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TECHNICAL CONSULTATION

TECHNICAL CONSULTATION ON THE MARKING OF FISHING GEAR

Rome, Italy, 5–9 February 2018

DRAFT ANNEXES AND APPENDICES TO THE DRAFT GUIDELINES ON THE MARKING OF FISHING GEAR

The Technical Consultation is invited to:

- Consider whether Annexes of the draft Guidelines, as amended by the Secretariat, should be further developed via a separate process and whether they could be periodically reviewed and updated by the Secretariat.

EXPLANATORY NOTE

The Annexes of the draft guidelines have been reviewed by the Secretariat as explained in TCMFG/2018/2 and presented below in this document. The Technical Consultation is invited to consider whether these Annexes should be further developed via a separate process and whether they could be periodically reviewed and updated by the FAO Secretariat.

DRAFT ANNEXES AND APPENDICES TO THE DRAFT GUIDELINES ON THE MARKING OF FISHING GEAR

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Previous title was 'Draft Annexes and Appendices to the draft guidelines for the application of a system on the marking of fishing gear''

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ANNEX A

RISK ASSESSMENT CRITERIA TO ASSIST IN DETERMINING THE APPROPRIATENESS OR OTHERWISE OF IMPLEMENTING A SYSTEM FOR MARKING FISHING GEAR

Many factors contribute towards fishing gear loss or abandonment, including but not limited to; the type of fishing gear, weather, sea and bottom conditions, equipment failure, the level of fishing effort in a particular area, human error and safety considerations.

A risk based approach to mitigating against gear loss and abandonment can reduce the likelihood of loss and the impact of the loss if it occurs.

Before a full risk assessment is undertaken, a simple yes/no assessment may be conducted based on the type of fishing gear and points of marking as suggested in Annex B.2 and the area of operation. This will allow simple small-scale methods, usually hand-held fishing gears, to be assessed without the need for a full risk assessment.

A risk assessment should be carried out to evaluate available data and information on both the fishery in which the gear is used and the ecological and economic characteristics in which the fishery is undertaken. The assessment should be devised ~~Based on this information, an assessment should be conducted~~ to determine the risk (i) of ~~serious, unavoidable or irreversible~~ ecological harm and (ii) to safety at sea associated with the current level of gear marking in the fishery in question.

The determination of risk levels involves four primary steps:

I. Estimation of the consequence (impact) of the lack of a gear marking system and the fishery under consideration;
II. Estimation of the likelihood of occurrence (probability) of the identified impacts, occurring as a result of the lack of a gear marking system in the fishery under consideration;
III. Scoring of the risk; and
IV. Categorization of the risk.

The specific criteria addressed in the risk assessment should be based on the specific fishery conditions under consideration. Notwithstanding, the scope of a risk assessment should include parameters influencing consequences and impacts including, *inter alia*:

(i) Ecological risks: Status of species impacted, habitats fished, vulnerability and fragility of the species and habitats where the fishery takes place and taking into account that ALDFG may

Commented [A2]: New introductory paragraph proposed to provide more context on the need for risk assessment to be applied

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drift large distances and settle in areas outside the fishery of concern, in areas beyond national jurisdiction or in another national jurisdiction;

(ii) Economic risks: Level of effort, the value of the fishery, economic nature of the fishery (subsistence, industrial) and the potential for IUU fishing);

(iii) Technological risks: Gear type, numbers of gears, numbers of vessels, method of operation;

(iv) Safety and Navigational risks;

(v) Social and cultural risks: Different users, language competencies, level of organization;

(vi) Availability of information and the quality of information; and

(vii) The synergies to be derived from harmonizing gear marking systems.

Determining a risk level requires defensible estimates of the consequences and likelihood. To be able to defend estimates, a clear rationale should be provided on how estimated levels were chosen, so that the process can be traced and verified. A clear rationale also provides a basis from which future assessments can be measured. The information, data and expert opinion collected and consolidated through the initial scoping exercise form the basis for that rationale, with additional information being provided where appropriate and necessary.

FURTHER INFORMATION TO CONSIDER IN THE RISK ASSESSMENT PROCESS

Feasibility and affordability

In addition to the risk assessment, decisions should also be informed by an assessment of the feasibility of implementing a system for the marking of gear and of the related cost/benefit issues. Accordingly, the assessment could address the following basic questions:

(i) Is the technology associated with the system feasible, cost-effective and fit for the required purpose?

(ii) Will the technology mature over time?

(iii) Are there any technical barriers to integrating the capability within the current fishery system?

(iv) How would the gear marking system affect the efficiency of the fishery (i.e., reduced CPUE, added down time, associated costs, etc.)?

(v) What measures would be necessary to assist the fleet into implementation of gear marking?

(vi) What resources would be available to ensure successful implementation?

