

TECHNICAL PAPER 11.

LEGAL ISSUES RELATED TO VESSEL MONITORING SYSTEMS

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LIST OF ACRONYMS AND ABBREVIATIONS USED

AFMA	Australian Fisheries Management Authority
ALC	automatic location communicator
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
EEZ	Exclusive Economic Zone
FFA	South Pacific Forum Fisheries Agency
FMC	fisheries monitoring centre
FMP	fisheries management plan
GPS	Global Positioning System
HMTC	Harmonized Minimum Terms and Conditions [FFA]
ICCAT	International Convention for the Conservation of Atlantic Tunas
LOA	length overall
MCS	Monitoring, Control and Surveillance
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North East Atlantic Fisheries Commission
NMFS	National Marine Fisheries Service (USA)
SAR	Synthetic Aperture Radar
TAC	total allowable catch
UNCED	United Nations Conference on Environment and Development
The 1982 UN Convention	United Nations Convention on the Law of the Sea
VMS	Vessel Monitoring System
VTU	Vessel Tracking Unit

1. INTRODUCTION – THE CONCEPT OF VMS

The need to improve the effectiveness of monitoring, control, surveillance (MCS) and enforcement schemes to ensure the sustainable use of the world's fisheries, both on the high seas and within national jurisdictions, has become a question of crucial importance in recent years. The fact that most of the traditional fishing grounds around the world are either overfished or in a threatened state calls for the development of new MCS and enforcement mechanisms to remedy this situation. A consensus seems to have formed among fisheries managers and enforcement officers that vessel monitoring systems (VMS) could be a key mechanism in reversing the current state of the world's fisheries.

Increasingly, the limitations of conventional MCS measures are being recognized due essentially to the prohibitive costs of carrying out such measures, especially observer programmes and naval and aerial surveillance operations throughout extensive EEZs, marine areas which in certain cases exceed several-fold the surface of the national land area. It is also recognized that VMS should not be considered as an alternative to conventional MCS measures, but rather as one element of a broader package of management tools. The purpose of MCS schemes is twofold: to ensure compliance with fisheries management and conservation rules, and to collect scientific data relating to fishing activities on the basis of which sound fisheries management measures can be devised.

Compliance with fisheries management rules, which is crucial to ensure the sustainable use of the world's fisheries, can only be achieved if an effective MCS regime is in place. It is this application for which VMS has mostly been proposed, due to its potential for providing timely and accurate information on the position of fishing vessels. Upon receiving such information, enforcement officers from the monitoring agency, if they suspect that a vessel is conducting an illegal fishing operation, can immediately dispatch a patrol boat or aircraft to the reported place of suspected violation so as to observe the activity of the targeted fishing vessel and, if warranted, inspect it. VMS will complement conventional MCS measures by making them more effective, but could also imply a need for redesigning aerial and naval patrol schemes. However successful a VMS scheme could be at the local or regional level, one should keep in mind that, in view of the increasing mobility of world's fishing fleets, the issue of compliance with fisheries management rules is global in scope and will thus require a high level of international cooperation to restore the health and assure the sustainability of the world's marine living resources throughout their range.

Catch and effort data are a primary source of information with regard to the status of fisheries and provide the basis upon which fisheries management measures are established. One of the major benefits of collecting catch and effort data through VMS is the improvement in timeliness of delivery of data to the monitoring agency. This, for instance, can dramatically improve the monitoring in almost real time of exhaustion of allocated quotas or total allowable catch (TAC). It shall be noted, however, that, to date, catch and effort reporting has not been a major focus of VMS implementation.

Prior to any further consideration, it is necessary to determine precisely to what the concept of VMS refers. Despite the common assumption, VMS and satellite surveillance are not synonymous. A VMS is a "cooperative" system, in that only participating vessels are monitored, since they are the only ones required to carry the appropriate equipment, in contrast to a "non-cooperative" system, such as satellite surveillance, aerial and naval surveillance, land-based radar and sea-based sonar, which will detect any vessels located within their operating range. In other words, a VMS will only be instrumental in assessing the extent of, and deterring, illegal fishing activities taking place within national jurisdictions or in areas of the high seas subject to a regional fisheries arrangement. However, development of new technology, such as satellite remote sensing, might be incorporated into future fisheries management regimes in order to, *inter alia*,

assist in monitoring illegal fishing activities taking place in national jurisdictions or on the high seas. Currently, there are two satellites with remote sensing in operation, using Synthetic Aperture Radar (SAR) technology (Radarsat-1 and ERS-2), which is capable of locating a vessel and also of ascertaining with some degree of certainty the activity of such a vessel without position reporting equipment on-board. This technology is assessed for fisheries purposes in the paper by Gallagher and Chemin de la Gardiere (1999).

A VMS legal workshop, organized by the South Pacific Forum Fisheries Agency (FFA), held in Nadi, Fiji, 22-26 September 1997 (hereinafter referred to as the 1st FFA VMS Legal Workshop), recommended that, for its purpose, VMS be defined as:

“VMS means the satellite-based reporting system approved by FFA that is capable of monitoring fishing and related activities of fishing vessels, including, but not limited to, the determination of a vessel’s identity, GPS position, course and speed, and special codes.”

A VMS consists of several components, namely a transmitter or receiver which is capable of fixing a position (i.e., the transmitter or receiver must have an integrated position-determining device, usually based on Global Positioning System (GPS) technology, and an automated reporting system that controls the transmission of the position data, and possibly other data, via a communications system to a fisheries monitoring centre (FMC). The communications system conveys data between the transceiver or transmitter on the vessel and the monitoring agency. For the purpose of monitoring of fishing vessels, satellite-based communications systems are considered as the most suitable since they offer global coverage and high reliability. The most commonly used satellite communications systems for the purpose of fisheries MCS are Inmarsat, Argos and Euteltracs.

The use of VMS in fisheries MCS dates from the early 1990s, when the first trials were implemented in Australia, Canada, EU, New Zealand and USA. Since then, and despite the fact that most of these trials are still in their early stages and therefore their levels of success or failure are still unclear, more and more countries have expressed interest in developing their own VMS at either the national or regional level. The driving force behind this trend is the easy availability of the technology at an affordable price, combined with the fact that, up to now, conventional MCS measures have not proved to be as effective as desired.

The main purpose of this paper is to identify and discuss, from a legal perspective, the problems arising from the implementation of VMS, and to offer a comparative analysis of VMS regulations. This analysis is based on information made available to the author from various countries or entities, including Argentina, Australia, CCAMLR, EU, FFA, New Zealand, Norway, South Africa and USA. It is recognized that matters of both international and national law are at issue, and both are considered. It should be noted that the study focuses primarily on VMS using satellite-based communications systems, since this is the most suitable technology for fisheries MCS and therefore the one likely to be adopted by a growing number of countries in the near future. Lastly, the paper attempts to inventory all issues that must be addressed by lawmakers when drafting VMS regulations.

2. LEGAL BASIS FOR THE USE OF VMS

2.1 International law

This section tries to identify the key provisions of international legal instruments that either deal directly with VMS or provide a basis for its utilization.

2.1.1 The 1982 United Nations Convention on the Law of the Sea

The 1982 United Nations Convention on the Law of the Sea (“the 1982 UN Convention”) was adopted on 10 December 1982, entering into force on 16 November 1994. It is the principal convention governing the international use of the seas and oceans. While it contains no provisions directly related to the use of VMS, it establishes a number of important principles of relevance for this study, relating to the conservation and management of living resources, within both national jurisdictions and the high seas.

It recognizes, *inter alia*, the sovereign rights of a coastal State over living and non-living aquatic resources, including fish stocks, occurring within a 200-n.mi. EEZ. Article 56 specifies that, in the EEZ, the coastal State has sovereign rights for the purpose of exploring, exploiting, conserving and managing the natural living resources of the water column and that of the sea-bed and its subsoil. Coastal States, taking into account the best scientific evidence available, must ensure through proper conservation and management measures the sustainable utilization of the living resources within their EEZs (Article 61 (2)). To this end, States are required to contribute and exchange on a regular basis, through competent international organizations, available scientific information, catch and fishing effort statistics, and any other data relevant to the conservation of fish stocks (Article 61 (5)). Such obligation is also applicable to foreign vessels operating within the EEZ of a coastal State. Such vessels are required to provide information on their fishing activities, including catch and effort statistics and vessel position reports (Article 62 (4) (e))¹.

The 1982 UN Convention makes clear that coastal States may enforce their national fisheries legislation against fishing vessels in the EEZ as well as in the territorial sea (Article 2), archipelagic (Article 49 (2))² or internal waters (Article 8). Fishing by foreign vessels is expressly prohibited during the exercise of innocent passage (Article 19 (2) (e)), and coastal States may exercise proscriptive jurisdiction over foreign vessels exercising the right of transit passage (Article 42 (1) (c)), and archipelagic sea lanes passage (Article 54). Within the EEZ, coastal States are specifically empowered to take such measures “including boarding, inspection, arrest and judicial proceedings, as may be necessary to ensure compliance with the laws and regulations adopted by it in conformity with this Convention” (Article 73 (1)). However, the 1982 UN Convention subjects such power to three conditions. First, arrested vessels must be promptly released upon the posting of reasonable bond or other security (Article 73 (2)). Second, the penalties for violations of fisheries laws and regulations may not include imprisonment, in the absence of agreement to the contrary by the States concerned, or any other form of corporal punishment (Article 73 (3)). Third, in the event of arrest or detention of foreign vessels the coastal State must promptly notify the Flag State, through appropriate channels, of the action taken, and of any penalties subsequently imposed (Article 73 (4)).

In contrast, the high seas beyond the EEZ were left to an open access regime in accordance with the customary international law of the sea. It should be noted, however, that the traditional freedom of high seas fishing is duly qualified and conditional to the respect of specific obligations. Article 116 stipulates that the right to fish on the high seas is subject, *inter alia*, to States’ treaty obligations and to the rights and duties as well as coastal States’ interest in respect of straddling stocks, highly migratory species, marine mammals and anadromous and catadromous species, as provided in Articles 63 (2) and 64 to 67 respectively. The 1982 UN Convention does not provide a legal mechanism for the enforcement of conservation and

1. Article 62 (4) provides a non-exhaustive list of conditions that can be imposed by coastal States on fishing vessels of other States duly authorized to operate within their EEZ.

2. Exercise of sovereignty over archipelagic waters by archipelagic States is subject to the recognition of “traditional fishing rights and other legitimate activities of the immediately adjacent neighbouring States in certain areas falling within archipelagic waters.” (Article 51 (1)).

management measures on the high seas; responsibility rests with the Flag State, as provided in Article 117. Furthermore, States have a general obligation to cooperate for the conservation and management of living resources in high seas areas. Article 118 further specifies, in this regard, that States that exploit identical living resources or different living resources in the same area have a specific obligation to enter into negotiations so as to take appropriate measures for the conservation of the targeted living resources and are required, as appropriate, to establish regional or sub-regional fisheries organizations to this end.

In accordance with Article 118, States have entered into fisheries arrangements or established regional or sub-regional fisheries organizations for the purpose of taking measures for the conservation of fish stocks on the high seas. With a view to improving compliance with their conservation and enforcement measures within their jurisdiction, certain of these organizations have introduced or are considering introducing VMS.

2.1.2 The FAO Compliance Agreement

The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (“the Compliance Agreement”) was approved, through resolution 15/93, by the FAO Conference at its Twenty-seventh Session (November 1993). In accordance with Article XI.1, the Agreement shall enter into force as from the date of receipt by the Director-General of FAO of the twenty-fifth instrument of acceptance. As of April 2000, 15 countries had deposited their instrument of acceptance. It should be noted that it constitutes an integral part of the International Code of Conduct for Responsible Fisheries.

The Compliance Agreement, which was primarily directed at curbing re-flagging of fishing vessels, does not refer specifically to VMS, but does contain relevant provisions.

It stresses the responsibility of the Flag State, which is required to take all necessary measures to ensure that fishing vessels entitled to fly its flag do not engage in any activity that undermines the effectiveness of international conservation and management. To this end, no State shall authorize any vessel entitled to fly its flag to be used for fishing on the high seas unless it is able to exercise effectively its responsibility. Vessels operating on the high seas are required to provide the Flag State with information on their fishing activities, including those pertaining to the area of their fishing operations (Article III).

Provisions of Article V require parties to the Compliance Agreement to exchange information, including evidentiary material relating to the activities of fishing vessels, in order to assist the Flag State in identifying those vessels flying its flag reported to have engaged in activities undermining international conservation and management measures.

