# Review of good practice in monitoring, control and surveillance, and observer programmes

Final Report to the Marine Stewardship Council

April 2019

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## MRAG Ltd.

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# Acronyms

| | |
|---|---|
| AIFCA | Association of Inshore Fisheries & Conservation Authorities (UK) |
| CCAMLR | Convention for the Conservation of Antarctic Marine Living Resources |
| CCS | Catch Certification Scheme (EU) |
| CCSBT | Commission for the Conservation of Southern Bluefin Tuna |
| CDS | Catch documentation scheme |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| COFI | FAO Committee on Fisheries |
| EEZ | Exclusive Economic Zone |
| FAO | Food and Agriculture Organization of the United Nations |
| FMC | Fishery Monitoring Centre |
| FOC | Flag of convenience |
| FPV | Fishery Patrol Vessel |
| IFCA | Inshore Fisheries & Conservation Authority (UK) |
| ICCAT | International Commission for the Conservation of Atlantic Tunas |
| IOTC | Indian Ocean Tuna Commission |
| IPOA-IUU | 2001 International Plan of Action to Prevent, Deter, and Eliminate IUU Fishing |
| ITQ | Individual Transferable Quota |
| LoA | Length overall (m) |
| MMO | Marine Management Authority (UK) |
| RFMO | Regional Fisheries Management Organisation |
| SIDS | Small island developing states |
| TAC | Total allowable catch |
| TDS | Trade documentation scheme |
| TIS | Trade information scheme |
| TREM | Trade restrictive measure |
| WTO | World Trade Organisation |

# 1 Introduction

## 1.1 MCS – Definition of Common Terms.

Monitoring, Control and Surveillance (MCS) describes a system to record data on fishing activity, and assess and enforce compliance with fishery regulations and management measures. It gathers information about the behaviour and performance of the fishery which provides feedback on management implementation. Monitoring gathers information on the fishery that can be used to assist with the development and assessment of appropriate management measures and control systems; surveillance and enforcement aim to ensure compliance with these measures and controls.

An FAO Expert Consultation nearly 40 years ago provided a seminal definition of MSC (FAO, 1981). There are, however, several alternatives: a more comprehensive definition was provided by Doulman (1993) and a more recent one by SADC (South African Development Community, 2001). These are compared in Table 1.

**Table 1 Definitions of Monitoring, Control and Surveillance.**

| Source | Monitoring | Control | Surveillance |
|---|---|---|---|
| FAO (1981) | The continuous requirement for the measurement of fishing effort characteristics and resource yields | The regulatory conditions under which the exploitation of the resource may be conducted | The degree and types of observations required to maintain compliance with the regulatory controls imposed on fishing activities |
| SADC (2001) | The follow-up of a fishery through collection, compilation, analysis, and reporting of information on fishing and related activities, including fish processing, fish trade and aquaculture | The establishment and enforcement of the legal and administrative measures under which living aquatic resources and aquatic ecosystems can be exploited | The monitoring and supervision of fishing activity to ensure compliance with control measures |
| Doulman (1993) | The collection, measurement and analysis of fishing activity including, but not limited to: catch, species composition, fishing effort, bycatch, discards, area of operations, etc. This information is primary data that fisheries managers use to arrive at management decisions. If this information is unavailable, inaccurate or incomplete, managers will be handicapped in developing and implementing management measures. | The specification of the terms and conditions under which resources can be harvested. These specifications are normally contained in national fisheries legislation and other arrangements that might be nationally, subregionally, or regionally agreed. The legislation provides the basis for which fisheries management arrangements, via MCS, are implemented. For maximum effect, framework legislation should clearly state the management measures being implemented and define the requirements and prohibitions that will be enforced | The regulation and supervision of fishing activity to ensure that national legislation and terms, conditions of access, and management measures are observed. This activity is critical to ensure that resources are not over exploited, poaching is minimized and management arrangements are implemented |

Although broadly similar, the SADC definition is more comprehensive and reflects how the perceived scope of MCS changed between 1981 and 2001: ‘monitoring’ includes references to processing and supply chain, ‘control’ refers to exploitation of the ecosystem rather than

just resources and ‘surveillance’ describes both monitoring and supervision of fishing activity rather than just ‘observations’, as in the FAO definition. The Doulman definition expands on both of these by giving the purpose as well as more detail regarding each of the MCS elements. Used together these definitions help to give a more complete understanding of the components of MCS, that it is more about just compliance and detecting IUU events but also includes collecting information on legitimate fishing activities which will enable their effective management.

Currently the MSC focuses only on how MCS is applicable to compliance (“*Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with*”) rather than some of the other areas defined in Table 1. Although these may be covered elsewhere under the scoring under other PIs.

In addition to MCS, we use a range of other associated terms throughout this report. These are best defined by Kelleher (2002) and are summarised below.

- **Enforcement** - To compel observance of the laws. Enforcement includes not only the process of recording violations of the fisheries laws, but also the legal processes and penalties applied.
- **Compliance** - To act in accordance with the regulations. The term 'compliance' is used to describe the extent to which fishermen adhere to the fisheries laws and can be considered as an indicator of effectiveness of the regulatory dimensions of the management regime. Estimates of compliance require an estimate of total violations.
- **Detection** – The act of discovering a fisheries violation. As it is not possible to detect all fisheries violations, estimates of compliance should be closely linked to the level of detection. Some violations, e.g., unauthorized discarding, may be extremely difficult to detect.
- **Deterrence** - To discourage, or hinder. Two forms of deterrence are identified: penalties (e.g., fines, or confiscation of fishing gear); and peer pressure from the fishing community. Deterrence is a function of: (a) the perceived probability of being caught and paying a penalty; (b) the perceived level of the penalty; and (c) peer group pressure, (d) weighed against the perceived benefits accruing from the violation.

Within the context of MCS, ‘best practice’ is difficult to define: there may be a range of solutions depending on the characteristics of the fishery, including the associated risks, and limiting factors such as cost and remoteness. Throughout this report will therefore refer to good practice ways that MCS tools and practices can be applied to different fisheries according to the risks and constraints that particular fisheries may face.

# 2 Best Practice MCS

## 2.1 Describe what exemplifies a good practice MCS System

The evolution of MCS since can be tracked through a number of subsequent fisheries instruments at global, regional, and national levels. Recent papers and evaluations of MCS systems have also contributed to an improved understanding MCS and which factors generally represent good practice these have been included and summarised in Annex 3 .

However, the most important message from these is that the structure and function of an MCS system should be good enough to achieve the specific management objectives of the fishery while ensuring an acceptable level of compliance. This often has to be achieved with limited resources and be able to meet the expectations of government, industry and other interested parties. An effective system will almost invariably contain a number of common characteristics outlined below:

- They are 'fit for purpose' – i.e. they are tailored to the outcomes that need to be achieved both in the short and long term;
- They are risk-based – resourcing priority is given to those things objectively assessed as the highest risk to achieving fishery specific objectives;
- They contain an appropriate mix of incentives for voluntary compliance and deterrence – the most cost effective MCS system is the one where everyone complies voluntarily – hence considerable value in creating conditions to maximise voluntary compliance; but there needs to be adequate penalties for those who transgress;
- They should allow stakeholder participation through defining clear user rights supported by conservation, technical and output controls;
- They are not 'set and forget' – fisheries operate in a dynamic environment and good MCS systems review themselves regularly;
- They should have a degree of flexibility so they can respond to management and industry needs; and,
- They should have regional and bilateral partnerships and structures in place, where appropriate;

When setting out the context for why an MCS system (or individual arrangements within it) might be considered 'good practice' or not, it is important to look at how an effective MCS system will fit into the overall fisheries management framework. Figure 1 illustrates a conceptual model of how this would work; management measures are developed to ensure that the fishery specific objectives are met, the MCS system will ensure compliance with these measures and provide information for managers to assess how effectively they are working. The critical thing therefore is whether the system of MCS overall is effective in helping to achieve the fishery specific objectives (by delivering information and ensuring the integrity of management measures) and not necessarily whether elements within the MCS system are reaching certain targets (e.g. VMS polling rates, levels of observer coverage).

In addition, an effective MCS system should be designed and implemented within the type of effective governance framework envisaged by MSC P3.1, i.e. an effective legal framework, effective institutional governance, participatory development, an appropriate process for dispute resolution and clear and precautionary long-term objectives. These should be reviewed consistent with the types of processes envisaged in PI3.2.4.

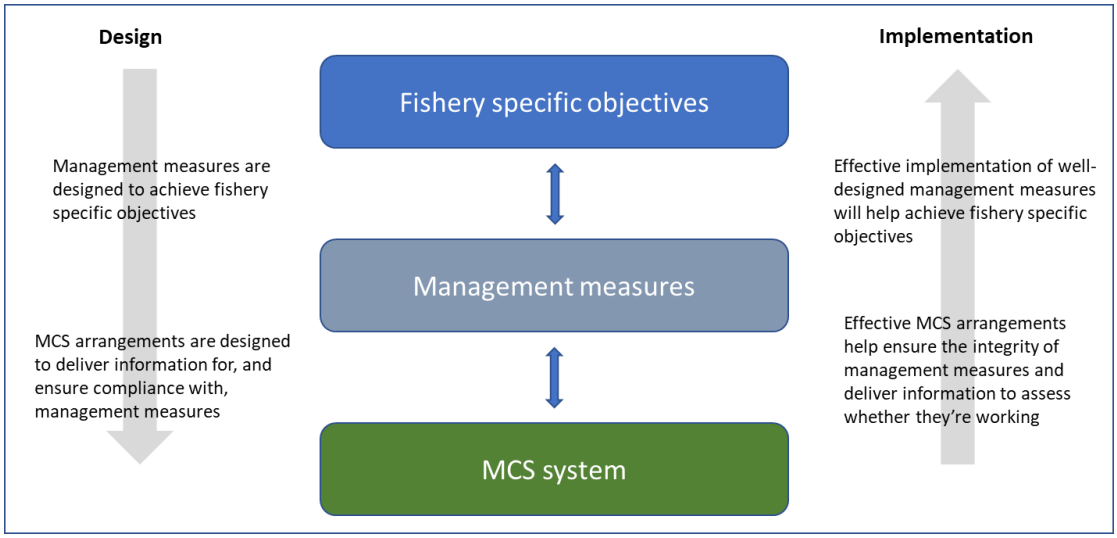


**Figure 1 An MCS Conceptual Model**

'Good practice' MCS arrangements may vary considerably based on the objectives to be achieved, Table 2**Error! Reference source not found.** gives some examples of how this works.

**Table 2 Sample MCS mechanisms in place covering three different management objectives**

| | **Parties to the Nauru Agreement (PNA) Purse Seine – bigeye tuna (BET) mortality** | **Australian Northern Prawn Fishery - ETPs** | **Australian Northern Prawn Fishery - Habitat** |
|---|---|---|---|
| **Fishery specific objective** | Maintain spawning biomass depletion ratio (SB/SBF=0) at or above the average SB/SBF=0 for 2012-2015. | Minimise interactions with ETP species such that the fishery does not hinder recovery | Minimise interactions with habitats such that the fishery does not result in serious or irreversible harm to habitat structure and function |
| **Management measures** | • 3-month FAD prohibition<br>• Catch retention<br>• Zone based effort control (Vessel Day Scheme (VDS), high seas) | • Effort limitation/gear/ vessel limits<br>• Risk assessment<br>• Compulsory Bycatch Reduction Devices (BRDs)/Turtle Exclusion Devices (TEDs)<br>• Spatial closures<br>• Prohibition on retention and compulsory reporting of all interactions | • Effort limitation/gear/ vessel limits<br>• Risk assessment<br>• Spatial closures |
| **MCS tools / arrangements** | • Licensing arrangements (PNA VDS Register, FFA Regional Register, WCPFC RFV) (to establish framework for effort controls, FAD prohibition, catch retention)<br>• Compulsory catch and effort logsheets<br>• VMS (to track effort limits)<br>• 100% observer coverage (to monitor compliance with FAD prohibition and catch retention) | • Licensing (to limit effort and establish conditions of access)<br>• Dockside and at sea inspections (to monitor compliance with gear requirements)<br>• Compulsory VMS (spatial closures and effort limits)<br>• Scientific observer coverage (inform risk assessments, verify fisher logbook reporting) | • Licensing (to limit effort and establish conditions of access)<br>• Compulsory VMS (spatial closures and effort limits)<br>• Scientific observer coverage (inform risk assessments) |

| | | | |
|---|---|---|---|
| | • At sea and dockside inspections | • Crew member observer program (inform risk assessments) | |

As can be seen in the northern prawn fishery, these can vary within a single fishery depending on the nature of the objective to be achieved – a fishery may have very good MCS arrangements for some management measures (e.g. target species), but weak arrangements for others (e.g. ETP[1]), although in the example above they have good arrangements for both.

In order to determine what is a good practice MCS system for a particular fishery we therefore need to look at the particular management measures that are employed to deliver the objectives of the harvest strategy that has been developed for it.

### 2.1.1 Management Measures

Management measures for fishery are defined by the objectives of that fishery and the harvest strategies in place to achieve those objectives. They are normally classified in two ways, input and output controls. Although they can be further divided into efficiency controls or technical measures for the purpose of this report the two broad categories are used. They are briefly described below, with the application of each measure described in more detail in Annex 2 .

#### 2.1.1.1 **Output controls**

Output restrictions regulate the amount of something that can be removed by the fishery, most commonly the target species but it can also be bycatch, ETP species or a combination of them all. The restrictions are set as a quota, or total allowable catch (TAC) so the objective of MCS scheme must be to effectively monitor the catches, landings and discards made by vessels or fishers. To effectively monitor catches of non-target species requires either complete monitoring by independent observers, inspection programmes combined with detailed logbooks or in some cases through REM. Output controls can be classified as:

- Target species quota (TAC, ITQ)
- Bycatch species quota
- ETP species limits

#### 2.1.1.2 **Input controls**

Input restrictions are placed on a fishery to limit the level of effort that is permitted. They take two forms; Capacity control, which limits the number, size or power of vessels; and, effort control, which will limit the time spent fishing, the areas that can be fished and technical measures that will affect the performance of the gear. They are used primarily where the level of outputs from a fishery are difficult to monitor. This can be where a large number of small vessels land into a large number of ports making effective monitoring of catches and landings difficult, but limiting the effort of a fleet will be easier to implement. The level of effort allowed in the fishery is typically set within the levels required to avoid overfishing, given the average fishing patterns and efficiency of the vessels involved. The objective of input restrictions as a management tool is therefore to have a record of the fleet capacity and ensure that effort can be effectively monitored.

Input controls will also include measures that can affect the CPUE of a fishery or part of a fishery. They include management measures typically used to protect a vulnerable element of a stock such as juvenile or undersized fish, spawning aggregations of adult fish or essential fish habitats for juvenile fish. The stock that is limited by the management measure may not actually be the target species concerned as for the output restrictions but may be a bycatch

[1] ETP is used here the same was as with the MSC

species or an ETP species that are impacted by the fishery. Input controls can be classified as:

- Fleet size
- Effort days at sea
- Effort
- Closed seasons
- Closed areas
- Gear restrictions (e.g. mesh-size, wire trace bans)
- Engine size
- Move on rules
- Size restrictions
- Discard bans
- Shark finning bans

As can be seen from Table 2, fisheries will employ a variety of these measures, each of which may require a number of different tools to ensure they are implemented.

### 2.1.2 MCS Tools

In order for the management measures within a fishery to operate effectively there are a number of MCS tools available to managers that can be applied help their enforcement, detect any infringements and collect the required information. They can be broadly categorised into four categories:

- **Platform** - patrol vessel, aircraft, drone.
- **Personnel** - fisheries inspectors, observers, customs.
- **Electronic tools** - radar, VMS, SAR, Remote electronic monitoring.
- **Administrative** - licensing, vessel lists, crew lists

It is important to understand what each of the MCS tools outlined above can and cannot do with respect to the following elements:

**Assessment of compliance with management measures** – Can the MCS tool accurately determine the level of compliance of the vessels (or fishers) operating in a fishery with respect to the set of management measures in place?

**Provision of information** – Can it provide the information required to effectively manage the fishery and meet the management objectives?

**Detection of unlicensed vessels / fishers** – Can the enforcement tool detect any unlicensed vessels or fishers that are operating in the fishery and to what level?

**Power of arrest / Evidential value** – Does the enforcement tool in itself have power of arrest of vessels or fishers that contravene the management measures and what is the value of the evidence from this tool, i.e. can a conviction be made based solely on the evidence from this one tool?

Measuring the effectiveness of any strategy or initiative against management objectives is a challenging task and as stated above a ‘good’ strategy will vary depending on the objective. In 2009 the EU funded a study looking at the benefits of different control strategies used for the enforcement of an assortment of different management measures (Costs and Benefits of Control Strategies (COBECOS (2009)). This involved identifying a number of enforcement tools and assessing their appropriateness against measures used to manage a fishery. Although this was also looking at which strategy gave the best value in terms of detection of different infringements, the MCS tools used for the report have also been used here. The

main additions are ‘licensing and registration’ and ‘legislation and sanctions’, they are considered important as they will cut across all fisheries and provide the basis for the management measures in place. The tools are summarised below and are outlined in more detail in

- Licensing and vessel registration;
- Legislation and sanctions;
- Logbooks;
- Patrol vessels and standard inspection systems;
- Onboard observers;
- Aerial surveillance;
- Remote Monitoring Systems (VMS / AIS);
- Remote sensing;
- Port State controls and dockside monitoring;
- Remote Electronic Monitoring (REM);
- Transhipment monitoring; and,
- Marketing and sales monitoring.