(vii) Does the gear marking system add potential hazards or interference to regular fishing activities?

(viii) Do the States in question have the administrative and economic capacity to implement and monitor the system?

(ix) What capacity building and/or funding needs should be considered (both in terms of administrations and fishery operators)?

Participation

Arrangements for conducting risk assessments and associated decisions should be carried out with balanced participation by independent technical experts and by representatives of interested parties in system development, revision and approval processes. Development of gear marking systems should, wherever possible, include representatives of fisheries management authorities, the fishing sector, the scientific community, and environmental groups, consumer associations, and any other relevant stakeholders.

Transparency

Risk assessments and associated decision making should be carried out in a transparent fashion and follow written rules of procedure. Once a risk assessment has been completed, it should be promptly published and where possible be accessible electronically by the public.

ANNEX B.1

TYPE OF GEAR MARKS FOR IDENTIFICATION

INTRODUCTION

This section gives a brief description of the type of marking identifiers that are used ~~and~~or could be used to attach to or to inscribe on the fishing gear to provide information, such as the ownership of fishing gear, and which could be used in fisheries management, proof of ownership, navigation, reduction of gear conflict, and in pollution control.

The basic requirement of ~~type of~~ gear marks

1. The actual method or device used to display or carry information set out in P~~p~~aragraph 24 in the Guidelines, hereinafter referred to as the "mark" or "marks", should to the extent possible be:
   (i) cost-effective;
   (ii) easily manufactured having regard to locally available materials;
   (iii) easily integrated, printed, inscribed or embossed on the fishing gear, or attached or bonded to the fishing gear;
   (iv) easily read or deciphered by persons engaged in fisheries monitoring and control, and in fisheries compliance in general;
   (v) durable with a high reliability of remaining attached and readable;
   (vi) for surface marks, to the extent possible, visible at a sufficient distance so as to allow the marks to be identified without physical contact with the fishing gear;
   (vii) when the relevant authority inspects fishing gear on the surface or the gear is lifted to the surface, the required mark should be accessible, legible and attached in a manner that will ensure a safe inspection upon lifting of the gear;
   (viii) environmentally neutral to the marine environment and posing a minimal risk of becoming marine debris; and
   (ix) to the extent possible not ~~minimal~~ interferinge~~nce~~ to the operation and performance of the fishing gear; and
   ~~(ix)~~(x) capable of accepting a variety of printed, embossed or electronically stored data.

Examples of gear marks ~~(identifiers)~~for identification of ownership

Gear identification essentially entails the marking of fishing vessel or other details on fishing gear, thus allowing gear to be identified; both when fishing or potentially if it becomes an ALDFG. Various new technologies have been developed to address this as follows:

Electronic tagging, such as Radio Frequency Identification (RFID) identifiers, can be produced with reasonable costs and be embedded with large amounts of user-definable information. One limitation is the relative short reading distance that is dependent on the size and type of the device. In many cases, the gear will have to be hauled up in order to access

RFID data, which is not desirable for inspection by control agencies. However this method is considered to be inexpensive to implement and is widely available and flexible in its usage.

Coded wire tags can be implanted into netting and ropes and scanned for identifying data when required.

L~~Hand held l~~**aser** ~~read~~**print bar or QR coding** is an easy and cheap method to produce and print onto "plastic" tags. These bars or QR codes can be read by handheld devices or smart phones for fast retrieval of information.

Colour coded ropes can be used to distinguish between categories of gear, for instance from fishers based in specific management areas, gears from different fishing companies and suppliers, and so forth. In some instances, a particular fishery has opted to obtain all of its nets in a specific colour, different to that of other nearby fisheries in order to easily identify its own nets. Consideration must be given to the colours used with respect to their comparable visibility, as well as possible fading of colour over time and after extensive useage. This method is unlikely to enable identification of individual owners but could identify a collective of fishers in a specific area.

Rogue yarn, or colour tracers, are yarns of different colour or otherwise visibly different from the rest, that can be built into multi-strand ropes and twines. As with colour coded rope, this method is suited for marking categories of gears or gears used in a specific region or fishery rather than as unique identifiers of vessels and owners. Reliable interpretation of gears based on rope coloration and rogue yarn requires establishment of agreed marking convention among authorities and operators in a given fisheries management region. It works best if incorporated during manufacture as can be costly afterwards. Consideration should be given to the possibility of the coloured yarn becoming faded.

Internal marker tapes are narrow tapes made from common rope-making materials on which information can be printed on. Marker tapes can be integrated in braided and twisted ropes in a range of ways. The method is particularly useful for facilitating identification of parts of fishing gears where other marks have been lost.

Metal stamping is an inexpensive method for marking metal components of fishing gear~~s~~ with desired information. For instance, this method is used to mark fishing hooks with codes corresponding to vessel in certain longline fisheries. Metal stamping can be used in many situations, and like colour coding and rogue yarn, is a feasible method of marking batches or categories of gears.

