INFORMATION AND INFLUENCE IN FISHERIES MANAGEMENT:

A PRELIMINARY STUDY OF THE SHRIMP AND GROUNDFISH RESOURCES IN THE BRAZIL-GUIANAS CONTINENTAL SHELF

by

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Information and Influence in Fisheries Management: A Preliminary Study of the Shrimp and Groundfish Resources in the Brazil-Guianas Continental Shelf

ABSTRACT

Scientific information on the shrimp and groundfish resources of the Brazil-Guianas Continental Shelf has been produced over the years by intergovernmental advisory bodies such as the Food and Agriculture Organization (FAO) and Caribbean Regional Fisheries Mechanism (CRFM) in collaboration with the national fisheries management agencies. In spite of the availability of information, there is limited evidence that it is being used in management.

The study examines scientific information use and its influence in managing the shrimp and groundfish fishery to determine the related barriers and opportunities for using information. A survey questionnaire was administered to five key players: fishing industry, scientists, fisheries managers, policy makers, and fisheries advisory bodies, to document the role of each stakeholder in the creation and distribution of scientific information, primarily for Trinidad and Tobago. The study used content analysis of survey responses and publications to gain insights into the reasons for the infrequent uptake of management advice provided by the FAO and the CRFM.

Publications have increased the knowledge base and strengthened technical capabilities. Advances in digital technology have made information more accessible to users. Assessments were largely driven by local scientists and the FAO and CRFM while other stakeholder groups were not fully engaged. The high technical content of information affected its usefulness to some stakeholders. There was no formal system for measuring the use and influence of information in decision making. More efficient communication strategies and streamlining scientific information with policy may increase the use and influence of information. Partnerships and education to encourage stakeholder involvement can facilitate the increased influence of information.

Keywords: scientific information, qualitative findings, information management, fisheries management, shrimp and groundfish fisheries.

ABBREVIATIONS AND ACRONYMS

CARICOM	Caribbean Community and Common Market		
CFRAMP	CARICOM Fisheries Resource Assessment and Management Programm		
CRFM	Caribbean Regional Fisheries Mechanism		
DFID	UK Department for International Development		
FAO	Food and Agriculture Organization of the United Nations		
GEA	Global Environmental Assessment		
IMA	Institute of Marine Affairs, Trinidad and Tobago		
INIA	El Instituto Nacional de Investigaciones Agrícolas (National Agriculture Research Institute), Venezuela		
INSOPESCA	Instituto Socialista de la Pesca y Acuicultura (Socialist Fisheries and Aquaculture Institute), Venezuela		
MALMR	Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago		
SOME	State of the Marine Environment reports		
WECAFC	Western Central Atlantic Fishery Commission		

GLOSSARY

For purposes of this research, several terms are defined and used within the context of fisheries management and information management. The list has been compiled largely with reference to the *Communication of research: guidance notes for research programme consortia* of the UK Department for International Development (DFID, 2005) and the Web sites of the Food and Agriculture Organization (FAO, 2009a) and Grey Literature Network Service (Greynet, 2009).

Communication: any imparting or exchange of information between persons, with the aim of bridging understanding within a community to enrich common knowledge and effect change. Communication may be verbal, non-verbal, intentional, or unintentional (DFID, 2005).

Decision Maker: synonymous with policy maker.

Distribution: the act of moving information from one stakeholder to another and this may not necessarily involve an adaption of the information to suit the needs of the different stakeholders (DFID, 2005).

Fisheries Advisory Body: a national or regional body with an advisory mandate and provides advice, decisions or coordinating mechanisms that are not binding on their members. In this case study, a Fisheries Advisory Body refers to a Regional Fishery Body through which States or organizations, that are parties to an international fishery agreement or arrangement, work together towards the conservation, management and/or development of fisheries (FAO, 2009a).

Fisheries Manager: the government authority charged with managing fisheries, for example a Director of the Department of Fisheries or other personnel, with overall responsibility for implementing fisheries management. Accountable and responsible for the advice passed on from the Department to the political decision-maker or decision-makers and is likely to have an overall coordinating role for fisheries management (Cochrane, 2002).

Fisheries Officer: technical/professional staff of the Department of Fisheries or fisheries administration and who are involved in a wide range of activities including research, extension services and production of technical and administrative reports. The role of the Fisheries Officer in the case of Trinidad and Tobago is synonymous with the role of Scientist.