### 2.1.3 MCS tools and Management Measures

Table 3 summarises the applicability of each of the tools to each of the management measures based on whether they are applicable and have the direct power of arrest (patrol vessels and dockside inspections only), directly applicable (whether it can be used as a primary means of detecting an infraction), partly applicable (it can detect a possible infraction but should needs to be used in conjunction with another tool), or not applicable for that particular measure.

There are some tools that cut across all the measures, most significantly licence and vessel registration and legislation and sanctions. Licensing and vessel registration should be considered the base control for all the management measures as they will set the rules for everything from target, bycatch and ETP quotas to gear restrictions and seasonal / area closures. Restricting licences and keeping a current vessel register can also be used to limit effort and engine size. Legislation will back up the licensing terms and conditions and a consistent, appropriate and transparent application of sanctions will act as an incentive to be compliant with the legislation. Patrol vessels can also be used to enforce all the measures, although they may not be applicable to all fisheries due to their cost.

Other tools are applicable to many of the measures but, as with patrol vessels, may be dependent on the fishery. As with licensing and legislation, logbooks should be considered one of the fundamental tools for all fisheries, regardless of their scale or location. They will provide the basic information required by managers to assess the status of the fishery provided they are set out to record it correctly and can ideally be independently verified. They can have no effect on the size of the fleet or the engine size but they can help to track other things such as days at sea or areas fished. Onboard observers can also be seen as a primary tool to independently collect and verify data collected by the fishery, although as with logbooks the data they collect can have no control over fleet or engine size.

It is important to understand that the individual MCS tools can be used to assist to achieve multiple fishery objectives (e.g. logbooks, observers, etc) and that a single management measure may not necessarily be enforced through all enforcement tools. Each enforcement tool outlined above will have different relative efficiencies and detection profiles in relation to each of management measures. They will have different qualities of evidence and information gathering and may require the use of one or more to achieve the measures objectives.

For example, a zone violation can be detected with VMS, but it will require a patrol vessel, observers or aerial surveillance to prove fishing is taking place. Only a patrol vessel or port inspection team will actually be able to arrest and detain the vessel.

**Table 3 Summary of the applicability of MCS tools against controls (adapted from COBECOS (2009)).**

| | | Controls | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output | | | Input | | | | | | | | | | | |
| | | Target species quota | Bycatch species quota | ETP species limits | Fleet Size | Effort days at sea | Effort | Closed seasons | Closed Areas | Gear Restrictions | Engine Size | Move on Rules | Size Restrictions | Discard Ban | Shark finning |
| MCS Tool | Licensing and vessel registration | | | | | | | | | | | | | | |
| | Legislation and sanctions | | | | | | | | | | | | | | |
| | Logbooks | | | | | | | | | | | | | | |
| | Patrol vessels | | | | | | | | | | | | | | |
| | On-board observers | | | | | | | | | | | | | | |
| | Aerial Surveillance | | | | | | | | | | | | | | |
| | Vessel Monitoring Systems | | | | | | | | | | | | | | |
| | Remote Sensing | | | | | | | | | | | | | | |
| | Dockside Monitoring | | | | | | | | | | | | | | |
| | Remote Electronic Monitoring | | | | | | | | | | | | | | |
| | Transhipment Monitoring | | | | | | | | | | | | | | |
| | Marketing and sales monitoring | | | | | | | | | | | | | | |

Key: (Dark Green – Applicable with power of arrest, Light Green – Applicable but without power of arrest, Orange – Partly applicable, Red – Not applicable).

## 2.2 Typology of MSC fisheries and respective MCS systems

There are over 340 fisheries with an MSC certification covering a wide range of scale, gears, target species, areas of operation and remoteness. The aim of this section is to outline a series of standardised classifications covering all the MSC fisheries currently certified that can also be used for the classification of newly certified MSC fisheries in the future, for the purposes of this report we used two main categories:

1. The types of management measure in place, as discussed in Section 2.1.1; and,
2. The physical characteristics of the fishery (e.g. gear type, scale, remoteness).

While the management system in place should the most important consideration when defining good practice when considering good practice, they have not been classified by this for this report. The physical characteristics have been used although this is more problematic to define what a good MCS system should be. As an example, there could be two medium sized trawl fisheries operating within an EEZ, one with a quota-based harvest strategy, the other using an effort limit / closure-based harvest strategy. Although both have similar physical characteristics what may be considered 'good practice' may vary considerably between the two. The physical characteristics should not therefore be considered without also considering the harvest strategy as well. From the data received the physical characteristics were classified from 222 fisheries.

### 2.2.1 Physical characteristics

#### 2.2.1.1 Harvesting Method

Of all the physical characteristics assessed the harvesting method will have the most significant influence on the MCS measures employed, particularly when considering P2 type requirements, e.g. longlines tend to associated with bird bycatch and shark finning, trawlers and gillnets with dolphin and other marine mammals. The classifications below are based on the 'Simplified Classification of Fishery Vessels by Vessel Types' developed by the FAO[2] and have been applied to all the MSC fisheries. Many of the fisheries use a number of different gear types, in these cases the main gear type has been used.

**Table 4 Classification of MCS fisheries according to harvesting method.**

| Harvesting method | Includes |
|---|---|
| Trawlers | Demersal and pelagic trawling (otter, beam, pair, continuous pumping) |
| Gillnetters | Drift nets, gill nets, trammel nets, pound nets, lift nets |
| Dredgers | Dredgers |
| Trappers | Pots, traps |
| Purse Seiners | American seiners, European seiners, drum seiners |
| Longliners | Demersal and pelagic longlines (auto and manual baiting) |
| Hand gathering | Gleaning, diving, harpooning. |
| Liner vessels | Jiggers, pole and line, trolling, hand line. |

### 2.2.2 Scale

The scale of the certified fisheries ranges from 35 tonnes to over 1,000,000 tonnes, although this is based on the total certified catch rather than the actual total catch made in the whole fishery. However, for the purpose of this report it will be assumed that this does represent the

[2] ftp://ftp.fao.org

size of the fishery. Although there is currently no standard classification for the size of fisheries the MCS requirements will vary depending on the scale so the fisheries have been grouped accordingly to reflect this, the categories are outlined in Table 5 with the numbers in each category in Table 5. While there is not necessarily any good practice MCS measure that can be related to the scale of the fishery it is included to give a measure of the resources that should be used, if it can be assumed that the scale of the MCS response can be based on the scale of the fishery under management.

**Table 5 Classification of MCS fisheries according to scale.**

| Category | Description |
|---|---|
| Small scale | Small scale fisheries where the total scale of the certified unit of the fishery is <1,000 tonnes landed per year. |
| Medium scale | Medium scale fishery with total landings of between 1,000 and 10,000 tonnes per year. |
| Medium / large scale | Medium to large scale fishery with small to moderate number of fishing vessels with a total catch of between 10,000 and 100,000 tonnes per year. |
| Large scale | Large scale industrial fishery with large numbers of fishing vessels and / or fishers with a total catch of > 100,000 per year |

### 2.2.3 Remoteness

The remoteness of the fishery has been defined according to the basic criteria below and is based on its distance from shore. Remoteness and size of the vessels fishery that operate in it will affect the way in which a fishery can be managed and it can be considered more likely that remote fisheries may be more exposed to poaching (although this will also be influenced by other factors such as the value of the species). More remote fisheries will also be limited in their use of other MCS tools such as observer programmes or port monitoring.

It has been assumed that vessels operating nearer to shore will be smaller although there will be exceptions, for example distant water fleets operating in the EEZs of third-party coastal states. Smaller scale fisheries close in to shore will have different control problems when compared to a distant water fishery that has vessels staying at sea for several months at a time. Some fisheries take place over a number of areas, both within EEZs and high seas, in which case they were categorised as high seas. Fisheries that took place in the EEZs of remote overseas territories (e.g. Heard and McDonald and South Georgia toothfish fisheries) were also classified as high seas due to their actual physical remoteness. There are also a number of fisheries that are physically remote but technically operate inland (e.g. most of the salmon fisheries) and have been classified as inshore.

**Table 6 Classification of MCS fisheries according to remoteness.**

| Range | Description |
|---|---|
| Inshore | Fisheries are conducted close to the shore within the territorial sea or contiguous zones of coastal states, also includes fisheries operating in lakes and rivers. Target species can be hand gathered or taken from boats, which will operate on a daily basis returning to port within a 24hr period. |
| EEZ | Fisheries are conducted in the EEZs of coastal states on the continental shelf or in deeper waters. Vessels will operate on a daily basis or have trip lengths of several days at a time. |
| High Seas | Fisheries conducted in the outer reaches of the EEZs of coastal states or within the EEZs of remote areas. Vessels will have trip lengths of several weeks at a time. |

### 2.2.4 Classifications.

The results of the classifications above are summarised in Table 7. The majority of the fisheries take place within in EEZs using trawl gear, with most of the inshore trawling targeting prawns, lobster and squid. High seas fleets tend to be mainly longline, purse seine and trawl with inshore fleets using gillnets, dredgers, trappers, and hand gatherers. There are some anomalies, for example all the small-scale trawl fisheries operating in the high seas are for Patagonian toothfish, a high value fish with a small quota but should not necessarily be classified as small scale.

**Table 7 Summary of MSC fishery classifications.**

| Remoteness | Scale | Total | Trawlers | Gillnetters | Dredgers | Trappers | Purse Seiners | Longliners | Hand gatherers | Liner vessels |
|---|---|---|---|---|---|---|---|---|---|---|
| Inshore (30%) | Small | 17 (8%) | 1 (1%) | 5 (14%) | 4 (17%) | 6 (32%) | | | 1 (7%) | |
| | Medium | 30 (14%) | 4 (4%) | 4 (11%) | 4 (22%) | 7 (37%) | 2 (12%) | | 9 (60%) | |
| | Medium/large | 13 (6%) | 2 (2%) | 2 (6%) | 5 (26%) | 3 (16%) | | | 1 (7%) | |
| | Large | 6 (3%) | | 1 (3%) | 1 (9%) | 1 (5%) | | | 3 (20%) | |
| EEZ (55%) | Small | 7 (3%) | 1 (1%) | 2 (6%) | | 2 (11%) | 1 (6%) | | 1 (7%) | |
| | Medium | 45 (20%) | 27 (29%) | 6 (17%) | 3 (13%) | 1 (5%) | 3 (18%) | 4 (29%) | | 2 (33%) |
| | Medium/large | 38 (17%) | 22 (24%) | 8 (23%) | 3 (13%) | 1 (5%) | 3 (18%) | | | 1 (17%) |
| | Large | 33 (15%) | 24 (26%) | 4 (11%) | | 1 (5%) | 3 (18%) | | | 1 (17%) |
| High Seas (15%) | Small | 6 (3%) | 4 (4%) | 1 (3%) | | | | 1 (7%) | | |
| | Medium | 13 (6%) | 1 (1%) | 1 (3%) | | | | 9 (64%) | | 1 (17%) |
| | Medium/large | 5 (2%) | 2 (2%) | | | | 2 (12%) | | | 1 (17%) |
| | Large | 9 (4%) | 5 (5%) | 1 (3%) | | | 3 (18%) | | | |
| **Total** | | **222** | **93 (42%)** | **35 (16%)** | **23 (10%)** | **19 (9%)** | **17 (8%)** | **14 (6%)** | **15 (7%)** | **6 (3%)** |

## 2.3 Describe good practices for each fishery and MCS category.

The following section summarises what would be expected from a good practice MCS system based on the management measures and gear type. Although they have also been classified by scale and remoteness, these are harder to assign good practice measures to but should be considered when assessing measures based on management and gear.

In addition, there will also be a range of MCS measures (or outcomes) that may be generic to all fisheries, irrespective of typology, for example all fisheries will need measures to prevent and sanction harvests by unauthorised people (e.g. poaching). The likelihood of it happening and the nature of the measures required will be dependent on a range of complex factors in addition may be difficult to incorporate into a simple typology – e.g. value of the product, ease of capture, ease of processing /marketing, size of adjacent unlicensed fleets.

### 2.3.1 Management Measures

While the fisheries have not been classified by the controls outlined in Section **Error! R eference source not found.**, it is important they are considered when along with the physical characteristics when defining what is good practice for a fishery. Table 8 gives a summary of the controls that may be used in fishery, either on their own or in combination with others, which may be assessed under PI1 of the MSC system. With each control the specific management objectives of that control are also given as well as the expected requirements from a good practice MCS system.

This does not specify the particular MCS element that should be in place as this will vary depending on a number of other factors including gear type, scale and remoteness as defined in Section 2.2.1, as well as things such as catch value and volume. As an example, any TAC based harvest strategy would require an '*Effective (near real time) arrangements to monitor catches against quota allocations (or a global TAC)*' but the means of doing this will vary, both in the frequency of reporting and how it is reported; in a small scale artisanal fishery it may be daily submission of logbook data when landing, on a larger scale offshore fishery it may be weekly reports submitted via email or through the VMS system. Table 8 also gives some examples from selected case studies from MSC certified fisheries.

**Table 8 Summary of management measures, their objectives and what would be expected in an effective MCS system.**

| Control Type | Management Measure | Management Objective(s) | Effective MCS System Requirements | Example of good practice |
|---|---|---|---|---|
| Output controls | Target species quota (TAC, ITQ) | • Ensure target species stays within acceptable biological limits.<br>• Ensure bycatch species stays within acceptable biological limits.<br>• Limit overall ecosystem impact.<br>• Minimise interactions with ETP species so that fishery does not hinder recovery. | • Effective (near real time) arrangements to monitor catches against quota allocations (or a global TAC).<br>• Independent means to verify the accuracy of fisher reporting.<br>• Effective arrangements to establish a robust index / indices of abundance.<br>• Means to verify the extent of high grading and discarding.<br>• Means to verify the extent of unauthorised removals (e.g. poaching).<br>• Means to verify capture of ETP species. | Section 2.3.3.4, Section 2.3.3.5 |
| | Bycatch species quota | | | |
| | ETP species limits | | | |
| Input controls | Fleet Size | • Monitoring fleet capacity and to limit fishing effort on target species.<br>• Reduce fishing on spawning aggregations and during spawning seasons.<br>• Reduce encounters with ETP species during sensitive seasons | • Regular fleet census (vessel list) and effective flag state control.<br>• Licensing system | Section 2.3.3.2 |
| | Effort days at sea | | • Effective tracking of distribution of effort at sea or on freshwater.<br>• Means of monitoring vessel activity | Section 2.3.3.3 |
| | Effort | | | Section 2.3.3.4, Section 2.3.3.5 |
| | Closed seasons | | • Licensing system.<br>• Effective tracking of distribution of effort at sea or on freshwater.<br>• Monitoring of port activity. | Section 2.3.3.2 |
| | Closed Areas | • Prevention of fishing in sensitive areas e.g. spawning grounds / sensitive VME areas. | • Means of monitoring vessel position.<br>• Independent means of monitoring vessel activity | Section 2.3.3.4 |
| | Gear Restrictions | • Avoid impact on non-commercial sizes, species or habitats.<br>• Avoid increases in fishing capacity through increased efficiency. | • Means of effectively communicating gear requirements to vessel.<br>• Means of verifying vessel gear type and set up before and after trip.<br>• Means of verifying gear usage while at sea.<br>• Verification that appropriate mitigation measures are on the vessel (streamer lines, BRDs, TEDs etc.).<br>• Assessment of correct application of mitigation measures. | Section 2.3.3.1, Section 2.3.3.4 |
| | Engine Size | • Reduce fishing effort, range and environmental impact in certain areas. | • Means to verify vessels details<br>• Means to restrict vessels entering the fishery | |

| Control Type | Management Measure | Management Objective(s) | Effective MCS System Requirements | Example of good practice |
|---|---|---|---|---|
| | Move on Rules | • Reduce catches of undersize fish / non-target species<br>• Minimise interactions with ETP species so that fishery does not hinder recovery. | • Effective (near real time) arrangements to monitor catches against move on trigger;<br>• Independent means to verify the accuracy of fisher reporting;<br>• Effective tracking of vessel position and monitoring of activity. | Section 2.3.3.4 |
| | Size Restrictions | • Reduce fishing mortality of non-commercially sized fish. | • Effective monitoring of catch sizes, preferably at sea but also on landing.<br>• Means to monitor and record discarded species and sizes.<br>• Independent means to verify the accuracy of fisher reporting. | Section 2.3.3.4 |
| | Discard Ban | • Improve implementation of catch limits for greater sustainability.<br>• Reduction in unwanted catch. | • Means to monitor and record discarded species.<br>• Independent means to verify the accuracy of fisher reporting. | |
| | Shark finning ban | • Improved collection of species-specific data.<br>• Reduce mortality of sharks and recovery of ETP species. | • Effective independent monitoring of handling of sharks at sea.<br>• Means to monitor product as it is landed.<br>• Means to monitor gear use (if used in conjunction with gear restrictions to reduce bycatch). | Section 2.3.3.2 |

### 2.3.2 Harvesting Method

The harvesting method will also have an effect on the MCS system in place, particularly when related to requirements under P2, which most will impact in some way. Table 9 summarises the potential impacts each harvesting method may have and, as with the management measures, what would be expected from an effective MCS system. As with the management measures the scale and remoteness of the fishery should also be considered.