S tamping or **banding** with inscribed identification can be secured around lines (e.g., leadlines, corklines, headropes, footropes) in multiple locations to increase probability of identifying

ownership of portions of ALDFG or those entangled on marine animals when the entire gear is not available.

~~**Radio surface transponders** are a common feature in many large-scale fisheries with the satellite tracking of vessels for safety and MCS purposes, and the use of radio transponders on gear (as in marker buoys or floats) is becoming more readily available. The fitting of transponders to gear improves the ability to locate gear in the water. This is an added cost to the fisher and is therefore most likely to be used, or is already being used, by fishing operations where gear tends to be larger and more expensive than in small scale and artisanal fisheries.~~

~~**Acoustic transponders** which transmit acoustic signals at specific frequencies from transmitters connected to subsea structures, are used as markers and tracking and location devices in marine industries. Other acoustic systems include long range cetacean deterrent (pinger) detection devices which have been developed to detect gillnets from vessels which possess hydrophone/receiver systems. This type of technology could potentially be applied to GMS (Groupe Spécial Mobile), with transmitters located for example at the bottom of surface floats or near the counter weight, and transmitted signals picked up by receivers on board control and enforcement vessel.~~

Metal ~~/steel~~ tags ~~– metal or steel tag type marks~~ with inscribed identification are low cost, and easily ~~can be~~ attach~~ed~~able to multiple gear types and components and may (depending on risk assessment) be acceptable to use in some cases. Plastic tags ~~Similar marks made of plastic~~ should ~~not~~ be discouraged ~~used~~ due to the environmental risk posed by plastic when lost.

Welding in some cases, can be used to add letters, numbers or other identifiers onto components of fishing gear such as otter boards in otter trawls and beams in beam trawls.

Chemical marking can be used to mark an entire net. It cannot be removed, but requires a 'reader' to identify the rope as the chemical contents cannot physically be seen. It is not commercially available for the fishing industry currently but has the potential to be added at manufacturing level. Further work should be done to eliminate any potential risks of fish contamination as well as possible pollution when using a chemically marked net.

Examples of gear marks for tracking of movement and identification of location

Radio beacons and transponders are a common feature in many large-scale fisheries with the satellite tracking of vessels for safety and MCS purposes. The use of radio beacons and transponders on fishing gear, such as in marker buoys or floats, also becomes more readily available. The fitting of transponders to gear improves the ability to locate gear in the water. This is an added cost to the fisher and is therefore most likely to be used, or is already being

Commented [A4]:
This is already a requirement in some fisheries, such as North Sea beam trawl fisheries which require port letters and numbers welded onto the beam

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This may be an inexpensive means for marking an entire net. Together wth sales/inventory management and tracking systems it will allow identification of retrieved nets to origin or owner

used, by fishing operations where gear tends to be larger and more expensive than in small scale and artisanal fisheries.

Acoustic transponders which transmit acoustic signals at specific frequencies from transmitters connected to subsea structures, are used as markers and location-tracking devices in marine industries. Other acoustic systems include long range cetacean deterrent (pinger) detection devices which have been developed to detect gillnets from vessels which possess hydrophone/receiver systems. This type of technology could potentially be applied to GMS (Groupe Spécial Mobile), with transmitters just below the surface and transmitted signals picked up by acoustic receivers on-board control and enforcement vessels.

Additional considerations

In many cases, only portions of the full component of gear are lost, and therefore redundancy in gear marking is an important consideration. However, attention should be paid to a~~A~~chieving a balance between ~~of~~ providing adequate identification information ~~on different parts of the gear in case only parts of the total gear are recovered with~~and associated cost and performance / handling~~. implications is an issue that deserves attention.~~ Seine, gillnet and other similar gear types could be identified with marks placed on the corks (floats) at regular intervals along the cork line to increase probability of identifying lost ~~as a method that would minimize risk of an~~ individual panels or pieces of net when they are recovered. ~~being lost and unidentifiable.~~ However, in many cases, cork lines are often severed with webbing, lead line and other components when part or entire seine and gill nets are lost.~~, the most commonly recovered component is the cork line, leaving webbing, lead line and other components.~~ Therefore, redundancy of marking on multiple gear components may be advised for certain gear types.

Identifiers could also be used to attach marks to fishing gear or its attachments (e.g. turtle excluder devices) that had been inspected and found to conform to ~~the~~ standards set by the fisheries authority.

Trawl doors and other equipment used in fishing operations should be marked with the vessel's registration or IMO number. Vessel's identifier can be welded in the case of steel otter boards, or carved in the case of wooden boards, on areas that it is less likely be obliterated due to abrasion. The steel and wooden beams used by beam trawlers can be marked in a similar fashion.