Global Environmental Assessments (GEAs): formal efforts to assemble selected knowledge with a view toward making it publicly available in a form intended to be useful for decision making (Mitchell, Clark, Cash and Dickson, 2008). A GEA is characteristically a product of the efforts of the international scientific community on an issue with potential impacts on a wide geographic scale. To be distinguished from species assessments referred to in the shrimp and groundfish case study.

Grey Literature: information produced by all levels of government, academics, business and industry in electronic and print formats and not controlled by commercial publishing, i.e., where publishing is not the primary activity of the producing body (GreyNet, 2004).

Network: individuals or organizations, under a formalized arrangement, willing to assist one another or collaborate on a common goal (DFID, 2005).

Policy: a plan, course of action, or set of regulations adopted by government, businesses, or other institutions designed to influence and determine decisions or procedures.

Policy Maker: sets the plan pursued by government, usually the political decision maker.

Primary literature: literature published in peer-reviewed journals and books.

Species Assessments: refers to biological assessments of fish stocks, giving the status of the fish or shrimp population in terms of abundance and population size. Used synonymously with 'stock assessments'.

Stakeholder: an individual/group that has expertise (has information or resources required to participate in the management process), and/or possesses power (is able to influence recommendations which result from the management process). A stakeholder

can significantly affect the formulation of recommendations and/or be significantly affected by them (DFID, 2005).

State of the Marine Environment (SOME) reports: report presenting the overall condition of the marine environment in terms of biodiversity, habitat and ecosystem health and other, often as a result of human impacts (Wells, 2003).

Target Audience: people who are intended to use the products of research both during and beyond the term of the research programme or project (DFID, 2005).

1.0 INTRODUCTION

1.1 The Management Issue

Globally, scientific information covering various aspects of the marine environment has been produced over the years by international advisory groups including the intergovernmental agencies of the United Nations (UN). This information includes reports covering a range of themes including pollution, natural resources, and marine fisheries resource management. Many of these reports, such as state of the marine environment reports, global environmental assessments and species assessments, have been produced as grey literature in association with national governments, academics, business and industry. Grey literature includes all materials produced and printed within these organizations and which has not been controlled by commercial publishers. This type of publication is generated worldwide in large quantities and is now usually available both in print and electronic formats. In spite of the increasing number of open access systems, the Internet, and powerful search engines which facilitate public access to information, there is still a lack of awareness of grey literature as an information source (MacDonald, Cordes, & Wells, 2004).

Access to and effective use of information concerns a wide range of stakeholders, including government, the maritime and fishing industry, environmental organizations and the general public. New scientific information may play an immediate role within the organizations responsible for its creation, but beyond these groups it is unknown whether the information is being accessed and utilized by members of the wider community of researchers and policy makers. From an information management perspective, this may be due to the nature of the information produced, its availability and accessibility.

The continuing decline in the state of the environment, in spite of the increasing volume of scientific information, seems to be a contradiction. Many reasons have been given for the continued declines in the marine environment, ranging from limited financial and human resources for management, lack of policies and legislation, lack of political will, insufficient information, to name a few. Specifically, the general declines in global fisheries have been attributed to ignoring of scientific advice for most fisheries in the

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world (Pauly, 2007). This challenge is faced in most natural resource harvesting, and on a wider scale in the fight between economic development and environmental conservation.

The Caribbean is no exception to global trends, and despite the available regional information and public support for marine biodiversity conservation, commercial fisheries statistics in the region show a declining trend in terms of species and abundance (Rivera-Monroy, 2004). The Caribbean Sea is already one of the world's 'hottest spots' of biodiversity threatened by extinction (Myers, Mittermeier, Mittermeier, da Fonseca & Kent, 2000; Brooks & Smith, 2001). Despite much more widely publicized support for biodiversity conservation recently, the lack of regional governmental and institutional support for research suggests that trends of declining biological diversity will continue over the next several decades (Myers et al., 2000; Brooks & Smith, 2001). There are inherent adverse impacts of declining biodiversity on the livelihoods of coastal communities. The evidence of continued declines in catches suggests that the advice provided in the fisheries assessment reports may not be having the desired influence on management and policy making. Communication of research findings may be limiting the uptake of scientific information into policy.