**Table 9 Summary of harvest methods, their considerations under MCS PI2 and what would be their expected monitoring requirements under an effective MCS system.**

| Harvesting method | PI2 considerations | Effective MCS System Requirements |
|---|---|---|
| Trawlers | • Capture of undersize primary / secondary species.<br>• Capture and discard of unwanted secondary species.<br>• Mortality of marine mammals, turtles, sharks incidentally caught.<br>• Mortality of birds incidentally caught.<br>• Morality of birds through contact with fishing gear (warps, third wire).<br>• Ghost fishing of discarded / lost gear.<br>• Pelagic / semi pelagic contact with benthic habitat. | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the extent and nature of interactions with ETP species.<br>• Effective means of ensuring compliance with any primary and secondary species requirements (e.g. bycatch reduction devices, minimum mesh sizes) and ETP requirements (e.g. TEDs, SLEDs).<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time.<br>• Effective means of monitoring gear loss.<br>• Effective means of monitoring offal management. |
| Gillnetters | • Capture of undersize primary / secondary species.<br>• Capture and discard of unwanted secondary species.<br>• Mortality of marine mammals, turtles, sharks incidentally caught.<br>• Mortality of birds incidentally caught.<br>• Ghost fishing of discarded gear. | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the extent and nature of interactions with ETP species.<br>• Effective means of ensuring compliance with any primary and secondary species requirements (e.g. bycatch reduction devices, minimum mesh sizes) and ETP requirements (e.g. 'pingers').<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time.<br>• Effective means of monitoring gear loss. |
| Dredgers | • Capture of undersize primary / secondary species.<br>• Capture and discard of unwanted secondary species.<br>• Mortality of marine mammals, turtles, sharks incidentally caught.<br>• Mortality of birds incidentally caught.<br>• Ghost fishing of discarded / lost gear.<br>• Habitat impact of fishing in closed areas. | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the extent and nature of interactions with ETP species.<br>• Effective means of ensuring compliance with any primary and secondary species requirements (e.g. bycatch reduction devices, minimum mesh sizes) and ETP requirements (e.g. TEDs, SLEDs).<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time.<br>• Effective means of monitoring gear loss. |
| Trappers | • Capture of undersize primary / secondary species.<br>• Capture and discard of unwanted secondary species.<br>• Mortality of marine mammals, turtles, sharks incidentally caught.<br>• Ghost fishing of discarded / lost gear.<br>• Interactions with benthic habitat. | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the extent and nature of interactions with ETP species.<br>• Effective means of ensuring compliance with any primary and secondary species requirements (e.g. escape hatches, minimum mesh sizes) and ETP requirements.<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time.<br>• Effective means of monitoring gear loss. |

| Harvesting method | PI2 considerations | Effective MCS System Requirements |
|---|---|---|
| Purse Seiners | • Capture of undersize primary / secondary species.<br>• Capture and discard of unwanted secondary species.<br>• Mortality of marine mammals, turtles, sharks incidentally caught.<br>• Mortality of birds incidentally caught.<br>• Ghost fishing of discarded / lost gear. | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the extent and nature of interactions with ETP species.<br>• Effective means of ensuring compliance with any primary and secondary species requirements (e.g. bycatch reduction devices, minimum mesh sizes) and ETP requirements (e.g. live release).<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time.<br>• Effective means of monitoring gear loss.<br>• Effective means of differentiating FAD / free school catches. |
| Longliners | • Capture of undersize primary / secondary species.<br>• Capture and discard of unwanted secondary species.<br>• Mortality of marine mammals, turtles, sharks incidentally caught.<br>• Mortality of birds incidentally caught.<br>• Mortality of birds from discarded hooks in offal / bait.<br>• Ghost fishing / entanglements from discarded / lost gear | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the extent and nature of interactions with ETP species.<br>• Effective means of monitoring setting technique and depth.<br>• Effective means of ensuring compliance with any primary and secondary species requirements (e.g. bycatch reduction devices, minimum mesh sizes) and ETP requirements (streamer lines, line weighting, time of setting).<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time.<br>• Effective means of monitoring gear loss.<br>• Effective means of ensuring or monitoring correct offal management |
| Hand gathering | • Gathering of undersize primary / secondary species.<br>• Use of illegal / mechanised gear. | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time. |
| Liner vessels | • Capture of undersize primary / secondary species.<br>• Capture and discard of unwanted secondary species.<br>• Mortality of marine mammals, turtles, sharks incidentally caught.<br>• Mortality of birds incidentally caught. | • Effective means of verifying total catch composition, including changes over time.<br>• Effective means of verifying the extent and nature of interactions with ETP species including live release<br>• Effective means of verifying the nature and extent of habitat interactions, including changes over time. |

### 2.3.3 MCS System case studies

The following section outlines some case studies to illustrate some of the MCS systems in place using the categories defined above. Each case study summarises how it would be classified, the harvest strategy and subsequent management measures in place and the MCS system used to enforce these measures.

#### 2.3.3.1 Ashtamudi Estuary short-necked clam fishery

The Ashtamudi Estuary short-necked clam fishery would be classified as a medium to large scale, inshore fishery using a hand gathering harvesting technique. It has certified tonnage of 10,368 tonnes and employs around 600 free diving fishers and a further 110 vessels using hand dredges. Harvest control rules ensure that the intensity of fishing is managed to within limits that are unlikely to deplete the stock, based on scientific advice from the Central Marine Fisheries Research Institute (CMFRI). The tools used are written into the fisheries regulations via the clam fishery management plan, these include spatial and temporal closures, catch controls limiting the minimum size of clams caught and technical measures restricting mesh size and prohibiting the use of mechanically powered devices to harvest the target species.

The local police and coastguard enforce fisheries regulations in the area. Licensed fishermen are generally compliant, with IUU activity perpetrated by unlicensed operators, who are rapidly detected and caught. Such incidents are reported to occur no more than 3-4 times per year. The geographical/spatial proximity between fishing grounds and density of fishing communities around the shores of the estuary enhance detection levels.

Local fishermen participate in discussion on control measures with the VCFC, which are then publicised in the local media outlets and communicated directly to fishermen's organisations to ensure a good level of awareness and overall support for regulations including sanctions available for non-compliance: confiscation of vessel and a fine, equivalent to a week's income. Fishermen's and the broader shellfish industry interests are also represented through organised groups: The Welfare Society, and by the Seafood Exporter's Association of India.

Fishers' relationships with NCAs illustrated by their participation in the management process described above also underpins good MCS practice and encourages relative compliance: promotes understanding and cooperation between stakeholders; and supports a strong rights-based identity and effect amongst stakeholders. The scale of sanctions and high risk of detection act as a deterrent.

#### 2.3.3.2 SZLC, HNSFC & CFA Cook Islands EEZ south Pacific albacore longline

The SZLC, HNSFC & CFA Cook Islands EEZ south Pacific albacore longline fishery is a medium sized fishery operating within the EEZ using longlines. It has a certified tonnage of 5,430 tonnes split between 22 vessels in the UoC (although in 2017 there were 43 vessels licenced for the fishery).

The fishery is managed under two regimes. The first internationally under WCPFC, sets out the overall harvest strategies for the region as a whole in terms of (interim) target reference points for for bigeye, skipjack and yellowfin. It requires member states to submit their catch and effort data for assessments on an annual basis in a prescribed format.

The second is a national strategy put in place by the Cook Islands which since 2017 has been operating a Quota Management System (QMS with a Total Allowable Commercial Catch (TACC)) which replaced the previous licence cap effort limitation. To monitor this effectively, vessels are required to submit logbook data to the Cook Islands Ministry of Marine Resources (MMR) on a weekly basis. Data submission is being developed in collaboration with the Forum

Fisheries Agency (FFA) with vessels trailing e-reporting via tablets with the aim getting the data on a near real time basis to better monitor the TACC.

With its designation as a shark sanctuary the monitoring of the capture of ETP species has become important given there have been complaints from local fishermen about increases in the population of inshore sharks and the knock-on effects this has had on their losses of bait and lures. The level of observer coverage has been relatively low at 6.7%, below that thought suitable to detect a rare event such as ETP capture (Section 3.3) and MMR had been working with industry and an NGO to significantly improve logbook and e reporting of incidental shark captures through training of vessel crew. This has seen a significant improvement in the reporting of shark interactions. A review of port inspection reports demonstrated a change in the behaviour of the fishery in response to enforcement of legislation (brought in in 2013) in regard to the shark sanctuary. Sharks were no longer landed, and compliance appeared to be good, with few reports of non-compliance.

As a developing or Small Island Developing State (SIDS) fishery, there has an emphasis on regional integration and cooperation with RFMOs (WCPFC & FFA) and other partner States, mainly through the development of a regional MCS strategy. Regional cooperation is also given effect through Cook Islands' use of subsidiary agreements made under the Niue Treaty for Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region. This Treaty is a multilateral treaty of members of the Pacific Islands Forum Fisheries Agency to enhance their ability to enforce effectively their fisheries laws, and deter breaches.

The Cook Islands therefore cooperates extensively with other members through a comprehensive range of MCS activities, including surveillance overflights by FFA members including Australia, New Zealand, a regional VMS, regional observer programme, harmonisation of Terms and Conditions of Access, a Regional Register of fishing vessels and the Agreed Minute of Cooperation in MCS between the US and FFA member states.

#### 2.3.3.3 **Kamchatka River salmon**

The Kamchatka river salmon fishery is categorised as a medium scale, inshore fishery using gillnets. Although as an inshore fishery it has been classified as not remote, in reality it should be considered as remote. The average salmon harvest in the Kamchatka region as a whole is around 95,000 tonnes, the UoC is 1,872 and it was certified in 2018.

The main objective of the fishery is to provide spawning escapements that will sustain high salmon productivity for future returns and the management of the fishery is based on restricting harvesting and exploitation rates to make them consistent with the required escapement goals and the main measures in place include:

- Establishing fishing seasons;
- Scheduling passing days (fishery closures allowing salmon to pass through);
- Gear restrictions;
- In season monitoring of harvest including species composition (real time reporting); and,
- Area closures to protect spawning areas.

The fishery is mainly enforced through the use of fishery inspectors from the local departments situated around the district who will monitor the catches from the participating organisations. Sanctions are reported as severe, with companies reported as being non-compliant being liable to lose their lease or be subject to heavy fines. Much of the area is managed by the fishing companies themselves who take an active part in the protection of the spawning grounds.

Being a remote fishery the area is subject to illegal poaching, as a result two drones are also employed to help monitor the area.

#### 2.3.3.4 **South Georgia Patagonian toothfish longline**

The South Georgia toothfish fishery is classified as a medium scale, remote fishery operating bottom set longlines. Although technically it operates within an EEZ, for the purposes of this analysis it has been considered remote. There are currently 6 vessels operating the in the fishery taking an average of 2,194 tonnes of toothfish annually, it has been certified since 2004 and an MPA since 2012.

The harvest strategy in place requires the SSB at 50% of the unexploited level. To do this the TAC is set every two years on the basis of the stock size estimated from the stock assessment and therefore the strategy relies the assessment being accurate and ensuring that there is no fishing beyond the set TAC. Other objectives of the fishery are to monitor catches of ETP species and benthic interactions and reduce impact on bycatch species. Within the MPA itself there are a number of Benthic Closed Areas (BCAs) where limited research fishing is allowed as well as minimum and maximum depth restrictions. The fishery itself has seasonal restrictions to limit impacts on seabird populations.

Vessel prosecuting this fishery operate under two regimes. The first is the overarching one for the Southern Ocean under the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the second specific to the South Georgia Maritime Zone managed by the Government of South Georgia and the South Sandwich Islands (GSGSSI). Vessels mush therefore be compliant with all CCAMLR Conservation Measures (CMs) as well as any extra requirements but on them through their licensing agreement with GSGSSI. Although CCAMLR set the TAC by Subarea, GSGSSI will sell the quota onto vessels in blocks.

The harvest strategy requires accurate catch, effort and biological data and is sensitive to overruns in the TAC. Biological data are collected through an observer programme, with 100% coverage using observers trained under the CCAMLR Scheme of Scientific Observation. Vessels report to both CCAMLR on a five-day basis, giving a summary of their catch and effort, and a monthly basis giving detailed haul by haul data. Through this CCAMLR can track how close Subarea 48.3 will be to reaching the TAC and predict the closure of the fishery. Vessel also provide daily reports to GSGSSI giving catch and position data (as well as whale sightings, incidental catches and unidentified vessel sightings).

In addition, the MCS system involves:

- Licensing: Licenses are currently limited to six vessels per year and from 2018 GSGSSI introduced a four-year licence for vessels that have been shown to have a good track record. The high value of this licence and the threat of losing it gives the vessels a good incentive to be complaint and cooperate with any requirements. The terms of the licence also outline the season and scientific equipment that should be on board to observers to effectively collect the required data.
- The Observer Programme: As well as collecting the biological data on the target species, observers will also monitor bycatch species including ETP species, covering at least 25% of the hooks hauled. While they are not compliance observers, they can advise vessels how to implement CMMs and the information they collect can be used by CCAMLR to assess their compliance with them.
- Logbooks: CCAMLR have developed a standardised set of logbooks that are submitted to on a monthly basis. Catch summaries are submitted every five days.
- Bycatch quotas and move on rules: CCAMLR have set quotas for key bycatch species groups (skate and grenadier), which is 5% of the TAC for the target species for each

group after which the fishery will close. This is monitored by CCAMLR through the five day reports the vessels submit and in 2018 the fishery was closed for the first time based on this rule. In addition, a move on rule means vessels catching more than a certain amount on a single line must move away from the area, this is monitored by the vessel itself and reported when the catch level is reached.

- Vessel Monitoring System (VMS): Introduced by CCAMLR in 1998, vessels operating in CCAMLR waters should have a VMS system installed with 100 % coverage. Vessels are tracked by their flag state as well as a centralised system operated by CCAMLR. Along with the observer information, they enable GSGSSI to monitor their compliance with the restricted areas, depth limitations and seasonal closures. VMS data are also made available to the patrol vessel to increase efficiency.
- At-Sea patrols: GSGSSI uses a patrol vessel, shared with the Falkland Islands, operates within the FCMZ. It will aim to board all licenced vessels at least once every season to ensure their compliance with CCAMLR CMs and GSGSSI requirements. Through the Scheme of Inspection any CCAMLR member can perform a CCAMLR inspections on other member vessels while operating in CCAMLR waters and reports will be sent on to CCAMLR. Any breach of GSGSSI regulations and vessel will be fined.
- Port Monitoring: GSGSSI monitors 100% of all landings which must first be made in Stanley before going to other destinations. This forms part of the Chain of Custody scheme required by the MSC.
- Catch Documentation Scheme (CDS) was introduced in 1999. All imports and exports of toothfish into CCAMLR member states should be associated with a catch document which allows the catch to be traced.
- Coalition of Legal Toothfish Operators (COLTO): Although not an MCS tool, COLTO is an organisation made up from the legal toothfish operators to distinguish legal and responsible fishing practices from those undertaken by IUU operators. All vessels operating in South Georgia are members and it encourages them through cooperation and support and provision of surveillance operation during fishing operations and working closing with other groups and authorities e.g. Interpol to identify IUU components and parties in the supply chain

#### 2.3.3.5 **Aker Biomarine Antarctic krill fishery**

The Aker Biomarine Antarctic krill fishery has been classified as a large, remote fishery using midwater trawls and was fist certified by the MSc in 2010. There are currently two vessels under the UoC with an average certified catch of 117,000 tonnes. The fishery as a whole is prosecuted by about 9-10 vessels, with one other vessel acheiving MSC certification in 2018.

Although the TAC for the fishery in Subarea 48 is set at 5.61 million tonnes CCAMLR have set a ‘trigger level’ of 620,000 tonnes which when reached will trigger additional management measures, currently defined as the closure of the fishery. To minimise local area depletion the trigger level is divided between the four Subareas within Area 48 where the fishing takes place, when the level is reached the area will be closed and the vessels must move onto another area. Other objectives of the fishery are similar to that of the toothfish fishery, minimise the impact on ETP and bycatch species as well as the overall environmental impacts.

As with the toothfish fishery, to correctly manage the fishery relied on both catch and position data. Catch data is submitted to CCAMLR on a monthly basis using a standardised reporting form, when the catch level reaches 80% of the ‘trigger level’ for a particular area the reporting rate is increased to a five-day period so that the closure of the fishery can be predicted more accurately.