In the absence of an enforcement mechanism on the high seas, the Compliance Agreement, like the 1995 UN Fish Stocks Agreement, requires Flag States to exercise responsibilities for the activities of fishing vessels flying their flags. This extends to the providing of information on vessel operations, including those relating to areas of fishing. As already indicated, VMS may constitute the most reliable method of collecting such information.

States must cooperate in particular in exchanging information that may help identify vessels conducting illegal fishing operations on the high seas. VMS may prove a very useful tool in providing evidentiary material, since it can identify a vessel that is fishing in a particular area of the high seas or inside an EEZ.

2.1.3 The 1995 UN Agreement for the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks

In 1992, the United Nations Conference on Environment and Development (UNCED) requested that the United Nations convene a conference aimed at implementing Articles 63 and 64 of the

1982 UN Convention relating to straddling and highly migratory fish stocks and with a view to establishing a conservation and management regime for these two types of stocks. On 4 August 1995, the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks adopted the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea (10 December 1982) Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the 1995 UN Fish Stocks Agreement). At the time of writing, the Agreement was not yet in force since, in accordance with its Article 40, it will enter into force 30 days after the deposit of the thirtieth instrument of ratification or accession. As of April 2000, 59 countries were signatory and 29 had ratified the Convention. The 1995 UN Fish Stocks Agreement is intended to give practical effect to the provisions of Articles 63 and 64 of the 1982 UN Convention, which deals with straddling fish stocks and highly migratory fish stocks. It contains a number of provisions that support the use of VMS.

Article 5 sets out the general principles governing the conservation and management of these two types of stocks and requires coastal States and States fishing on the high seas to take some specific actions, *inter alia*:

- (i) collect and share, in a timely manner, complete and accurate data concerning fishing activities, including vessel position, catch of target and non-target species and fishing effort (Article 5(j));
- (ii) promote and conduct scientific research and develop appropriate technologies in support of fisheries management (Article 5(k)); and
- (iii) implement and enforce conservation and management measures through effective monitoring, control and surveillance (Article 5(l)).

Article 10 provides that, in fulfilling their obligation to cooperate through regional or sub-regional fisheries management organizations or arrangements, States are required, *inter alia*:

- (i) to agree on standards for collection, reporting, verification and exchange of data on fisheries (Article 10 (e));
- (ii) to compile and disseminate accurate and complete statistical data, to ensure that the best evidence is available, while maintaining confidentiality where appropriate (Article 10 (f)); and
- (iii) to establish appropriate cooperative mechanisms for effective monitoring, control, surveillance and enforcement (Article 10 (h)).

Article 14 stipulates that it is the duty of the Flag State to ensure that vessels flying its flag provide necessary information. To this end, States are required to:

- (i) collect and exchange scientific, technical and statistical data with respect to the two fish stocks considered (Article 14.1 (a));
- (ii) ensure that data are collected in sufficient detail to facilitate effective stock assessment and are provided in timely manner to fulfil the requirements of sub-regional and regional fisheries management organizations or arrangements (Article 14.1 (b)); and
- (iii) take appropriate measures to verify the accuracy of such data (Article 14.1 (c)).

It also indicates that States must agree on the specification of data and the format in which they are to be provided to sub-regional or regional fisheries management organizations or arrangements (Article 14.2 (a)).

In accordance with Article 117 of the 1982 UN Convention, Article 18 of the 1995 UN Fish Stocks Agreement specifies that a Flag State shall ensure that fishing vessels operating on the high seas and flying its flag comply with sub-regional and regional management measures and that vessels do not engage in any activity which undermines the effectiveness of such measures. Consequently, a Flag State shall authorize vessels flying its flag to fish on the high seas only if it

is able to effectively exercise its responsibilities over them. In addition, a Flag State is expected to take a set of measures as part of its duties that include, *inter alia*:

- (i) requirements for recording and timely reporting of vessel position, catch of target and non-target species, fishing effort and other relevant fisheries data in accordance with sub-regional, regional and global standards for collection of such data (Article 18.3 (e)); and
- (ii) MCS of such vessels, their fishing operations and related activities by, *inter alia*: the development and implementation of VMS, including as appropriate, satellite transmitter systems, in accordance with any national programmes and sub-regional, regional or global programmes that may have been agreed to (Article 18.3 (g) (iii)).

Article 25, dealing with the forms of cooperation with developing states, indicates that assistance to developing states shall be specifically directed towards:

- (i) improving conservation and management of straddling and highly migratory fish stocks through collection, reporting, verification, exchange and analysis of fisheries data and related information (Article 25.3 (a)); and
- (ii) MCS, compliance and enforcement, including training and capacity-building at the local level, development and funding of national and regional observer programmes and access to technology and equipment (Article 25.3 (b)).

Annex I defines the standard requirements for the collection and sharing of data.

Article 1.1 of Annex I indicates that the timely collection, compilation and analysis are fundamental to the effective conservation and management of straddling fish stocks and highly migratory fish stocks and that such data must be verified to ensure accuracy. It also specifies that confidentiality of non-aggregated data shall be maintained.

Article 2 of Annex I requires that States devise appropriate system of verification of fishery data and communicate such data in a timely manner to the relevant sub-regional or regional fisheries management organizations or arrangements. It also stresses the need for States to agree, within the framework of the abovementioned organizations or arrangements, on the specification of data and the format in which they are to be provided.

It is the responsibility of Flag States to ensure that vessels flying their flag transmit to their national fisheries agency and, where applicable, to the relevant sub-regional or regional fisheries management organization or arrangement, logbook data on catch effort at sufficiently frequent intervals to meet national requirements and regional and international obligations. It specifies that such data shall be transmitted, among other means, by satellite (Article 5 of Annex I).

With a view to ensuring sound fisheries management measures, States are also required to establish mechanisms for verifying fishery data, such as position verification through VMS (Article 6 of Annex I).

As is clear from the foregoing, the 1995 UN Fish Stocks Agreement provides ample support for the use of VMS. In particular, Article 18, on duties of Flag States, explicitly requires Flag States to implement VMS as a means of controlling fishing vessels flying their flag. When developing VMS at national level, States must ensure its compatibility with sub-regional, regional or globally agreed VMS programmes.

The 1995 UN Fish Stocks Agreement stresses the vital importance of timely collection and exchange of data for both fisheries management and enforcement purposes, and also emphasizes the need to design systems of data verification. VMS is a suitable vehicle for the collection of catch data, particularly in terms of timely collection and as a means of verifying catch location. With regard to its technical features and its availability at an affordable cost, it can certainly be

argued that VMS is the primary instrument for achieving the State's obligation of improving the effectiveness of MCS scheme. It also underscores the necessity to make technology and equipment available to developing countries through international cooperation, in particular those that may enhance MCS, compliance and enforcement capabilities.

With a view to facilitating the exchange of fisheries data, the need to develop international standards for the collection and reporting of such data, as well as the format in which they are to be provided, is recognized. In addition, confidentiality of data – including those collected via VMS – shall be ensured.

2.1.4 The Code of Conduct for Responsible Fisheries

The Code of Conduct for Responsible Fisheries was adopted by consensus at the Twenty-eighth Session of the FAO Conference, in 1995, as Res. 4/1995. The Code of Conduct is a comprehensive document, including general and specific parts. It is very wide in scope³ and applies to all fisheries (on the high seas, within the EEZ, in territorial waters, as well as inland fisheries, whether shared or not). General Principles are set out in Article 6, which as such provides the outline of the Code. One of the principles urges that States should: “ensure compliance with and enforcement of conservation and management measures and establish effective mechanisms to monitor and control activities of fishing vessels and fishing support vessels” (Section 6.10)⁴. The Code does not contain specific provisions on VMS but recommends States to implement them in accordance with their national legislation. Indeed, Section 7.7.3 provides that “States, in conformity with their national laws, should implement effective fisheries monitoring, control, surveillance and law enforcement schemes and vessel monitoring systems. Such measures should be promoted and, where appropriate, implemented by sub-regional or regional fisheries management organizations or arrangements.”

2.2 Regional and sub-regional fisheries organizations and VMS

The contracting parties to the Northwest Atlantic Fisheries Organization (NAFO)⁵ agreed to implement a pilot project for satellite tracking of fishing vessels (Part VI of Conservation and Enforcement Measures)⁶. According to this agreement, the parties undertook to install satellite-tracking devices on 35% of their respective vessels fishing in the NAFO Regulatory Area. At the 20th NAFO Annual Meeting (held in Lisbon, Portugal, in September 1998), the Fisheries Commission modified Part VI of the Conservation and Enforcement Measures, entitled “Pilot Project for Observers and Satellite Tracking” by requiring each Contracting Party to ensure that all vessels flying their flags operating in the Regulatory Area be equipped with satellite tracking devices as soon as possible and not later than 1 January 2001⁷.

3. The resolution states it to be “global in scope, and is directed towards members and non-members of FAO, fishing entities, sub-regional, regional and global organizations, whether governmental or non-governmental, and all persons concerned with the conservation of the fishery resources and management and development of fisheries, such as fishers, those engaged in processing and marketing of fishery products and other users of the aquatic environment in relation to fisheries” ...It continues “It also covers the capture, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries in the coastal area management”. (Article I: The Nature and Scope of the Code)

4. See also sections 7.1.7 and 8.1.4.

5. The Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries was adopted on 24 October 1978 and came into force on 1 January 1979.

6. Decision made by the contracting Parties at their 17th Annual Meeting in September 1995 (NAFO/FC, Document 95/17). See also Article 1 of Council Regulation (EC) No. 3070/95, of 21 December 1995, on the establishment of a pilot project on satellite tracking in the NAFO Regulatory Area, as modified by Council Regulation (EC) No. 731/98 of 30 March 1998.

7. NAFO/FC Doc. 99/1 (serial No. 4040).

The North East Atlantic Fisheries Commission (NEAFC), which is responsible for the management of fisheries resources outside areas under national jurisdiction in the northeast Atlantic, has adopted a framework for the implementation of VMS that should be operational no later than 1 January 2000⁸.

In the Antarctic Region, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) adopted, during its Seventeenth meeting, conservation measure 148/XVII on automated satellite-linked VMS. This measure provides that each Contracting Party shall, no later than 1 March 1999, establish an automated VMS to monitor the position of its fishing vessels, which are licensed to harvest living resources in the Convention Area, and for which catch limits, fishing seasons or area restrictions have been set by conservation measures adopted by the Commission. Any Contracting Party unable to comply with such obligation in time is required to inform the Commission within 90 days following the notification of this conservation measure and communicate its intended timetable for implementation of VMS. In any event, all Contracting Parties must establish a VMS no later than 31 December 2000.

At its Fourteenth Regular Meeting on 21 December 1995, the International Commission for the Conservation of Atlantic Tunas (ICCAT)⁹, adopted a resolution on vessel monitoring encouraging Flag States to use satellite tracking and catch reporting systems for vessels operating in the ICCAT area. At the 1997 Meeting, ICCAT recommended that each Contracting Party adopt a satellite-based VMS pilot programme applicable to 10% of fishing vessels flying their flags (or ten vessels, whichever is greater), and exceeding 24 m length overall (LOA) (or greater than 20 m between perpendiculars). The three-year pilot programme was to become effective on 1 January 1999, except for vessels operating in the Mediterranean Sea, for which it would be effective on 1 January 2000.

The Forum Fisheries Agency (FFA) is responsible for assisting member countries with management of fisheries and enforcement of fisheries law in areas of the Pacific Ocean. Cooperation between member states led to the adoption in May 1992 of the 1992 Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region (came into force on 10 May 1993). Article V, which deals with exchange of information on, *inter alia*, the location and movement of foreign fishing vessels, provides the legal basis for the development of a satellite-based VMS. As a prerequisite to applying for a licence to fish in the South Pacific Region, any foreign fishing vessel must first be registered on the VMS Register of Foreign Fishing Vessels, maintained by FFA (Annex 5 of the Harmonized Minimum Terms and Conditions for Foreign Fishing Vessel Access). Although no mention is made of subjecting national vessels to similar conditions, it is already required by several FFA member states (Australia, New Zealand and the Solomon Islands). While the Forum Fisheries Committee “retains the primary responsibility for providing general policy and administrative guidance for the operation of the VMS register” (Annex 4 of the Harmonized Minimum Terms and Conditions for Foreign Fishing Vessel Access), implementation of the FFA VMS is ensured by FFA member states.

2.3 Multilateral and bilateral fishing agreements

The adoption of the 1982 UN Convention had a profound impact on the traditional way of conducting fishing on the seas and oceans. Indeed, by enabling coastal States to claim 200-n.mi.

8. Article 8.1 (a) stipulates that “Each Contracting Party shall require its fishing vessels, fishing in the Regulatory Area, to be equipped with an autonomous system able to automatically transmit messages to a land-based fisheries monitoring centre allowing a continuous tracking of the position of the fishing vessel by the Contracting Party of that fishing vessel in conformity with the specifications and schedule set out in Annex ...”

