- marks attached to each of the upper wing ends, where the headrope finishes;
- as a minimum, at the posterior edge of the first belly, close to the joining of the second belly and near the centre of the panel;
- on the anterior edge of the codend top panel, five meshes down from the joining (lengthening piece to the codend) and attached to the lacing (selvedge) of the upper section of the codend;
- if used, trawl doors and centre clumps (weights), sledges, or other weights;
- for beam trawls:
    - mark placed immediately behind each sledge on the webbing;
    - mark at the centre of the main beam; and
    - mark on the codend, near the aft end.

Possible additional marking positions:

- on all wing ends (two, four or more, depending on design);
- on every float of the headrope, specially marked floats with RFID inserted; and
- on or inside the lastridge ropes.

Marking points

Figure 20. Marking points for trawls



Source: Elaborated by author.

Note: The drawing has been adjusted for the purposes of this manual, and the trawl is not to scale. Red arrows indicate good marking points; striped arrows provide alternative points. Examples are provided of marking the doors with the manufacturer's serial number, and the floats with a country code and vessel registration number.

Source (otter trawl): Adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. Classification and illustrated definition of fishing gears. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.

Mark types

The main marks:

- wing end marks with written/printed/stencilled letters on the floats, or marks on the end with clear letters engraved/written/printed/stencilled, QR codes or RFID mark;
- codend marks with wooden/metal/plastic plate, or other attached material with written/printed/stencilled letters;
- small light marks with written/printed/stencilled letters on the main panels;
- welding letters on the trawl doors (otter board) using engraved/written/printed/stencilled letters;
- a mark written, welded or engraved at the centre of the main beam.

Figure 21. Marking points for beam trawl and example of a beam trawl marked with a written ID

Possible additional marking:

- QR code or barcodes on the floats;
- RFID marks in the marked floats or all floats;
- small RFID marks on the netting panels and codend;
- internal tracer thread inside all lastridge ropes and the footrope; and
- a metal ring pressed onto the wing ends or lastridge ropes with stamped, engraved or welded ID.

Comments

Trawls are generally structured in a similar way; for instance, all trawls have codends, which should be marked accordingly. However, not all operational methods with trawls require trawl doors (otter boards), but they should be marked if in use. They may have a numbers of wings (2, 4 or 6), or even have none, in the case of beam trawls. Users are advised to mark the right uppermost wing end as a minimum, although marking both wings (and more, if more than two) is desirable. The codend can be very long (> 50 m) in some midwater trawls. In such cases, a good approach is to mark the codend every few metres to the end. If multiple codends are used, each should be marked.

4.4. Dredges

There are three main types of dredges (04): towed dredges (DRB 04.1), hand dredges (DRH 04.2), and mechanized dredges (DRM 04.3) which can be all marked in a similar way. Most dredges are relatively small (except the mechanized type and some offshore dredges) and are primarily made of steel. Operating dredges constitutes no risk to navigation and little plastic pollution hazard.

Desirable marking positions:

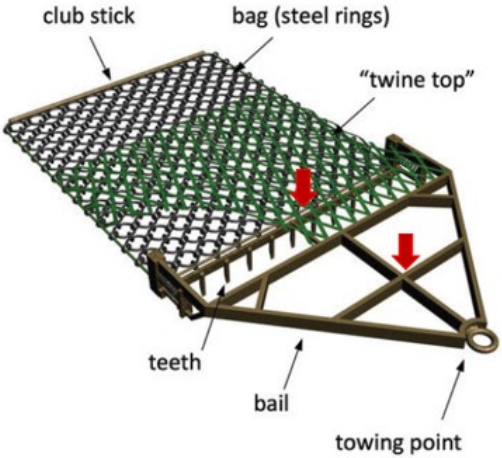
- on the webbing, immediately behind the frame, when applicable;
- a weld bead mark on the centre of the upper frame; and
- a weld bead mark on the towing beam, where employed.

Possible additional marking position:

- mark on large dredges, on the end of the bag, especially if made with twine.

Marking points

Figure 22. Marking points for dredges.



Note: The drawing has been adjusted for the purposes of this manual. Red arrows indicate recommended marking points for dredges.

Source: M. Montgomerie. 2022. Basic Fishing Methods. Seafish. https://www.seafish.org/document/?id=9f2fcd97-8bef-4c28-9185-b219b8eedf8a

Mark types

The main marks:

- on the frame or towing beam, with welded letters; another possible approach is engraving; and
- marks on the twine top or bag can be a wooden/metal/plastic plate or other attached material with written/printed/stencilled letters.

Possible additional marking:

- QR or barcodes on the tag stored on the twine material;
- RFID mark on the twine material; and
- metal ring with mark pressed on the foremost centred bag steel ring.

Comments

If a dredge is lost, it will most likely not drift far as it is heavy. If floats are used on a netting bag or elsewhere, the floats should be marked with country and vessel ID.

4.5. Lift nets

Lift nets are relatively small, and mostly hand-operated, making them unlikely to be lost.