1.2 Purpose and Scope

The goal of this research was to examine information use and its influence in managing a Caribbean fishery. The shrimp and groundfish fishery of the Brazil-Guianas Continental Shelf ecosystem is used as a case study. Exploitation of the shrimp and groundfish resources in the Caribbean is managed by national governments. The management of the fisheries is assisted by regional fisheries organizations under the UN Food and Agriculture Organization (FAO) and Caribbean Regional Fisheries Mechanism (CRFM). Scientific information on the shrimp and groundfish fisheries of the Brazil-Guianas Continental Shelf, largely published as grey literature by the FAO, CRFM and national governments, is widely available (CRFM, 2008; FAO, 2001a). The reports indicate that many of the countries harvesting the marine resources of the Brazil-Guianas Continental Shelf are experiencing declines in fish stocks, which affect many fisher communities. The

reasons for the frequent lack of uptake of the management advice from these fisheries assessment reports are unknown.

This study examined how information, largely available as grey literature, is accessed and used in the management of the fishery. The study sought the views of the stakeholders, in Trinidad and Tobago and Venezuela, involved in the creation, distribution and use of information to determine the reasons for the infrequent uptake of scientific advice into management and sustainability of living marine resources. These two countries were selected since it is understood that they exploit shared 'sub-stocks' of shrimp and groundfish in the Gulf of Paria on the Brazil Guianas Continental Shelf. This paper presents an account of the opportunities and barriers for using scientific information to manage the shrimp and groundfish resources in the region.

The broad research questions being addressed in this study are:

- What is the role of the stakeholders (fishing industry, scientists, fisheries manager, policy maker, fisheries advisory bodies) in the creation, distribution and use of scientific fisheries information?
- 2. How is this information being used for decision making?
- 3. What are the opportunities and barriers for using this information for decision making and how does this compare with other case studies on communication and use of scientific information?

The knowledge gained from this case study of the shrimp and groundfish fisheries may be beneficial to the organizations involved in funding and co-ordinating scientific research in terms of facilitating data collection, analysis and information dissemination. The research will identify the needs of the fishing industry, fisheries managers and policy makers, the nature of the communication from scientists, and how management advice, prepared in collaboration with the FAO and CRFM, is conveyed to policy makers. This knowledge can contribute to a better understanding of the pathways of fisheries information access and use and it is anticipated that application of the findings will lead to increased usage and influence of scientific information in the policy process. This paper is divided into seven main chapters. Chapter 1.0 gives the background to the study area, the Brazil-Guianas Continental Shelf. This background includes an overview of the geography of the region and the history of resource assessments. Chapter 2.0 describes the methods used in the research and Chapter 3.0 is a literature review on information and influence in resource management in general. Chapter 4.0 outlines the institutional arrangements for fisheries management in both Trinidad and Tobago and Venezuela and describes the five main stakeholders that form the focus of the research. The results are presented in Chapter 5.0, and the section describes the available information, the current management issues and recommendations arising from the scientific assessments and the pathway of information between the five stakeholders. Chapter 6.0 and Chapter 7.0 discuss the results of the survey and make recommendations.

1.3 Background Information

1.3.1 The Brazil-Guianas Continental Shelf The Brazil-Guianas region encompasses the marine area between the mouth of the Amazon River in Brazil to the Gulf of Paria shared by Trinidad and Tobago and Venezuela in the northwest (Cervigon et al., 1993). Figure 1 shows the location of the shelf and countries of northeast South America. It represents a coastal length of approximately 2,000 km (1,600 km between the Orinoco and the Amazon Rivers, plus the Gulf of Paria). The continental shelf varies in width between 80 and 200 km (Charlier, 2001). The Brazil-Guianas Shelf ecosystem is considered within the larger Caribbean Large Marine Ecosystem (CLME) (CERMES, 2007) for the Latin America and Caribbean region (see Appendix 1 for map). The fisheries landings from the shelf are dominated by shrimp and groundfish species which are shared by neighbouring countries and exploited by different fleets and gear consisting of mainly trawl, gillnets, lines and fish traps. The shrimp and groundfish resources have a high commercial value and contribute to food security for the region, income and rural stability and export earnings. The fisheries in the region are important in a biological, social and economic context and are worth being sustained and managed. The area is geographically well-circumscribed

and shared by relatively few countries; it includes a mix of political and technical entities (Chakallal, Mahon, McConney, Nyrse, & Oderson, 2007). In Trinidad and Tobago, there are some 209 active, locally registered trawlers and around 570 fishermen actively involved in the local trawl fishery (Soomai, 2008). In Venezuela, 39 fishing enterprises and 98 industrial vessels are recorded to be operating in the joint area shared between the two countries, from the Gulf of Paria, to the Orinoco Delta (Marcano, Alió & Altuve, 1998).