9. The International Convention for the Conservation of Atlantic Tunas was signed on 14 May 1966 in Rio de Janeiro (Brazil) and came into force on 21 March 1969.

EEZs, the 1982 UN Convention allowed most of the high seas traditional fishing grounds to be included within national jurisdiction, thus altering the traditional freedom of high seas fishing. As a result, traditional high seas fishing fleets were denied access to fishing grounds that, in some cases, they had fished for centuries, thus compelling them to enter into bilateral or multilateral access fishing agreements with coastal States to pursue their operations.

Even though VMS is not yet a common feature of fishing agreements, it can be argued that this is just a matter of time, as some of these agreements already contain VMS provisions. In this regard, the EU has made clear that it would use VMS in bilateral fisheries agreements and with third countries and in the framework of regional fisheries organizations (see Verborgh, 1999). For instance, the fisheries agreement concluded between the Islamic Republic of Mauritania and the EU in 1996¹⁰ stipulates that, pending the implementation of a national satellite monitoring system, Community vessels authorized to operate within the framework of the agreement are required to carry a vessel tracking unit. This system is primarily designed to monitor fishing effort and geographical restrictions. Procedures for setting up, implementing and financing the project have been approved. It is expected to be operational by the end of 1999¹¹. Norway and the EU have a reciprocal fisheries agreement by virtue of which their vessels can operate in each other's waters under certain conditions¹². In May of 1999, Norway and the EU agreed on the establishment of a pilot VMS project. It started on 1 July 1999 for a six-month trial period. On 1 January 2000, a general agreement on the use of VMS on EU and Norwegian fishing vessels fishing in EU and Norwegian waters officially entered into force. Another example can be found in the bilateral subsidiary fishing agreement concluded between Australia and Japan, where it is a condition of the fishing licence that Japanese vessels carry VMS when operating within Australian waters.

In the FFA region¹³, the multilateral treaty concluded between the USA and certain Pacific Island States¹⁴ (Multilateral Treaty) stipulates that where a region-wide vessel tracking system applicable to all vessels licensed to fish in the Treaty Area may be established, USA vessels licensed to fish under the Multilateral Treaty "shall participate in the system and shall install and operate a transponder of a type and in such a manner as may be agreed by the Parties" (Section 30, Part 8 of Annex 1).

2.4 National law

Recently enacted fisheries legislation usually contemplates the implementation of a VMS or provides for electronic reporting of fisheries information (by a satellite-based communications system), whereas fisheries legislation enacted prior to the early 1990s does not contain such provisions. In Namibia, for instance, law-makers clearly foresaw the development of new technology, such as VMS, for the purpose of fisheries MCS and enforcement, since the Sea Fisheries Act, Act 29 of 1992, in Government Gazette No. 493, 1 October 1992, provides that the Minister may make regulations in relation to the installation and maintenance of communication, safety or surveillance equipment on fishing or factory vessels (Section 32 (q)). Likewise, the

10. Agreement on cooperation in the sea fisheries sector between the European Economic Community and the Islamic Republic of Mauritania (1996).

11. Similar provisions (Chapter VII of Annex II) can be found in the fisheries agreement concluded between the Kingdom of Morocco and the EU in 1995 (OJ L 306 of 19 December 1995).

12. Agreement in the form of an Exchange of Letters between the European Economic Community and the Kingdom of Norway relating to the Agreement on Fisheries between the European Economic Community and the Kingdom of Norway (OJ L 346 of 31 December 1993).

13. FFA, primarily a consultative and advisory body, was established in 1979 by the member states of the South Pacific Forum to increase regional cooperation between its members in fishery matters. The member states of the South Pacific Forum are Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

14. Treaty on Fisheries between the Governments of Certain Pacific Island States and the Government of the United States of America signed on 2 April 1987 in Port Moresby, Papua New Guinea.

recently enacted Fisheries Act, 1997, of Argentina (Decreto 6 de enero 1997 promulgando la ley nacional de pesca no. 24922) incorporates specific language on VMS stipulating that the Secretary of Fisheries could decide on the installation of vessel tracking system on board fishing vessels (Article 33). Although more broadly worded, the South African Marine Living Resources Act, 1998 (Act No. 18 of 1998) makes provisions for the Minister to prescribe “the operation of, and conditions and procedures, to be observed by any fishing vessel while in South African waters, having due regard to the provisions of the United Nations Convention on the Law of the Sea.” (Section 77 (2) (i)).

Another example is the New Zealand Fisheries Act, 1996, which contains a specific provision on electronic transmission. It stipulates that “for the purpose of this Act, the chief executive may approve the transmission of accounts, records, returns, transactions, information, notices, objections, requests, applications, or other documents provided for under this Act by means of electronic transmission” (Section 296).

In order to implement their own VMS, or to translate into national legislation their international obligations on this matter, States may need to modify their principal legislation on marine fisheries before devising specific VMS regulations. Common-law countries may not have to amend their principal fisheries legislation since they, typically, contain a section devoted to “regulations” or “power to make regulations” that may confer sufficient power to the specified authority to implement a VMS. Such modification, however, is more likely to be required in civil-law countries, where such broad provisions are not commonly found. In New Zealand, for example, the Fisheries (Satellite Vessel Monitoring) Regulations, 1993, were established on the basis of Section 89, entitled “Regulations”, of the Fisheries Act, 1983. Although the Fisheries Act 1983 is now amended and superseded by the Fisheries Act 1996, pursuant to Section 323 of the Fisheries Act 1996 all regulations made under Section 89 of the Fisheries Act 1983 are deemed to be validly made under Section 297 of the Fisheries Act 1996). In contrast, in Morocco, where the installation of a VMS is under way, the Sea Fisheries Act, 1973¹⁵, needed to be amended in order to both provide a legal basis for the implementation of such a system and determine specific offences and penalties for the breach of VMS regulations.

3. LEGAL ISSUES

While the use of VMS is undoubtedly expanding, the number of countries having implemented or being in the process of implementing a VMS, insofar as the author has been able to determine, is still limited. Argentina, Australia, Canada, Chile, EU, Japan, NAFO, NEAFC, New Zealand, Norway, Peru, South Africa and USA are the principal countries or entities currently using or requiring the use of such a system within their area of jurisdiction. Despite differences in their state of implementation, most VMS programmes are still in an early stage of development. Whereas it is well established as a MCS tool in Australia and New Zealand, it is still in a trial phase in the EU and only used in a few regions of the USA. In April 1998, FFA brought its region-wide VMS into operation.

This section attempts, through a study of various VMS regulations, to identify the legal issues arising from the implementation of a VMS.

3.1 Constitutionality

As a general rule, introduction of any new approach to fisheries management, including MCS, is bound to have legal implications. The nature and extent of such implications should, to the extent practicable, be identified and analysed by fisheries managers and fisheries legislation drafters

15. Dahir portant loi no. 1-73-255 du 27 charoual 1393 (23 novembre 1973) formant reglement sur la peche maritime (Bulletin Officiel no. 3187).

prior to making a decision as to whether or not to implement such a new approach. Particular attention should be given to the possible unconstitutionality of the new approach or system to be introduced. Also, in countries, where implementation of VMS is envisaged, fisheries managers and fisheries legislation drafters must consider the “constitutional dimension” of VMS in order to ensure that introduction of such a system does not constitute a (clear) violation of the supreme law of the country. In countries where introduction of a VMS is likely to raise serious legal issues, and where the extent of their legal implications is uncertain, it would certainly be advisable to hold public debates on the issue, involving representatives of the fishing industry, lawyers, judges and other interested persons, to determine more precisely what the legal implications of introducing a VMS might be.¹⁶

To date, as far as the author has been able to establish, implementation of satellite-based VMS programmes has not been challenged in court on the ground of their being unconstitutional. Note, however, that, in the USA, a lawsuit has been brought against a series of management measures, including VMS, pertaining to the Highly Migratory Species Fishery. It is contended that VMS represents a prohibitive cost for small vessels (“unnecessary burden”)¹⁷ and for vessels that do not fish anywhere near closed areas¹⁸.

3.2 Confidentiality of VMS information

Typically, the principal fisheries legislation enables the governmental agency responsible for fisheries management to collect information, including VMS data, which is relevant and necessary for the conservation and management of fisheries. The corollary being that the authorized agency is required to ensure confidentiality of the collected information.

Confidentiality of VMS data is a major issue for the fishing industry. It is not restricted to the non-disclosure of such information, but also entails other aspects relating to access to and use of VMS data. What is examined in this section is the extent of protection that the administration is required to provide to fishers. In this regard, it is important to note that administration’s responsibility starts when data are received by the fisheries monitoring agency. Protection of VMS data prior to this point, i.e., during the transmission, is not the responsibility of the monitoring agency but rather that of the manufacturer, since they relate to the technical reliability of the system. John Fitzpatrick, in a manuscript on VMS prepared for FAO, raises the issue of security of data at source and during transmission, including concepts such as integrity and authenticity, which relate to the technical reliability of the system and which are defined as follows: “integrity” as “whether or not data has been altered or the function of a process is as intended” and “authenticity” as “whether or not a source of data can be positively identified and accepted as valid.”

3.2.1 VMS information warranting confidentiality

Requiring installation of VMS equipment on board fishing vessels may be felt as too intrusive by some fishers and may therefore face strong resistance from the fishing industry. Experience has

16. Such consideration is essential, as the recent decision of the Icelandic Supreme Court on the Individual Transferable Quota (ITQ) system shows (See G. Palsson, 1999). The Court ruled that the ITQ system, which was established in 1984 and was a central element of fisheries management in Iceland, was unconstitutional on the ground that it violated constitutional rules on equal rights and rights to work, on the one hand, and the constitutional rule against discrimination, on the other. Although not directly relevant to our study, this decision shows how crucial it is to fully comprehend and discuss the constitutional implications associated with the introduction of any innovative approach or system in fisheries management, prior to implementation. One might think that the Icelandic Supreme Court may have ruled differently if a public debate on this issue had taken place prior to the introduction of such a system.

17. This is the very reason why small vessels have been excluded from the obligation to carry a VTU in the EU. Note, however, that the EU will review ways of improving the application of VMS. In particular, and if appropriate, the EU may bring forward proposals for the extension of the scope of VMS to vessels measuring less than 20 m between perpendiculars or 24 m length overall as a means to control fishing effort (Verborgh, 1999).

18. Mr. P. Ortiz, NOAA, *pers. comm.*

shown that it is essential to gain their support for the installation of a VMS, possibly by making vessel operators aware of the benefits they can derive from certain VMS applications, in particular those concerning their safety at sea¹⁹ and their way of conducting business, combined with assurances regarding the confidentiality of VMS information. The first step in order to assure confidentiality of VMS information is to determine what type of information would qualify as warranting confidentiality. Most commonly, the range of information that is transmitted electronically includes, but is not limited to, catch data, vessel position, vessel identifier, notification of intentions (EEZ entry/exit, port entry, etc.), owner identification, speed and course. In the recommendations made by the Second VMS Legal Workshop, organized by FFA, held in Nadi, Fiji, 16-18 February 1998 (hereinafter referred as the 2nd FFA VMS Legal Workshop), VMS information categories were defined as including, non-exhaustively: “sighting reports; self reported positions; catch reports; notification (EEZ entry/exit, port entry, etc.); position reports; and VMS analyses.” Note that, up till now, fisheries legislation does not contain specific provisions on the confidentiality of electronically transmitted data and that only a few countries have addressed the confidentiality of fisheries data in general in their fisheries legislation. In the USA, for example, the Magnuson Fishery Conservation and Management Act, 1976, provides for the confidentiality of statistics, which are defined (Section 1853 (a) (5)) as:

“including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors.”

It was further specified in the Federal Register (50 C.F.R., Section 600.405 (1996)) that statistics covered all data “required to be submitted to the Secretary with respect to any Fisheries Management Plan (FMP).” Therefore, statistics are all data that are used for management purposes, irrespective of the nature and the means of transmission of such data. VMS information, even though not specifically mentioned as such, clearly falls into the broad category of “statistics” and will therefore be protected accordingly. In Australia, there is a regulation on confidentiality of logbook data, but none on VMS. However, it is envisaged to extend it to electronic transmission of data in order to cover catch data provided by VMS²⁰. The approach adopted in Australia differs from that of the USA. Whereas in the USA confidentiality applies to all data that are necessary for the design of a FMP, confidentiality in Australia applies to specified categories of data, which are defined on the basis of their means of transmission.