There are three main types of lift nets (05): portable lift nets (LNP 05.1), boat-operated lift nets (LNB 05.2), and shore-operated stationary lift nets (LNS 05.3). They can be marked in a similar way.

Desirable marking position:

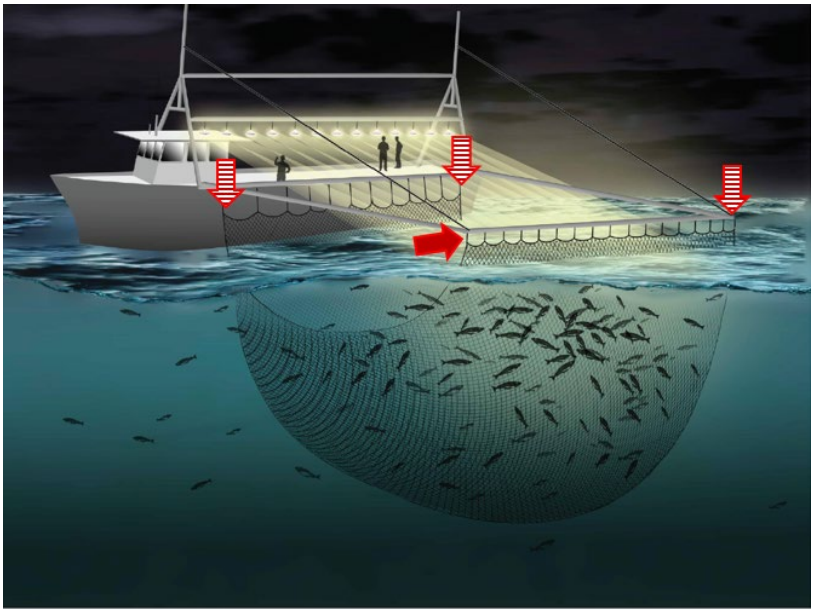
- for a single panel: one identity mark at the corner.

Possible additional marking position:

- one mark on each corner or seaming for a single- or multipanel lift net.

Marking points

Figure 23. Marking points for lift nets



Note: The drawing has been adjusted for the purposes of this manual. Red arrows indicate good marking points; striped arrows provide alternative points.

Source: Adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. Classification and illustrated definition of fishing gears. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.

Mark types

The main marks:

- marks on panel corners can be wooden/metal/plastic plates or other attached material with written/printed/stencilled letters.

Possible additional marking:

- QR code or barcodes on the tag attached to the panel corners; and
- RFID mark on the panel corners.

Comments

Boat-operated lift nets are the type that most require marking. However, even for portable lift nets small marks featuring owner identification is a good approach.

4.6. Falling gear

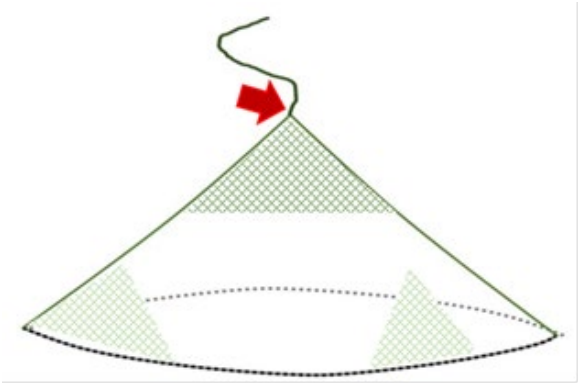
Falling gear (06) includes cast nets (FCN 06.1) and cover pots/lantern nets (FCO 06.2). They can be marked in similar ways. The most common type of gear is a hand-operated cast net. For this reason, losses are unlikely to occur. There are examples of boat-operated falling gear, and those should be marked similarly to the boat-operated lift nets described in Section 4.5.

Desirable marking position:

- at the horn or next to the swivel, if in use.

Marking points:

Figure 24. Marking points for falling gear



Note: Red arrow indicates good marking point.
Source: Elaborated by author.

Mark types

The main marks:

- marks at the horn can be made of plastic plate or fabric, with written/printed/stencilled letters.

Comments

Marks must be very light and not adversely affect the performance of the gear.

4.7. Gillnets and entangling nets

There are many versions of gillnets and entangling nets, but their operations are generally similar. This category includes set gillnets (anchored) (GNS 07.1), drift gillnets (GND 07.2), encircling gillnets (GNC 07.3), fixed gillnets (on stakes) (GNF 07.4), trammel nets (GTR 07.5), and combined gillnets–trammel nets (GEN 07.6).

Localized environmental pollution can occur when gillnets and entangling nets are abandoned, lost, or otherwise discarded. These nets can potentially accumulate on beaches or at points of oceanic convergences. Ghost fishing and entanglement occur when these gears are lost or otherwise discarded. Gillnets, especially near-surface nets, can constitute a significant navigational hazard for other fishers and ocean users, and should always be marked according to the VGMFG. Poorly designed marks attached to gillnets and entangling nets can affect gear operation and can lead to severe complications when deploying or retrieving the gear. The presence of deployed gillnets and entangling nets is indicated to other fishers and marine environment users by surface marker buoys. Marker buoys, should at the very least be placed at each end of a net, or string of nets, and where appropriate at suitable intervals to indicate the location, as well as ownership, of the fishing gear.