Figure 1. Map showing the Brazil-Guianas Continental Shelf and countries comprising the FAO/WECAFC Working Group. (Circle shows the marine area shared by fishing vessels from Trinidad and Tobago and Venezuela.).

1.3.2 History of Fisheries Resource Management

Research and assessment of the resources of the region date back to the early 1970s with the inception of the FAO/Western Central Atlantic Fishery Commission (WECAFC) (FAO, 2009b). Since then, there have been meetings of the FAO/WECAFC ad hoc Working Group on Shrimp and Groundfish Resources of the Brazil-Guianas Continental Shelf (henceforth referred to as the "FAO/WECAFC Working Group"), leading up to annual scientific meetings between 1996 and 2000 (FAO/WECAFC, 2001a). The

FAO/WECAFC Working Group was jointly supported by the CARICOM Resource Assessment and Management Programme (CFRAMP). Results of biological and bioeconomic assessments on the shelf show that most of the shrimp and groundfish species are fully to over-fished (FAO/WECAFC, 2001a). Overall recommendations were to reduce fishing effort, improve and enhance data collection systems, and continue fisheries assessments. The countries of the Brazil-Guianas (Trinidad and Tobago, Venezuela, Guyana, Suriname, French Guiana, and Brazil) are committed to adopting the FAO Code of Conduct for Responsible Fisheries (FAO, 1995) and the ecosystem approach to fisheries management (FAO/WECAFC, 2001a; 2001b), however, the countries have not implemented the related recommendations arising out of the FAO/WECAFC Working Group.

In 2000, countries of the FAO/WECAFC Working Group held national consultations to present the findings of the Working Group to the stakeholders and to initiate their participation in the management of these fisheries. In 2001, a regional meeting of Fisheries Ministers and managers of the countries of the FAO/WECAFC Working Group was held to inform decision-makers on the status of shrimp and ground-fish resources in the Brazil-Guianas Shelf and to identify an appropriate strategy for the implementation of effective co-operation in research and management. In 2002, there was a regional meeting of stakeholders on the sustainability of fisheries in the Brazil-Guianas Shelf (FAO/WECAFC, 2002).

In 2003, the CRFM, the successor to CFRAMP, formed a similar Shrimp and Groundfish Working Group comprising the CARICOM (Caribbean Community and Common Market) countries exploiting these resources on the shelf (Guyana, Suriname and Trinidad and Tobago) and other CARICOM countries with shrimp fisheries (Belize, Haiti, Jamaica) (Haughton, Mahon, McConney, Kong, & Mills, 2004). Since 2003, the CRFM annual scientific and related meetings provide a forum for the CRFM Shrimp and Groundfish Working Group (henceforth referred to as the "CRFM Working Group") to assess data and information and numerous technical reports have been published.

2.0 METHODS

This graduate research was conducted concurrently with an internship with the School of Information Management (SIM), Dalhousie University. The SIM internship involved working with the research project 'Environmental Information: Use and Influence,' which is funded by the Social Sciences and Humanities Research Council (SSHRC) of Canada and which is examining the use and influence of grey literature produced by governmental and intergovernmental organizations focused on marine environmental matters (MacDonald et al, 2004; 2007). Methodologies from the SIM project were applied to this shrimp and groundfish case study.

2.1 Research Context

In order to address the research questions, five stakeholder groups involved in the sharing of information were identified: scientists, managers, policy makers, fishing industry, and fisheries advisory bodies. Figure 2 shows the hypothetical linkages and flow of information among these five stakeholders. The links between scientists, managers and policy makers are considered to be of key importance and the hypothesized connections seen in Figure 2 do not reflect a hierarchical framework.



Figure 2. Hypothetical flow of fisheries information related to the Brazil-Guianas Shelf.

The study utilized two main sources of data to examine the influence of scientific information and the pathway of information use among the stakeholders. One source is the grey literature on shrimp and groundfish that has been produced by the respective national fisheries organizations in collaboration with the FAO and CRFM. The second source was obtained from a survey questionnaire administered to a sample of key participants in each of the five stakeholder groups. An application for ethics approval for the research component of this project was submitted to the Dalhousie Social Sciences and Humanities Research Ethics Board on May 11, 2009. The approval was received on June 2, 2009 (see Appendix 2).