In addition, the MCS system involves:

- Licensing: If fishing in Subarea 48.3 vessels must also purchase a licence from GSGSSI, though this they be required to report catches daily to GSGSSI (in addition to CCAMLR requirements) as well as take an additional observer onboard.
- The Observer Programme: The krill fishery was the last of the CCAMLR fisheries to make observers mandatory, from 2019 coverage will be 100% of all trips. Observers monitor 100% of all hauls for ETP species captures and trawl warp strikes from birds. Data are collected on the target and bycatch species, particularly the smaller and larval fish whose impact from the fishery has been identified as relatively unknown by CCAMLR.
- Vessel Monitoring System (VMS): Vessels are required to have a VMS on board although this has only recently become mandatory for krill vessels. From December 2019 this will be required to transmit on an hourly basis for greater resolution.
- At-Sea patrols: Vessels can be inspected through the CCAMLR Scheme of Inspection, although there is no power of arrest and in reality this rarely happens except when operating within the GSGSSI EEZ.
- Association of Responsible Krill fisheries (ARK): Simlar to COLTO, ARK is an organisation made up of a number of krill operators who recognise the importance of working with the Scientific Community to ensure the sustainable development of the krill fishery. Most recently they have agreed to a number of voluntary restriction zones at certain times of year around penguin colonies to minimise the impacts they may have. As the restrictions are voluntary it is unclear how they will be enforced.

## 2.4 Describe good MCS Practices for spatial restrictions, shark finning and other rare events and discard bans.

The appropriate MCS tools for detecting or reducing the events are summarised in **Error! R eference source not found.** and levels of observer coverage for detecting rare events are given in Table 3.

For best practise in detecting these events a combination of tools summarised in **Error! R eference source not found.** would need to be used. The combination required would vary considerably across fisheries and the practicalities of usage and cost effectiveness would also need to be considering in deciding upon the best combination of MCS measures [3]

**Spatial Restrictions**

For spatial restrictions the primary tool for MCS is VMS, good practice would also include the physical checking of the area by means of a patrol vessel or aerial surveillance. Observer programmes in conjunction with these measures would constitute best practice. The South Georgia toothfish fishery enforces spatial restrictions through a combination of VMS, patrol vessel checks along with a full coverage observer programmes with many vessels carry two observers.

**Shark finning & Bycatch of protected species**

The main challenge for the detection of shark finning is that shark fins are a small volume high value product that be easily hidden and that the practise can be carried out very rapidly on deck. MCS options that are applicable and current best practice place a high emphasis on dock side monitoring for discrepancies between the volume of fins landed and carcasses with tRFMOs passing resolutions that required sharks to be landed with fins attached.

Bycatch of protect species is generally subsequently discarded at sea which poses challenges for detection.

Observer programmes would be part of the suite of MCS tools engaged that would constitute best practice in detecting incidents of both shark finning and protected species bycatch.

**Landing Obligation (EU, Norway etc)**

EFCA recommend Joint Deployment Plans (JDPs) as the best practice method of enforcing the landing obligation. With the analyses focussing on the following components; a. last haul, b. gramme size c. grade size.

For certain fisheries such as small pelagics in the North Atlantic it is proving difficult to effectively monitor regarding the EU landing obligation as discarding takes place underwater and before the net is hauled. EM would be the most effective MCS tool to detect incidents in this particular environment though as of now EM has not been implemented[4].

Similar to the previous points observer programmes provide one of the best means of monitoring the compliance with landing obligations.

[3] Monitoring and evaluation of spatially managed areas: A generic framework for implementation of ecosystem based marine management and its application. Stelzenmuller et. al. (2013)

[4] House of Lords, European Union Committee 26th Report of Session 2017–19, (https://publications.parliament.uk/pa/ld201719/ldselect/ldeucom/276/276.pdf)

# 3 Best practice in Observer Programmes

## 3.1 Key functions of observer programmes for effective fisheries management.

Fisheries observers collect information that is essential for fisheries management and although vessel self-reporting is often mandated, realistically, only limited data collection demands on catch and effort can normally be placed on the captain and crew. An on-board observer programme is necessary to enhance this data collection and will often confirm information gathered from other monitoring and surveillance sources, for example electronic monitoring or the vessels themselves. This includes information on:

- Vessel and catch position;
- Commercial bycatch species numbers;
- Active fishing and searching effort;
- Amount of quota uptake;
- Type of gear used; and
- Conversion factors.

The functions of an observer programme can broadly be divided into three roles: science, compliance and management. Often these functions will overlap with both science and compliance contributing to the management role. MRAG (2006) identified a number of key functions for observer data in relation to the management of the fishery. Examples included:

- Stock assessment;
- Monitoring TAC / quota utilisation;
- Implement management regimes such as closures;
- Environmental impact assessments (bycatch and incidental mortalities);
- Satisfying obligations to international agreements and / or organisations;
- Vessel performance evaluation; and,
- Fishery policy development.

The role of the observer is essential to the management of many fisheries and with an increasing emphasis on an ecosystem management approach to fisheries, observer programmes have proved to be an effective tool for providing a better understanding of the effect that the fishery has on the ecosystem as a whole.

## 3.2 Good practice in observer programme design and implementation

Regardless of the function of an observer programme, it can broadly be split into three key components:

- **Management -** This is related to the institutional arrangements of the organisation(s) supplying the observers, for example do they have a system in place for good record keeping and information security, is there any conflict with industry. It should also look at how observers are recruited, briefing and debriefing procedures, what at sea support they receive and overall quality assurance for the programme.

- **At sea -** This can assess how observers perform at sea, what equipment are they provided with, whether the level of coverage appropriate for the data and precision

required, the independence of the observers and the quality of trip reports and data submitted.

- **Training -** Training is a key component of any observer programme and observers must be properly trained to undertake their work. This includes an understanding of the fishery management regime, species identification, fishing vessel and gear operations, sampling techniques and catch estimation.

Each of these key components is made up of a number of sub-components and for a programme to succeed in achieving the functions outlined in Section 3.1, each sub-component should aim to follow a good practice guideline. While there are no universal standardised set of guidelines, SC-CAMLR XXIX developed a set of guidelines for observer programmes based on programmes from around the world. These were developed as part of a policy to accredit Member's observer programmes and while this has not yet been implemented the guidelines provide a useful reference. They have been adapted and are summarised in Table 10.

**Table 10 Good practice guidelines for designing and implementing an observer programme.**

| Component | | Good Practice Guideline |
|---|---|---|
| Arrangements within organisations | Provision of gear and equipment. | The programme provides appropriate personal and safety gear for working in the conditions unless predetermined that it is provided by the vessel. Sampling equipment provided that will facilitate optimum performance of tasks expected from observers. |
| | Relationship of the observer provider/organisation with industry. | Observer provider/organisation has no financial interest in, or relationship with any vessel or business involved with any part of the fishery, other than the provision of observers. |
| | Training. | Comprehensive training programme designed to meet assessment criteria (see Training section). |
| | Infrastructure and record keeping. | Ideally, the programme provides dedicated infrastructure that supports observer logistics and deployment as well as all data and records recorded by observers. |
| | Information security. | Protocols in place defined within a Scheme of Observation with protected access control to premises containing data and information systems. |
| | Code of Conduct. | The programme has a process in place that ensures applicants and observers conform to the Scheme of Observation through a code of conduct. |
| Observer programme: Briefing | Physical and mental health. | Adequate physical and psychological health assessment requirements for applicants and observers. |
| | Provision of gear and equipment. | The programme provides appropriate safety and personal gear to observers according to the conditions within which they work unless provision is agreed by the vessel. Sampling equipment provided to facilitate optimal performance of observer tasks. |
| | Supporting documents | The programme provides up-to-date observer manuals and data reporting forms as well as additional supporting literature. |
| Observer programme: At-sea support | Communications | The programme has established communication protocols for observers at sea with provision of independent means of communication such as Garmin In-Reach system. |
| | Monitoring and evaluating observer performance | The programme has procedures for monitoring and evaluating observer performance of tasks and quality of data collected. Provision of feedback to observers. |
| Observer programme: Debriefing | Data submission and reporting | The programme has protocols for data submission and reports. |
| | Observer feedback on vessel | The programme has protocols for internal observer reports on vessel performance, living and working conditions during at-sea operations. |
| Quality assurance | Data quality assurance | The programme ensures comprehensive range and logic checks are performed on data prior to submission. |
| | Observer performance feedback | The programme has protocols to provide feedback to observers on feedback for future skills development. |
| | Vessel operator feedback | The programme has protocols for vessel operators to provide feedback on observer performance during at-sea operations. |

| Component | | Good Practice Guideline |
|---|---|---|
| Organisation | Management regime, structure and inception. | Observers are trained in the historical background, structure and framework of the programme and relevant ecosystem monitoring. |
| | Conservation measures. | Observers trained in conservation measures (CMs) related to the fishery and provided with relevant reference material. |
| Role of observers | Duties and responsibilities of observers and vessel's crew. | Comprehensive briefing on key crew and observer roles; where roles are distinct, demarcated or have shared components. Provision of an understanding of how data is to be used within the management of the fishery. |
| | Code of Conduct of observers within the Scheme of Observation. | Provides a full briefing to the observer on the requirements of the observer within the programme Code of Conduct. |
| | Conflict avoidance and resolution. | Training provided in avoiding and resolving conflicts within a stressful environment. Observers briefed on cultural differences on board the vessel they are to be deployed. |
| | Functions, tasks and priorities of work to be carried out by the observer. | Detailed training on the roles, tasks and priorities of the observer and how they relate to the CMs and any other programmes within the fishery. |
| Vessel and fishing operations | Fishing methods. | Training in all aspects of fishing methods and practical training provided in gear configuration and deployment. |
| | Location determination and electronic devices | Observers trained in types of electronic bridge equipment to allow them to independently determine vessel and gear positions, depths and course and other fishing reference information. The observer is able to independently verify position using own GPS. |
| | Identification of various types of fishing gear, their component parts and how to measure them. | Comprehensive training on all relevant types of fishing gears, practical training on how to measure them and how they relate to any CM requirements. |
| | Construction and use of gear used for mitigation of by-catch. | Training provided on any requirements for mitigation of by-catch and how these are applied with respect to CMs. Relate through historical and developmental contexts of the fishery. |
| | Health and safety at sea. | Observers have a minimum at-sea experience requirement and instructed in working conditions on fishing vessels within the fishery and potential health and safety issues. Observers required to participate in formal training courses (e.g. first-aid, sea-survival). |
| | Waste disposal | Instruction in MARPOL regulations and appropriate CMs, noting environmental effects of discarding waste. |
| Species identification | Identification of target and main by-catch species. | Comprehensive training provided to enable accurate species identification for target species and main by-catch species. Training provided in the use of identification keys provided and morphometric analysis. |
| | Marine mammal and seabird identification and behaviour. | Training provided to enable species identification using identification keys and morphometric analyses. |
| Sampling techniques | Sampling and types of measurement. | Training observers to fulfil sampling protocols set out in an Observer Manual. Training in statistical techniques and sampling theory as required within the fishery. |
| | Obtaining and preserving samples. | Practical and theoretical training on collecting and preserving samples if required. |

| Component | | Good Practice Guideline |
|---|---|---|
| | Determination of conversion factors from product to green weight. | Training provided to enable accurate measurement of green and product weights of products. Background instruction on how these figures are used in stock assessment and quota management. |
| | Sexing of species and the use of maturity scales. | Provision of practical training in the assessment of sex and maturity stages of species. Reference guides provided and observers instructed on their use. Background provided on why this data is collected. |
| | Determination of species composition. | Observers instructed in using sampling protocols for catch for determining species composition. |
| | Monitoring discards. | Observers instructed to monitor discards using sampling protocols. |
| | Monitoring effort. | Observers instructed to monitor fishing effort using protocols. |
| | Gathering meteorological and oceanographic data. | Observers trained in the use of standard meteorological and oceanographic instruments on board fishing vessels, how to collect information and it's use. |
| | Collecting data on vessel sightings. | Background and training provided on IUU fishing and collection of data on vessel sightings including recording of specific vessel features. |
| Data handling | Using data forms and electronic data forms. | Training given on specific information collecting data forms or electronic forms used in the fishery. |
| | Completion of cruise reports. | Observers instructed how to complete a cruise report and encouraged to provide supplementary information in their report. |

## 3.3 Monitoring rates (observer/electronic) appropriate for different functions of observer programmes.

There have been a number of studies into the optimal levels of observer and electronic coverage (MRAG (2002), Northridge and Thomas (2003)), and coverage rates are regularly reviewed by RFMOs (Agnew et. Al (2010), Debski et al. (2016), GARFO. (2018)) and fisheries managers against the objectives of their programmes. Before discussing observer coverage it is important to recognise that there are a number of different ways in which coverage can defined:

**Trips** – the number of vessel trips that carry an observer.

**Days** – The number of sea days that are covered by observers.

**Effort** – The amount of fishing effort that should be covered by observers. This in turn can be defined at different levels as hauls, trawls, hooks.

**Catch** – The proportion of catch that should be sampled.

In a previous best practice guideline (MRAG (2006) levels of coverage were divided into four broad categories: no coverage; occasional coverage (<2%), partial coverage (20-30% of trips, 10-20% of hauls) and total coverage (100% of vessels, 30-70% hauls) and the relative advantages and disadvantages of each examined. These have been updated and are summarised in Table 11.

**Table 11 Observer coverage, advantages and disadvantages**

| Coverage | Advantages | Disadvantages |
|---|---|---|
| No coverage | • No cost<br>• Money saved can be applied to other approaches to monitoring, for example port sampling. | • No observer data<br>• No on-board compliance monitoring<br>• Not equitable compared to other components of the fleet |
| Occasional coverage (eg <5 % coverage of trips and/or hauls, or specific research programmes | • Cheap to implement<br>• Provides qualitative information on issues of concern<br>• May provide good estimates of particular parameters in directed research efforts<br>• Easily acceptable to fleet | • Cannot provide robust estimates of fleet-wide parameters.<br>• Unlikely to give precise estimates of ETP species catch. |
| Partial coverage<br><br>(e.g. observers covering 20% or 30% of all trips, and 10-20% of all hauls) | • Cheaper than 100% coverage<br>• More feasible for smaller vessels<br>• May provide sufficient coverage for routine scientific sampling | • Propensity for differences in vessel behavior between observed and non-observed days<br>• Data may be biased for various reasons: including non-random observer deployments and differences in behavior between observed and non-observed vessels<br>• May not provide enough spatial or temporal coverage for special scientific programs (e.g. otoliths, stomach contents sampling for ecosystem studies)<br>• Implementation may be uneven across the fleet and lead to resentment of inequity |
| Total coverage (i.e. observers on 100% of vessels all the time, monitoring between 30 and 70% of all hauls) | • Good cover for compliance monitoring<br>• Equitable across the fleet<br>• Possible to collect large amounts of data | • May not provide 100% coverage of fishing effort, if not all fishing activity is observed.<br>• True 100% coverage of fishing effort may require more than one observer on each vessel.<br>• Expensive<br>• May not be feasible to put observers on all vessels (issues of space, cost etc. for small vessels)<br>• May not be necessary for purely scientific programs<br>• Difficult to get fleet acceptance |

As can be seen from Table 11, a combination of coverage rates can also often be used, and the coverage rates can vary according to the area fished. For example is CCAMLR is widely seen as one of the pioneering RFMOs[5] with regards to developing procedures for reducing bird bycatch and developed a rick assessment methodology to help define the monitoring levels in each of its Subareas. Depending on the level of seabird and marine mammal activity and the subsequent likelihood of them encountering a vessel all Subareas are rated on a level of 1 (low risk) to 5 (high risk) and the recommended level of coverage defined accordingly (Waugh et al. (2008). For the longline fishery 100% observer coverage is required of all fishing trips and days at sea. Within each trip the level of coverage of longline observations, in terms

[5] Although not technically an RFMO, CCAMLR has responsibility for fisheries management in the Southern Ocean.

of hooks observed, will vary from 25% for low risk areas to 100% for high risk areas (although 100% coverage is rarely achieved).

The Falkland Island Fisheries Department (FIFD) also vary their required observer coverage for the *loligo* trawl fishery depending on the area fished. Vessels wishing to fish an area considered high risk (near a seal colony) must have 100% observer coverage and they should monitor 100% of the hauls. This is to ensure that the mandatory seal exclusion devices (SLEDs) were being installed and operating correctly and that all seal mortalities were reported.

In reality 100% coverage of trips, days or effort is not always possible and representative levels of coverage should be applied. These levels will depend upon the objectives of the particular programme, whether it is science, compliance or a combination of both.

GARFO (Greater Atlantic Regional Fisheries Office) recently reviewed their levels of observer coverage for their multi-species fisheries. Observers collect scientific data that are used in the estimation of all the groundfish stocks. The required level of observer coverage should '…provide a reasonable expectation of meeting the requirement of achieving the Coefficient of Variation of 30% (CV30) or better precision at the overall stock level for each groundfish stock.' Based on past performance (since 2010) the recommendation for 2018 was that a coverage level of 15% of all trips would achieve this aim.