~~Integrating gear positioning into e-reporting and e-monitoring: one approach to improving g~~Gear marking and ~~providing~~ spatial/location information (GPS data) of static gear such as traps, pots, gill nets and longlines can be integrated ~~on the location of passive gear is using global positioning system (GPS) data and integrating this~~ into electronic reporting (e-reporting) and monitoring (e-monitoring) systems. This allows ~~skippers~~fishers to electronically mark the start and finish of ~~passive~~ gear shooting or setting and potentially to share~~ing~~ this data with other marine users and control authorities. There are evident concerns

of confidentiality, cost and software compatibility, but such reporting and data sharing could reduce ~~solve issues of~~ gear conflict on popular fishing grounds fished ~~over busy areas such as banks that might be targeted~~ by both mobile and static ~~fishers~~gears.

ANNEX B.2

SUGGESTED LOCATION OF MARKS IN RELATION TO GEAR TYPE

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It is proposed that this table be restructured to follow the new FAO gear classification system

Suggested marks for different gear types

Gear Type	Points of Marking	Comments
SURROUNDING NETS Purse seines Surrounding nets without purse line	1. At each end of the headline (floatline), and if applicable, incrementally along the leadline. 2. On the spar buoys and supplementary buoys if used. 3. On different netting panel, when practicable and applicable.	• *These nets are not lost often, and when lost, webbing may sink to bottom, potentially causing damage to reef systems or other habitat.* • *Surrounding nets are unlikely to be broken into smaller pieces.* • *Due to the size and cost of these nets, repairs are usually carried out on shore.* • *There is no significant hazard to navigation as the gear is near the vessel which displays the appropriate lights and shapes.* • *Fish aggregation devices (FADs) are often used with purse seines; their marking requirement is provided elsewhere.*
SEINE NETS Beach Seines Boat Seines	1. At each end and on the floats of headline. 2. On the codend, if applicable. 3. On each main netting panel.	• *Beach seines usually have no significant danger to navigation as they are operated close to shore. They are unlikely to be lost at sea.* • *Boat seines, however, often cover a larger area of sea bed in initial stage of setting, therefore is liable to loss or damage on bottom obstructions.* • *Webbing panels may be buoyant and could present problems to navigations as well as through entanglement.*
TRAWLS		

Beam Trawls	1. Mark placed immediately behind each sled on the webbing. 2. A weld bead or carved mark on center of the main beam. 3. On the the ending bag or codend	• *Usually very ruggedly constructed, with relatively little net webbing.* • *Sometimes very heavily weighted with chain.*
Bottom Otter Trawls Bottom Pair Trawls Mid-water Otter Trawls Mid-water Pair Trawls	1. Mark on each major panel of webbing, especially the codend and bellies (see below the additional information on the marking of towed gears). 2. Otter boards should be marked as described below. 3. Dropper weights, if applicable, should be marked. 4. Marking of central clumps (weights) in the case of twin and multi-rigs, when appropriate.	• *Bottom trawls in general sink and are no major hazard to navigation but may still potential hazard to fishing operations.* • *The webbing of mid-water trawl may float and may therefore be a major navigational hazard if lost.* • *When gear is in contact with the bottom, it has a risk to lose netting panels and other components, and is liable to habitat damage.* • *Heavy weights used in midwater trawl on each lower wingend are the lowest points of the trawl, and can be lost when hooked on the bottom structure.*
DREDGES	1. On the webbing immediately behind the frame, when applicable. 2. A weld bead mark on center of the upper frame. 3. The towing beam, where used, should be marked with a weld bead mark.	• *Most dredges are relatively small (except mechanised offshore dredges)* • *Largely made of steel.* • *Constitutes no risk to navigation and little pollution hazard.*
LIFT NETS	1. If single panel, one identity mark at the comer.	• *Relatively small, and mostly hand-operated*
FALLING GEAR Cast Nets	1. At the toe of ending bag or codend, if considered necessary. 2. Identification marks to be placed where applicable.	• *Mark must be very light and not adversely affect the performance of the gear.*