Desirable marking positions:

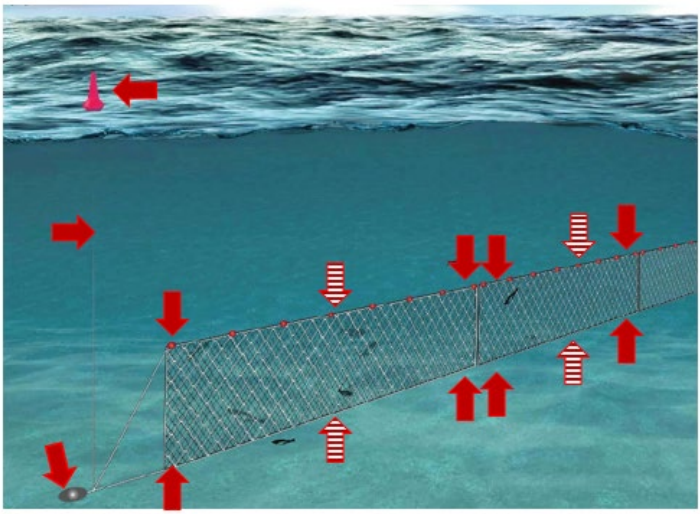
- on the buoys with flags (spar buoys) at each end of the gillnets, with ID marks;
- on the intermediate buoys between ends, marking buoys (drift nets) should hold ID marks;
- on the headline rope (< 30 cm from the end) on each net (all nets in a fleet);
- at each end of the lead line on each net (all nets in a fleet);
- on the anchor, if in use; and
- on the buoy ropes.

Possible additional marking positions:

- headline and lead line at a fixed interval.
- on each headline float, if possible.
- when large gillnets are in use, the panel webbings should be marked at regular intervals.

Marking points

Figure 25. Marking points for gillnets



Note: The drawing has been adjusted for the purposes of this manual. Red arrows indicate good marking points; striped arrows provide alternative points.

Source: Adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. Classification and illustrated definition of fishing gears. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.

Mark types

The main marks:

- The regulation for marker buoys to show the gear location, often with flags and various devices, is common in many countries and

fisheries. Users are advised to use such location marking even when no regulation is in place.

- A clear mark showing the owner's identity should be visible on all marker buoys with written/printed/stencilled letters on the flag or buoy.
- When anchors are used, metal anchors should be welded with ID information. For other materials, use any wooden/metal/plastic plate or other attached material with written/engraved/printed/stencilled letters.
- Marks on the headline must be light, so as not to affect the floating characteristic of the rope. Such marks should be of the kind that do not entangle the net, possibly splicing the mark into the rope. Any suitably durable material forming a ring that fits the diameter of the rope with clear letters may be used.
- Twine in different colours, including marks, can be spliced into the buoy rope; it should be clearly visible, with one mark at each end of net as a minimum.
- Marks on the lead line should adopt the same approach as on the headline, with due consideration of the fishing operation and the durability of the mark.
- Internal tracer in the headline and buoy ropes – and if possible, also in the lead line.

Possible additional marking:

- Marker buoys with RFID for long-distance reading.
- Marker buoys with a radio, or a GPS with satellite connection, which provides the exact position of the nets on both ends, with the owner ID.
- Tiny RFID tags on the headline and lead line that detail the owner ID, as well as the date of the gear's first use. This information may help fishers to know how old the net is.
- Marks on each float of the headline or at regular intervals (if floats are used), with RFID tags installed when possible.
- Acoustic tags that provide ID information can be used and relevant in deep waters or in areas of intense fishing activity.

Comments

Using well-designed marks is essential for the prevention of accidents. If a mark entangles the netting during setting and hauling operations it can be ripped off the net, causing the loss of netting pieces and the tag. In the worst cases, such entangling could endanger the safety of fishers working with the nets; well-designed marks on the headline or lead line of gillnets are therefore crucial to reducing the chances of entanglement. Entangling or bunching of the net caused by poorly designed marks may also result in reduced catch rates.

4.8. Traps

There are various types of traps, and their operations can sometimes be very different. Traps (08) include stationary uncovered point nets (FPN 08.1), pots (FPO 08.2), fyke nets (FYK 08.3), stow nets (FSN 08.4), barriers, fences, weirs, etc. (FWR 08.5) and aerial traps (FAR 08.6). The alphabetic or numeric code is suitable for use as an addition to marking sign to indicate different gear types within the category of traps.

A large variety of trap shapes and sizes are in use and can be set individually or in a fleet (group or strings of pots connected by ropes). The buoys and the lines attached to them can be hazardous to navigation and also present entanglement risks for both vessel traffic and megafauna species, especially cetaceans; it is therefore essential to have all buoys and lines well marked. Pots have the potential to ghost fish if lost or otherwise discarded.