The optimum level of coverage to detect the capture of ETP species (specifically bird bycatch, but could also apply to other species) in the pelagic longline fishery was recently reviewed by Debski et al. (2016). They examined levels of observer coverage in a number of different fisheries and concluded that while 100% coverage obviously provides complete information on catch composition, in most longline fisheries this is never achieved or sought. To establish a reasonable precise estimate of seabird bycatch, a coverage level of 20% (of hooks observed) is required, although levels of over 2.5 times that would be required to detect captures of species that are rare or rarely interact with fishing gear. Specifically, if a seabird is infrequently captured but caught in large numbers when it is caught then higher levels of coverage will be required to obtain a specified level of precision. Conversely a species often captured but in low numbers per event will require less coverage for the same level of precision. They went on to identify a number of factors that will affect the adequacy of all catch monitoring undertaken by observers these are summarised in Table 12.

**Table 12 Key factors that influence the accuracy and precision of seabird bycatch estimates based on observer data collected from pelagic longline fisheries (Source: Debski et al. 2016)**

| Factor | Type of variation | | | | |
|---|---|---|---|---|---|
| | Target fish species | Day / night | Annual / seasonal | Spatial | Vessel to vessel |
| Fishing effort | X | | X | X | X |
| Seabird abundance | X | | X | X | |
| Seabird behaviour | X | X | X | X | |
| Vessel characteristics | X | | X | | X |
| Vessel behaviour | X | X | X | X | X |
| Mitigation use | X | X | | | X |

They provided a number of recommendations with regards to levels of observer coverage in the pelagic longline fishery:

- the extent of observer coverage needed to generate robust bycatch estimates varies with the characteristics of the fishery being monitored, species of interest, and bycatch patterns;
- observer coverage levels of 5% may be adequate to collect information identifying some bycatch risks and issues but is likely insufficient for effectively quantifying seabird bycatch;
- in general, to robustly estimate bycatch levels of more frequently caught species, observer coverage levels of 20% or more may be necessary, whereas to estimate bycatch of species caught infrequently, coverage levels of 50% to almost100% may be necessary;
- observer coverage should aim to be maximally representative, taking into consideration factors such as seasonality of fishing, between-vessel variation within a fishery, timing of sets, and location of fishing activities; and,
- even with high levels of observer coverage there can be unobserved bycatch (i.e. “cryptic” mortality), and this can form a high proportion of total bycatch and can vary substantially between fisheries.

### 3.3.1 Monitoring Rates for REM Systems

Monitoring rates for fisheries that currently carry REM systems can vary widely depending upon the objective of the programme. In general, there are two models in current use, the full coverage and the audited model.

For programmes where the objective is to have data in order to verify self-reporting by fishers the audited model is generally used. The percentage of trips audited varies by fishery.

Australia currently operates REM in four fisheries;

- Eastern tuna and billfish
- Western tuna and billfish
- Gillnet, hook and trap
- Small pelagics (mid water trawl)

All of these programmes use a minimum auditing level of 10%. The objective for all of these fisheries was to be able to independently validate fishing logbooks.

In the USA New England groundfish fishery a REM programme has been in place with the same objectives of the Australian programmes but in addition there had been issues with discarding in this particular fishery due to specific choke species with the fisheries management regime and as such this was an additional focus to the REM programme. This programme operates with a review rate of 50% of all trips.

For the audited model the rational of which trips to review will be based upon the same principles as that for observer programmes where coverage is less than 100%.

For full coverage models, which are more commonly found in REM systems in tuna fisheries, all fishing events, or related, such as checking on FADs for tuna purse seining will be monitored and recorded through the review process.

There are currently a number of these programmes in operation working with this model;

- Ghanaian tuna purse seine fleet
- Fijian tuna longline fleet segment (n=50)
- A large number of Spanish and French flagged tuna purse seiner in order to fulfil ISSF requirements

For these fisheries full catch and effort will be monitored along with discards and interactions with FADs and marine mammals.

It should be noted that many REM programmes currently in operation are either in a pilot stage or relatively new programmes and as such monitoring rates are evolving as programmes are maturing.

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# Annex 1 Enforcement tools

**Legislation and Sanctions.**

The effective application of legislation and sanctions are applicable to all fisheries, though more prevalent in developed industrial fisheries with adequate infrastructure and resources. An effective legal framework will be the basis for which everything else will be based on. It is important to promote knowledge and understanding of MCS issues within national judicial systems.

In the context of legislation and sanctions, the essential part of an effective MCS system is that the relevant jurisdiction has an effective legal system in place that allows the for the application of effective MCS measures, including the application of sanctions for non-compliance.

Most recently, the basis for States setting sanctions is outlined in Section 21 of the International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing (FAO 2001). They have a responsibility to, *inter alia*:

> "*ensure that sanctions for IUU fishing by vessels and, to the greatest extent possible, nationals under its jurisdiction are of sufficient severity to effectively prevent, deter and eliminate IUU fishing and to deprive offenders of the benefits accruing from such fishing*."

- Improved prosecution rates;
- Consistent application of sanctions;
- Enhanced deterrent effect.

**Licensing and Vessel Registration**

Licensing, used in conjunction with vessel registration, provides a mechanism through which fisheries departments can manage and control their fisheries. Licensing establishes the conditions under which the fishery can be accessed and can be structured in a number of ways depending on the management strategy in place. It can be used to achieve a number of outcomes, outlined below:

- Limit on gear (restriction to one or more gear types);
- Limit on effort (most usually in terms of days);
- Limit on seasons (protecting species during high risk seasons e.g. spawning); and
- Limit on area (protecting species in high risk areas or where habitats may be damaged).

For any sustainable management system to be implemented for any fishery, there is a need for an understanding of the fishing capacity of the fleet and the different fleet segments prosecuting it. Fishing capacity refers to the total capability of a vessel or group of vessels to catch fish and provides an indication of the maximum theoretical amount of fish that can be caught over a period by that vessel or group of vessels for a given status of the stock. The management of fishing capacity is key to fisheries sustainability because overcapacity can lead to overfishing, depletion and potential collapse of a target stock and the fishery. Managers often use reference points to help them define appropriate capacity controls to optimise benefits and avoid overexploitation.

Depending on the management system in place, the maintenance of an accurate fishing vessel and gear registry will be important in providing an up to date assessment of capacity. All vessel owners should be required to ensure that any new vessels, modifications to vessels or the gear that they can carry or any vessels that are removed from the fishery be notified to

the appropriate authority to ensure records are up to date. Removal from a vessel registry can also be used a sanction against IUU vessels and as such can be an effective deterrent.

**Logbooks (paper and electronic)**

Logbook recording of catches by paper or electronic means is a requirement of most fisheries. In most cases they are the fundamental basis for monitoring catch and effort for the purposes of the harvest strategy. In many cases they will also be the main source of both primary and secondary species information as well as providing information on ETP species and other ecosystem information. Additional MCS tools will be required to verify the extent to the logbook reporting is accurate or provide information on issues that are not well covered, for example discards where discards are not required to be reported. The contents of the logbook will vary between fisheries but minimum data reporting requirements will often be defined by the management organisation. For example, the minimum data requirements for CPCs operating within IOTC are outlined under Resolution 15/01[6] and CPCs must submit templates of their logbooks to the Secretariat for approval before use. These are also available on the IOTC website[7] for public reference. Other organisations require vessels under their control to use standardised logbooks for submission of their data (these can be used in conjunction with their own logbooks). Having set fields and formats makes it easier for the data to be uploaded and checked. Examples of this include CCAMLR, which provide logbooks for their four fisheries that can be updated on an annual basis according to the requirements of the Scientific Committee and Commission, and the EU, which has an electronic recording and reporting system (ERS) on all Eu vessels over 12 meters based around their electronic logbook (e-logbook).

**Patrol vessels and standardised inspection systems.**

Patrol vessels offer an at sea platform for surveillance and are one of the highest profile enforcement tools in fisheries management and at sea boarding and inspection can provide key information that other forms of monitoring do not. It is one of the only forms of MCS that can check for offences that must be detected in situ, for example the use of illegal gear, shark finning, fishing in closed waters (although VMS / AIS can tell you is a boat is in there, often a patrol vessel is required to provide evidence that the vessel was actually fishing). Some of these events can also be detected by other means, for example observers or ERM, but these also have the effect of changing a vessel's behaviour. Although this may have the desired effect or preventing illegal behaviour it may also mean that illegal events are not detected if they perceive the observer or ERM is monitoring at the time. It also provides considerable deterrent value – fishers are more likely to comply if they're capable of being boarded at any time.

The size and type of patrol vessel will vary according to the scale and location of the fishery and the particular MCS strategy of the State. Analysis of patrol boats as an enforcement means should therefore classify them by type and size. Each different type of patrol vessel will have a different range (from port), endurance (the time the unit can stay at sea) and detection abilities (radar range, speed, VMS / AIS on board).

**On-board observers**

Observers placed on board vessels typically fulfil one of two roles, although in reality it is normally to some extent a combination of the two. In a scientific role, observers monitor from

[6] Resolution 15/01. On The Recording of Catch and Effort Data by Fishing Vessels in the IOTC Area of Competence http://www.iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_15-01_en.pdf

[7] http://www.iotc.org/node/4788

a scientific perspective at the point of extraction, whereas compliance observers are primarily placed to ensure that management measures are adhered to, checking for and reporting on any infractions. While the role of a scientific observer is primarily to collect data for scientific purposes, they may also have a secondary role of checking some elements of compliance which they will report at the end of the trip. Observer programmes may have very different observation rates and the base measure should be related back to the fishery specific objective. Is the level and quality of coverage sufficient to (a) provide the level of information necessary to inform management decisions to meet fishery specific objectives, and/or (b) sufficient to determine the level of compliance? Simple catch sampling might be 5%; however, getting good estimates of ETP species interactions might require very high levels of coverage given low rates of interaction. Either way, 'good practice' is all related to what the management is trying to achieve. Observer programmes are covered in more detail in Section 3.

**Aerial Surveillance.**

As for patrol vessels a number of different aircraft can be used for aerial surveillance e.g. planes of various sizes and helicopters and as for patrol vessels each will have different ranges, endurance and detection profiles. Aerial surveillance can be used to verify vessel's VMS / AIS recoded location or monitor smaller vessels, under 15m, that may not be required to carry a VMS on board. It is also good for monitoring closed areas to detect is vessels are fishing or just in transit. It should be measured in patrol hours and the number of sightings made during that period. The indicators should be sightings per patrol hour (total) and infractions (sightings of illegal vessels or vessels in unauthorised areas) per patrol hour.

**Remote Monitoring Systems (VMS / AIS)**

Remote monitoring systems are used to track the position of fishing vessels over time and Vessel Monitoring Systems (VMS) are mandatory on all fishing vessels over a specified size depending on their area of operation and the subsequent national and international requirements. As well as monitoring the vessel's position, VMS can also be linked to e-logbooks to transmit catch reports, this is increasingly being used in EU and US fisheries. The VMS will allow a flag state to track its own fleet while operating within its EEZ or on the high seas but there are also a number of systems in place where vessels can be tracked regionally, such as through the Forum Fisheries Agency (FFA) or CCAMLR. Polling rates may be varied depending on the nature of the fishery and the particular management objective to be achieved. Although more frequent polling is often used for spatial closures or area management, it is not exclusively so and is often more about tracking the distribution of effort.

Although not yet mandatory, many fishing vessels also carry Automatic Identification Systems (AIS) which was introduced primarily as a safety measure for vessels operating in busy waterways. Unlike VMS, AIS can be publicly accessed and used as a form of passive enforcement and vessels will use AIS transponders to track their fishing gear. It is being increasingly used by companies such as Global Fishing Watch to monitor global fishing activity and other private companies to monitor specific areas[8]. Remote monitoring systems are used to inform targeted surveillance which will increase the effectiveness of other expensive resources such as patrol vessels and aircraft.

**Remote sensing**

Remote sensing covers a multitude of surveillance means that passively monitor the activity of vessels. These means can include synthetic aperture radar (SAR), hi resolution photo observation by satellite, Visible Infrared Imaging Radiometer Suite (VIIRS) and traditional radar that identify vessel targets of all sizes from which the possible target vessels can be

[8] See for example https://catapult.org.uk/

identified. Although not mandatory in any fishery it has been introduced in some areas as a means of monitoring and as with the remote monitoring systems can be used to provide intelligence for other surveillance assets such as patrol vessels and aircraft. This has recently been employed in a number of UK Overseas Territories (OTs) through the Blue Belt programme where suspicious activity is identified and the relevant authorities notified.

**Port monitoring**

Port monitoring can be divided into two different areas, dockside inspections and port sampling. Dockside inspections are the inspection of vessels in port by authorised compliance officers. They will include pre-trip or pre-licensing inspections, undertaken by flag states on their own vessels or on foreign flagged vessels wanting to fish within their EEZ. While the fisheries law will vary between coastal states, the pre-licensing inspection is important to ensure that all documentation is onboard and correct (e.g. licensing, logbooks), fishing gear is legal (e.g. checking of mesh sizes, bottom chafers on nets) and mitigation measures (e.g. streamer lines, BRDs, TEDs) are in place to the required standards for the area the vessel will be operating in. Dockside inspections are however normally focussed on landings, where the weight of fish by species being checked against logbook catches and quotas where appropriate. They can also be used to detect some of the rarer events, such as shark finning, or landing of prohibited species.

Port sampling involves catch sampling for scientific purposes by scientists or observers and will reduce the costs of collecting data at sea. Data collected in port are also useful for MCS purposes depending on the particular management strategy in place.

**Remote Electronic Monitoring (REM)**

Video surveillance of fishing operations entails the installation of (usually) high definition (HD) cameras onto fishing vessels to record the fishing operations. There are currently a wide variety of REM systems. These can range from a single camera taking pictures at a rate of on frame per second to an array of up to eight HD video cameras recording constantly. This is due to the wide variety of fisheries currently using REM. Small inshore vessels that carry this technology can be using a single camera which would be sufficient to monitor all working areas of the vessels while large tuna purse seiners for example would carry an array of up to eight HD video cameras covering all working areas above and below deck as well as cameras covering the areas around the vessel monitoring interacts with ETP species and fish aggregating devices (FADs).

REM is currently viewed in a number of different ways, firstly as an alternative for observer coverage to monitor catch numbers or catches of ETP species in where small sizes of vessels preclude the presence of observers. For larger scale fisheries where REM has been implemented REM is used to compliment the tasks completed by observers and is carried concurrently in a number of fisheries, such as tropical tuna purse seine fisheries.

REM systems store pictures and video footage on secure hard drives on board and these are then recovered and replaced at the end of a trip and sent for review. Some systems do not require the recovering of the hard disk for review to commence as once they come within range of shore-based communications, either the GSM cellular systems or purpose-built stations for the system, they then automatically upload the footage to the monitoring centre. For this type of system hard disk are replaced when they are approaching capacity rather than at the end of every trip. Most systems also have the capacity to send images and/or video in real time via satellite to the monitoring centre on land. This capacity is generally not used for the review and estimation of actual fishing events but rather as a shore-based check that the system is working as it should.

When the footage has been received by the REM provider bespoke software is used to filter the footage so that the reviewer will only need to monitor actual fishing events rather than watch the entire amount recorded. This is done in a variety of ways depending on the specifics of the fishery involved. Some systems will apply a variety of filters such as vessel speed to determine the likely fishing events, these are then checked by the reviewer for false positives and then the actual fishing events will be reviewed at normal speed or below and the required data gathered. Most REM providers are using machine learning to further increase the accuracy of these filters and rapid progression is also being made at using machine learning for species identification of catch. Many systems also have inbuilt tools that also allow the recording of length frequency which can then be used to extrapolate catch weight using conversion factors for that species. The successful application of REM is dependent on having reviewers that are experienced in that particular fishery with the automated systems being used to reduce the ratio of time spent fishing relative to the review time.

**Transhipment Monitoring**

Transhipments occur when a fishing vessel transfers fish to another vessel, normally a refrigerated carrier vessel, at sea or in port and allows the it to continue fishing for longer without having to visit its home port. However, they are commonly seen as a way getting illegally caught fish into the market chain and allows illegal operators to avoid port controls which can't be conducted at sea. Monitoring of transhipments requires the deployment of an inspector or observer onto the carrier vessel that is receiving the transhipment from the fishing vessel, observers are most commonly deployed on the high seas with inspectors in port or within an EEZ. Between 2008 and 2010 all of the tRFMOs brought in measures to restrict transhipment activity, allowing it only in ports where it must be verified by the port's state. The only exceptions are longline vessels which can tranship on the high seas provided they carry a certified observer on board. Vessels must be on the RFMOs authorised vessel list and from a flag state that participates in the observer programme. Whether in port or on the high seas, all transhipments must be accompanied by a transhipment declaration which is verified and countersigned by the inspector or observer. In the case of southern bluefin tuna, all fish are accompanied by a catch monitoring form and each fish is tagged, through the gill cavity, with an individual number. Inspectors and observers countersign the monitoring form and check the tag numbers.

Catches, at the final point of landing, can then be traced back to the individual vessels and a balance of landings from the carrier vessel, the transhipments made and the recorded logbook catches of the fishing vessels can be performed to ensure only legal catches are landed. Some RFMOs (IOTC, ICCAT) also require that observers board the fishing vessel undertaking the transhipment and request to see the vessel's VMS, logbook and licence. In the case of IOTC, these observations are reported in the annual Compliance Committee meeting[9].

