Satellite-based vessel monitoring systems

# Beam it to me, Fishie!

**Space-age satellite technology has all the potential to become an important management tool in fisheries**

Satellite technology is useful for the exploitation and exploration of marine living resources in a variety of ways. Remote sensing techniques improve our understanding about the seas and oceans in general, but also more specifically about abundance and distribution of target stocks. Satellites are also increasingly used for two-way communication between ship and shore or between ships. Many of the larger fishing operators depend on this to optimize their business strategies. The focus of this article is on relatively recent developments in using satellite technology for the monitoring and surveillance of fishing vessels.

So-called 'satellite-based vessel monitoring systems (VMSs)' provide management authorities with near real-time information about fishing vessels and their activities. In most cases, this information is limited to the vessel's identity and location, but a range of other data could be transmitted as well. This could be information that is 'voluntarily' provided by the master of the ship (e.g. catch reports) or information that is automatically generated. For instance, on-board sensors could disclose the vessel's speed and direction, the operational status of the engine or the hydraulic boom used for fishing gear, or the sea temperature and salinity in the vessel's vicinity. The latter option is already in operation in the Maldives, for instance.

All vessels covered by a satellite-based VMS are equipped with an automatic location communicator (ALC). Sometimes referred to as a 'blue box', an ALC ascertains its position through a fully integrated global positioning system (GPS) and transmits this and other selected information via a satellite to a fisheries monitoring centre (FMC) on shore. Many alternative applications are possible. The main providers of satellites are Inmarsat, Argos and Eutelsat.

Depending on the manufacturer and satellite system used, the cost of an ALC currently ranges between US$1,500 to US$3,500. Data entry terminals (if necessary) range from US$400 to US$1500. The latest types of ALCs are smaller than a soccer ball. Some are even fully self-contained, with their own power supply and thus suitable for artisanal fisheries. The amount of training needed to operate ALCs depends on the type of information to be transmitted. If this is limited to automatically generated information (e.g. identity, location, speed and direction), only very little instruction is necessary. More training is required with extended applications, for instance the transmission of catch reports. However, it can be expected that technological innovations will continue to simplify operation.

Data on the vessel's identity and location allow the FMC to check compliance with closed areas or seasons, or restricted fishing effort through fixed fishing days. A vessel's speed and navigation patterns often reveals a so-called 'fishing signature', which indicates it is engaged in fishing. This can even be used for multiple-licence (multiple-species) fishing, as most types of fishing have a more or less unique fishing signature.

**Sophisticated features**

Features of sophisticated systems such as the one operated by the South Pacific Forum Fisheries Agency (FFA), include remote 'polling' where the frequency of vessel position reports can be varied at wish, and 'decision engines' which automatically carry out the polling

function and generate recommendations on the necessary steps of enforcement.

The advantages of satellite-based VMSs have appealed to many fisheries management authorities at the national and regional level. Not only do most developed States already use or intend to use this technology, more and more developing States are following suit. Regional fisheries management organizations in the Central and Western Pacific, in the Atlantic (three different organizations), and in the Southern Ocean already have the systems in place or have installed pilot programmes. Many more are expected to follow. These developments indicate that the obligatory use of ALCs is likely to be introduced in all major industrial fisheries within the next few years.

The popularity of this new technology relies, to an important extent, on its proven utility in two key tasks: data gathering and ensuring compliance with management objectives. It is evident that satellite-based VMSs enables the compilation of a wealth of data on a near real-time basis and, at the same time, it is significantly more economical, compared to traditional means of surveillance by boat or aircraft. The integration of this information with data obtained through other sources will ultimately create a sophisticated and powerful tool for enhancing not only compliance but fisheries management in general.

At the same time, care should be taken not to regard this technology as an absolute necessity in all situations or a panacea to all management problems. The 'high-tech' character might be so alluring that a blind eye is turned to the technology's shortcomings. The first thing policymakers should, therefore, do is to assess whether, in the specific circumstances, a satellite-based VMS is the most cost-effective compared to other means of data gathering and ensuring compliance. The need for such an assessment addresses essentially the same concerns as those on the suitability of management through individually transferable quotas (ITQs). Previous issues of SAMUDRA Report clearly revealed the need for a balanced approach, instead of either regarding ITQs as ideal solutions or dismissing them as utter failures.