Desirable marking positions:

- When applicable, for pots and fyke nets, marks can be placed in the corner of each net panel or upper line, either at appropriate intervals or on floats.
- Marker buoys and flags should show the location of pots or a fleet of pots at both ends; all buoys should also be carefully marked with ID.
- Each pot should be marked at the corner or on the side panel, and on floats if used.
- For stow nets, markings should be placed at the centre of each headline or upper frame.

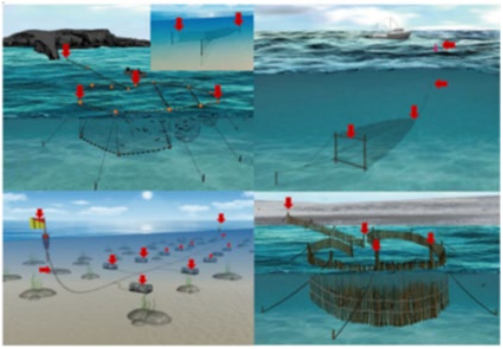
- For large stow nets, each panel and codend should be marked, as should any vertical lines to a buoy.
- Users of barriers, fences, weirs and similar gear should fasten marks in an easily accessible position (i.e. top leader ends and pockets).

Possible additional marking:

- Register the location and ID to a central database in order to give a virtual location of the fishing gear, possibly with navigation chart software. This is particularly important if a ropeless method is being used with pots, and no marker buoys are present.

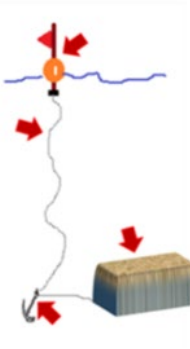
Marking points

Figure 26. Marking points for various type of traps or pots



Note: The drawings have been adjusted for the purposes of this manual. Red arrows indicate good marking points.

Source: Four images adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. Classification and illustrated definition of fishing gears. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.



Drawing Elaborated by author.

Mark types

The main marks:

- A clear mark showing the owner's identity should be visible on all marker buoys with written/printed/stencilled letters on the flag or float.
- Users should mark each pot or separate parts of the fishing gear. Any wooden/metal/plastic plate or other attached material with written/engraved/printed/stencilled letters can be used for marking.
- Register location in a central database. This is particularly important if a ropeless method is used and no surface marker buoys are present.

Possible additional markings:

- Marker buoys with an RFID for long-distance reading.
- Marker buoys with a radio or satellite connection, with a GPS location, to send an exact position of both ends of a fleet of pots to any vessel, followed by ID information of owner, especially when fishing offshore and on high seas.
- Marks on the buoy ropes.
- QR code or similar, with other written marks to give additional information about the gear.
- Tiny RFID tags on the traps, pots or other types, which give the owner ID and the gear's date of first use; this helps fishers know how old the gear is.
- Marks on floats (if floats used), possibly with installed RFID tags.
- Acoustic tags with ID information may be used and are relevant for deepwater fishery or fishing in a busy area.

Comments

All floating parts should ideally hold proper marking for tracking to the gear owner and country of origin. This category of fishing gear is very diverse, but the marking should generally be attached in accessible and visible positions.

4.9. Hooks and lines

Globally there are many versions of hooks and lines, and the operation can vary greatly. In the FAO classification, hook-and-line gears include handlines and hand-operated pole-and-lines (LHP 09.1), mechanized lines and pole-and-lines (LHM 09.2), set longlines (LLS 09.31), drifting longlines (LLD 09.32), vertical lines (LVT 09.4), and trolling lines (LTL 09.5). The alphabetic or numeric code is suitable for use as an additional marking sign to indicate the specific fishing gear type.

When used with handlines, jigging gears, or directly attached to a vessel or fisher, hooks are generally not considered a high risk for loss. However, if gears such as drift or set longlines are left unattended they may present a higher risk of loss, and therefore require more extensive marking. Unattended longlines or vertical lines should have location marking, especially when the lines are near the surface.

Desirable marking positions:

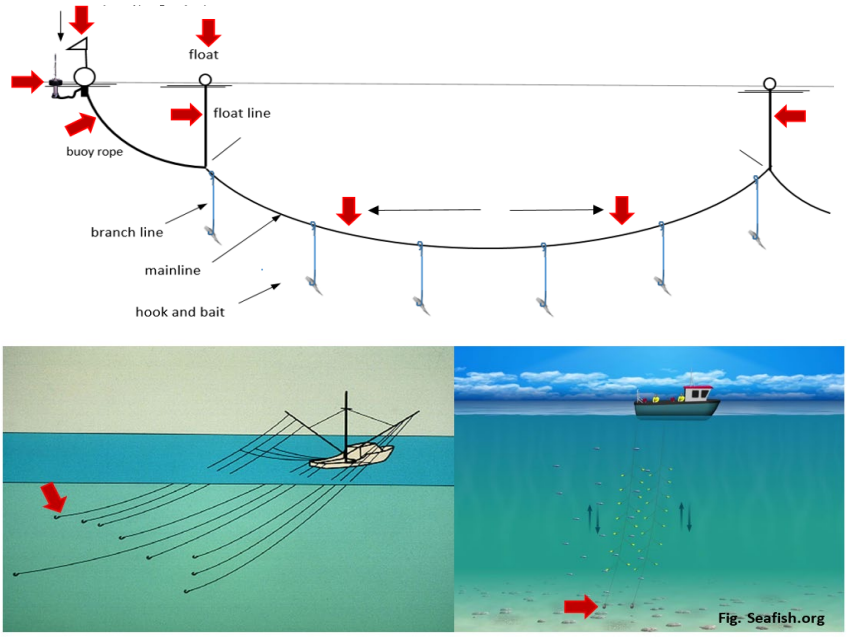
- location marker buoys and flags at each end of set longlines should be marked clearly with owner identification;
- if intermediate buoys between end-marker buoys are used (drifting longlines), they should also be marked;
- marks at fixed intervals on the mainline of longlines: the interval should be determined according to longline type and fishery, but the recommendation is every 50–100 m;
- marks on the buoy ropes; and
- a mark on the weight or near/on the hook.