**Marketing and Sales Monitoring**

The monitoring of the post-harvest sector is a key growth area for enforcement. Enforcement staff are now monitoring different points in the supply chain from first sale at the point of landing through the production chain to the end users.

Catch Documentation Schemes (CDS) are market driven tools that will track a product from its capture through its landing or transhipment to export and re-export and into the market. They were put in place specifically to combat IUU fishing and can either be multilateral or unilateral. Multilateral CDSs have been put in place by RFMOs to monitor the legitimacy of the catch of high value species. There are currently four in place, three covering tuna

[9] See for example - http://www.iotc.org/sites/default/files/documents/2018/04/IOTC-2018-CoC15-08b_Rev2_E_-_Summary_Report_possible_infractions_2017.pdf

managed by CCSBT, ICCAT and most recently IOTC are not certified by the MSC. A third managed by CCAMLR covers both species of toothfish caught in Antarctic waters and is applicable to five MSC certified fisheries. While a multilateral CDS will apply to the entire stock under an RFMO's mandate, a unilateral CDS regulates only what comes into an end market regardless of the species. There is currently one in operation, one managed by the EU through the its IUU regulation. The US also operate a documentation scheme, although this is limited to 13 species considered to be at risk.

From a management perspective it is a means to illuminate IUU and reduce poaching and can verify catch and landings data. it has also evolved as a tool to encourage better flag state compliance with RFMO requirements and enable coastal states to verify catches taken in their waters which enable them to negotiate access agreements and better monitor fishing activities (ISSF, 2016).

Trade Restrictive Measures (TREMs) are used against countries seen as not being active in addressing IUU fishing. Both the EU and the US have systems in place for this which can put a ban on imports from these countries, or in the case of the US fleets or product types within these countries to encourage them to take more positive action.

# Annex 2 Management Measures

### Target species TAC

TACs for the target species are the most common output control measures in use and are normally set through a combination of stock assessment and socio-economic criteria. They should be defined in metric tonnes but can be numbers of individuals for specific fisheries where weight is difficult to measure. It is important that weights are accurately reported within the time limits set by the fishery to give managers time to react to close the fishery, or areas of the fishery and prevent quota overruns. As most fisheries convert processed weights to green or live weight using a conversion factor, these should be reviewed on a regular basis as appropriate (seasonal, by area, by species) as the TAC will be set on the green weight removed. Where quotas are based on total catches, rather than just total landings, the weight of any discarded target species should also be factored in.

### Bycatch species quota

Quotas may also be specified for bycatch species where assessments on the species have carried out or precautionary limits are in place. Stock assessments conducted on a bycatch species, in the same manner as for target species, will recommend a TAC for each of the species assessed where appropriate. In multispecies fisheries it may be that the quota of one of the bycatch species is reached before the quota of the target species and it becomes the limiting factor closing the fishery. The closure may apply to the whole fishery or to individual vessels depending on how the fishery is regulated. Bycatch quota regulations operate, for example, in the CCAMLR toothfish fishery where limits are set for *Macrourus* spp. and skates and rays as well as for the target species. In this case the bycatch trigger level is not set according to any stock assessments on the bycatch but rather as a percentage (5%) of the target species quota. This was triggered for the first time during the 2017/18 season in Subarea 48.3. Bycatch quotas, like target species quotas, should be defined in metric tonnes or numbers of individuals for specific fisheries where weight is difficult to measure.

### ETP species

Restrictions may also be placed on the level of interaction with and/or incidental mortality on ETP species to reduce their impact on the fishery. These can be set for the entire fishery or on vessel by vessel basis, with each vessel having its own limit set. Once the level has been reached it will trigger a particular management action ranging from the closure of the fishery, or an area of the fishery, to increasingly restrictive measures being put in place, for example switching to night setting in a longline fishery. Limits on ETP species are often expressed in terms of numbers by species or species group and normally rely on the vessel self-reporting or occasionally independent verification through observer programmes. More recently REM of catches has been employed as ETP species are often larger and or of different body form to the majority of the catch so can be more effectively identified by the image analysis software. For example, the CCAMLR icefish fishery has a limit of 20 birds per vessel in Subarea 48.3. When a vessel reaches this limit, it must leave the area (the area stays open for other vessels). Although this fishery has 100% observer coverage, and it is part of the observers' role to record incidental mortality of seabirds, it is the vessels' rather than the observer data that are used to trigger the closure of the fishery for the vessel.

### Input controls

Input restrictions are placed on a fishery to limit the level of effort that is permitted. They take two forms; Capacity control, which limits the number, size or power of vessels; and, effort control, which will limit the time spent fishing. They are used primarily where the level of outputs from a fishery are difficult to monitor. This can be where a large number of small vessels land into a large number of ports making effective monitoring of catches and landings

difficult, but limiting the effort of a fleet will be easier to implement. The level of effort allowed in the fishery is typically set within the levels required to avoid overfishing, given the average fishing patterns and efficiency of the vessels involved. The objective of input restrictions as a management tool is therefore to have a record of the fleet capacity and ensure that effort can be effectively monitored.

Input controls will also include measures that can affect the CPUE of a fishery or part of a fishery. They include management measures typically used to protect a vulnerable element of a stock such as juvenile or undersized fish, spawning aggregations of adult fish or essential fish habitats for juvenile fish. The stock that is limited by the management measure may not actually be the target species concerned as for the output restrictions but may be a bycatch species or an ETP species that are impacted by the fishery. Efficiency restrictions may include closed areas, engine size, gear restrictions (e.g. mesh-size, wire trace bans), move on rules, size restrictions, discard and shark finning bans.

**Fleet Size (Number of vessels / Power of vessels)**

The most basic form of effort management is to put a limit on the number of vessels operating in the fishery. Putting a capacity limit on the total number of vessels or a limit on the total tonnage or power of the fleet and only allowing like for like replacements is a common tool to ensure the effort levels do not increase beyond the capacity of the fishery to levels where overfishing may occur. These management measures are easy to enforce as the flag state of the vessel must license their own vessels to fish and any other vessels will be fishing without a licence. Fleet sizes should be reported in terms of numbers of vessels, or the total power / tonnage of the fleet in terms of kWh or GRT.

**Effort days at sea**

The next level of detail when considering restricting the level of effort in a fishery is to limit the time spent by every vessel at sea. Restrictions of this type usually are referred to as “days-at-sea” and can measure individual days or total time spent at sea by each vessel as required by each specific fishery. This mechanism of input restriction has been made much easier by the implementation of vessel monitoring systems that can track and calculate the days at sea. For example, within EU fisheries fishing effort has been limited on an individual vessel basis since 2002 according to days-at-sea restrictions in the Irish Sea (ICES Area VIIa) and West of Scotland (ICES Area Via) as part of the ongoing cod recovery plans that have been implemented in these areas.

**Effort**

A more precise way of limiting effort is through restricting kilowatt-hours or kilowatt days (i.e. the engine power in kilowatts, multiplied by the amount of time spent at sea (in hours or days). This defines the “cost” to each vessel of their activities in terms of effort based on their estimated fishing power.

**Closed seasons**

Closed seasons effectively sets the effort level to zero for a specified period of time, thereby reducing the overall effort level in the fishery. Closed seasons are usually introduced to protect one or more vulnerable stages in the life cycle of a species such as spawning seasons or migration periods when fish may be aggregated into a small area making them more susceptible to fishing.

**Closed Areas**

Closed areas are a common management measure used to protect vulnerable portions of a fish stock. These could be areas simply where fish are much easier to catch in high volumes,

where fish aggregate to spawn, where the closed area gives the stock protection from fishing prior to spawning when the greatest damage to the stock may be done. The closed area may be implemented to protect any one particular species but will protect all stocks in that area. Closed Areas work by removing (or reduce) the fishing effort from a specific area and the remaining displaced effort in the fishery is then relocated into the areas which remain open. The definition of the closed area must be carefully drawn up to ensure the impacts substantially reduce the critical factor(s) such as mortality of target species, and the probable redistribution modelled after discussions with stakeholders to estimate the effects on target and bycatch stocks. Fishers that are prevented from accessing traditional stocks of their preferred target stocks may move into areas that they may not have fished before, which may result in conflict with fishers already operating there, inefficiency due to lack of knowledge and reduced income due to increased costs of operation.

Closed areas are typically measured simply in terms of their area (and sometimes the area of critical habitat protected). Areas should all be measured in terms of $km^2$. Additional measures of shape complexity using a measure of normalised distance from the centroid of the shape can be made if required to define the complexity of a closed area (or to compare closed areas), but most are simple shapes, either regular polygons or circles or ellipses of a set distance defined around and point or line.

**Gear Restrictions**

Gear restrictions will obviously depend on the type of fishing vessel and gear employed, but all generally work by restricting the catchability of a unit of gear. This can be to put a limit on the fishing capacity of a vessel or restrict the species and size of fish it may catch. In the case of longline fisheries this may be a ban on wire trace to reduce shark catches. For trawl, seine and dredge fisheries the commonest form of gear restrictions are those enforced on the size and shape of the meshes that make up the net and dredge to ensure as far as possible that the fishery catches the intended target species/stock/size of fish. Restrictions can also be placed on net chafers to reduce the incentive for semi-pelagic trawls to come into contact with the bottom and impact the benthic environment. Trap and pot fisheries work on a similar principle with the entry and escape “windows” being set at a size that allows for the escapement of smaller and juvenile fish. Hook and line fisheries are easily limited by the enforcement of a certain hook size and type which will limit the size of individual fish caught.

Other restrictions may be placed on the fishing gear may force the inclusion of bycatch reduction devices such as the turtle and seal exclusion devices used in trawl fisheries or the banning of gear enhancements such as tickler chains that increase the catches of demersal trawls by persuading demersal fish off the bottom and into contact with the fishing gear.

**Engine Size**

The fishing effort may also be restricted by limiting the engine size of a vessel. This limitation affects the power available to trawl a net or the speed of hauling of a net or line, thereby reducing the area able to be fished by a vessel in a unit time. A restriction of fishing power was introduced in the Dutch fishery in 1985 in order to limit the total engine power of the fleet. The licenses are freely transferable between vessels and numerous licensed can be aggregated on a single vessel. The maximum engine power for a new vessel has been set to 2000 hp.

**Move on Rules**

Move on rules are put in place to reduce bycatch, catches of undersize fish or ETP species. When a defined limit has been met a vessel or fleet must move to another area for a fixed period of time or for the remainder of the season. Examples of this include the Pacific groundfish fishery, where real time reporting of salmon bycatch by observers will trigger time

and area closures, forcing vessels to move on. Other examples can be seen in the CCAMLR toothfish fishery where, according to Conservation Measure 41-02, vessels that catch over 1 tonne of any skate or grenadier species in any one haul must on move to another location at least 5NM away for at least 5 days. The CCAMLR icefish fishery also includes move on rules for undersize fish where vessels must move on if over 10% of the fish in the catch are less than 24cm. While the Pacific groundfish fishery relies on observer data, the CCAMLR move on rule relies on vessel's self-reporting, although observer data may be used retrospectively so see if move on rules should have been triggered.

The trigger for a closure or move-on will be based on the catch either the total catch of a species in a haul or series of hauls (e.g. >1t of species A in a particular haul) or as a proportion of the catch (e.g. >10% of the catch of species B made up of juveniles of less than 50cm). The affected area and time span of the closure should be clearly defined. The area is usually defined as a box, where the fishery is organised around a predefined grid or as a series of positions with an area of known radius defined about the point where the rule was triggered.

**Size Restrictions**

Restrictions based on the size of the fish caught or landed, in terms of length or weight, are designed to encourage vessels to target larger individual fish avoiding the problems encountered by fishing the juvenile population. The aim of management measures of this type would be to change the fishing patterns or gear of the vessel to only target the adult population. Size restrictions may also apply to ensure that all fish above a certain size are retained to ensure that no "hi-grading" of fish occurs. However, size restrictions may have an additional problem in that the undersized fish that are caught are then discarded and these fish are often not recorded by the vessel as either catch or discards. The only effective enforcement measures that can identify size restriction management measures are those where direct observation of the fishing activity or landed fish can take place, i.e. observer programmes, at sea patrols and landings inspections.

**Discard Ban**

Discard bans simply ensure that all catches made by the vessel are retained on board. This affects the total level of the catch of the target species that the vessel can make during a trip as all fish previously discarded are now retained and the space for target fish would be restricted. The implementation of a discard ban therefore encourages a more effective targeting by the fleet to avoid unnecessary catches of non-target species. Regarding size restrictions the only effective enforcement measures that can identify size restriction management measures are those where direct observation of the fishing activity or landed fish can take place, i.e. observer programmes, electronic monitoring, at sea patrols and landings inspections.

**Shark finning ban**

Implementing a ban on shark finning will in effect reduce the capacity of a fleet as vessels will be forced to retain the whole carcass of the shark rather than just the fins. To be effective in reducing overall shark mortality, a finning ban should be used in in conjunction with other measures such as catch controls and gear restrictions.

# Annex 3 MCS Paper Literature Review

| Paper / Document | Provisions for good MCS practice |
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| Flewwelling, P. An introduction to monitoring, control and surveillance for capture fisheries. | Characterises influencing factors such as geographic and demographics, economic and role of politics:<br>• Size of the fishing area, number and type of vessel in context of their respective threat and risk to long-term sustainability and conservation goals.<br>• Potential areas of conflict between fishers; whether the fishery is prosecuted across more than one sovereign jurisdiction and the level or intensity of fishing.<br>• The significance of direct and added value of the fishery: seafood production, significance to coastal communities and marine conversation and employment opportunities and other revenue streams.<br>• Recognises the importance of political will and commitment to MCS; the predominance of a complimentary legal framework.<br>• Synergy and interface between national and regional cooperation and systems.<br>Also introduces and rationalises core infrastructure requirements:<br>• For monitoring: cost effective verifiable data on fishers triangulated from land and at-sea sources and inspection activities; collated in an accessible format across an efficient communication network.<br>• Strategically located and connected assets and personnel coordinated by/linked to a central hub responsible for operational decision-making.<br>• For control: adequate, proportional and enforceable legislation required to implement fisheries plans; defined responsibilities of authorities/fisheries officers and their respective powers; fishing eligibility requirements (licence/access or user rights/registers of vessels etc) and terms and conditions and penalties for non-compliance.<br>• Availability of judiciary/fisheries lawyers for both drafting legislation, and also for support on implementation<br>• For surveillance: Appropriately equipped (FMC, surveillance platforms, personnel etc), operations are sustainably funded and adequately trained officers to enforce the legislative mechanisms of fisheries management. |
| | Specifically with respect to MCS, it sets out the obligations of flag States:<br>• States should ensure compliance with and enforcement of conservation and management measures and establish effective mechanisms, as appropriate, to monitor and control the activities of fishing vessels and fishing support vessels. |

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| | • Exercise effective control over their vessels and ensure that they do not undermine the conservation and management measures.<br>• Ensure that vessels flying their flags provide data relating to their fishing activities.<br>• Promote stakeholder participation:<br>– Facilitate their involvement in decision-making with respect to policies, rules and implementation processes of fisheries management.<br>– Promote awareness of responsible fisheries through education and training.<br>• On Controls:<br>– Fishing is authorised through State control (consistent with respective jurisdiction)<br>– Fishing remains within limits of fisheries resources and economic returns favour responsible fishing (catch, effort, gear controls in lieu of their respective impacts: target, bycatch, discards, ETP species and ecosystem function).<br>– Advocates a precautionary approach for the benefit of conservation of marine resources where an absence or paucity of data exists.<br>– Should be publicised and disseminated across all scales.<br>– Ensure an effective legal and administrative framework at the local and national levels etc.<br>– States should ensure that sanctions are adequate in severity to be effective.<br>– Make provisions to refuse, withdraw or suspend masters and/or officers charged with a fishing offence from serving as masters or officers of a fishing vessel.<br>• Implemented through:<br>– Cost-effective availability of data: timely, complete and reliable statistics on catch and fishing effort are collected, maintained and disseminated in sufficient detail to allow sound statistical analysis.<br>– Arrangements for data exchange agreements and/or systems between States.<br>– Effective monitoring, control, surveillance and law enforcement measures including observer programmes, inspection schemes and vessel monitoring systems.<br>– Promoted and where appropriate, implemented through RFMOs and or consensus arrangements.<br>• States duties<br>– Ensure that only authorised fishing operations occur within their waters and that they are carried out in a responsible manner.<br>– Maintain a contemporary record of all fishing authorisations.<br>– Maintain reliable statistical data on all authorised fishing operations<br>– States should cooperate to establish systems for monitoring, control, surveillance and enforcement of applicable measures with respect to fishing operations and related activities in waters outside their national jurisdiction.<br>– Enhance through education and training programmes the education and skills of fishers and, where appropriate, their professional qualifications. |