3.2.2 Disclosure of information

Ensuring confidentiality of VMS information, especially those concerning location of successful fishing grounds (fishing positions) and catch data, is a particularly sensitive issue for the fishing industry, since such data can be highly valuable commercial information, the disclosure of which may put a vessel’s owner at a commercial disadvantage. It can be argued that such types of information, by reason of their commercial nature, may require a higher level of protection. In this respect, it was specified in the US Federal Register that:

“the disclosure of data indicating individual vessel positions will be treated in accordance with the provisions of the Freedom Information Act and the Trade Secrets Act. This means that if data is requested, it will not be divulged if the vessel owner can show that the disclosure would cause substantial harm to the owner’s competitive position.”²¹

19. VMS using Inmarsat-C satellite communications are compatible with the Global Maritime Distress Safety System (GMDSS) designed to enhance the safety of both the vessel and the crew.

20. Dr Anthony Bergin, Canberra, *pers. comm.*

21. Federal Register, Vol. 59, No. 219, 15 November 1994, Rules and Regulations, p. 58790.

The intent of US lawmakers was not to provide special protection for commercial information *per se*, but to ensure that disclosure of such information would not unfairly affect the competitive position of the vessel owner. The burden of proof rests upon the vessel owner, who must show substantial harm so as to preclude certain information from being disclosed²². It can be inferred from this reasoning that provisions of both the Freedom Information Act and the Trade Secrets Act are likely to also be applicable to information other than individual vessel positions if the vessel owner can show that disclosure of such information may cause substantial harm to their competitive position. As the USA example shows, provisions ensuring confidentiality of VMS information are not only found within fisheries legislation and regulations but also in legislation dealing with the safeguarding of privacy, the use of computerized personal data, or concerning unfair competition.

In addition, a number of countries have enacted legal instruments addressing the issue of Privacy, directed at striking a balance between the government's legitimate need for certain information and the individual's right of informational privacy in the context of computerized record-keeping systems. The USA and Australian Privacy Acts, for example, also apply to the disclosure of VMS data. One of the underlying principles of the US Privacy Act of 1974 is the "limitation disclosure principle," which sets limits on the external disclosures of information a record-keeping entity may make about an individual.

Confidentiality may also be ensured by requiring the release of data in an aggregated form, i.e., as data containing no identifying particulars. In this regard, Article 1 of Annex I of the 1995 UN Fish Stocks Agreement specifies that "confidentiality of non-aggregated data shall be maintained." Likewise, in the USA, the Magnuson Fisheries Conservation and Management Act of 1976 stipulates (Section 1853 (d)) that "any statistics ... shall be confidential and shall not be disclosed" and that

"the Secretary shall, by regulation, prescribe such procedures as may be necessary to preserve such confidentiality, except that the Secretary may release or make public any such statistics in any aggregate or summary form which does not directly or indirectly disclose the identity or business of any person who submits such statistics."

Similar provisions can be found in the EU, where Article 37 of Council Regulation (EEC) No. 2847/93 of 12 October 1993 provides that

"Member States and the Commission shall take all necessary steps to ensure that the data received in the framework of this Regulation shall be treated in a confidential manner" and "shall not be transmitted unless they are aggregated in a form, which does not permit the direct or indirect identification of natural or legal persons."

Another safeguard preventing unwanted disclosure of data is the incorporation of provisions within fisheries legislation specifying that all persons having access to confidential data will be held responsible for the unauthorized disclosure of any such data. In Australia, persons employed by the Australian Fisheries Management Authority are required to sign a form relating to the disclosure of information gained in confidence. In the USA, the fisheries regulations (50 C.F.R., Section 600.420 (3) (b) (1996)) established a control system requiring that all persons having access to statistics be informed of the confidentiality of the statistics and sign a statement acknowledging their having been so informed and their being familiar with the procedures to protect confidential statistics. In addition, these persons are explicitly prohibited from

22. In the EU, data on fisheries activities, including VMS data, are covered by professional secrecy and thus must benefit from the same protection accorded to data by the national legislation of Member State receiving them and by the corresponding provisions applicable to Community Institutions (Article 37 (4) of Council Regulation (EEC) 2847/93 of 12 October 1993, establishing a control system applicable to the common fisheries policy).

unauthorized disclosure of data and subject to sanctions for doing so (50 C.F.R., Section 600.415 (e) (1996)).

3.2.3 Access to confidential information

Access to confidential information, including VMS information, is generally restricted to specified categories of persons. In the USA, for instance, specific provisions regulating access to confidential fisheries data have been devised (50 C.F.R., Section 600.415). They lay out the general criteria that are applied when determining whether to grant access to confidential data: (i) specific types of data required; (ii) relevance of data to conservation and management issues; (iii) duration of time access; and (iv) explanation of why the available aggregate or non-confidential data would not suffice (50 C.F.R., Section 600.415 (a)). They also spell out the various categories of federal employees that have access to “statistics submitted as a requirement of FMP” (50 C.F.R., Section 600.415 (b)). Conversely, other categories of federal employees that are not specifically mentioned in the regulations do not have access to statistics. In order to have access to the statistics, state employees must demonstrate a need for such information for use in fishery conservation and management (50 C.F.R., Section 600.415 (c)). Likewise, statistics are accessible to council employees who are responsible for FMP development and monitoring. A council member may also have access to such information for use by the Council for conservation and management purposes, provided that such member might not gain personal or competitive advantage from access to the data and that suppliers of data would not be placed at a competitive disadvantage by public disclosure of such data at Council meetings or hearings (50 C.F.R., Section 600.415 (d)). In sum, under USA law, the granting of access to confidential data is a two-step process, whereby the requesting person must demonstrate a need for such data and establish that such data will be used for conservation and management purposes.

In the EU, general provision restricting access to confidential data is made. In this respect, Article 37 (3) of Council Regulation (EEC) No. 2847/93 of 12 October 1993 provides that

“the data exchanged between Member States shall not be transmitted to persons other than those in Member States or Community Institutions whose functions require them to have such access unless the Member States transmitting the data give their express consent.”

3.2.4 Use

The general principle governing the use of VMS information is that they can only be used for fisheries management purposes, which may include fisheries research²³ and enforcement of fisheries regulations, since the fisheries monitoring agency cannot employ them for any other purposes than those for which they have been required by law²⁴. The issue of use of VMS information has recently been examined by a working group within the framework of the 2nd FFA VMS Legal Workshop. Recommendations made by the working group established a distinction between primary and secondary uses of VMS information. Primary uses are those restricted to fisheries management purposes, whereas secondary uses aim at other purposes, such as general law enforcement, search and rescue and international obligations. It recognizes the fact that VMS information may be used for purposes beyond the scope of the monitoring agency's authority and that consequently the use of VMS information for secondary purposes would need to be based on enabling legislation. This would also require the modification of the fisheries regulations in order to include language allowing the disclosure of certain VMS information for

23. In the USA, NMFS continues to examine the issue of whether VMS information should be used for research purposes. Currently, NMFS scientists do not have access to such data.

24. In the EU, VMS information must not be used for any other purposes than those defined by law unless the authorities providing the data give their express consent (for other use) and on condition that the provisions in force in the Member State of the authority receiving the data do not prohibit such use or communication (Article 37 of Council Regulation (EEC) 2847/93 of 12 October 1993, establishing a control system applicable to the Common Fisheries Policy).

specific purposes to specified agencies. One of the most obvious examples, which relates to the enhancement of fishers' safety at sea, is the disclosure of vessel's positions to the authority responsible for search and rescue

3.3 Intellectual property

Issues relating to intellectual property, and more specifically to that of copyright and database protection, are only briefly touched on here. This is a complex issue that would justify a separate study. In fact, the 1st FFA VMS Legal Workshop recommended: (1) that the FFA seek technical assistance from the World Intellectual Property Organization (WIPO) to study these emerging issues; and (2) the organization of a separate workshop to address intellectual property issues relevant to VMS.

The central issue is to determine whether the VMS database kept by the competent authority would be granted copyright protection. This is certainly questionable since, in the copyright legislation of most countries, intellectual creativity as a distinctive human intervention is still the basic requirement for the granting of copyright protection. Also, issues to be addressed include: definitions of database/compilation; nature of VMS data (raw data, processed data, analysed information); notion of originality (not a copy of an existing work/degree of creativity/novel nature compared with existing work); and the development of *sui generis* protection in Europe²⁵.

3.4 Evidence

With regard to evidentiary matters, the central issue is to determine whether VMS information, by itself, provide evidence of a standard likely to satisfy most criminal courts²⁶ of an offence that involved fishing activity. Consequently, what needs to be established is whether the level of trustworthiness and credibility of VMS information, in particular that relating to a vessel position, is of a sufficient standard to warrant a conviction. In this respect, it should be noted that position reporting is automatic and independent of the vessel operator and that position reports generally provide for identification of the vessel, date and time of the position fix, the latitude and longitude of the fix, and the speed and course of the vessel at the time of the position fix. Based on this information, the monitoring agency is able to plot the tracks of vessels and monitor their entry into and exit from waters placed under national jurisdictions, and their compliance with the bounds of fishing exclusive zones. From the vessel position and speed provided in a number of consecutive reports, it is possible for the monitoring agency to draw conclusions about the activities of a vessel. The speed of a vessel is an indicator of its possible activity (steaming, longlining or trawling). Likewise, a pattern of positions may also indicate possible fishing activity. It is clear that, at this stage of development, VMS, which merely indicates probable activity of a vessel, fails to furnish evidence of a calibre sufficient to warrant, on its own, a conviction. In criminal prosecutions, the standard of proof required is higher than in civil proceedings ("beyond reasonable doubt" versus "preponderance of the evidence"²⁷). The USA, for example, applies the system of civil and administrative penalties to fisheries offences. This approach presents the advantages of permitting hearings that do not necessarily follow strict rules of evidence, expedited proceedings, lower standards of proof, and negotiated settlements. As a

25. Cf. Directive 96/9/EC of the European Parliament and of the Council, of 11 March 1996, on the legal protection of databases. This Directive offers two alternatives: copyright protection and a new *sui generis* right to prevent unfair extraction or reutilization of the contents of a database.

26. "Reasonable doubt" as defined in Black's law dictionary is "the standard used to determine the guilt or innocence of a person criminally charged. The accused's guilt must be established "beyond a reasonable doubt", which means that facts must, by virtue of their probative force, establish guilt".

27. The concept of "preponderance of the evidence" as defined in Black's law dictionary is "evidence which is of a greater weight or more convincing than the evidence which is offered in opposition to it; that is, evidence which as a whole shows that the fact sought to be proved is more probable than not."

result, while VMS information is not evidence of sufficient stature to warrant a conviction by itself, it may nevertheless be of assistance in establishing the preponderance of evidence in combination with information provided by other means.

In many countries, it is a requirement for fishery control officers to establish “probable cause”²⁸ prior to conducting certain types of investigations, such as search, seizure and arrest. VMS may provide reasonably trustworthy information to lead a fishery control officer to believe that an illegal act has occurred²⁹. To establish probable cause, it is not necessary that a fishery control officer possess knowledge of facts sufficient to establish guilt, but more than suspicion is required. Therefore, what needs to be ascertained is whether VMS information provides evidence of a standard higher than mere suspicion. In this respect, it is important to note that the high level of accuracy of GPS³⁰, which is the most widely used position fixing method in the context of fisheries, has not been challenged to date. This seems to indicate that GPS accuracy is widely recognized and may even be regarded as universally established by common notoriety. In spite of its accuracy, a vessel position, even though it may indicate a clear violation of the limits of a prohibited fishing area, does not provide adequate information to determine the nature of the suspicious activity. It should be noted that VMS and the information it provides would be integrated with other surveillance and enforcement functions. Effective monitoring of fishing vessel location and activity and confirmation of the accuracy and integrity of vessel positions will be achieved by the comparison of VMS positions with sighting reports, primarily from aerial surveillance, scientific observer records and reports (if applicable), vessel records and returns, and in-port vessel inspections. Computer systems can be used to compare vessel activity and location from these sighting reports with relevant VMS positions transmitted to the monitoring agency³¹. Any discrepancies, outside acceptable tolerances, will be identified for further analysis and investigation. This indicates that VMS information will not suffice, by itself, to determine whether or not the activity of a vessel needs to be further investigated, but that its use as corroborating evidence in relation to other information provided by other means will be of assistance in allowing a fishery control officer to determine with reasonable certainty that a violation had occurred.

During the 2nd FFA VMS Legal Workshop, a working group was created to identify and review evidentiary issues. In its findings, the working group emphasized the fact that the presentation of VMS information may not be admissible as evidence in court because of the hearsay rule. Hearsay evidence, as defined in the United States Federal Rules of Evidence,

“is testimony in court of a statement made out of court, the statement being offered as an assertion to show the truth of matters asserted therein, and thus resting for its value upon the credibility of the out-of-court asserted.”