2.2 Data Collection

2.2.1 Grey Literature

The grey literature, primarily produced by the Ministry of Agriculture, Land and Marine Resources-Trinidad and Tobago, the Ministerio de Ciencia y Tecnología (Ministry of Science and Technology)-Venezuela, FAO/WECAFC Shrimp and Groundfish Working Group and the CRFM Shrimp and Groundfish Working Group was read directly in order to build an understanding of the information that was available and its flows and uses in policy-making settings. The contents were analyzed to determine policy directives and to assess their origin so as to build an understanding of information flows and uses in policy-making settings. The reviewed documents included meeting and technical reports and project proposals. The technical and meeting reports produced by the FAO and CRFM are listed in Appendix 3.

2.2.2 Survey Description

Key persons from each of the five main stakeholder groups, scientists, fisheries managers, policy makers, fishing industry and fisheries advisory bodies from Trinidad and Tobago were surveyed. For Venezuela, only the scientist and fisheries manager groups were surveyed. These individuals were either previously and/or are currently involved in the Shrimp and Groundfish Working Groups of the FAO and the CRFM. The primary objectives of the questionnaire were to establish the information links among the five groups of stakeholders and to gain insights into opportunities and challenges for using information in decision making.

The survey was conducted by the author using a semi-structured questionnaire. A questionnaire was developed, for each stakeholder group, to determine the influence of information in the management and policy making process in the shrimp and groundfish fishery of Trinidad and Tobago and Venezuela. The questionnaires for the fishing industry and scientists are given in Appendix 4 and Appendix 5 respectively. The fisheries managers and policy makers were interviewed using the same questionnaire, which is given in Appendix 6. The fisheries advisory bodies were surveyed using the questionnaire in Appendix 7. In general, the questionnaires each had four main sections in which the respondents were asked to define their role as a stakeholder and note their awareness of the scientific information and their role in the production, distribution and use of scientific information produced by the Working Group. These sections contained a series of questions about their personal involvement in the flow of information.

The individuals selected for the survey comprised the participants in the previous scientific meetings of the FAO/WECAFC and CRFM Working Groups and included scientists, staff of FAO and CRFM, senior administrators in the Ministry of Agriculture and its fisheries departments, and fishermen/vessel owners. The members of the fishing industry were representatives of small-scale and industrial fishing and members of fishing organizations. The policy makers were primarily involved in project planning and evaluation. Apart from those directly involved in fishing activities, the 'community' of participants in the shrimp and groundfish fishery is small in numbers. It was estimated that in the scientist, fisheries manager and policy maker groups overall, 13 persons in Trinidad and Tobago and at least an equal number in Venezuela made up the population. Six key staff members of the FAO and CRFM were involved with both countries. Letters were sent to each of the individuals to be surveyed, inviting their participation.

In the case of Venezuela, a collaborator based in that country, assisted with the conduct of the survey, since the principal researcher was based at Dalhousie University, Halifax.

The collaborator, a researcher employed with the Ministry of Science and Technology, Venezuela, was a participant in the FAO/WECAFC Shrimp and Groundfish Working Group. He was also involved in previous joint surveys between Trinidad and Tobago and Venezuela and has often performed the role of an assistant collaborator/facilitator. It was agreed by email and telephone contact that he would assist with distribution of the survey questionnaires, collect responses and forward them to the principal researcher. The e-mail survey to the Venezuelan scientist and FAO were completed in English, the language of operation of both the FAO/WECAFC and the CRFM (see Appendices 5 and 6). The email questionnaire sent to the Venezuelan fisheries managers and policy makers was translated into Spanish (see Appendix 8).

In total, the questionnaire was sent to 25 individuals and responses were received from 23 of which 15 were from Trinidad and Tobago, 2 from Venezuela and 6 from the fisheries advisory bodies. Table 1 shows the numbers per institutions and stakeholder group. The questionnaire was fielded through email and telephone/internet contact where necessary.