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| | • Flag State duties<br>– Maintain a vessel register, detailing their ownership and authorization to fish.<br>– Ensure that fishing vessels fishing in international waters or in waters of another State are:<br>▪ Authorised by an NCA; and carry the authorisation onboard.<br>▪ Are marked in accordance with uniform and internationally recognisable vessel marking systems<br>▪ Fishing gear should be marked for identification purposes and in accordance with uniform and internationally recognisable gear marking systems.<br>– Should ensure compliance.<br>– Should take enforcement measures against fishing vessels found to have contravened conservation and management measures.<br>– Ensures sanctions are adequate to secure compliance and discourage violations; plus deprive offenders of the benefits from their illegal activities including: refusal, withdrawal or suspension of the authorisation to fish.<br>– Ensure that fishing is conducted with due regard to the protection of the marine environment.<br>– Make every effort to ensure that documentation with regard to fishing operations is collected and forwarded systematically to respective bodies:<br>▪ Retained catch of fish and non-fish species and discards,<br>– Establish programmes, such as observer and inspection schemes, in order to promote compliance with applicable measures.<br>• Port State duties<br>– Assist flag States when a fishing vessel is suspected of non-compliance of conservation and management measures<br>– Establish mechanisms for cooperation and coordination among national authorities of Port and Coastal States involved in planning, development, conservation and management of coastal areas.<br>– States should ensure that the authority or authorities representing the fisheries sector in the coastal management process have the appropriate technical capacities and financial resources.<br>• Trade<br>– States should ensure that international and domestic trade in fish and fishery products accords with sound conservation and management practices through improving the identification of the origin of fish and fishery products traded.<br>– States should establish and maintain effective national safety and quality assurance systems to protect consumer health and prevent commercial fraud.<br>– States should collect, disseminate and exchange timely, accurate and pertinent statistical information on international trade in fish and fishery products through relevant national institutions and international organisations. |

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| FAO International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing. Rome, FAO. 2001. 24p. | • Provide clear definitions of IUU activities<br>• Emphasises the importance of coordination and participation by all fishing players/stakeholders:<br>– Effective implementation by all States either directly, in cooperation with other States, or through RFMOs<br>– Close and effective coordination and consultation, and the sharing of information to reduce the incidence of IUU fishing<br>– The full participation of stakeholders: including industry, fishing communities, and non-governmental organisations.<br>• Advice on implementation:<br>– Phased, comprehensive in scope and integrated;<br>– Embrace measures building on the primary responsibility of the flag State;<br>– Using all available jurisdiction and laws across port, coastal and marketing aspects of fishing;<br>– Identifies that the obligations of flag States extends to nationals e.g. prosecuting unregulated fishing<br>• Obligations of States<br>– Take measures or cooperate to ensure that nationals subject to their jurisdiction do not support or engage in IUU fishing.<br>– All States should cooperate to identify those nationals who are the operators or beneficial owners of vessels involved in IUU fishing.<br>– States should discourage their nationals from flagging fishing vessels under the jurisdiction of a State that does not meet its flag State responsibilities.<br>– Sanctions<br>▪ Consistent and transparent application<br>▪ Apply to IUU vessels and nationals under its jurisdiction<br>▪ Are of sufficient severity to effectively prevent, deter and eliminate IUU fishing and to deprive offenders of the benefits accruing from such fishing.<br>– Undertake sufficient screen activities to avoid providing economic support, including subsidies, to companies, vessels or persons that are involved in IUU fishing.<br>– States should undertake comprehensive and effective MCS<br>▪ Scope: from commencement of fishing, through the point of landing, to final destination;<br>▪ Schemes for access to waters and resources; and vessel authorisations;<br>▪ Maintain records of vessels, their owners and operators, and authorisations;<br>▪ Implement a vessel monitoring system (VMS) and a requirement for vessels to be equipped with VMS as a condition of authorisation;<br>▪ Implement observer programmes where appropriate;<br>▪ Provide training and education to all personnel involved in MCS operations;<br>▪ Plan fund and undertake effective MCS operations; |

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| | ▪ Promote industry knowledge and understanding of the need for, and their cooperative participation in MCS;<br>▪ Promote knowledge and understanding of MCS issues within national judicial systems;<br>▪ Establish and maintain systems for the acquisition, storage and dissemination of MCS data;<br>▪ Ensure effective implementation of national and internationally agreed boarding and inspection regimes<br>– States should develop and implement national plans of action for IUU consistent with the objectives of IPOA as an integral part of their fisheries management programmes and budgets.<br>▪ Review the implementation of these plans for their cost-effectiveness in order to improve their performance;<br>▪ Ensure plans are coordinated e.g. across NCAs and natural resource management objectives.<br>• Cooperation between States<br>– Coordinate their activities and cooperate directly, and through RFMOs.<br>– In particular, should:<br>▪ Exchange data or information from records of vessels<br>▪ Cooperate in effective acquisition, management and verification of all relevant data and information from fishing;<br>▪ Allow and enable their respective MCS practitioners or enforcement personnel to cooperate in the investigation of IUU fishing;<br>▪ Collect and maintain data and information relating to such fishing;<br>▪ Cooperate in transferring expertise and technology;<br>▪ Cooperate to make policies and measures compatible;<br>▪ Develop cooperative mechanisms that allow rapid responses to IUU fishing; and<br>▪ Cooperate in MCS including through international agreements.<br>▪ Nominate and publicise initial formal contact points;<br>▪ Publicise information about vessels whose authorisation to fish has been revoked and the reasons why;<br>▪ Publicise widely, including through cooperation with other States, full details of IUU fishing and actions taken to eliminate it;<br>▪ Flag States should enter into agreements or arrangements with other States and otherwise on enforcement cooperation.<br>▪ States should endeavour to make available the technical capacity and resources which are needed.<br>• Flag Sate responsibilities:<br>– Ensure vessels fishing, transport and support vessels on its register do not engage in/support IUU activity;<br>– Avoid flagging vessels with a history of non-compliance: scope includes beneficial ownership and operators;<br>– Ensure that chartered vessels do not engage in IUU fishing;<br>– Prevent/deter vessels from reflagging for the purposes of non-compliance;<br>– Avoid creating incentives for vessel owners to reflag their vessels; |

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| | – Ensure sufficient cooperation and information sharing between the NCAs responsible for vessel authorisations and registers;<br>– Maintain records of authorisation including reciprocal arrangements for a vessel to fish within the jurisdiction of a coastal State;<br>– Standard authorisation requirements: owner, master, gear, area, logbooks, observer coverage etc.<br>• Coastal State responsibilities<br>– Implement effective MCS of fishing activities in the exclusive economic zone;<br>– Cooperation and exchange of information with other States, including neighbouring coastal States and with RFMOs;<br>– Ensure that no vessel undertakes fishing activities within its waters without a valid authorisation issued by the coastal State NCA;<br>– Ensure that each vessel fishing in its waters maintains a logbook of fishing activities;<br>– Prohibits activities that may encourage IUU activity;<br>– Undertakes regulation of fishing access to prevent IUU activity;<br>• Port State measures<br>– States should establish and publicise a national strategy and procedures for port State control including: training, technical support, qualification requirements and general operating guidelines for port State control officers; plus consider capacity-building needs;<br>– Develop cooperation bilaterally, multilaterally and within RFMOs;<br>– Require vessel to provide advance notice of their entry into port plus verifiable information of: their authorisation to fish, details of their fishing trip and quantities of fish on board<br>– In those circumstances where a vessel has been engaged in IUU fishing activity, the port State, should deny access to port services.<br>– Operate a designated port scheme and exercise of the right to inspect fishing vessels;<br>▪ In the event of IUU activity take appropriate action;<br>▪ Report to the flag State/RFMO;<br>• Market-related measures:<br>– Prevent fish caught by vessels engaged in IUU fishing being traded or imported into their territories;<br>– Cooperation across States through multilateral agreements to ensure that trade in specific fish and fish products does not in any way encourage IUU fishing or otherwise undermine the effectiveness of conservation and management measures<br>– Trade-related measures: adoption of multilateral catch documentation and certification requirements; multilaterally-agreed import and export controls or prohibitions;<br>– Improve the transparency of their markets to allow the traceability of fish or fish products;<br>– Mutual assistance arrangements between States; |

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| | – Ensure that their broader sector e.g. importers, buyers, consumers, service providers, financial services and the public are aware of the detrimental effects of IUU fishing: ban such trade;<br>– Develop harmonized commodity description and coding systems; standardised and electronic certification and documentation<br>– schemes to ensure their effectiveness, reduce opportunities for fraud, and avoid unnecessary burdens on trade. |
| European Council (EC) Regulation 1005/2008: establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing.<br><br>Commission Regulation (EC) 1010/2009: laying down detailed rules for the implementation of Council Regulation (EC) No 1005/2008. | • Provides clear definitions per IUU activity<br>• Set out conditions for access to port by third country fishing vessels, specifically inspection in port schemes:<br>– Use of designated ports, prior notification and reporting (minimum information and timeline) requirements; authorisations and powers and circumstances to confiscate catch/landings if conditions are not met i.e. fishing details provided in the prior notification have not been verified/false.<br>– Port inspection schemes to be direct by risk assessment and sampling at least 5% of number of landings and/or transhipments in port.<br>– Standard inspection protocols and reporting to flag State<br>– Cooperation with a flag or coastal State to perform investigation and apply sanctions on its behalf.<br>• Promotes adoption of catch certification scheme:<br>– Requirement for fish products to be accompanied by catch certificate for import/export purposes.<br>– Must be validated by flag State – firmly puts on the onus of responsibility for manging the vessel with the flag State<br>– Standardises catch reporting; and offers a means of triangulating information with other sources.<br>– Minimum certificate submission timeline; linked to<br>▪ Necessity of importing State to verify details contained within the certificate.<br>▪ Basis for refusing import/export.<br>• Cooperation between States<br>– Notifications by flag States of their respective competence for managing their fisheries and validating catch certificates<br>– Cooperation extends to data exchange systems: evidence of IUU activity and submit official requests to take action against vessel, owner, operator;<br>– Arrangements to conduct on-the-spot third party audits by to verify the effective implementation of the cooperation arrangement;<br>– Publicising NCAs responsible for the validation and verification of catch certificates;<br>– Establishes an alert system providing information on vessels / third countries where IUU is evident;<br>– Requires MS to pursue an adequate response to investigate and verify catch certificates of similar nature: vessel, product, origin flag State; and disseminate results and conclusions on the same system; |

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| | – Establishes a vessel black or IUU list: strict protocols in place to provide affected parties an opportunity to respond to charges; and in the absence of a satisfactory response to an official request by the respective flag State;<br>– Measures for identifying non-cooperating third countries; including establishment of a list of non-cooperating third countries;<br>– Suite of actions available to MS in those instances of either a vessel of third country on an IUU list e.g.: confined to home port, prohibition of services in port, restrictions on trading goods originating from either;<br>– Provisions for a broad suit of measures and sanctions vessels, owners, operators or benefactors are subject to.<br>– Sets a suite of sanctions including benchmarks x5/x8 the equivalent value of the fishery products obtained through IUU/non-compliance.<br>– Arrangement for mutual assistance between States<br>▪ Establish an automated information system, to assist competent authorities in preventing, investigating and prosecuting IUU fishing |
| European Council (EC) Regulation No. 1224/2009. The Control Regulation.<br><br>European Commission Communication. 2018/0193 (COD): Proposal for a Regulation of the European Parliament and of the Council amending Council Regulation (EC) No 1224/2009, and amending Council Regulations (EC) No 768/2005, (EC) No 1967/2006, (EC) No 1005/2008, and | • Evaluation of MCS systems (audits permissible under article 100);<br>• Register of infringements;<br>• Point system for serious infringements; and<br>• Minimum inspection standards. |

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| Regulation (EU) No 2016/1139 of the European Parliament and of the Council as regards fisheries control | |
| Special Report 08: EU fisheries controls: more efforts needed. European Court of Auditors. 2017. | • Evaluation of MCS systems (audits permissible under article 100);<br>• Register of infringements;<br>• Point system for serious infringements; and<br>• Minimum inspection standards. |
| Hosch, Gilles. 2016. Trade Measures to Combat IUU Fishing: Comparative Analysis of Unilateral and Multilateral Approaches. Geneva: International Centre for Trade and Sustainable Development (ICTSD). | The paper sets out how trade policy plays a critical part in combatting IUU fishing and how policy can be more joined-up for greater effect through the role trade-related measures, distinguished into two categories and assesses the respective merits and limits of unilateral and multilateral approaches with regard to both types of instruments:<br><br>• Trade restrictive measures (TREMs) or trade sanctions enacted by one or more market-states; and<br>• Catch certification schemes, comprising of trade documentation schemes (TDS) and catch documentation schemes (CDS).<br><br>TDS have been used by a number of tuna RFMOs e.g. IOTC bigeye tuna statistical document, and have been successful in identifying flag of convenience (FOC) vessel operations; and deterring and suppressing trade in tuna from FoC States. However, the unintended consequences have been a shift in IUU practices in global tuna fisheries with 95% of IUU activity carried out by legally registered and licensed fishing vessels: misreporting or under-reporting of catches. The author suggests that it can be eliminated by well-designed CDS.<br><br>Multilateral CDSs provide a mechanism for validating catches by the flag State. The author proposes that if implemented effectively by the State authorities and supply chain, under-reporting by otherwise compliant, registered, and licensed fleets can be eliminated e.g. the near elimination of under reporting of Atlantic bluefin tuna catch was attributed to important market states, significantly Japan, enforcing the relevant CDS: imports of Atlantic bluefin tuna into Japan fell by 90% following implementation of the scheme.<br><br>CDS and TDS work, because without a valid certification, the market value of illegal fish is significantly suppressed; thus reducing the financial incentives to engage in IUU fishing e.g. certified Patagonian toothfish has been shown to trade at prices 20–30% higher than non-certified product, and non-certified Atlantic bluefin tuna in the Mediterranean has been reported to lose 85% of its legal international market value. The paper does note that enforcement of a |

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| | CDS/TDS is likely to cause short-term economic and social costs, but will be balanced by long-term economic and social impact of stocks recovering as a result.<br><br>When comparing multilateral and unilateral approaches to schemes, Hosch highlights the short-comings of unilateral system e.g. the EU operates a unilateral CDS, at the time of publishing (2016) it was only in paper form allowing opportunities to fraudulently launder IUU fish: prevents the cross-checking of information among the different EU border control agencies.<br><br>Hosch points out that unilateral CDS are inherently difficult to enforce given a significant proportion of the same fisheries products may circulate through most of the supply chain without certificates i.e. how can the supply chain distinguish between IUU and non-IUU material. Conversely, multilateral systems cover and protect entire fish stocks/fisheries or at the least allow the interrogation of catches if the CDS/TDS has been effectively implemented. Therefore the direct positive impact of multilateral systems is greater.<br><br>Hosch compares the use of TREMs by the EU and USA: the EU's uses TREMs in the form of yellow cards (identification of non-cooperating countries) and red cards (ban on imports) and concluded that it has limited effect because they are restricted to flag States only, whilst port or market states that actively participate in the laundering of IUU products remain relatively unaffected. Furthermore, these trade restrictions are broadly applicable to all fish and all fleets of the offending flag State regardless of whether a specific entity was responsible for the IUU. Consequently, disproportionate impacts will be felt by small-scale fisheries. Small-scale fisheries are inherently unable to escape embargoes on their flag state, while industrial operators generally have the option of reflagging their vessels to avoid flag state-related restrictions.<br><br>However US TREMs or red card equivalents are more precise: designed to target only fleets, species, and product types directly tied to the IUU fishing activity.<br><br>Plus, Hosch comments on the decision-making process of identifying countries again comparing the EU and USA: He suggest that that EU system is opaque and that the standards on which decisions to identify (or not to identify) specific countries are based are unclear. In the US, on the other hand, biennial reports to Congress provide detailed information on cited infractions, the reasons behind a country's identification, and the reasons for an identified country's positive certification. The countries identified by the US and the EU are fundamentally different. Only three countries out of 51 identified appear on both lists. EU identifications are currently confined to Africa, Asia, the Caribbean, and the South West Pacific; 48% are small island developing states (SIDS). US identifications are more evenly distributed between world regions and target more developed fishing nations. The largest number of |

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| | identifications is of South American countries, closely followed by EU member states, which represent 25% of all US identifications.<br><br>EU identifications appear to have pushed some identified countries to improve frameworks for fisheries governance, but there is no clear evidence as yet that this has translated into actual reductions in IUU fishing. It is also not clear what tangible effect the US system has had on IUU fishing because no sanctions have been implemented to date. More broadly, however, the impact of unilateral TREMs on IUU fishing, and hence on fish stocks, may in fact be greater than that of unilateral CDS.<br><br>Hosch goes further on the merits of unilateral identification and sanctioning process: it is likely to be more effective in changing the behaviour of countries if they export significant amounts of seafood to the market imposing the sanctions. If soft flag, port, and processing states can be pushed, through the application of transparent and fair trade-restrictive measures, into becoming more responsible, the impact of unilateral TREMs could be substantial.<br><br>The paper provides the following conclusions and recommendations:<br><br>• RFMOs should be supported and strengthened so that they can continue to deliver and expand multilateral solutions to the problem of IUU fishing in shared fisheries. Unilateral end-market CDS may protect markets from sourcing a wide range of illegally harvested products, but because they close off only one market to IUU products, they may have limited overall impact on IUU fishing and the sustainable management of individual fish stocks.<br>• Policymakers looking to improve the effectiveness of multilateral and unilateral CDS could consider focusing on the following:<br>– Systems should be based on a technically sound design which achieves verifiable traceability and encompasses supply chain operators at flag, port, processing, and market state levels in an even-handed manner;<br>– Systems should be designed around a central certificate (or data) registry spanning the full supply chain to achieve verifiable traceability;<br>– Verifiable traceability requires online electronic submission and validation of data within a centralised repository at every step along the supply chain;<br>– CDS ought to be risk based and apply only to fisheries suffering from established and serious IUU fishing issues.<br>• Policymakers looking to improve the effectiveness of multilateral and unilateral TREMs could consider focusing on the following:<br>– Ensuring that TREMs are as species- and product-specific as possible, in order to address IUU problems with precision and minimise undue economic and social impacts;<br>– Ensuring there are clear standards regarding what constitutes IUU fishing, clear rules and procedures for the identification of countries, and transparent public records on dialogues with potential targets of TREMs; |