Hearsay rule is not ordinarily admissible because the person who made the out-of-court assertion cannot be cross-examined by the judge or the jury. The working group noted that exceptions to the hearsay rule were based upon the level of reliability and trustworthiness of VMS

28. The concept of “probable cause” as defined in Black’s law dictionary is “a reasonable ground for belief in certain alleged facts. A set of probabilities grounded in the factual and practical considerations which govern the decisions of reasonable and prudent persons and is more than mere suspicion but less than the quantum of evidence required for conviction.”

29. The phrase “reasonable grounds to believe”, which means substantial probable cause, is the standard commonly used in fisheries legislation to allow fishery control officer to carry out arrest, search and seizure.

30. Industry standards for GPS are generally accepted as providing an accuracy of 100 m from uncorrected GPS readings.

31. In this regard it is interesting to note that Article 19 (1) of Council Regulation (EEC) No. 2847/93 of 12 October 1993, establishing a control system applicable to the Common Fisheries Policy, provides that “each Member States shall establish a validation system comprising in particular cross-checks and verification of data”, including VMS information, and that Article 3 (2) of Commission Regulation No. 1489/97 of 29 July 1997, laying down detailed rules for the application of Council Regulation No. 2847/93, stipulates that each Flag Member States shall take all the necessary measures to check the accuracy of the data referred to in paragraph 1, which includes the position of fishing vessels.

information and set out the exceptions that can be found in most jurisdictions of FFA member countries. These include: business records, public records, evidence by certificate, rebuttable presumption, and judicial notice. Of particular interest are the comments made on both rebuttable presumption and judicial notice. With regard to rebuttable presumption, which means that a fact is assumed to be true unless the contrary is proved (reversing the burden of proof)³², the working group indicated that the fisheries legislation of the Federated States of Micronesia (Code of the Federated States of Micronesia, Title 24, Section 515) provided that

“Where, in any legal proceedings instituted under this title or any regulations issued under this title, the place in which an event is alleged to have taken place is in issue, the place stated and copy of the relevant entry in the logbook or other official record of an enforcement vessel or aircraft as being the place in which the event took place shall be presumed to be the place in which the event took place, unless the contrary is proved.”

Considering the level of accuracy of GPS, lawmakers may well consider modifying such type of provisions so as to make vessel positioning provided by VMS a rebuttal presumption. In respect of judicial notice³³, the working group noted that

“judicial notice may be taken of the fact that certain machines are notoriously accurate, i.e., their accuracy comes to be accepted over a period of time through usage, and their data therefore is accepted as accurate as well”

indicating, thus, that GPS may satisfy this requirement since its accuracy remains unchallenged.

The South African Marine Living Resources Act, 1998 (Act No. 18 of 1998) contains no less than six sections (Sections 71-76) devoted to evidentiary issues. Of particular interest for our study are Sections 73 and 76. Section 73, dealing with certificate as to location of vessel (documentary evidence), provides that

“a certificate given by a fishery control officer or observer shall be *prima facie* evidence³⁴ in any proceedings in terms of this Act, of the place or area in which a vessel has been at a particular date and time or during a particular period of time.”

It also sets out the information that is required to be mentioned in such a certificate, including “the position fixing instruments used to fix the place or area and their accuracy within their specified limits.” (Section 73 (2) (e)). Section 76 empowers the Minister, by public notice in the Gazette, to designate any device or machine or class of device or machine as an observation device. All information or data (including the vessel’s position and fishing activities entered manually into the observation device or automatically from machines aboard the vessel), obtained or ascertained by the use of an observation device, shall be *prima facie* evidence that such information: (a) came from the vessel so identified; (b) was accurately relayed or transferred; and (c) was given by the master, owner or charterer of the fishing vessel, and evidence may be given of information and data so obtained or ascertained whether from a printout or visual display unit³⁵ (Section 76 (3)). These provisions were specifically designed to deal with the increasing use of new technology in fisheries management, and in MCS in particular. Although not expressly mentioned, it is clear that they apply to VMS information and that vessel tracking units on-board

32. For more information on the use of the device of shifting the burden of proof in fisheries legislation, see FAO, 1998.

33. Judicial notice as defined in Black’s law dictionary means “the act by which a court, in conducting a trial, or framing its decision, will, without the production of evidence, recognize the existence and truth of certain facts.”

34. Such evidence as, in the judgment of the law, is sufficient to establish a given fact, and which if not rebutted or contradicted, will remain sufficient.

35. See Cho, 1998, where, in Chapter 7, the author discusses the use of geographic information systems in court, notably that of maps. It also examines evidentiary issues raised to the need for establishing high standards in the production and use of data as well as uniformity in the exchange of data and information.

fishing vessels are likely to be designated as observation devices. Recognition of VMS information concerning the vessel's position as *prima facie* evidence will certainly be of great assistance to fisheries managers, when used to enforce prohibited fishing areas or closed seasons, as in these cases it is sufficient to establish the vessel's position at a certain date and time to prove that an offence has been committed. However, it will provide little assistance in enforcing other types of management measures, as location of a vessel furnish no evidence as to whether or not the vessel was fishing.

In conclusion, it appears that, at present, VMS information is primarily used to trigger further investigation into suspicious fishing activities. However, as the South African example mentioned above shows, VMS information on the vessel's position might be of a sufficient standard to prove that an offence was committed, when used to enforce prohibited fishing areas or closed seasons.

3.5 Maritime boundaries

Many countries have not yet formalized their maritime boundaries in accordance with the requirements of Articles 15 and 74 of the 1982 UN Convention. Uncertainty regarding boundaries of maritime zones may destroy a case, whether civil or criminal, and provoke tension between countries involved (e.g., in the China Sea). Though formal delimitation of maritime boundaries throughout the world is certainly highly desirable and would, *inter alia*, facilitate the implementation of VMS projects, it must be recognized that this is an extremely delicate matter, involving national sovereignty, and that it can only be achieved through negotiations or other peaceful means of dispute settlement. Regional organizations³⁶, including regional fisheries organizations, may provide forums where progress can be made on this issue. Meanwhile, caution should be exercised in the implementation of VMS projects in areas where maritime boundaries are contested between two or more countries, or where a case involves a position fix in the direct vicinity of a maritime boundary.

4. VMS REGULATIONS

This Section identifies, through comparative study, the current main features of VMS regulations.

4.1 As a condition to fishing licences

As a preliminary remark, the equipment required to be installed on board fishing vessels will be referred to as a Vessel Tracking Unit (VTU) hereinafter. Although installation of a certified VTU on board fishing vessels required to carry such equipment may not be specifically mentioned as a condition to a fishing licence, it is clear that vessels falling into this category will not be authorized to conduct fishing operations unless they comply with such requirement. In Australia, installation of a VTU is a condition of the fishing permit in respect of Australian vessels. With regard to foreign fishing, obligation to carry a VTU is negotiated on a case-by-case basis in the framework of bilateral fishing agreements. For instance, it is a provision of the bilateral subsidiary agreement with Japan and a condition of the licence that Japanese vessels carry a VTU. New Zealand has adopted a different approach, since it has formulated a blanket provision requiring all foreign fishing vessels authorized to operate within its EEZ to carry a VTU³⁷.

36. In this regard, it can be noted that Article 4.2 of Commission Regulation (EC) No. 1489/97 of 29 July 1997, laying down detailed rules for the application of Council Regulation (EC) No. 2847/93 as regards satellite-based vessel monitoring systems, stipulates that "Each Member State shall transmit to the other Member States, before 31 December 1997, a comprehensive list of latitude and longitude coordinates which delimit its exclusive economic zone or exclusive fishery zone " and that the 2nd FFA VMS Legal Workshop strongly recommended that "FFA Member Countries ascertain and formalize their maritime boundaries as soon as possible."

37. The Fisheries (Satellite Vessel Monitoring) Regulations 1993, article 3 (1) (a).

In the northeast USA fisheries, owners of fishing vessels required to install a VTU on board their vessels must provide documentation to the Regional Director at the time of application for a fishing permit that the vessel is equipped with an operational VTU that meets the specified minimum performance criteria. It is further specified that if a vessel has already been issued a fishing permit without providing the required documentation, the Regional Director shall allow at least a 30-day period for the owner to comply with their obligations (50 C.F.R., Section 648.10 (1996)).

In the region served by FFA, FFA member states have agreed to include in the fishing licences of foreign fishing vessels operating within their EEZs, conditions that require these vessels to install and carry automatic location communicators (ALCs)³⁸. This requirement is considered to be the first step in the implementation of the FFA VMS, pending amendments to existing laws and regulations or the promulgation of new VMS regulations by FFA member states. In addition, the VMS Guidelines for Installation and Registration of ALCs provide that member countries must not licence a foreign fishing vessel unless that fishing vessel or support vessel is registered on the VMS register.

4.2 Scope

Since there was little understanding of VMS as a fisheries management tool and considerable distrust of it within the fishing industry, most countries have adopted an evolutionary approach to implementing VMS. This led fisheries managers to decide to implement VMS on a fishery by fishery basis. In a first phase, trials were generally conducted on one or two fisheries for a period of one or several years, following which decisions to pursue the experiment and extend VMS requirement to other fisheries were made. At the time of writing, VMS has become a common feature in several countries, including Australia, Japan and New Zealand, whereas it is in what can best be described as an intermediary stage in the EU, the USA and NAFO, i.e., beyond the trial stage but still requiring some time for the installation of VTUs on board fishing vessels to be completed, and in a trial phase in Norway and South Africa.

In 1993, New Zealand, which is the country that has developed the most comprehensive set of VMS regulations to date, enacted the Fisheries (Satellite Vessel Monitoring) Regulations 1993, whereby it was required that by 1 April 1994 an ALC should be carried on board the following classes of vessels: (i) foreign licensed fishing vessels (Article 3 (1) (a)); (ii) foreign chartered fishing vessels capable of engaging in trawling for fish (Article 3 (1) (b)); and (iii) New Zealand fishing vessels exceeding 43 m LOA and capable of engaging in trawling for fish (Article 3 (1) (c)). The Director-General was empowered to specify, by notice in the Gazette and after consultation with the New Zealand Fishing Industry Board, fishing vessels of any class, being New Zealand fishing vessels or foreign chartered fishing vessels, in respect of which such regulations should apply (Article 3 (1) (d)). In 1994, the Director-General issued a notice³⁹ providing that by 1 October 1994 the requirement to carry an ALC be extended to the following classes of vessels: (i) all foreign chartered vessels not specified in the 1993 regulations, except those used for jigging for arrow squid or used for longlining for tuna; and (ii) all New Zealand fishing vessels exceeding 28 m LOA, not specified in the 1993 regulations, which are used for jigging for squid or used for longlining for tuna. It further specified that by 1 April 1994 all New Zealand fishing vessels of 28 m LOA or less, which are used at any time during a fishing year for fishing for orange roughy or scampi, be subject to the obligation of carrying and operating such devices as well. In order to determine the scope of VMS regulations, New Zealand fisheries

38. The agreement to include conditions in fishing licenses requiring the installation of ALCs on foreign fishing vessels was facilitated through amendments to the Harmonized Minimum Terms and Conditions for fishing access (HMTTC). The governing body of FFA, the Forum Fisheries Committee (FFC), approved the HMTTC amendments at FFC 34 (24-28 November 1998).

39. The Fisheries (Fishing Vessels Subject to Satellite Vessel Monitoring) Notice 1994 (No. 5325).

managers rely on a combination of four distinct criteria: nationality of the vessel (national or foreign), the type of fishery the vessel is involved in, fishing gear used and length of the vessel.

Furthermore, Regulation 10 of the Fisheries (Satellite Vessel Monitoring) Regulations 1993 provides for the Director-General to authorize a person or vessel to operate without complying with all or any of the requirements of these regulations. The dispensation can be allowed “to the extent that compliance with the regulations is unreasonable or impracticable in the case of that person or vessel.” The Ministry of Agriculture and Fisheries (MAF) does not intend to monitor the location of vessels where there is no need to do so, and the dispensation provisions under the Regulations will be utilized in cases in which fishing is not affected by location, such as for a vessel not subject to any area restrictions or one fishing species not subject to quota, or when a vessel’s location is not relevant to fishing, e.g., a vessel undergoing lengthy refit and not fishing for a few months.