Stakeholder Group	Organization	No.
Fisheries Advisory Bodies	Food and Agriculture Organization (FAO)	3
	Caribbean Regional Fisheries Mechanism (CRFM)	3
	Artisanal fishery	2
Fishing Industry	Semi-industrial fishery	2
	Industrial fishery	2
Policy Makers	Ministry of Agriculture, Land & Marine Resources	2 (2)
Fisheries Managers	Ministry of Agriculture, Land & Marine Resources	5
	Ministry of Science & Technology (INSOPESCA) (Venezuela)*	1
Scientists	Ministry of Agriculture, Land & Marine Resources	1
	Institute of Marine Affairs (IMA)	1
	National Institute for Agriculture research (INIA) (Venezuela)*	1
	TOTAL	23

*Respondents from Venezuela. Numbers in parentheses represent non-responses.

Table 1. Number of respondents in the survey in each stakeholder group.

2.3 Data Analysis

The responses from the survey questionnaire, in association with the grey literature reports produced by the FAO and CRFM, were used to determine how the information was produced, distributed and used by the stakeholders. This information was incorporated into a new conceptual diagram that describes its flow among the five types of stakeholders.

Content analysis of the responses followed the methodology of coding for qualitative data analysis (Coffey & Atkinson, 1996; Weston et al., 2001). Coding was applied to the responses to each question in all of the completed surveys, and was performed manually using an Excel spreadsheet. Establishing codes or themes was guided by the literature for communication of scientific information and the literature on information and influence that was reviewed.

2.4 Research Challenges

The shrimp and groundfish resources are shared by six countries in the region. To obtain the entire picture of the role of information within the Shrimp and Groundfish Working Group, stakeholders in all six countries should be surveyed. Given the limited time allotted for this project, it was possible to field the questionnaire in only two countries: Trinidad and Tobago and Venezuela.

Given the unique specialization of the shrimp and groundfish work in the region, the sample size was limited to participants directly involved in the Working Groups. This situation may have influenced the statistical appropriateness of the sampling design and the level of the qualitative analysis. However, the objective of this study was to gain a preliminary understanding of the issue of resource management and the influence of information. Thus, drawing a sample of two countries was deemed sufficient for this purpose.

In Trinidad and Tobago, the questionnaire was sent to only three policy makers with familiarity with fisheries issues, since the current staff was new due to turnover in personnel with changes in political administrations over the period that the publications were published. Locating policy makers willing to respond to the survey also proved to be difficult, given the remoteness of the principal researcher. The survey responses for the policy makers were also insufficiently completed and follow up telephone interviews were made for clarification on some of the responses.

In Venezuela, while it was hoped that the full complement of respondents could be surveyed, it proved difficult for the collaborator to receive completed responses. In the end, only two completed responses were received. A recent political decision in March 2009 in Venezuela to ban all industrial trawling was given as a contributing factor for the lack of response to the questionnaire at this time (J. Alio, personal communication, June 17, 2009). The responses from Venezuela were therefore insufficient to perform a full comparative analysis of the influence of information in Trinidad and Tobago and in Venezuela. However the role of the scientist and fisheries manager is noted in the results.

A limited content analysis of the survey data was performed. Future work can be conducted using qualitative analysis software packages such as NVivo8 (QSR International, 2009), described by O'Flaherty and Whalley (2004).

The interdisciplinary approach to the project brings together the fields of information science and management, fisheries management and policy within a dynamic and historical context. The integration of these fields was attempted in the nature of the questions developed for the survey. The questionnaire is considered a prototype model which can be amended accordingly, based on analysis of the results, and used in similar surveys in the future.

3.0 LITERATURE REVIEW

The questions asked in this study have been studied previously in different contexts. The following literature on information use and influence shows that there are many commonalities among the various types of assessment reports with regard to their influence in policy. Some of the main themes used to evaluate the role and influence of global environmental assessments (GEAs), state of the marine environment reports and other scientific information, were used to examine the role of the fisheries assessment reports produced by the Shrimp and Groundfish Working Groups. Literature on the gaps between science and policy-management, in terms of communication of research, is also available as grey literature from many international, regional and multi-governmental organizations and are examined in the following sections.