GILLNETS AND ENTANGLING NETS Set Gillnets Drifting Gillnets (Driftnets) Encircling Gillnets Fixed Gillnets (on stakes) Trammel Net Combined Gillnets-Trammel Nets Drift Trammel Nets Bottom drift nets	1. Mark at each end of the headline rope, and at suitable intervals along the headline, if longer than 200 m. 2. The mark may be inscribed also on floats of the headline, when applicable. 3. Incremental marking along the leadline, when applicable. 4. Marker buoys and flags should be marked.	• *Environmental pollution can occur when lost or discarded* • *Potential for "ghost fishing" and entanglement when lost or otherwise discarded.* • *These nets, especially near-surface nets, can constitute significant navigational hazard to other fishers and other users of the marine environments, and should always be marked in accordance with the Guidelines.* • *The existence of these nets is only evident by the presence of marker buoys, which should be placed at each end and at suitable intermediate positions.* • *Some types of marks can affect operation and cause serious complications in deploying or retrieving gear.*
TRAPS & POTS		
Pound Nets Fyke Nets	1. Mark to be placed where there is easy access (e.g., top leader ends and at the pockets at the shore side of the leader, at the corner of the wings). 2. At the corner for each net panel or upper line at appropriate intervals, or at some floats, when applicable.	• *Low risk of environmental pollution, but have been known to entrap marine megafauna.* • *Large pound nets may constitute a navigational hazard and should be marked with surface floats.* • *If large pound nets are set close to navigational fairways, they should be marked with lights and radar reflectors, or with any other appropriate surface markers.* • *Fyke nets are usually smaller and are set in shallow water or in rivers and in general do not constitute a major navigational hazard (except when close to navigational fairways) or pollution risk.*

Pots Creels	1. Each individual pot should be marked 2. Each float or marker buoy should be marked	• *A large variety of shape and sizes of pots are in use and can be set individually or in a fleet.* • *No navigational hazard if well marked.* • *Potential for "ghost fishing"* • *Buoy lines may be a significant entanglement hazard for megafauna.*
Stow Nets	1. Marks at the center of each headline or upper frame 2. On the toe end of each netting bag.	• *Stow nets are usually set in very shallow water (10 to 15 m) and can constitute a navigational hazard when close to navigational fairways.* • *In the case of a stow net used from a vessel, the vessel should show the lights and marks appropriate for an anchored vessel engaged in fishing.*
Barriers, Fences, Weirs, etc.	1. Marks to be placed where there is easy access (i.e. top leader ends and pockets).	• *Large barriers and fences may constitute a navigational hazard.*
HOOKS AND LINES (including jigging gears)		
Handlines and Pole lines (Hand operated) Handlines and Pole lines (Mechanized)	1. No marks recommended, but vessel marked for licensing reasons.	• *Constitutes no danger to navigation, very little risk of pollution.* • *Machines are normally marked with serial number which would be entered in the ships inventory*

Set Longlines Drifting Longlines Trotlines Vertical lines	1. Marks should be on the longline at each end and at suitable intervals. 2. Floats and buoys should also be marked. 3. Radio or satellite buoys where appropriate or possible at each end and at intervals of 6-7 nm.	• *A longline can be made up of various units and may be up to 40 km in length.* • *Longlines set close to the surface constitute a navigational hazard to other users of the marine environment and should be marked in accordance with the Guidelines.* • *The existence of these longlines are only evident to other fishermen and users of the marine environment by the presence of marker buoys, which should be placed at each end and at intermediate positions.* • *To avoid gear conflict such as between trawlers and demersal longlines, where it is not feasible to mark the presence of demersal lines throughout their extent, area based management or active communication between fishermen with different gears can prevent frequent gear loss.*
Trolling Lines	1. No marks required on the fishing gear, but the vessel should be marked	• *Minimal risk to environment and sea life when lost*
MISCELLANEOUS GEAR Harpoons	1. Mark should be applied at location that is not close to the active part of the gear to avoid interference to operation	• *One of the simplest of fishing gears, but has been used widely to avoid fisheries regulations, and was one of the first fishing gears to require marks by legislation for this reason.*
Pumps	1. No marks required on the fishing gear, but the vessel should be marked	• *Normally marked as part of the vessel's machinery* • *Often combined with other fishing gear. e.g. purse seine*

FISH AGGREGATION DEVICES	1. The surface raft structure and subsurface appendage structure should both contain a physical unique identification mark, and a Radio or Satellite buoys should be attached to enable real time tracking of spatial position. marked and attached for both monitoring and tracking	• *FADs are primarily used with purse seines* • *The marking to indicate position should include flags, radar reflectors and lights as appropriate.* • *Satellite buoy positional data should be reported to the management authority with consideration of promoting best practice strategies for dealing with time-sensitive commercial data*

Additional recommendations for the marking of towed nets

To facilitate owner identification when a complete net or webbinged section of a towed net (typically various types of trawls) is recovered, it is essential to have identification marks. These nets are often very large , but with numerous webbed or rope sections. However, completed nets generally do not have more than a few major components (panels). These components include wings, bellies, squares, side panels, lengthening or extension pieces and codend. These nets should be identified with a minimum of three marks as indicated below.

Wing end

Suggested point of marking

4. Marks should be located at the right upper wing end and should be attached to the head-rope.

Suggested type of mark

5. Marks, with proper encoded information, should be attached to gear in a manner that will prevent tag from moving on net during regular handling of the gear.

