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# Monitoring, control and surveillance of protected areas and specially managed areas in the marine domain

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ABSTRACT

A checklist is provided for monitoring, control and surveillance (MCS) actions to be applied in the areal-based management of marine fisheries and attached biodiversity conservation needs. The application of MCS to underpin compliance enforcement in marine protected and specially managed areas is seen as important in addressing such needs. Spatial, temporal, management and practical considerations are identified as important implementing considerations for effective MCS-based compliance enforcement. Most notably, human activity impact mitigation appears to possess the greatest potential to reduce potentially-harmful and cumulative long-term effects across all relevant spatial-temporal ranges considered. Equally, selection of suitable MCS approaches requires careful consideration of spatial and/or temporal constraints, as well as regulatory requirements. Express reference is therefore made to conservation measures adopted by the Commission of the Conservation of Antarctic Marine Living Resources (CCAMLR) as examples of where specific, areal-based, precautionary, ecosystem-directed and operational MCS measures have been applied. It is concluded that customary MCS measures are suitable for both fisheries management and biodiversity conservation in protected, or specially managed, areas. The importance of cost-benefit considerations, management feedback and information review is also discussed in the context of minimising protected-area MCS costs.



## 1. Introduction

The 2012 United Nations Conference on Sustainable Development (Rio+20) built on previous World Summits to promote ocean conservation and management [1] pursuant to Chapter 17 of Agenda 21 [2]. Most notably, Sub-Paragraph 177 of Rio+20's outcomes paper (The Future We Want) reaffirmed the importance of area-based conservation measures. The Conference noted Decision X/2 of the Tenth Meeting of the Parties to the Convention on Biological Diversity that 10% of coastal and marine areas are to be conserved through '… ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures' [3]. These areas are seen as useful tools for protecting biodiversity and ameliorating the effects of destructive fishing practices.

The implementation of protected areas on the high seas has progressed since the last World Summit in 2002. In particular, biodiversity conservation has been advanced through a number of international marine governance arrangements.[1] This has been achieved despite concerns that the fisheries aspects attached to such areas may not be fully understood, or appropriately taken into account when protecting them [4].

Despite these developments, a question remains on how protected marine areas may be managed in a practical sense. This particular issue has not been comprehensively addressed, particularly in terms of ensuring compliance[2] with, and enforcement of, regulatory provisions. The situation is complicated by the fact that the levels of protection required may range from simply limiting fishing, and/or other human activities, to the complete prohibition[3] of any forms of activity, use or extraction in the area(s) concerned. Furthermore, there has only been limited

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[1] On the high seas, notable developments have included marine protected areas designated by Regional Fisheries Management Organisations (RFMOs) such as the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), Northwest Atlantic Fisheries Organisation (NAFO) and South-East Atlantic Fisheries Organisation (SEAFO), as well as regional arrangements like the OSPAR Commission, set up under the Convention for the Protection of the Marine Environment of the North-East Atlantic.

[2] 'Compliance' is defined as—"conforming to regulatory requirements including, but not limited to legislative provisions, regulations, rules, standards, orders and emergency directives". 'Enforcement' is defined as — "the measures taken to bring about compliance".

[3] Areas where fishing, or other stipulated activities are prohibited, are termed "no-take" zones or "closed" areas.

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elaboration of the compliance enforcement actions required, or how they will be applied.

Monitoring, control and surveillance (MCS) are the customary tools for compliance enforcement and combating illegal, unreported and unregulated (IUU) fishing. Their general purpose is to underpin implementation of agreed policies, plans and strategies for management, as well as to augment fisheries regulation [5]. Given the currently limited appreciation of how MCS may be effectively applied to marine specially managed, and/or protected areas, this paper outlines how such application might be achieved. A practically-based, MCS action framework has been developed to account for, and to address, key compliance enforcement needs for sustainable fisheries and biodiversity conservation. The framework identifies spatial, temporal, management and practical considerations likely to affect MCS implementation in protected marine areas.

## 2. What is MCS?

A 1981 FAO Expert Consultation defined MCS as:

- 'Monitoring': Continuous requirement for measurement of fishing characteristics and resource yields, which implies supervising and observing relevant activities with appropriate reporting;
- 'Control': Regulatory conditions under which the exploitation of resources may be conducted;
- 'Surveillance': Degree and types of observations required to maintain compliance with the regulatory controls imposed on fishing activities [6].

The implicit consequences are that any regulatory action, and/or sanction, arising from MCS requires that non-compliance with a regulatory provision(s) is **detected** as a 'relevant object, error or crime'. '**Interception**' then leads to seizure, or apprehension, of the perpetrators of non-compliant activities. '**Interdiction**' follows and this results in actual seizure of the person(s), vessel(s) or catch involved. **Restraint** is applied to prohibit further non-compliant activity. Finally, '**Deterrence'** ensures that the potential benefits of non-compliant activity are minimised [7].