3.1 Environment and Information: Impact on Decision Making

The current literature on the use and influence of scientific information was examined mainly for global environmental assessments and state of the marine environment reports, much of which is published as grey literature (Mitchell et al, 2006). GEAs and the state of the marine environment reports are characteristically produced for and relate to a more international scale whereas the "assessments," referred to in respect of this shrimp and groundfish case study, are characterised by having a more regional or national scale of influence. The literature to date indicates that there are general commonalities, regardless of scale, in terms of the opportunities and barriers to the use and influence of scientific information (Healy & Ascher, 1995; Wells, 2003; Mitchell et al. 2006; Biermann, 2006; Kirk, 2008; Lexmond, 2009). For many of the scientific fields of study "massive amounts of new information were generated, new sophisticated analytical tools used, yet the expected improved policy making was not realized" (Healy & Ascher, 1995, p. 3). To comprehend the role of information in decision making, "it is important to understand how actors in the policy process employ information to advance their interests and to distinguish between the different levels of policy making" (Healy & Ascher, 1995, p. 3).

In this section, the main factors affecting the impact of environmental information on policy and decision making are discussed.

How information is used and how it influences the policy process is still not well understood; however, some studies have used surveys to describe and explain the process. It is believed that information produced by scientists becomes important for use and manipulation by managers and policy makers (Healy & Ascher, 1995). Apart from commonalities shared by a number of fields, each area of study, political regime and geographic region, has its unique reasons for the use and influence of information. The decision-making process is not necessarily made any shorter or easier in any one case since a range of factors may impact on how useful information is or how much influence it can have. Some researchers have noted that the influence of an assessment flows from the process by which knowledge was created rather than from the final report produced (Healy & Ascher, 1995; Wells, 2003).

A report's influence may depend on the informational environment that it enters and some may have more influence than others in terms of how they are used and their overall value. The degree of competition from other sources of information can be a contributing factor (Healy & Ascher, 1995). The usefulness of reports may be impeded by the way in which the information is presented. For instance, information generated for regional and multilateral regimes that have been compiled into summary reports of generality of objectives may compromise the usefulness of the results to managers and policy makers (Kirk, 2008). This mismatch of needs and data affects the ability of managers to make appropriate decisions based on the general summary reports provided.

The rationale behind the production of information, as seen in the preparation of state of the marine environment reports, may also influence its usefulness and influence (Wells, 2003). Although many reports are prepared, 'it is uncertain that the audiences are known, that the reports are recognized, or that they are being used effectively' (Wells, 2003, p. 1219). The production of reports is considered as a "value-added activity" since they are usually expensive to produce and often a one-time production (Wells, 2003, p. 1220). Reports are an important product of research and environmental monitoring, yet it

appears that attempts to determine their value in bringing community concerns to politicians, and in policy and decision making, have not been seriously made.

The impact of information, as seen with GEAs, for example, depends partly on the timing of its production relative to an issue's development (Mitchell et al., 2006). In the early stages of production, different readers use available information to prompt scientific, public, or political debate. In the later stages, policy makers use these information resources to support particular policy options. Often new reports and ideas need to be 'incubated' for a decade or more before they have influence on behaviour, which indicates that assessments can be either 'too early' or 'too late'.

Information can be described as being relevant and useful if it fulfills the characteristic functions of being salient, credible, and legitimate to the audience to which the publications are directed (Mitchell et al., 2006). Salience, credibility and legitimacy can be dependent on many factors. The stature of the individuals and institutions that have produced a report may have an impact on its credibility and therefore its usefulness and influence. Audiences often view assessments that they have participated in as most relevant, and this is considered as co-production of knowledge. In the case of developing countries and in economies undergoing a transition, GEAs will often be less salient, largely due to the insufficient involvement of their national scientists (Biermann, 2006). In response, managers rely on a "proxy credential" to evaluate the content of an assessment and this means using their own trusted networks to "vet" an assessment or give it credibility. Biermann (2006) recommends that managers need to create credibility through an understanding of the field of study.

Information use can be facilitated by information brokers or mediators who can redress the disconnection between large-scale assessment and local level decisions (Mitchell et al., 2006). The role of the mediator may be played by fisheries and environmental managers or science advisors and it is a facilitation function. Mediators influence salience in decision matching which ensures that scale of research conclusions and timing of information meets the needs of decision makers. Similarly, mediators can be used "to encourage consilience and overall effectiveness of information use and influence" (Lexmond, 2009, p. 511).

The usefulness of scientific information may be dependent on the political and economic environment that it enters. For instance, in a developing country or economy, information faces many basic challenges that affect its influence on policy, and these challenges may not be present for a developed country. In developing countries, fighting poverty and unemployment, servicing debt repayments and economic development may be given priority. The result is that environmental information is often ignored, not because of the information content, but more because development often proceeds at the cost of the environment (DFID, 2005).