Lower panel

As this part is highly vulnerable to damage or loss, one mark to identify ownership should be attached to this webbing panel. This is considered sufficient marking for the web sections of the net (excluding the codend), as reported accidental losses are usually lower panels or entire nets.

Suggested point of markings

6. Marks should be located at the posterior edge of the first belly, five meshes before the joining to the second belly, and near the center of the panel (at minimum).

Suggested type of marks

7. Marks must be abrasion-resistant and non-corrosive with encoded information. The type of mark used should not alter the webbing performance. The above noted marks are required for any types of towed gear (except dredge and lampara seine) where the netting is the principal material. This is the minimum requirement and does not include a codend mark.

Codend

Marking the codend meets a multi-purpose requirement to:

i. identify ownership (recovery of codend or net);
ii. serve as a conservation measure;
iii. provide an indication of certification; and
iv. provide identification during transfer operations.

Suggested point of marking

8. Marks should be on the anterior edge of the top panel, five meshes down from the joining, (lengthening piece to codend), and attached to the lacing (selvedge) of the upper section of the codend.

Suggested type of mark

Mini or cable lock seal with proper encoded information.

ANNEX C

GUIDANCE FOR THE MARKING OF FISHING GEAR TO INDICATE POSITION

One of the key purpose of gear marking is to allow fishing vessels, control authorities and other maritime users to easily locate and therefore avoid fishing gear that has been deployed, especially where the responsible fishing vessel is absent. The key requirements for the marking of fishing gear are as follows:

i. Marking equipment (e.g. flags, lights, buoys, etc.) should be in a suitable size so as not to alter the fishing characteristics of the gear and affect handling on deck, with consequence for crew safety and vessel stability.
ii. Marking equipment should not be difficult and dangerous to deploy and retrieve.
iii. Radar reflectors should be designed without sharp edges. They should be effective and reliably detectable.
iv. Lighting should be powerful, robust, energy efficient and compact.
v. Marking equipment should ~~need to~~ be affordable in the context of the fishery involved.

Buoys, fitted with lights, radar reflectors and flags, increase the visibility of the spar buoy on the fishing gear to approaching vessels and assists them to navigate safely around the fishing gear. It also enables the owner to detect the marker at a greater distance. In addition, the cardinal system of shapes and lights ~~would~~should indicate the direction in which the passive gear is lying so that mobile gear vessel can fish in the vicinity with minimum risk of~~hout~~ ~~causing~~ gear conflict which often result in the ~~cause~~ loss of gear.

Nets and lines, certain FAD types and other gears which ~~that~~ are set less than 2 m below ~~from~~ the surface are considered to be a special navigational hazard to passing vessels, therefore they are subject to a more rigorous marking regime. For these fishing gears, spaces ("gates") should be left in the configuration of the gear ~~nets and line~~ so that ~~small~~ vessels can pass safely through them particularly where there is high traffic density. These "gates" sho~~co~~uld be marked by two extremity markers, if practicable. Where appropriate, notices to mariners or similar public information sources should indicate where these gears are likely to be encountered.

Buoys, lights, radar reflectors, flags and radio beacons used for marking fishing gear

Lights come in many shapes, ~~and~~ sizes and colours. For energy efficiency, the conventional lights should have a sensor which switches on the light automatically at dusk and ~~then~~ switches off at daylight, for example, using a Passive Infra-Red (PIR) sensor. High power strobe lights are commonly used but they are not readily available in all countries. The lights should be visible at a distance of two nautical miles and should not be confusable with lights specified for those required by vessels under the Collision Regulations or for navigational buoys, beacons or lighthouses.

LED (**light emitting diode) lights have~~ing~~**: ~~light emitting diode (LED) lighting has~~ been around for about 30 years, but major advances in brightness, colour, power efficiency and form have only been made over the last decade. LED lights are more energy efficient and more compact than conventional incandescent lights, ~~and very compact,~~ making LEDs an obvious choice for marine lighting. Furthermore, they come with ~~can be provided in a number of~~ different colours (commonly red, green, white, yellow and blue), and can be programmed to standard International Association of Marine Aids and Lighthouse Authorities (IALA) flash characters, as well as other customized to new flash patterns. Depending upon their size, they can have a visible range of one ~~1 nautical mile~~ to over 12 nautical miles. They can be robust (e.g. rated as IP68 in terms of protection against water ingress) and maintenance free with service lives in excess of ten years. Power can be provided by batteries and/or solar panels~~ower~~. Battery lives are from ~~3 – 5~~three to five years, so the devices potentially require no maintenance or additional cost during this period, providing major advantages over the alkaline battery powered ~~basic~~conventional lights.