Possible additional marking:

- a mark/stamp on individual hooks.

Marking points

Figure 27. Marking points for various type of hooks and line



Note: The drawing has been adjusted for the purposes of this manual. Red arrows indicate good marking points.

Source: Top drawing adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. Classification and illustrated definition of fishing gears. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.
Bottom left: FAO. https://www.fao.org/fishery/en/fishtech/1015/en
Bottom right: M. Montgomerie, 2022. Basic Fishing Methods. Seafish. https://www.seafish.org/document/?id=9f2fcd97-8bef-4c28-9185-b219b8eedf8a

Mark types

The main marks:

- Marker buoys should clearly feature the gear owner's ID information, with written/printed/stencilled letters on the flag or the float.
- If extra floats are used, written/printed/stencilled letters should be visible.
- Marks located at regular intervals on the mainline can be made of metal or plastic rings with clear written/engraved/stamped/printed/stencilled letters.
- Marks stamped on metal, or any other material used as a weight.
- Small light tags like bird rings near the hooks.
- Marks on the buoy ropes with bird rings, colour tracer, or internal tracer.

Possible additional markings:

- Marker buoys with RFID for long-distance reading.
- Marker buoys with a radio or satellite connection, with GPS location technology to send the exact position of both ends of a fleet of lines to any vessel, including gear owner identification.
- QR code or similar codes with other written marks to give further information about the gear.
- Tiny RFID tags on the main line, branch line or other types give the owner ID information.
- Marks on some floats (if floats are used), possibly with installed RFID tags.
- Acoustic tags providing ID information can also be used and are relevant for deepwater fisheries or a fishery in a busy area.

Comments

On a longline it is possible to tag gear with a snap clip – such as those used to fasten the hooks on the mainline – or rings clamped tight on the mainline. Where available, the serial number on jigging machines may be used to register the gear, if needed. Stamping on the sinker used for jigging can be a cheap and easy option to implement.

4.10. Miscellaneous gear

The miscellaneous gear (10) in the category includes harpoons (HAR 10.1), hand implements (wrenching gear, clamps, tongs, rakes, spears) (MHI 10.2), pumps (MPM 10.3), electric fishing (MEL 10.4), pushnets (MPN 10.5), scoopnets (MSP 10.6), drive-in nets (MDR 10.7), and diving (MDV 10.8). The alphabetic or numeric code is suitable for marking, to indicate gear type.

Most of the gears in this group are hand-operated, and are therefore not at a high risk of loss. Registered fisheries may make it mandatory to mark these tools, but it is possible to exempt from marking if it is deemed appropriate through a risk assessment. As this group contains countless gear types in use all over the world, marking methods will vary considerably.

Desirable marking positions:

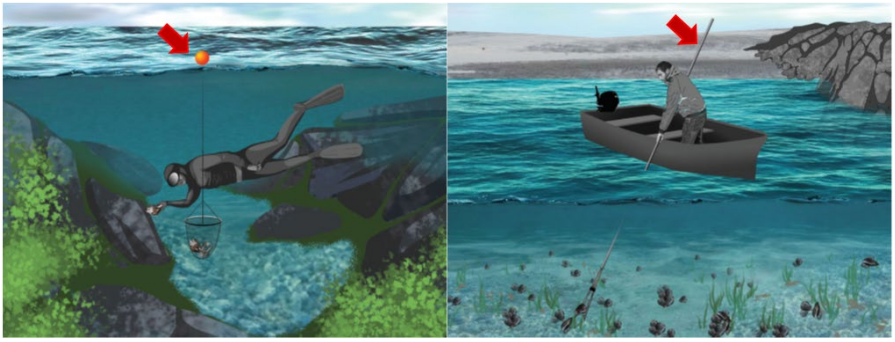
- if any buoys are used, these should be marked;
- if floats of any kind are used, these should have clear marks;
- marks with written/printed/stencilled letters to identify the owner for any handheld gear in use, e.g. harpoons or similar;
- stamps, welding or engraving on metals or hard parts of the gear; and
- marking or tags may be displayed on the operator when operating some hand tools, if a permit or licence is required.