In the EU, VMS regulations were devised on the basis of the findings derived from VMS pilot projects that had been carried out by Member States of the EU on the basis of Article 3 (2) of Council Regulation No. 2847/93 of 12 October 1993, establishing a control system applicable to the common fisheries policy. The categories of vessels to which VMS applies is defined by Article 3 (1) of Council Regulation No. 2847/93, as amended by Council Regulation (EC) No. 686/97⁴⁰ which contains provisional measures stipulating that

“the VMS shall apply no later than 30 June 1998 to all Community fishing vessels exceeding 20 m between perpendiculars or 24 m overall length belonging to any one of the following categories:

- vessels operating on the high seas, except in the Mediterranean Sea⁴¹;
- vessels operating in the waters of third countries, provided that provisions have been made in Agreements with relevant third country or countries for the application of a VMS to the vessels of such country or countries operating in the waters of the community;
- vessels catching fish for reduction to meal and oil.”

Article 3 (2) further specifies that “the VMS shall apply no later than 1 January 2000 to all Community fishing vessels exceeding 20 meters between perpendiculars or 24 meters overall length wherever they operate.” Note that the EU has modified its policy with regard to application of VMS to third-country fishing vessels, which was based on the reciprocity principle, to require, as from year 2000, that all third-country fishing vessels operating in the Community fishing zone be equipped with a VMS position monitoring system (Council Regulation (EC) No. 2846/98 of 17 December 1998 amending Regulation (EEC) No. 2847/93 establishing a control system applicable to the Common Fisheries Policy). Council Regulation (EC) No. 2846/98 introduces a new Title (Title VIa) on “Monitoring the fishing activities of third-country vessels.” It defines the concept of third-country fishing vessels as:

- a vessel, whatever its dimensions, used primarily or secondarily to take fisheries products;
- a vessel, that even if not used to make catches by its own means, takes the fisheries products by transshipment to other vessels;
- a vessel aboard which fisheries products are subject to one or more of the following operations prior to packaging: filleting or slicing, skinning, mincing, freezing and/or processing;

40. Council Regulation (EC) No. 686/97 of 14 April 1997, amending Council Regulation (EEC) No. 2847/93 establishing a control system applicable to the Common Fisheries Policy, contains VMS provisions that replace Article 3 of Council Regulation No. 2847/93.

41. No EEZs have yet been established by EU Member Countries in the Mediterranean Sea.

- and flying the flag of, and registered in, a third country (Article 28 a).

All third-country fishing vessels operating in Community fishing zone, and exceeding 20 m between perpendiculars and 24 m LOA, are required, as from 1 January 2000 at the latest, to be equipped with a VMS position monitoring system approved by the Commission. Of particular interest is the fact that VMS is applicable not only to vessels directly engaged in fishing, but also to what are often referred to as fishing support vessels⁴².

Unlike New Zealand's VMS regulations, which authorize the Director General to exempt, on a case-by-case basis, a person or vessel from complying with these regulations, EU VMS regulations specifically mention the categories of fishing vessels to which the VMS requirement does not apply. They concern "vessels operating exclusively within 12 n.mi. of the baseline of the Flag Member State; or vessels which never spend more than 24 hours at sea, taken from the time of departure to the return to port."⁴³ This regulation is directed at small fishing vessels for which the obligation to carry and operate a VTU was thought to constitute a disproportionate burden in relation to their fishing capacity.

In the USA, VMS regulations have been adopted in the Northeast and Western Pacific regions⁴⁴. A VTU is required to be installed on board Northeast multispecies vessels that have been issued an individual day-at-sea or combination permit, and scallop vessels that have been issued a full-time or part-time limited access scallop permit (50 C.F.R., Section 648.10 (1996)). While scallop vessels had to have complied with VMS requirement by 15 May 1998, the multispecies fleet was allowed by the National Marine Fisheries Service (NMFS) a one-year grace period in which to comply.

FFA launched the research, design and implementation of a region-wide satellite-based VMS in 1995. After extensive testing, the FFA VMS became technically operational on 1 April 1998⁴⁵. Currently, the agreement of FFA member states to include as a condition of licence the requirement to install an ALC applies to foreign fishing vessels that are licensed to operate within the FFA region.

By the end of 1998, Morocco was expecting to have implemented an experimental monitoring programme covering all vessels⁴⁶, including foreign fishing vessels, authorized to participate in the squid fishery. The experimental phase was to run for approximately one year, after which the entire programme was to be assessed and a decisions made by the Ministry of Marine Fisheries as to whether or not to extend VMS to other fisheries.

In 1998, Peru decided to implement a "turn-key" VMS on its fishing fleet, which represents more than 1000 vessels. One year later, an estimated 600 vessels, essentially purse seiners with a storage capacity exceeding 30 t, trawlers and longliners, have been fitted with a VTU. Peruvian fishing vessels are required to have their VTU switched on both inside and outside Peru's

42. Legal issues raised by the concept of "fishing support vessels" under The 1982 UN Convention are discussed in the manuscript on Satellite-Based Vessel Monitoring Systems for Fisheries Management prepared by Mr. M. Tsamenyi and Mr. E. Molenaar. See also the decision of the International Tribunal for the Law of the Sea (ITLOS) in the Saiga (Merits) Case (the M/V "Saiga" Case No.2) (Saint Vincent and the Grenadines v. Guinea).

43. Article 3(3) of Council Regulation (EEC) No.2847/93 of 12 October 1993, establishing a control system applicable to the Common Fisheries Policy, as amended by Council Regulation (EC) No. 686/97 of 14 April 1997.

44. Note that the use of VMS in the Western Pacific Region has been included to cover the crustacean fishery on a voluntary basis, and that use of VMS is under consideration for other fishery management plans as well (currently only Hawaii longliners are required to be equipped with a VTU). In the Northeast, fisheries managers are looking at a possible significant expansion of VMS, notably to the highly migratory species fishery. VMS has been used, or is soon scheduled to be used, in both the Southeast Region and Alaska. It is interesting to note that the Southeast programme to apply to the Calico shrimp fishery utilizes cell technology rather than the standard Inmarsat-C technology (Mr. P. Ortiz, NOAA, *pers. comm.*).

45. See the FFA website <http://www.ffa.int/> for more information on the FFA VMS.

46. Initially, about 400 vessels (300 Moroccan and 100 EU) were to be required to install a VTU.

maritime zones. Foreign fishing vessels licensed to operate in Peru's maritime zone are also required to be equipped with a VTU, but only need have VTUs switched on when operating within Peru's maritime zones.

The above examples show that States do not use uniform criteria to determine the scope of their VMS regulations. Indeed, fisheries management agencies rely on various sets of criteria established in relation to the specific parameters of their fisheries and with regard to the goals of their vessel monitoring programme, as defined in FMPs.

4.3 Standards and requirements relating to VTUs

4.3.1 VTU minimum performance standards

Quite commonly, only VTUs that have been certified can be used on board fishing vessels required to carry such equipment. In order to be approved, a VTU must meet the minimum performance standards specified in fisheries regulations. Based on the findings derived from a thorough analysis of relevant EU, New Zealand and USA regulations, it appears that the basic required features in a VTU are:

- (i) **Tamper-proof** US Northeast fisheries regulations require that the VTU be tamper-proof and specify that it shall not permit the input of false positions. Furthermore, it indicates (50 C.F.R., Section 648.9 (b) (1) (1996)) that when using satellites to determine position, "satellite selection should be automatic to provide an optimal fix and should not be capable of being manually overridden by any person aboard a fishing vessel or by the owner." It is worth noting that whereas the USA and the EU have devised general specifications applicable to all types of VTUs, New Zealand has developed specific requirements in relation to particular types of equipment⁴⁷, namely Argos⁴⁸ and Inmarsat-C⁴⁹ ALCs. In order to secure positioning information, both sets of regulations contain similar language stipulating that "the user interface shall not allow user access to functions that can alter or disable any functions relating to position reporting." EU regulations do not contain specific language with regard to this issue, but require that a VTU ensures automatic transmission of requested data, including positioning information, to the relevant FMC, thus denying any manual input.
- (ii) **Operational at all times** While US Northeast fisheries regulations require that a VTU be operational at all times, regardless of weather and environmental conditions (50 C.F.R., Section 648.9 (b) (2) (1996)), without providing further details, New Zealand regulations specify that the ALC "shall be able to function at specified accuracy between -10°C and +40°C."⁵⁰ Furthermore, requirements relating to the mounting of the transceiver box⁵¹ and antenna are designed to ensure continuous reliable operation of the ALC.
- (iii) **Position accuracy and velocity** VTUs installed on board fishing vessels operating in the Northeast region must provide position accuracy within 400 m (C.F.R., Section 648.9 (b) (3) (1996)). While NMFS acknowledges that position accuracy must be determined on the basis of industry standards, it also recognizes that only systems using GPS can obtain

47. Regulation 4 (2) of the Fisheries (Satellite Vessel Monitoring) Regulations 1993 provides that "different standards and requirements may be so specified in respect of automatic location communicators."

48. Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular Two on Certification Requirements for Argos Automatic Location Communicators (December 1993).

49. Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular One on Certification Requirements for Inmarsat-C Automatic Location Communicators (December 1993).

50. Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular One on Certification Requirements for Inmarsat-C Automatic Location Communicators (December 1993), section 2.2.3.

51. *Ibid.*, Section 4.2.1 stipulates that "fixings used shall be capable of securing the device [the transceiver box] to prevent movement when exposed to the vibration and shaking typically experienced aboard a deep sea going vessel so as to ensure continuous reliable operation of the ALC as a part of the VMS".

accuracy of less than 100 m. Therefore, in order not to exclude other systems from consideration, NMFS requires a VMS to meet industry standards while maintaining a minimum accuracy of 400 m. Based on a similar reasoning, EU regulations require position accuracy within 500 m, with a confidence interval of 99%⁵². With regard to systems using GPS, New Zealand regulations require that position error with selective availability⁵³ turned on must be within 100 m, and 25 m with selective availability turned off⁵⁴, and velocity error with selective availability turned on must be less than 1.5 knots, and less than 1.0 knot with selective availability turned off⁵⁵. It is interesting to note that both EU and US regulations are silent on the issue of velocity accuracy. Lack of velocity standards may have legal implications, notably, where a monitoring agency tries to establish probable cause by determining whether a vessel is fishing on the basis of its reported speed.

- (iv) **Frequency of position reports and polling** In the USA, all required VTUs must transmit a signal indicating the vessel's accurate position at least every hour, 24 hours a day, throughout the year (50 C.F.R., Section 648.9 (c) (1996)). In addition, the VTU must allow polling of individual vessels or any set of vessels at any time and receive position reports in real time. "Real time" refers to "data that reflect a delay of 15 minutes or less between the displayed information and the vessel's actual position." (50 C.F.R., Section 648.9 (b) (5) (1996)). This feature is particularly important in that it allows the monitoring agency to act swiftly by directing an aircraft out to photograph the violator, and then wait for it to return to port for a dockside investigation. EU regulations provide that requisite VMS information, including positioning report, be transmitted to the FMC at least every two hours unless otherwise specified. In this respect, Annex 1 of Commission Regulation (EC) No. 1489/97 sets out various maximum intervals of time between receipt of position reports in relation to the location of the vessel: (i) when in port, the vessel is required to communicate its position at least once every 24 hours over a 48-hour period. However, if the vessel remains in port for more than 48 hours, the VTU may be switched off; (ii) when operating in the Mediterranean Sea outside Community waters or in the NAFO area, vessels must communicate their position at least every 12 hours; and (iii) when operating in areas other than the Mediterranean Sea outside Community waters and in the International Council for the Exploration of the Sea (ICES) area north of 62°N outside Community waters (except ICES division III_d), vessels are required to transmit their position at least every 24 or 6 hours respectively. Polling of individual vessels is recommended but not mandatory. In case a VTU does not offer the possibility of polling the actual position of a fishing vessel, the Member State concerned is, however, required to take all necessary measures to ensure that the

52. Article 3.1 of Commission Regulation (EC) 1489/97 of 29 July 1997, laying down detailed rules for the application of Council Regulation (EEC) No. 2847/93 as regards satellite-based vessel monitoring systems

53. GPS is a navigation system designed and operated by the US Department of Defense (DOD). Pursuant to the downing of the Korean Airlines Flight 007 after it had strayed into Soviet airspace, President Reagan ordered GPS to be made available for civil navigation use worldwide. Accuracy of GPS varies according to its use: (i) GPS has a Precise Positioning Service (PPS) providing a highly accurate position (within 20 m or less), which is available only to the US military and other selected users; (ii) GPS has Standard Positioning Service (SPS) providing lesser accuracy (within 30 m) and can be accessed with commercially available GPS receivers worldwide. Since November 1991, the DOD has further degraded the SPS signal available to civilian users through introduction of intentional errors in the signal called Selected/Availability (SA) reducing GPS accuracy to 100 m. In response to the need to provide accuracies better than those currently available, several US government agencies have developed, or are developing, augmentation systems, the most prevalent of which is differential GPS (dGPS). Using dGPS the accuracy of the SPS can be improved from 100 m to less than 5 m. For more information, see Epstein (1995).