Radar reflectors can be a good aid to increase the detection range of the spar buoy for vessels fitted with radar. This helps the fishing vessel to locate the gear and the passing vessels to avoid the gear. The radar reflectors should be light in weight so that they can be carried high on the spar. Wire types are recommended over solid types to decrease wind resistance. The radar reflectors may be the traditional octahedral shape or in a round shape.

Flags should be displayed to increase the visibility of the marker, but should be placed in a position that does not interfere with the visibility of the light at night. They should be in suitable size so as not to affect the spar buoys' ability to stand erect in strong winds. Water resistant materials are recommended so that they are light even when wet and would not affect the flag's ability to stand upright. The dimensions of the flag should be at least 25 x 35 cm and the distance between two flags on the spar (if more than one) shall be at least 10 cm. The flag colour should be such as to be visible at considerable distances; fluorescent colours or black are recommended.

Radio **beacons** are used to mark fishing gear which can be subsequently ~~recovered~~detected by using a radio direction finding system. They can emit a coded signal so that in areas of high fishing concentration each buoy is only discernable by its owners. Many merchant and navy vessels are now fitted with scanning receivers which can detect ~~the~~ signals transmitted by these beacons, thus alerting these passing vessels to the presence of fishing activity in the area. Such markers are good technical options, though their cost-effectiveness should be considered in each fishery, especially when small-scale fisheries in developing countries are involved. ~~.~~

Spar **buoys** shapes are varied and are often constructed with a buoy which may be inflatable or solid and a plastic or aluminum pole. The pole is inserted through the center hole of the ~~an inflatable~~ spar buoy ~~,~~which ~~is inflated and thus~~ which holds the pole securely. A weight is

fastened on to the base of the pole so that the pole stands upright. The size of the weight is dependent on the wind resistance of the flags and/or the radar reflectors on the other end, ~~and on~~ the prevailing weather conditions and the length of the pole. This type of spar buoy can be visible for up to three nautical miles to the naked eye and can be detected even further by radar if fitted with a radar reflector. Gear marking details should be marked on the buoy and on the flags, if required, with indelible marking ink for the monitoring and control purposes. ~~(see also CIR 404/2011; Article 11).~~ Supplementary buoys are normally used in conjunction with spar buoys as the spar buoy is to act as a marker and not to support the fishing gear. I~~, sometimes however i~~n small scale fishing gear used inshore areas, however, the functions are often combined in one buoy.

Satellite beacons, as often used in offshore ~~with the use of~~ FADs, ~~as a fishing aid,~~ should have both a spar buoy with flag and lights and a radio or satellite beacon attached to the specifications in these guidelines.

APPENDIX

MARKING THE POSITION OF A GEAR IN THE WATER COLUMN

The FAO 1996 Proposal for the Application of a **Standard System of Lights and Shapes for the Identification and Location of Fishing Gear**[1], was prepared on the basis of the Report of the 1991 Expert Consultation for the Marking of Fishing Gear (FAO Fisheries Report No. 485 and its Supplement) and the outcome of discussions at the International Maritime Organization (IMO). The content (without the gear drawings) of this 1996 Annex is the following[2]:

1. General Provisions

1.1. In order to protect fishers and their gear and to warn other mariners of the presence of deployed fishing gear, States should make provisions in national legislation for the adoption of a standard system of lights and shapes for the identification of fishing gear and for marking its position in the water.

1.2. States should make provisions for the inclusion of the details of the system in training programmes for fishers and mariners.

1.3. The need to comply with a system of lights and shapes related to fishing gear, fishing implements and fishing vessels should be in a condition of the authorization to fish.

2. Technical Provisions

2.1. The system should take into account:

a) the provisions of the International Regulations for the Prevention of Collisions at Sea (COLREGS);
b) any local rules, including rules of navigation governing river, lake or coastal fisheries;
c) regulations pertaining to offshore structures; and
d) systems for the marking of fishing gear for the identification of ownership.

2.2. Where practicable, all position indicators attached to fishing gear should:

a) be as conspicuous as possible in a clear daytime atmosphere from a distance of at least 2 nautical miles at sea level;
b) carry radar reflectors;
c) carry lights with characteristics which do not conflict with those of navigational marks and which would be visible on a clear night at a distance of at least 2 nautical miles; and

[1] Annex IV (Proposal for the Application of a Standard System of Lights and Shapes for the Identification and Location of Fishing Gear) of the FAO Technical Guidelines for Responsible Fisheries. No.1. FAO (1996).

[2] This 1996 proposal may have to be updated due to the potential amendments made after 1996 to COLREGS. Furthermore, this appendix may not be part of the final guidelines. The 2016 Expert Consultation for the Marking of Fishing Gear recommended carrying forward the existing recommendations.

d) be fitted with a coloured flag or flags of fluorescent material, as an aid to daytime visibility.