Assessing the cost-effectiveness of satellite-based VMSs should, among other things, take full account of the system's principal limitations:

- vessels not equipped with ALCs, or whose ALCs are not functioning properly, can not be located. Complementary means of surveillance, such as by boats or aircraft, will, therefore, always be necessary. Alternatives are over-the-horizon radar (OHR) or remote sensing through synthetic aperture radar (SAR). The feasibility of the latter option is currently being investigated by Indonesia with the help of Argos;

- traditional means of surveillance will, at any rate, generally be required to bring or order offenders to port and thus ensure prosecution; and

- a satellite-based VMS is most effective in conjunction with management based on measures such as closed areas or seasons, or restricted fishing days.

A noticeable distinction in regulatory approaches that are currently pursued by States and regional organizations is that between imposing satellite-based VMSs on individual fisheries or, instead, more generally on all fishing vessels or those above a certain size. It is, therefore, very pertinent to ask whether a satellite-based VMS is in general suitable for small-scale or artisanal fisheries. This should be assessed by taking into account a number of factors, including:

- the size of the regulatory area, the part in which the actual fishing takes place and the topography of the coastline;

- the type of stocks and their level of exploitation;

- the type and size of fishery, i.e. industrial / artisanal or domestic / foreign;

- the nature and extent of infringements and the effectiveness of flag State control (if relevant);
- other social and economic considerations, such as the human and financial resources available for enforcement in relation to the fisheries' revenue in social and economic terms;
- the (lack of) support of stakeholders;
- the potential for successful co-operation with other States at a regional or sub-regional level; and
- the political will and commitment to make optimal use of the chosen VMS.

This non-exhaustive list underscores the need for a tailored and balanced approach. At the same time, it seems safe to say that satellite-based VMSs would, in general, be more appropriate for industrial than for small-scale and artisanal fisheries, as the latter commonly involve a large number of fishers, mixed gear and landing points. But the reference made above to the latest model of a self-contained ALC indicates that new technology can resolve initial impediments. This implies that satellite-based VMSs will become suitable for more and more types of fisheries.

One of the factors included in the second list above is the significance of support by stakeholders. Crucial in this context is the extent to which confidentiality and security of information is guaranteed. In many fisheries, the possibility that near real-time location and / or catch data ends up in the hands of (non-participating) competitors is bound to have enormous impact on acceptance and, if already in operation, on compliance and co-operation.

Confidentiality and security risks exist in every phase of transmission and will, in general, increase when more parties share VMS information. All those involved—States, companies and (satellite-) organizations alike—should, therefore, exercise the utmost diligence. This may, for instance, require the enactment of legislation to counter breaches of confidentiality or security.

**Broadened support**

In certain situations, but particularly for small-scale or artisanal fisheries, support by stakeholders could be broadened through providing ALCs free of charge. Moreover, stakeholders should be thoroughly informed about the way in which satellite-based VMSs function and how they contribute towards fair

competition and optimizing fisheries management.

Evidently, efforts to secure wide support should eventually be complemented by a solid legal framework to deal with regulatory violations detected by satellite-based VMS and attempts to tamper with ALCs. New technology also raises the issue of its evidentiary value in legal proceedings. Although several legal hurdles have already been taken, cases recently instituted in Australia and the US are expected to address the question whether a prosecution can rely on VMS data exclusively, without subsidiary sightings by boats or aircraft. An affirmative answer to this question is expected to lead to a wider use of VMS technology.

In designing a legal framework, a fisheries management authority will also have to abide by international law. This is particularly relevant for the scope of application of a satellite-based VMS. From a legal perspective, there is a wide margin of discretion in relation to domestic ships and foreign ships with fishing licences. Domestic ships can be asked to install ALCs and have them switched on, in principle, anywhere on the globe. Foreign ships with licences can only be asked to do this when they are in the maritime zones of coastal States. Unfortunately, international law does not grant coastal States the power to impose similar requirements on foreign ships that merely want to pass through a coastal State's maritime zones. Such ships may therefore still be tempted to engage in illegal fishing. However, international law is not static. Broader acceptance of information sharing in general and specifically through a widespread use of satellite-based VMSs will certainly have an impact on this limitation.

In conclusion, satellite-based VMSs have all the potential of contributing to more sophisticated and cost-effective fisheries management. Despite these obvious advantages, a thorough assessment should be made to ascertain if a satellite-based VMS is, under the specific circumstances, the most cost-effective, compared to other forms of monitoring and surveillance. Finally, in designing the regulatory framework for a satellite-based VMS, account should be taken of a wide range of factors, including the need for consistency with international law.

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