54. Section 2.3.2 of Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular One on Certification Requirements for Inmarsat-C Automatic Location Communicators (December 1993)

55. *Ibid.*, Section 2.3.3.

FMC receives the position of the vessel every hour⁵⁶. New Zealand regulations as regards systems using GPS provide that the VTU must be capable of supplying position information at pre-set intervals using unreserved or reserved access over the data reporting channel and specify that the minimum range of reporting intervals must be between 15 minutes and 24 hours⁵⁷. Such systems are also required to supply information on demand (polling) using unreserved access over the data reporting channel⁵⁸. Finally, it is important to keep in mind that frequency of position reports may vary, within the range of reporting intervals set in the regulations, in relation to the type of fishing gears used (longlining, trawling, seining, etc.) or according to the target species (e.g., species subject to quotas).

- (v) **Data to be transmitted** As indicated earlier in this paper, VMS has hitherto primarily been used for the purpose of monitoring the movement of fishing vessels, notably in order to monitor compliance with prohibited fishing areas (e.g., marine sanctuaries, closed areas, spawning grounds, exclusion zones) or adherence with days-at-sea programmes (e.g., Northeast multispecies and scallop fisheries). As a result, emphasis has generally been put on the transmission of data relating to the position of fishing vessels. In the EU, required VMS information encompasses: (i) vessel identification; (ii) the most recent geographical position of the vessel expressed in degrees and minutes of latitude and longitude; and (iii) the date and time of the fixing of the position of the vessel⁵⁹. In addition, EU regulations require that those data be transmitted simultaneously to both the FMC of the coastal Member State in the waters of which the fishing vessel operates and to the FMC of the Flag Member State. At the same time, one should be aware that standard GPS reports contain owner identification and speed and course information. Likewise, current Northeast fisheries regulations only require the transmission of information relating to the position of the vessel. In New Zealand, however, required VMS information extends to the transmission of catch data for selected species, while Japan and Australia require that vessels flying their flags operating in specific fisheries transmit catch data. Unlike other type of information communicated through VMS, which are transmitted automatically, input of catch data requires human intervention and thus may not be as reliable. In addition, VMS is used to notify port of call⁶⁰.
- (vi) **Format** It is important that VMS regulations specify formats to be used when preparing and sending requisite information. In this respect, New Zealand fisheries regulations state that VMS reports, including catch reporting, notice of port call and test report, be sent in binary format. In addition, it also defines formats of polling commands for remote programming. It should be emphasized that the main issue concerning this matter lies in the fact that, as of yet, neither a universal standard for the purpose of exchanging VMS data between national monitoring agencies nor a standard communications system or communications protocol for delivering the data have been agreed upon. This matter is covered by John Fitzpatrick in his draft manuscript for FAO, where he reviews existing international standards, analyses various formats that

56. Article 3.3 of Commission Regulation (EC) 1489/97 of 29 July 1997 laying down detailed rules for the application of Council Regulation (EEC) No. 2847/93 as regards satellite-based vessel monitoring systems.

57. Section 2.1.2.1, Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular One on Certification Requirements for Inmarsat-C Automatic Location Communicators (December 1993)

58. *Ibid.*, Section 2.1.2.2.

59. Article 3.1 of Commission Regulation (EC) 1489/97 of 29 July 1997 laying down detailed rules for the application of Council Regulation (EEC) No. 2847/93 as regards satellite-based vessel monitoring systems

60. Section 2, [New Zealand] Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular Four on Port of Call and Catch Reporting (February 1994)

can be utilized in relation to position report, catch reporting and polling and stresses the necessity to agree on a universal standard format for the purpose of exchanging VMS data between national monitoring agencies.

- (vii) **Two-way communications systems** Most fisheries management agencies require systems that provide two-way communications⁶¹, that is being capable of operating in both send and receive modes.

4.3.2 Approval

Approval is the procedure by which the competent authority certifies that a VTU complies with the requirements and specifications established by fisheries regulations. In Australia, choice of VTU is limited to a list of equipment that has been approved by the Australian Fisheries Management Authority (AFMA). AFMA also approves commercial installers and maintainers of the equipment. In the USA, the Regional-Director annually approves a list of VTUs that meet the minimum performance standards. The list of approved VTUs is published in the Federal Register upon addition or deletion of a VTU from the list. In this regard it is worth noting that, as of writing, only one vendor has been certified (Boatrac Inc.) by the Northeast Regional-Director, and therefore only Boatrac equipment can be used in this area, although NMFS indicated in its Federal Register notice that it was continuing testing equipment from another supplier (SeaConnect), which, like Boatrac, had participated in the VTS experiment. Pursuant to the publication of the White Paper on Fisheries Policy, formally recognizing the use of VMS as a fisheries monitoring and control tool, South African authorities have been testing various VMS systems⁶² and should soon be in a position to devise certification requirements for VMS, with an approval procedure for the equipment deployed. Regulation 5 of the New Zealand Fisheries (Satellite Vessel Monitoring) Regulations 1993 provides that “any person may apply to the Director-General for a type approval in respect of any automatic location communicator” and establishes two levels of type approvals: a full type approval and a provisional type approval⁶³. The former is granted where the VTU submitted for approval fully complies with the appropriate standards and requirements. If it does comply in some respects, but not fully, then the provisional type approval may be granted. A provisional type approval is valid for a specified period of time, which may, at any time, be increased or reduced by the Director-General. When granting a provisional type approval, the Director-General may specify the reasons for granting that kind of approval and indicate the period within which the device must comply with the appropriate standards and requirements. Circulars One and Two specifying standards and requirements in respect of, respectively, Inmarsat-C and Argos ALCs, set out procedures to test these devices for type approval. Such procedures mainly consist of off-line and on-line tests. It is worth noting that if there is more than one supplier for exactly the same equipment and that such equipment has

61. The Argos system, which is, for instance, used in New Zealand, currently operates in send mode only. Receive mode, however, should be integrated by year 2000.

62. According to: *Report on the Introduction of Vessel Monitoring Systems (VMS) in South Africa with Specific Application to the Deployment of Satellite Tracking Units on Toothfish-Directed Vessels Operating from South Africa*, submitted by the Delegation of South Africa to CCLAMR (Document CCLAMR-XVI/BG/18). Systems tested were: Seawatch (using Inmarsat-C/GPS and a Trimble maritime transceiver); Sailor/Capsat (using Inmarsat-C/GPS and a Thrane & Thrane maritime transceiver); Argos (using the Argos satellite communications network linked to GPS); and Inmarsat-A.

63. In respect of Inmarsat-C ALCs, Section 6.1 of Circular One stipulates that “ALC Approval” shall be granted if: (1) “the unit is highly integrated so that the link between the Inmarsat-C transceiver and the GPS module may not be accessed in any unauthorized manner that could result in a compromise to the integrity of GPS position reports; and (2) all other requirements outlined in this document [Circular One] are met” and that “Provisional ALC Approval” shall be accorded if: (1) “it does not qualify for ALC Approval; and (2) the unit is secured using a form of technology acceptable to MAF that will provide a level of security against willful attempts to compromise the integrity of GPS position reports; and (3) all other requirements in this document [Circular One] are met.

been approved, then each supplier does not have to apply for type approval. Lastly, VMS regulations identify the Ministry of Commerce as the approved organization to test VTUs⁶⁴.

4.3.3 Registration

Insofar as the author has been able to determine, it appears that only New Zealand and FFA currently requires the registration of VTUs.

In New Zealand, Regulation 6 of the Fisheries (Satellite Vessel Monitoring) Regulations 1993 provides that the Director-General shall register a VTU if they are satisfied that the device under consideration is of the same type as a type approved in accordance with the appropriate standards and requirements set out in regulation 5 of the regulations. It further specifies that the Director-General may make the registration of a VTU subject to such reasonable conditions as they may indicate in writing to the applicant. They are also empowered to cancel at any time the registration of a VTU if they are satisfied that it no longer complies with the appropriate standards and requirements. The registration certificate issued by the Ministry of Agriculture and Fisheries must be kept on board the fishing vessel to which it relates and maintained in a legible condition and produced immediately on the request of a Scientific Observer⁶⁵. The registration expires when the vessel to which the VTU is registered is no longer authorized to operate within New Zealand waters or at such earlier date if cancelled by the Director-General⁶⁶.

FFA established a separate VMS register⁶⁷. Registration of foreign fishing vessels on the VMS register is a condition of licensing. Registered status in the VMS is accorded to all foreign fishing vessels which meet the following requirements when registering: (a) duly completed application forms have been received; (b) the specified levy has been received; and (c) the VMS Operations officer confirms to the Director of FFA that an FFA-approved operational ALC has been installed in accordance with the "Type Approval Process and Responsibilities for Automatic Communication Locators" specification. Registration may be suspended if, notably, the vessel operator violates terms and conditions of access, including but not limited to: (a) failure to activate ALC upon entry into zones; (b) failure to provide manual reports when so directed by the delegated member country while in a zone in the event of an ALC breakdown; (c) failure to stow fishing gear and either leave the zone in the event that manual reports cannot be provided; (d) failure to take the vessel to a nominated port for ALC repair when so directed by the delegated member country authority; and (e) interfering with, tampering with, altering, damaging, or disabling the ALC. Suspension of registration will in turn suspend the authorization to fish, as registration on VMS register is a prerequisite to licensing.

4.3.4 Procedures in case of VTU failure

Lawmakers have generally designed specific procedures to apply in the event a VTU fails to transmit the required information. In the event of technical failure or non-functioning of the VTU fitted on board a fishing vessel, EU regulations require that the master or the owner of the vessel or their representative communicate at least every 24 hours, starting from the time that this event is detected, providing the requested data by alternative means of communication, namely telex, fax, telephone message or radio (via a radio station approved under the Community legislation for

64. Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular Three on Approved Organization for the testing of Automatic Location Communicators (1994).

65. Section 3.2 of Ministry of Agriculture and Fisheries, Vessel Monitoring Systems, Circular Five on Registration of Automatic Location Communicators.

66. *Ibid.*, Section 4.

67. FFC 34 (24-28 November 1997). In addition to the requirement for registration of VTUs, the HMTCs set out the procedures for registration, criteria for withdrawal or suspension of registration, reinstatement of registration (Annex 4), a guide for application for registration (Annex 5), application for registration form (Annex 6) and the registration form (Annex 7).

the reception of such reports)⁶⁸. Interestingly, identical provisions apply in the event of technical failure or non-functioning of the VMS of the Flag Member State. The applicable procedure is uniform regardless the cause for malfunction of the device, whether it is the result of an intentional action (tampering) or a technical failure. Clearly, what matters is the continuous functioning of the VMS. As to whether the failure or non-functioning of the VTU can be linked to an intentional act will be determined at a later stage. It is further specified that the owner of the fishing vessel or their representative has the duty to have the VTU repaired or replaced within one month. Once that period has elapsed, the master is not authorized to commence a fishing trip with a defective VTU. The only exception to this rule concerns a vessel embarked on a fishing trip exceeding one month, in which case, the repair or replacement of a defective VTU must take place as soon as the vessel enters a port⁶⁹. As a corollary to the fact that most VTU are fully automatic (transmission of catch data is not currently required under EU regulations) and that failure or non-functioning of a VTU may therefore not be easily detected by the operator of the vessel, Member States are required to ensure that the master or the owner of the vessel or their representative is informed of any defective or non-functioning VTU⁷⁰.

The 1st FFA VMS Legal Workshop addressed the issue of VTU failure and recommended that, upon notification by the member country that the vessel's VTU has failed to report, the licence holder be required to ensure communication, at intervals of 8 hours, or less if so specified, of reports containing the vessel's name, call sign, position and date and time of reports, commencing from the time of notification of VTU failure. Emphasis is put on the obligation to continue communication of required information, but no mention is made of which alternative means of communication may be used. Call-in notification is not subject to any time frame and therefore must continue until such time as the delegated authority directs the vessel to return to a port designated by the licensing country or until communication of any further position reports becomes impossible. In these circumstances, the master of the vessel must: (a) immediately stow the fishing gear and take the vessel to a port; and (b) as soon as possible, report to the delegated authority that the vessel has been taken to port with gear stowed due to failure of the vessel's VTU. This recommendation appears to be incomplete and imprecise since it does not include any delay for the repair or replacement of the defective VTU and does not explicitly mention whether such fishing vessel may commence a new fishing trip before having undertaken all necessary repairs.

New Zealand fisheries regulations do not provide any specific procedure in the event of a VTU failure but require that the Fisheries Communication Centre be notified if a VTU on board a fishing vessel fails to work properly⁷¹.