2.3. Light and shapes should also indicate the direction and extent of set and drifting gear.

2.4. Electronic devices, such as transponders and radio beacons which automatically and continuously indicate their position by means of signals may be used in addition to the lights and shapes. Such devices, however, must not operate at frequencies that would conflict with other devices used for navigation and search and rescue purpose.

3. Application of a Standard System

3.1. An individual pot, trap, fyke net, stake net and other similar gear, should be marked with a buoy or other device at the surface to indicate its position. Gear set in series, such as a number of pots connected on line, should be marked at each end with a buoy.

3.2. Anchored or drifting fishing gear with the upper continuous edge of the gear at a depth of more than 2 metres below the surface should be marked in the following manner:

a) fishing gear set below the level of the sea and extending from an anchor or parent vessel, should be marked at both extremities by a spar buoy and at intermediate positions. The distance between the intermediate marks, and between the intermediate marks closest to the extremities and the extremity markers should not exceed one kilometre. In the case of fishing gear attached to a vessel, the extremity of the gear nearest to the vessel need not carry a marker;
b) for recognition in daytime, the westernmost end spar buoy of such gear extending horizontally in the sea should be fitted with two flags one above the other or one flag and a radar reflector. The end spar buoy at the most easterly extremity should be fitted with one flag or a radar reflector; and
c) for night time recognition, the most westerly end spar buoy should have two white lights one above the other, the most easterly end spar buoy to have one white light.

3.3. Fishing gear set within the upper two metres of the water column, and therefore a hazard to small transiting vessels, should be marked in the following manner:

a) for day time recognition, the extremities of the gear should have spar buoys carrying top marks consisting of two spherical shapes, one above the other at no more than one metre apart; the diameter of the upper of the two spheres to be smaller but no less than one half diameter of the lower one;
b) for night time recognition, the spar buoys placed at the extremity of the gear should have two yellow lights, one above the other at no less than one metre apart and of different characteristics to lights fitted to intermediate buoys;

c) gear extending more than one kilometre should have intermediate buoys placed at distances of not more than one kilometre; intermediate spar buoys should have one spherical shape for day time recognition and one yellow light for night time;
d) "gates" should be provided for the free passage of surface vessels. Each side of the gate should be marked by spar buoys; the closest intermediate float should not be more than 10 meters from these spar buoys; and
e) attended gear need not be marked at the extremity attached to a fishing vessel.

3.4. The dhan-buoy used with active gear, such as anchor seining, fly dragging and purse seining, should comply with the provisions as set out in paragraph 2.2.

3.5. Fish aggregating devices (FADs) should be marked in the same way as fishing gear and carry means to identify their position by day and night. As a minimum requirement, they should comply with the provisions set out in paragraph 2.2. The requirements of paragraph 2.4. should apply to the use of electronic devices fitted to FAD's.

4. Technical Specifications

4.1. A spar buoy should meet the following requirements:

a) the pole of a spar buoy extending above the flotation buoy should have a height of at least 2 metres; the height of the spar buoy may be less than 2 metres if an administration is satisfied that the fishing gear so marked would not be a hazard to navigation;
b) where radar reflectors are required, they should be fitted at the top of the pole;
c) the size of flags should not be less than 25 centimetres in height and 35 centimetres in width; when two flags are required, the distance between them should not be less than 10 centimetres; flags should be made of waterproof material in fluorescent colours;
d) lights should be attached to the pole in such a way that they will not be obscured by a flag;
e) for shapes that give the appearance of being spherical when viewed from a distance, provided for in paragraph 3.3 c) above, the lower of the spherical shapes and the shape, if only one is fitted, should have a diameter of not less than 30 centimetres, the upper shape should be smaller in diameter but not less than half that of the lower shape; and when two shapes are required, they should not be less than 10 centimetres apart; and
f) intermediate floats should have a diameter of not less than 50 centimetres[3].

4.2. Radar reflectors should be:

a) as light as possible;
b) octahedral in shape; and

Commented [A7]:
We believe this to be a technical omission so the word 'not' has been added back in - without addition of 'not' the paragraph would be in contradiction to Annex C, the paragraph on 'Flags' which reads: "the dimensions of the flag should be at least 25 x 35 cm and the distance between two flags on the spar (if more than one|) shall be at least 10cm

[3] The competent authority should take into account locally available material for the construction of float and whereas most fishers use a spherical shape, in some parts of the world it is common practice to use pieces of wood bound together; the underlying principle is that they should be visible from a distance.

c) of metal plate or wire mesh construction.

4.3. Lights should be visible at a distance of at least 2 nautical miles; and preferably of a type that are fitted with sensors that automatically switch the light on at dusk and off at daylight.

Radio Beacons may be of the type that can be attached to the pole of the spar buoy or FAD, if they are of the free floating type, they should be linked to the spar buoy.