Possible additional markings:

- marks on the buoy ropes, if used;
- a QR code or similar code, to provide further information about the gear, can be a good additional marking on handheld gear; and
- acoustic tags with ID information can be used and relevant for deepwater fisheries or fisheries in a busy area, especially for harpoons.

Marking points

Figure 28. Marking points for miscellaneous gear



Note: The drawing has been adjusted for the purposes of this manual. Red arrows indicate good marking points.

Source: Adapted from He, P., Chopin, F., Suuronen, P., Ferro, R.D.T & Lansley, J. 2021. Classification and illustrated definition of fishing gears. FAO Fisheries and Aquaculture Technical Paper, No. T672. Rome, FAO. doi.org/10.4060/cb4966en.

Mark types

The main marks:

- marker buoys should hold a mark of the owner's identity with written/printed/stencilled letters on the flag or the float; and
- markings with written/printed/stencilled letters on the shaft of any handheld gear used in a commercial fishery.

Possible additional markings:

- if any floats are used, written/printed/stencilled letters should be visible;
- marks on any ropes, if in use; and
- a QR code or similar, with other written marks to give further information about the gear and owner.

Comments

This category of fishing gear includes various types of gear whose operation varies enormously. However, it is relatively easy to tag gears used in the fishery. Writing, stamping, or any method mentioned above will, in most cases, be easy to implement and can help confirm the ownership of any tool used.

4.11. Fish aggregating devices

Fish aggregating devices (FADs) can be a structure or device made of any material, artificial or organic. They are deployed, and often tracked, to aggregate fish for subsequent capture. These devices are either anchored (aFADs) or drifting (dFADs). Most FADs are composed of a surface raft and a submerged appendage, but they can also be positioned on, or near the sea bed. While FADs are generally not considered fishing gears, these devices may significantly increase fishing efficiency. As FADs are highly susceptible to loss and abandonment, each device must be marked and traceable to the owner or those responsible for its operation. The marking of anchored and drifting FADs is considered separately, in separate sections, because of the differences in their structure, associated fishing tactics, and risk of loss and abandonment.

4.11.1. Drifting FADs (dFADs)

Drifting FADs (dFADs) are commonly made of synthetic materials and often deployed in the open ocean with a geolocating buoy, equipped with an echo sounder that provides remotely their position in real time, together with aggregated biomass estimates. Fishers use this marking system to track their dFADs, which drift unattended till the owner, driven by the biomass estimates sent by the echo sounder buoy, decides to visit them. To date, four tuna RFMOs require FADs to be marked (IOTC, 2021; ICCAT, 2021; IATC, 2019; WCPFC, 2017). However, there is no clarity on the type of mark or method to be used. Although the buoy used by fishers to track the dFADs has an ID code, the dFAD does not usually bear any tags; besides, the buoy can be detached from the dFAD or exchanged. The recommendation is therefore to always tag dFADs with clear markings identifying the owner/vessel responsible for first deploying the dFAD.

As dFADs are unattended at sea they frequently get lost or drift out of reach of the first user. However, it is common for fishers to appropriate productive FADs found at sea, by replacing the geolocating buoy for one of their own. In such cases, it is recommended that in addition to marking for the identification of new users, the original mark should be retained.

Desirable marking positions:

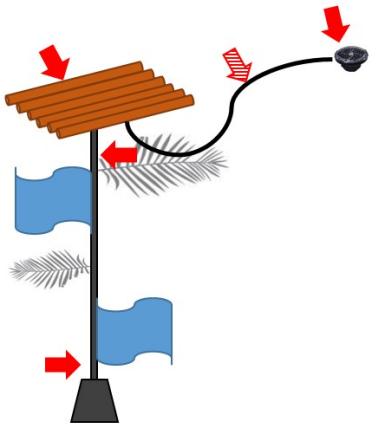
- on the buoy attached to the dFAD;
- on the raft of the dFAD;
- near the highest top of the dFAD; and
- near the deepest part of the dFAD.

Possible additional markings:

- on the rope between the floating part of dFAD and the buoy; and
- adding more marks on the tail.

Marking points

Figure 29. Marking points for dFADs



Note: Red arrows indicate good points for marking.
Source: Elaborated by author.

Mark types

The main marks:

- Satellite buoys should hold a mark of the owner's ID with written/printed/stencilled letters. In addition, the manufacturer's electronic buoy code should be written or printed on the outside of the buoy.
- Any wooden/metal/plastic plate or other attached material with written/engraved/printed/stencilled letters can be used to mark the raft, as well as, as a minimum, the tail or submerged appendage hanging from the raft. There should be two marks: one near the top and one near the bottom.
- The marking information on the raft and on the appendage should bear the information of the original owner/vessel that first deployed the FAD, and additionally any subsequent users.

Possible additional markings:

- marks on the rope attached to the buoy, if in use;
- use colours to identify the owner, company or region;
- a QR code or similar, with other written marks to give further information about the original owner/vessel and subsequent users of the dFAD; and
- an RFID tag on the raft could be a good solution for only authorities holding the database track to the original owner/vessel.