4.4 Responsibilities of permit holder and master

As a general rule, masters of vessels to which VMS applies must ensure that VTUs are fully operational and that the requisite VMS information is regularly transmitted. In New Zealand, Regulation 7 of the Fisheries (Satellite Vessel Monitoring) Regulations 1993 also specifies that the permit holder and master must ensure that the VTU carried on board the vessel operates continuously and is properly registered. USA regulations applicable in the Western Pacific region provide that the holder of a Hawaii longline limited-access permit and the master of the vessel operating under the permit must: (1) provide opportunity for the competent authority to install and make operational a VTU; (2) carry the VTU on board whenever the vessel is at sea; and (3) not

68. Article 6(1) of Commission Regulation (EC) No. 1489/97 of 29 July 1997

69. *Ibid.*, Article 6 (2).

70. *Ibid.*, Article 6 (3).

71. Regulation 7 (e) (ii), The Fisheries (Satellite Vessel Monitoring) Regulations 1993

remove or relocate the VTU without prior approval from the competent authority (50 C.F.R., Section 660.25 (d) (1996)). As indicated in Section 4.3.4 above, in New Zealand and the EU, masters of fishing vessels have the duty to notify any failure or malfunction of the VTU installed on board.

4.5 Offences and penalties

First assessments of VMS programmes in Australia, New Zealand and USA clearly indicate that implementation of a VMS has significantly reduced the number of violations, notably in relation to incursions into prohibited fishing areas. Since VMS appears to act as a deterrent, its effectiveness will certainly be enhanced if supported by a sound legal framework providing for adequate types of offences and dissuasive penalties. In New Zealand, Regulation 8 of the Fisheries (Satellite Vessel Monitoring) Regulations 1993 defines the different categories of offences relating to VMS. These include:

- (i) the removal of a VTU from a fishing vessel without prior approval of the Director-General;
- (ii) interference with a VTU to an extent that such device no longer complies with the type approval granted in respect of the device, or no longer operates in accordance with the manufacturer's specifications;
- (iii) failure to notify the Director-General of any matter required by or under these regulations; and
- (iv) communication of false or misleading information.

In addition, it contains a blanket provision stipulating that any person commits an offence when failing to comply with any other provision of these regulations. According to Article 73 (3) of the 1982 UN Convention, Regulation 8 does not provide for a period of imprisonment, but stipulates that "every person who commits an offence against these regulations, is liable on summary conviction to a fine not exceeding \$ 10 000." By including language stating that any continuing offence would be punished by a further fine not exceeding \$ 500 for each day during which the offence is continued, law-makers made clear their intention to compel the violator to act promptly to correct the wrongdoing. Finally, New Zealand Regulation 9 specifies that the defendant may defeat the charges held against them if they can prove that:

- (i) the offence occurred as a result of an accident, or a mechanical or technical failure, but it explicitly rules out mechanical or technical failure due to the negligence of the defendant such as inadequate maintenance of the equipment; and
- (ii) they acted reasonably in the circumstances.

USA regulations applicable to the Western Pacific region contain a comprehensive set of prohibitions in relation to VMS. In addition to the abovementioned offences, it stipulates that it is unlawful for any person to:

- (i) possess on board a vessel without a VTU Pacific pelagic management unit species harvested with longline gear after NMFS has installed the VTU on the vessel;
- (ii) interfere with, impede, delay, or prevent the installation, maintenance, repair, inspection, or removal of VTU;
- (iii) interfere with, impede, delay, or prevent access to a VTU by a NMFS observer; and
- (iv) connect or leave additional equipment to a VTU without the prior approval of the competent authority.

In 1999, the EU established a list of types of behaviour that seriously infringe the rules of the Common Fisheries Policy (Council Regulation (EC) No. 1447/99 of 24 June 1999). This list includes, *inter alia*, tampering with the satellite-based VMS and deliberate failure to comply with

the Community rules on remote transmission of movements of fishing vessels and of data of fishery products held on board. Sanctions applicable to such types of behaviour are to be determined by each member state, which are required to notify the Commission on a regular basis of the instances of such behaviour that have been observed and provide it with all information regarding action taken by the administrative and/or judicial authorities.

As noted in Section 4.3.3 above, FFA provides a set of “criteria” for withdrawal or suspension of registration of foreign fishing vessels on the VMS register. Withdrawal or suspension of registered status on the VMS register for any foreign fishing vessel will in turn affect the status of the fishing licence.

In South Africa, Section 76 of the Marine Living Resources Act, 1998 (Act No. 18 of 1998), provides that

“no person shall destroy, damage, render inoperative or otherwise interfere with an observation device or machine aboard a vessel which automatically feeds or inputs information or data into an observation device.”

It further specifies that

“no person shall intentionally feed or capture information or data into an observation device which is not officially required in terms of this Act, or is false or inaccurate.”

Any person who contravenes these provisions is liable on conviction to a fine not exceeding two million Rand, or to imprisonment for a period not exceeding five years (Section 58 (1) (b)).

5. REQUIRED ELEMENTS IN VMS REGULATIONS

This chapter aims to summarize briefly, in light of the above study, the required elements that need to be incorporated in VMS regulations.

Generally, VMS regulations should clearly establish the VMS if this had not been done in principal legislation on marine fisheries or identify the VMS to be implemented and create obligations for compliance with its requirements.

5.1 Definitions

As a general rule, incorporation of definitions of key terms is necessary in order to avoid any problem of interpretation when implementing VMS regulations. Even though the extent of the definitions to be included in VMS regulations will vary from one country to another in relation to their fisheries legislation or other relevant laws, it would certainly be useful in any case to define precisely what constitutes a “VMS” and what a “VTU” is.

5.2 Scope

Determining the scope of VMS regulations is an important issue that will be decided by fisheries managers based both on the priorities set out in the fishery policy and the capability of the local administration to carry out its task. In view of the evolutionary approach (on a fishery-by-fishery basis) adopted by most fisheries managers the world over, the scope of most VMS regulations is likely to change in the years to come as the VMS requirement may be extended to other, already existing, fisheries, or be a condition for the exploitation of new fisheries. As indicated earlier, criteria to be applied to define the scope of VMS regulations will vary in accordance with the specific characteristics of each country’s fisheries and with the objective of each country’s fisheries policy. Criteria most commonly used are: vessel length, vessel nationality, the type of fisheries in which the vessels are involved, gear used, and area of operation.

5.3 Fisheries monitoring agency

VMS regulations must specify the authority responsible for the implementation of a VMS programme and ensure that it is properly staffed and equipped to carry out its task.

With regard to the issue of telecommunications terminal and satellite earth station equipment, it is interesting to note that the EU has recently adopted Directive 98/13/EC of the European Parliament and of the Council of 12 February 1998, relating to telecommunications terminal equipment and satellite earth station equipment, including the mutual recognition of their conformity.

5.4 Minimum performance standards

In order to ensure the effectiveness of a VMS programme, it is necessary to verify if vessels to which VMS applies are equipped with the proper type of equipment, i.e., equipment capable of accurately and securely transmitting the required information. Typically, minimum performance standards relate to: incorruptibility; position accuracy; velocity; reliability for operation in extreme weather or climatic conditions; capability of transmitting adequate information; frequency of position reporting; polling; and format standards.

5.5 Approval

A detailed approval process, as has been established in New Zealand and FFA, is highly desirable in order to ensure compliance of the equipment to be used with the minimum performance standards and proper functioning of the VTU. Such a process should encompass provisions relating, notably, to: application (procedure, documents to be provided); testing (off-line and on-line); designation of organizations or entities approved for carrying out testing; and installation (fitting requirements, approved organizations or suppliers).

5.6 Registration

Currently, it appears that only New Zealand and FFA require the registration of VTUs in a register to be kept by the responsible authority. Inclusion of such provisions does not seem essential at this stage of development of VMS and thus countries may elect not to establish a VTU register at this point. However, creation of such a register may prove useful as VMS requirements extend in order to monitor vessels required to carry a VTU on board and to prevent illegal removals or transfers of VTUs.

5.7 Procedure to be applied in the event of VTU failure or malfunction

The effectiveness of VMS as a fisheries management tool is based on its ability to continuously monitor the movements of fishing vessels. It is therefore crucial to assure the continuity and permanency of the reporting of fishing vessel positions. To this end, a detailed procedure to be applied in the event of VTU failure or malfunction must be incorporated in VMS regulations. Such a procedure should include at least the following elements: notification of VTU failure or malfunction (the onus should be on both the master of the vessel and the monitoring agency); transmission of required VMS information through alternative systems of communication (call-in system); and the specified period within which the repair or replacement of defective VTUs must take place.

5.8 Offences and penalties

Offences must be defined in such a manner as to cover every imaginable interference with the proper functioning of VMS. The various types of interference that might occur include blocking of antenna, disruption of power supply, physical removal of VTU, duplication of VTU, or transmission of false position.

Penalties must be sufficiently high to deter any person from committing any subsequent violation. In this regard, higher penalties could be provided for any subsequent violation (e.g., higher fines and fishing licence suspension/revocation).

6. CONCLUSIONS

Experiments conducted in various fisheries the world over have confirmed that VMS, when properly implemented, is a potent fisheries management tool that can significantly improve the effectiveness of MCS and enforcement schemes. Reports from Australia, New Zealand and USA unanimously indicate a sharp decrease in reported violations in areas where VMS applies, especially where used to monitor adherence to prohibited fishing areas. As a result of these experiences, more countries, including developing countries, are considering the development of VMS for their fisheries, either at the national or regional level.

However, successful implementation of VMS programmes will depend, to a large extent, on the ability of each national government to devise an appropriate legal regime.

It must be borne in mind that, to be successful, a VMS programme must be supported by:

- (i) an adequate general legal framework, providing, *inter alia*, dissuasive sanctions; and
- (ii) a comprehensive set of VMS regulations.

Beyond the need to design specific regulations for VMS, one theme of this discussion has been the need to conceive an appropriate legal regime for the protection of VMS data. Therefore, each country, that intends to implement a VMS programme, may need to thoroughly assess its legal framework to ensure that existing legislation offers adequate protection to VMS information in relation to, *inter alia*, secrecy of communications, use of computerized personal data, unfair competition, and legal protection of databases. Where insufficiently developed or absent, appropriate legislation will have to be drafted. Inadequate legal protection of VMS data is likely to be a major problem in a large number of countries, and especially in developing countries, where in many instances legal concepts such as secrecy of communications, freedom of information or unfair competition, are still foreign. The inability of fisheries management authorities to guarantee adequate legal protection of VMS data may, in turn, antagonize the fishery industry and thus compromise the viability of VMS programmes.

Equally important, given the mobility of both fish stocks that swim across maritime boundaries and distant-water fishing fleets that target them, is the need to develop an international approach to VMS. Recognizing such a need and responding to the recommendation of the Conference on Integrated Fisheries Monitoring (held in Sydney, Australia, 1-5 February 1999) that called on the FAO Committee on Fisheries to prepare guidelines for the integrated monitoring of fisheries, within the context of the FAO Code of Conduct for Responsible Fisheries, FAO has elaborated a Strategy for the Global Implementation of Vessel Monitoring Systems in National or Regional Monitoring Control and Surveillance Programmes. The FAO VMS strategy envisions a two-phase process. In the first phase FAO would coordinate a web site to facilitate the exchange of information on fishing activities between developed countries with distant-water fleets (Flag States) and coastal States (developing countries). In the second-phase, a regional approach would be adopted on the model of that implemented in the South Pacific, and would use existing FAO Regional Fisheries Bodies as forums for the establishment of regional VMS. Developing countries, especially those with large EEZs, should benefit from such a regional approach, as they are, in most instances, unable to individually establish and support MCS programmes, including VMS, for their EEZs. The FFA experience demonstrates that a regional or sub-regional approach is instrumental in developing a VMS in areas where the lack of MCS capability of each individual country (developing countries) would be an insurmountable obstacle to the establishment of national VMS. Note that MCS regional programmes have already been implemented in other

areas of the world, notably in West Africa, through the Sub-Regional Commission on Fisheries⁷². Others are under consideration, including in the Southern African Development Community (SADC) region and in the Indian Ocean.

A high level of cooperation between coastal States and Flag States will also be required in order to:

- (i) harmonize VMS regulations;
- (ii) agree on standard communications systems for delivering data; and
- (iii) agree on uniform formats to facilitate the exchange of fisheries information between national monitoring agencies.

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72. The Sub-Regional Commission on Fisheries has 7 members, Cape Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and FAO. Note that the regional project on aerial surveillance of fishing zones implemented by the Sub-Regional Commission on Fisheries does not, in its current form, use satellite-based communications.