In its entirety, MCS is a key element in the 'enforcement triangle' [8], which comprise a range of actions, legal steps and processes to counter non-compliant activities. Exchanging information, or 'intelligence', and education, form the triangle's base. In particular, education improves appreciation of, and insight into, why regulatory measures are necessary. It also serves to legitimise the measures themselves. Consequently, education and knowledge come into effect when MCS initiates regulatory action, with such action ranging from administrative sanctions to prosecution and criminal conviction. Equally, fines and the payment of recompense also constitute actions to promote deterrence and punish non-compliance.

As emphasised by Sumaila et al. [9], the probability of detection is usually linked to the probability of non-compliant activity taking place. Therefore, low detection probability often encourages non-compliant activities. Equally, low deterrence enhances the likely profits of non-compliant activities, thereby further reducing the risks a perpetrator faces in pursuing non-compliant activities.

## 3. Spatial and temporal considerations

Initially, it must be acknowledged that the key natural qualities of any ocean space are confined by space and time [10]. The space's physical dynamics underpin a continuum of attached biological responses and attributes. Fig. 1 shows that the population dynamics (e.g., physiology and behaviour) of marine organisms overlap in space and time, with physical driving forces, such as ocean mixing or diffusion, impacting where, and how, such organisms lead their lives. These driving forces are further linked to specific physical events (e.g., upwelling fronts) that occur over scales of between 10's and 100's of kilometres, and complementary temporal scales of days to years.

Fig. 1 further demonstrates that various key factors identified by the FAO [11] are important when considering protected, or specially managed, marine areas in terms of their biodiversity conservation and fisheries management needs. Such needs reflect space-time associations for the particular fishery or biodiversity properties concerned. They are also a function of the inherent aggregating characteristics of harvest target species or biodiversity assemblages. For example, a fishery may target fish shoals at scales between 1 km (individual shoals) and 100 km (groups of shoals), as well as over periods ranging from days to years. Effects of fishing on biodiversity assemblages would occur over similar scales.

Put another way, the time and space associations described above characterise the 'natural realm'. In this realm, physical and environmental properties, as well as natural variability, play the dominant role in determining how organisms respond to the physical space in which they find themselves and over what time scales these responses take place.

The natural realm is essentially beyond the reach of human management actions. While the consequences of human activities

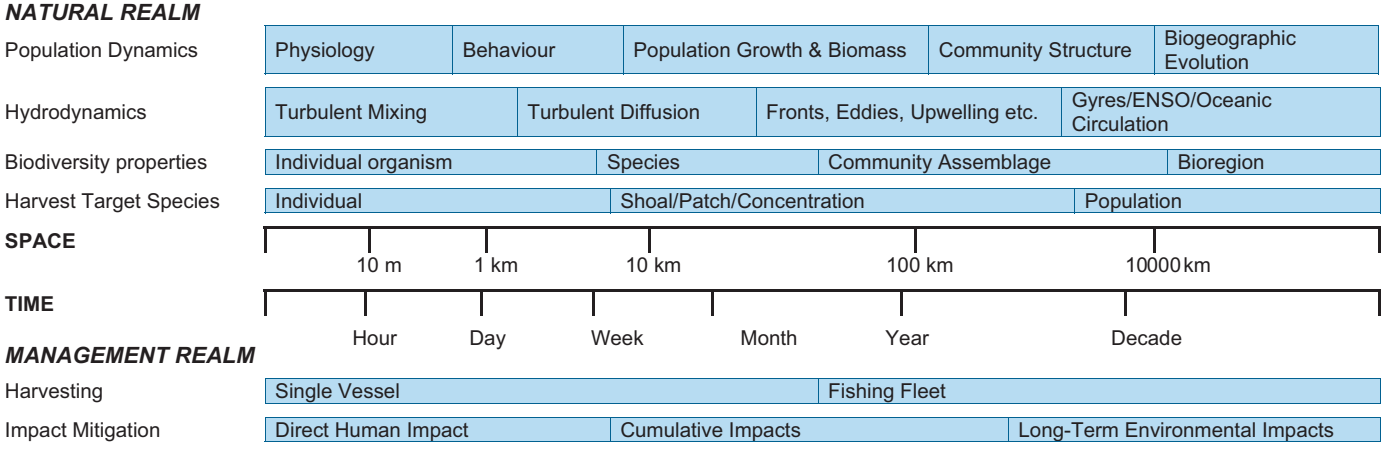


**Fig. 1.** The spatial and temporal structure of the 'natural' and 'management' realms as a function of ecological and physical properties. (See text for explanation).