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| | – Designing TREM provisions in a way that allows countries to be identified in their capacity as flag, coastal, port, or market states, and to be sanctioned in those same capacities;<br>– Using regional trade agreements (RTAs) as an avenue for enhancing the regulatory coherence in the design and application of unilateral trade instruments. Eventually, governments could consider adopting a multilateral approach to TREMs, for example in the World Trade Organisation (WTO).<br>• A further focus for work could be how to improve the coherence, and eventual multilateralisation, of various CDS initiatives. In this regard, policymakers could consider the following:<br>– New and existing unilateral schemes ought to devise means for mutual recognition and equivalence of their certificates. Systems could then be aligned. The merging of unilateral CDS would eventually produce de facto multilateral systems, which could then be opened up for expanded end-market state membership;<br>– The international community could assess the feasibility of the development and operation of global multilateral CDS systems, designed to apply to specific species of fish in need of protection from IUU fishing throughout their global geographic range. |
| | • Port State MCS implementation framework:<br>– Designated ports<br>▪ Publicised and adequately resourced and equipped – physical assets and trained personnel;<br>▪ Internal (local and national) and external (regional and international) interfaces:<br>o Coordinated deployment/intervention and decision-making;<br>o Integrated data exchange arrangements and apparatus;<br>– Defined and legally supported conditions for port use e.g. prohibit IUU/non-contracting party of RFMO vessels from using port facilities<br>– Operationally<br>▪ Reliable data exchange and communication systems (internal/external) e.g. report outcomes to flag State;<br>▪ Access to expertise e.g. fishing data interpretation, fisheries lawyers/legal advice; risk profiling;<br>▪ Minimum inspection standards in port,<br>o Standardised recording and reporting protocols between national NCAs and external partners/flag States;<br>o Verification of vessel authorisations and catch documentation<br>▪ Clear definitions of infringements.<br>• Obligations of vessels using ports to discharge catch<br>– Minimum notification period;<br>– Reporting obligations: vessel identity, ownership and registration details, fishing effort (where and when), catch on board, authorisations, gear, VMS details.<br>• Obligations of flag States |

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| | – Require its vessels cooperate with the port State inspections;<br>– Request port States to inspect/deny port service to its vessels if IUU activity is suspected;<br>– Encourage vessels to ports in States that are acting in accordance with, or in a manner consistent with the PSM;<br>– Identify procedures for identifying any State that may not be acting in accordance/consistent with the PSM;<br>– Immediately and fully investigate its vessels suspected of IUU activity following a port inspection;<br>– Report to other Parties, port States and RFMOs actions it has taken in respect its vessels that as a result of PSM have been determined to have engaged in IUU fishing activity<br>– Ensure measures applied to vessels engaged in IUU activity are effective in preventing, deterring, and eliminating further IUU activities. |
| FAO The Voluntary Guidelines for Flag State Performance 2014. | The performance assessment criteria for:<br><br>• General principles and rules<br>– The flag State has incorporated binding international law into its domestic laws, regulations, policies and practices and ensure that its vessels do not engage in any activity that undermines the effectiveness of international conservation and management measures including those under the auspices of a RFMOs.<br>– The flag State implements its duties as a contracting party or as a cooperating non-party of a RFMO including reporting requirements for fishing and fishing related activities and compliance of its vessels; and compliance within areas under the national jurisdiction of other States.<br>– The flag State supports cooperation among flag States on managing capacity and fishing effort, catch limits and output controls.<br>• Flag State fisheries management responsibilities:<br>– Established an institutional, legal, technical foundation or framework for fisheries management<br>– Adopted laws, regulations or other arrangements implementing conservation and management measures<br>– The flag State effectively implements conservation and management measures:<br>▪ Clear and effective communication with vessel owners, operators and crews on their obligations;<br>▪ Provides guidance to the fishing sector to meet these obligations;<br>▪ Effectively manages the fishing and fishing related activities of the vessels.<br>• Information, registration and records<br>– Follows minimum requirements, e.g. transparent and accessible i.e. authorisations, standard specifications for marking and identification; including restrictions on registration;<br>– Information on dimensions, beneficial owners, vessel owners and operators;<br>– Historical vessel profiling and cooperation with other flag States;<br>– Follows registration procedures including IUU screening and lists; updates and exchanges with other NCAs and States. |

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| | • Authorisations<br>– Robust and effective licencing regime in place: fishing authorisation, compliance with regulations<br>– and with the sustainability of the relevant stocks.<br>• MCS and enforcement<br>– Implements a control regime over vessels:<br>▪ Monitoring tools, such as VMS, logbooks/documentation, and observers;<br>▪ Mandatory fishing recording and reporting requirements;<br>– Inspection system, on land/port and at-sea<br>▪ Resources to detect and take enforcement action; conduct timely investigations and an appropriate system for the acquisition, collection, preservation and maintenance of the integrity of evidence;<br>▪ Make that information available to other States/RFMOs;<br>– Undertakes comprehensive and effective MCS commensurate with IPOA-IUU;<br>▪ Participates in JDPs/JIS;<br>▪ Takes action when vessels flying its flag are identified participating in IUU activity;<br>– Promotes knowledge and understanding of MCS issues within national judicial and administrative systems;<br>– Sanction system<br>▪ Commensurate to benefits derived from the infringement; consistently applied and represents an effective deterrent:<br>▪ Promotes and facilitates cooperation and mutual legal assistance, including as appropriate information sharing and reporting arrangements with other States, international organisations including RFMOs;<br>▪ Ability to prohibit/revoke authorisation of those vessels with history of non-compliance and outstanding sanctions.<br>• Cooperation between flag States and coastal States<br>– Cooperate with coastal States it has entered into fisheries access agreement with;<br>– Implement its respective obligations as per the agreement; and make appropriate provisions and commit sufficient resources prior to fishing activity;<br>– Ensure vessels are authorised accordingly;<br>– Impose sanctions that may be applied by a coastal State under the coastal State's own laws and jurisdiction, for fishing related infringements that have occurred in maritime areas under coastal State jurisdiction.<br>• Procedure for carrying out assessments<br>– Conduct performance assessments periodically.<br>– If undertaking a self-assessment:<br>▪ Adopt a transparent process, make the results publicly available;<br>▪ Consider the participation of an independent assessor;<br>▪ Consider international mechanisms for self-assessment, including assistance; |

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| | ▪ Consider possible linkages with multilateral assessment, including a global standard.<br>– If undertaking an external assessment:<br>▪ Invite a competent multilateral body or another State or States to conduct the assessment;<br>▪ Ensure transparency and international law. |
| Costs and Benefits of Control Strategies: COBECOS. 2009 | The objective of COBECOS was to conduct a cost-benefit analysis of control schemes for management strategies relevant for the CFP and, based on this analysis, infer the potential economic benefits which might accrue from proper enforcement of the management measures. The process involved:<br>• an appropriate theory of fisheries enforcement,<br>• empirical research involving intensive case studies and estimation of theoretical relationships,<br>• computer modelling of fisheries enforcement (based on the theory and empirical estimations)<br>The case studies comprised of nine different European fisheries: activity, the type of management and enforcement system in place.<br>The approach required the development of a standard data description applicable to all fisheries; and to provide data necessary for the estimation of theoretical relationships and the constructions of a practical computable enforcement model for the fishery.<br>Consequently a suite of six fisheries categories and their respective indicators were proposed to characterise the nine case study fisheries (see opposite).<br>The literature review focused on the enforcement category and highlights the importance of understanding the application/suitability of enforcement tools for different management measures, cost-effective surveillance; understanding fishing practices and behaviours, and the significance of undertaking a review and/or performance evaluation.<br>The study also highlighted those data could not be obtained for each case study fishery e.g. efficiency of the system (probability of being apprehended); expected link between the evolution of the management systems in the country and the evolution of compliance; estimates of IUU; total cost of VMS.<br>The data for each case study fishery was organised into six categories for harmonisation purposes:<br>1) General settings of the fishery<br>2) Technical characteristics of the fleet<br>3) Biological characteristics of the fishery |

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| | 4) Socio-economic characteristics of the fisheries<br>5) Management of the fishery<br>6) Enforcement of the fishery<br>Each data category was described followed by a set of indicators e.g.: those for Management and Enforcement are provided below as examples.<br><br>Management of the fishery<br><br>This set of information aims at describing the institutional settings of the fishery, including the governance and the compliance issues.<br><br>• The categorization of the management system, using the three criteria proposed the OECD (OECD, 2006, "Using market mechanism to manage fisheries"):<br>• the description and evolution of the management approach (administrative or "command and control" vs incentive / economic instruments)<br>• the description and evolution of the main management objective(s) followed (e.g. maintaining fish stock productivity vs regulating access)<br>• the variable of control used: input (fishing effort) vs output (catch) based methods<br>• The description of the management system:<br>• the main objective followed (profitability, biological, employment, environmental)<br>• the organisation of the decision-making process (Top-down vs. self-management)<br>• the quantitative evolution of the management regime (Number of licenses or other access rights)<br>• the evolution of the cost of managing fisheries during the last years (decades) – figure<br>• the existence of cost recovery schemes<br>• A list of the main stakeholders by importance if relevant<br>Indicators included: Number of licenses, catch quota, allowed fishing days, minimum landing size, minimum mesh size, marine protected areas, seasonal closures, cost recovery<br><br>Enforcement of the fishery<br><br>The description of the enforcement system should include:<br><br>• the organisation of the system of control: type (VMS, control at sea, log-books…) - including its coverage (e.g. % of the fleet equipped with VMS) |

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| | • the evolution of the system of control during the last years (decades)<br>• the evolution of the enforcement cost during the last years (decades)<br>• the evolution of compliance (if possible quantitative data or at least indication of the trends – increase or decrease)<br>• the evolution of the type (fine, licence withdrawal) and structure (administrative vs. penal) of expected sanctions (the "penalty structure") (if possible quantitative data or at least indication of the trends – increase or decrease)<br>• the efficacy of the system, in particular with respect to the perceived probability of being apprehended (yes or no, explain).<br>• the expected link between the evolution of the management systems in the country and the evolution of compliance (i.e. whether the move towards increased regulations modified the compliance behaviour)<br>• the expected link between the evolution of the management systems and the – effective – fishing pressure (i.e. whether the move towards increased regulations affected the fishing pressure)<br><br>Indicators included: Total cost of VMS, average cost of VMS poll, Controlled fisheries area as percentage of total are to be policed by country; number of patrol vessels; number of onboard inspections, cost per boarding.<br><br>The study also described enforcement tools in the context of:<br><br>• Assessment of compliance with management measures – Can the enforcement tool accurately determine the level of compliance of the vessels (or fishers) operating in a fishery with respect to the set of management measures in place?<br>• Detection of unlicensed vessels / fishers – Can the enforcement tool detect any unlicensed vessels or fishers that are operating in the fishery and to what level?<br>• Power of arrest / Evidential value – Does the enforcement tool in itself have power of arrest of vessels or fishers that contravene the management measures and what is the value of the evidence from this tool, i.e. can a conviction be made based solely on the evidence from this one tool?<br><br>COBCOS output on Enforcement tools<br><br>The study clearly described the relationship between management measure and suitability of enforcement tools: each enforcement tool will have different relative efficiencies and detection profiles in terms of the detection of infractions of each management measure; different qualities of evidence and possibly the level of fine or sanction that can therefore be imposed. Some may not have the power of arrest and may require the use of one or more means to facilitate arrest, (e.g. you can detect a zone violation with VMS, but you may need a patrol vessel or aerial surveillance to prove fishing is taking place, and a patrol vessel or port inspection team to actually arrest and detain the vessel).<br><br>A summary of which enforcement means can be applied to each management measure was illustrated e.g. use of a patrol vessel is suitable for a broad range of controls: target species quota, bycatch species quota, PET species limits, |

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| | fleet size, effort days at sea, effort, closed seasons, closed areas, gear restrictions, engine size, move on rules, size restrictions, discard bans. Plus possesses powers of arrest.<br><br>Furthermore the study highlighted the importance of measuring the effectiveness of any enforcement strategy or tool, recommending a baseline with which to compare the effect using agreed methods and standard indicators which must be easily interpreted by the fisheries managers, fishers and all other interested stakeholders. It also noted that the effect of a single measure would be difficult to estimate given the integrated approach and complexity of fisheries. |
| Association of Inshore Fisheries and Conservation Authorities (IFCAs) Annual Plan 2016/17.<br><br>Guidance to Inshore Fisheries and Conservation Authorities (IFCA) on the establishment of a common enforcement framework. | The Annual Plan sets out five high level objectives (HLOs) and success criteria (SC), paraphrased here: IFCAs will manage a sustainable marine environment and inshore fisheries, by balancing social, environmental and economic benefits. The SCs are articulated as suite of actions, linked to aims, performance indicators and timeline.<br><br>Enforcement is addressed in SC2: implement a fair, effective and proportionate enforcement regime. It recognises the ongoing need for effective engagement with National Inshore Marine Enforcement Group (NIMEG) on changes to policy that impacts enforcement matters; and for effective joint enforcement with national partner, the Marine Management Organisation (MMO), demonstrated through the implementation of a shared joint intelligence project that reflects both the IFCA and the MMOs risk-based enforcement by the end of 2017.<br><br>SC3 recognises the importance of an evidential basis to develop appropriate measures. Actions include reports, published every five-years, on the review of byelaws and MPA byelaws; assessing progress and awareness of IFCA's lead role in delivery of a well-managed network of MPAs by 2016.<br><br>Identifies the need for supporting IFCAs evidence gathering by linking to programmes to national data gathering frameworks and through working with membership and partner NCAs, MMO and DEFRA, to inform and elevate awareness of policy changes and implications related to byelaw revision. Resultant outcome is the provision of up to date information provided to IFCAs in the form of recommendations to senior managers and Members and support for the IFCA Technical Advisory Group (TAG).<br><br>The Guidance provides the structure of a common enforcement framework that can be adopted by IFCAs following consideration of IFCA's functions and resources and consultation. The framework is aimed at promoting efficient and effective approaches to regulatory inspection and enforcement, consisting of:<br><br>• An advice and guidance policy statement incorporating the key principles that will help those regulated understand regulations and how to comply with them.<br>• A sanctions policy statement to inform those regulated of the possible sanctions that may be applied for breaches of byelaws and how sanctioning decisions will be made. |

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| | • Principles for embedding risk-based enforcement approaches.<br>• A common structure and approach to handling complaints.<br><br>Approaches set out include:<br><br>• Standardising advice and guidance, particularly on engaging with fishers:<br>– Clear.<br>– Standardising provisions for dealing with complaints, incorporating a review and corrective approach;<br>– Objectives of enforcement; and the links between enforcement, decisions on prosecution, plus the aims and application of sanctions;<br>– Applying an evidence-based marine management cycle, aspects of which deal with risk management and enforcement.<br>– Deploying standardised inspection procedures and common enforcement approaches to help achieve the high-level enforcement objectives agreed across IFCAs<br>– Embedding the Five Principles of Good Regulation:<br>▪ Proportionate: Enforcement action appropriate to the threats/risks posed.<br>▪ Accountable: IFCAs to justify enforcement activities and decisions, and be subject to public scrutiny.<br>▪ Consistent: IFCAs" enforcement rules and standards to be joined-up helping to establish a common playing field for those regulated.<br>▪ Transparent: Enforcement action should be open, and transparent.<br>▪ Targeted: Enforcement activity focused on the threats by applying risk-based approaches<br><br>The Guidance also defines IFCA parameters for best practice on the Principles of Good Regulation when devising, enforcing and reviewing regulations:<br><br>• Proportionate: Enforcement action appropriate to the risk posed.<br>• Accountable: Justifying decisions and subject to public scrutiny.<br>• Consistent: IFCAs" rules and standards (where appropriate) are joined-up and implemented in a consistent way.<br>• Transparent: Enforcement action that is open and transparent.<br>• Targeted: Enforcement activity focused on the threats, by applying risk-based approaches<br><br>The Guidance also recommends that applying risk-based enforcement principles and methods should take account of risk profiling, impact and potential of the risk, and available enforcement resources. |