4.11.2. Anchored FADs (aFADs)

Anchored FADs are similar to dFADs but they are anchored. Ownership is usually known. Anchored FADs should always be marked with the ownership ID of the entity that deployed or is managing it.

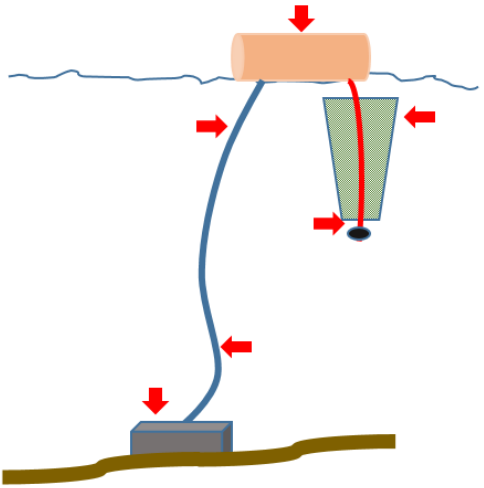
Desirable marking positions:

- on the buoy (if used) and flag, with the ID written on;
- on the floating body of the FAD;
- on the tail or submerged appendage hanging from the raft (two marks, one near the top and one near the bottom);

- on the buoys used for flotation; and
- on the anchor.

Point of marking

Figure 30. Marking points for aFADs



Note: Red arrows indicate good marking points.
Source: Elaborated by author.

Mark types

The main marks:

- Marker buoys should bear a mark showing the country code and ID of the entity who deployed or is managing the FAD, with written/printed/stencilled letters on marking points.
- The raft and appendage should be marked with similar information.
- Any floats on the raft, if used, should be similarly marked with written/printed/stencilled letters.
- Any electronic device, if used, should be similarly marked.

- The anchor or weight block should be marked with welding (if metal) or other means (if made of other materials).

Possible additional markings:

- A QR code or similar, with other written marks to provide further information about the FAD.
- RFID tags on the FAD can provide the owner or manufacturer's ID, and date of first use.

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Appendix I

INTERNATIONAL STANDARD STATISTICAL CLASSIFICATION OF FISHING GEARS (ISSCFG), REV.1 (2016)

Gear categories (First tier)	Subcategory (Second tier)	Standard abbreviations	ISSCFG code
SURROUNDING NETS			01
	Purse seines	PS	01.1
	Surrounding nets without purse lines	LA	01.2
	Surrounding nets (nei)	SUX	01.9
SEINE NETS			02
	Beach seines	SB	02.1
	Boat seines	SV	02.2
	Seine nets (nei)	SX	02.9
TRAWLS			03
	Beam trawls	TBB	03.11
	Single boat bottom otter trawls	OTB	03.12
	Twin bottom otter trawls	OTT	03.13
	Multiple bottom otter trawls	OTP	03.14
	Bottom pair trawls	PTB	03.15
	Bottom trawls (nei)	TB	03.19

Gear categories (First tier)	Subcategory (Second tier)	Standard abbreviations	ISSCFG code
	Single boat midwater otter trawls	OTM	03.21
	Midwater pair trawls	PTM	03.22
	Midwater trawls (nei)	TM	03.29
	Semipelagic trawls	TSP	03.3
	Trawls (nei)	TX	03.9
DREDGES			04
	Towed dredges	DRB	04.1
	Hand dredges	DRH	04.2
	Mechanized dredges	DRM	04.3
	Dredges (nei)	DRX	04.9
LIFT NETS			05
	Portable lift nets	LNP	05.1
	Boat-operated lift nets	LNB	05.2
	Shore-operated stationary lift nets	LNS	05.3
	Lift nets (nei)	LN	05.9
FALLING GEAR			06
	Cast nets	FCN	06.1
	Cover pots/Lantern nets	FCO	06.2
	Falling gear (nei)	FG	06.9

Gear categories (First tier)	Subcategory (Second tier)	Standard abbreviations	ISSCFG code
GILLNETS AND ENTANGLING NETS			07
	Set gillnets (anchored)	GNS	07.1
	Drift gillnets	GND	07.2
	Encircling gillnets	GNC	07.3
	Fixed gillnets (on stakes)	GNF	07.4
	Trammel nets	GTR	07.5
	Combined gillnets-trammel nets	GTN	07.6
	Gillnets and entangling nets (nei)	GEN	07.9
TRAPS			08
	Stationary uncovered pound nets	FPN	08.1
	Pots	FPO	08.2
	Fyke nets	FYK	08.3
	Stow nets	FSN	08.4
	Barriers, fences, weirs, etc.	FWR	08.5
	Aerial traps	FAR	08.6
	Traps (nei)	FIX	08.9
HOOKS AND LINES			09
	Handlines and hand-operated pole-and-lines	LHP	09.1

Gear categories (First tier)	Subcategory (Second tier)	Standard abbreviations	ISSCFG code
	Mechanized lines and pole-and-lines	LHM	09.2
	Set longlines	LLS	09.31
	Drift longlines	LLD	09.32
	Longlines (nei)	LL	09.39
	Vertical lines	LVT	09.4
	Trolling lines	LTL	09.5
	Hooks and lines (nei)	LX	09.9
MISCELLANEOUS Gear			10
	Harpoons	HAR	10.1
	Hand implements (wrenching gear, clamps, tongs, rakes, spears)	MHI	10.2
	Pumps	MPM	10.3
	Electric fishing	MEL	10.4
	Pushnets	MPN	10.5
	Scoopnets	MSP	10.6
	Drive-in nets	MDR	10.7
	Diving	MDV	10.8
	Gear (nei)	MIS	10.9

Gear categories (First tier)	Subcategory (Second tier)	Standard abbreviations	ISSCFG code
GEAR NOT KNOWN			99
	Gear not known	NK	99.9

Appendix II

METHOD OF TESTING FISHING GEAR MARKS

Fishing gear marks hold information that identifies the owner or user of the fishing gear. Marking fishing gear does not always mean location marking. Fishing gear includes all gear components, including location marks such as buoys, if used.

Marks must be easy to use and attach to the fishing gear; they must not disrupt the operation of the gear, reduce its catching efficiency, or be a danger to users. The marks must be cost-efficient and last the lifetime of the gear, or even longer. Labelling should be easy to read over the gear's entire lifetime.

The following elements should be considered or evaluated when testing fishing gear marks:

- Select the place to mark and record both the type of mark and the location.
- If testing more than one type of mark, ensure no interaction between the marks when operating the fishing gear.
- If fishers have any comments about the fishing gear tagging, register them.
- Record the level of ease of attaching the mark to the gear, e.g. 1 – very easy; 2 – doable; and 3 – challenging.
- After a number of trips at sea, record whether the tag is still in the same place, if there is any damage to the mark or the fishing gear it is attached to, e.g. 1 – looks like new; 2 – few scratches and some deformation; 3 - ruined, totally damaged or lost.
- Record fisher's comments about the mark, such as entangling or operation problems: 1 – no issues; 2 – minor problem(s); 3 – major problem(s).
- Record the fisher's experience if the marks poses any danger during operation.

- Evaluate whether it is still easy to read the labelling of the mark.

The following is an example of a recording sheet when testing fishing gear marks:

Gear type: _____

Place of tagging/component: _____

Type of tag: _____

Number of operations: _____

	1	2	3	Remark
Ease of attachment				
Durability/condition				
Impact on operation/Problems				
Safety concerns				
Readability				

Figures providing photos of marks before and after if possible.

Comments from users.

Example 1:

Gear type: Set bottom gillnets for cod in Iceland

Place of tagging: On the headline next to the breast line, over one strand of three-stranded rope.

Type of tag: Land stock marks with Marine & Freshwater Research Institute labelling (HAFRO; yellow).

Time or times of use: From 29 March to 20 April (6 sets of about 18–20 hours soaking time).

	1	2	3	Remark
Ease of attachment	X			
Durability/condition		X	X	Some deform other lost
Impact on operation/Problems		X		Entangling few times
Safety concerns	X			
Readability		X		

Total score = 1 + 2.5 + 2 + 1 + 2 = 8.5/5 = **1.7**

Figures providing photos of marks before and after if possible.

Comments from users.

Example 2:

Gear type: Nephrops trawl, Iceland

Place of tagging: 1. Upper wing end, starboard; 2. Headline, centre; and 3. Codend and belly seaming.

Type of tag: Land stock marks with FAO labelling (orange).

Time or times of use: From 23 April to 25 April, 11 trawling periods of 90 minutes each, totalling 16 hours and 30 minutes.

	1	2	3	Remark
Ease of attachment	X			
Durability/condition	X			
Impact on operation/problems	X			
Safety concerns	X			
Readability	X			

Total score = 1 + 1 + 1 + 1 + 1 = 5/5 = **1**

Figures providing photos of marks before and after if possible.

Comments from users.

This manual is a supplement to the Voluntary Guidelines on the Marking of Fishing Gear (VGMFG), providing practical instructions on marking methods of the main types of fishing gears for the purpose of identifying ownership. The marking of fishing gear contributes to sustainable fisheries, improving the state of the marine and freshwater environments by combatting, minimizing, and eliminating abandoned, lost or otherwise discarded fishing gear (ALDFG); it also facilitates the identification and recovery of such gear. In addition, fishing gear marking supports fisheries management and can be used as a tool in the identification of illegal, unreported and unregulated (IUU) fishing activities. This manual is intended to assist fisheries managers, fishing gear manufacturers and the fisheries sector to meet the relevant international, regional or national obligations for gear marking. More specifically, it enables all stakeholders to comply with the specific gear marking requirements outlined in the FAO Code of Conduct for Responsible Fisheries, as well as in other international instruments and agreements. Organizations or parties concerned with, or actively addressing the issue of ALDFG may also find the information in this publication useful.

Voluntary Guidelines on the Marking of Fishing Gear can be downloaded through the above QR-code

ISBN 978-92-5-137616-4

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CC4251EN/1/02.23