3.2 Science-Policy Divide and Usefulness of Information

This section describes the issues related to the science-policy divide. According to Tribbia and Moser (2008) in their review of information needs for coastal management, "Clearly, a disconnect remains at the intersection between science and decision-making, i.e., between the information and knowledge produced by scientists and the information and knowledge applied by decision-makers." (p. 316). Scientists are concerned with problem solving using scientific procedures, with results that often entail a great deal of uncertainty and which are tailored for acceptance within the scientific community. Policy makers and managers, on the other hand, need solutions to immediate problems. The correlation between these two ways of looking at problems is often weak. The communication of research between scientists and policy makers and managers and other stakeholders is considered an important factor which can influence the use of information (Tribbia & Moser, 2008).

Information use and influence is challenging in most natural resource harvesting settings, and on a wider scale in the competition between development and environmental conservation. Several guides to effective communication of research have been produced by international development funding agencies, particularly those providing overseas aid to developing countries (DFID, 2005; DFID, 2008; Williams, Eiseman, Landree, & Adamson, 2009). The guides generally state that communication needs are complex and scientists have to prepare documents in a way that policy makers understand the results, and scientists should also be more sensitive to policy needs. The science-policy divide is characteristic for both developed and developing countries, for instance, the challenges of communication of science seen at the global level with regard to use of scientific information in climate change issues (IPCC, 2009). Developing countries, however, have extra social and economic pressures that need to be factored in.

A review of the literature, mainly the guides by the National Marine Fisheries Service, USA (NRC, 2002), the American Fisheries Society (Sullivan et al, 2006), the UK Department of Fisheries and Development (DFID, 2005) and the RAND Corporation (Start & Hovland, 2004) describe strategies for communicating research. Many initiatives have been taken by governments, based on similar guides, to develop communication strategies to promote more effective use of science to inform policy-making and regulation. Holmes and Clark (2008) review such initiatives in the UK over the last 10 years. The findings indicated that in addition to information and expertise being accessible, there is a need to establish pertinent research questions and agendas, and a requirement for transparency and evaluation.

Effective communication of research is essential but it will not guarantee the uptake of research results into policy (DFID, 2005; Williams et al, 2009). There must be an understanding of the political and social environments that create and foster the obstacles to the use of scientific information in policy (DFID, 2008). Support is also needed in three areas: improvement in the incentives for researchers to communicate; building skills at personal and institutional levels to more effectively communicate; and strengthening the capacity and demand for evidence in policy and practice. Networks are being promoted as having potential to both generate research and to enable effective uptake at national, regional or international levels.

"We need to understand better how to build coalitions at the national level and link these to international learning networks which can support partnerships between different service providers/users (such as scientists, communications specialists, NGOs) and those that bridge the gap between researchers and users" (DFID, 2008, p.15).

The news media can play a major role in creating an enabling environment in which scientific information can be conveyed to policy makers. Without demand for research, there will be little absorption of its lessons and instructions, however well communicated.

If some scientists want to have an impact on policy, they must carefully assess what research is relevant (Guildin, Parrotta, Hellstrom, & Eigner, 2005). Selecting research questions that are relevant to the most pressing policy issues helps build interest and support for scientific research. Policy-makers respond more readily to research that affects their constituents' or clients' needs. Scientists who integrate high priority constituent or client needs into their research will improve the likelihood that the research results will be useful for making policy. This practice is seen particularly in forest management cases which have demonstrated some success in terms of uptake of scientific information into policy development and implementation (Healy & Ascher, 1995).

3.3 Literature Review - Summary

Five major factors impacting the use and influence of scientific information were identified in the literature:

- Credibility, legitimacy and salience of the information or the stature of the institution/individuals producing the information in the mind of the audience.
- Timeliness of production
- Target audience
- Methods of communication
- Political environment into which it enters

These factors, individually or in combination, can act as barriers to or facilitate effective communication of scientific information. The survey responses from this study are examined within the context of these factors.

4.0 SCIENTIFIC AND MANAGEMENT REGIMES IN TRINIDAD AND TOBAGO AND VENEZUELA

This chapter consists of three sections. The first section describes the current national systems for scientific research and management in both countries. It introduces and defines the roles of scientists, fisheries managers, policy makers and the fishing industry in the national institutional arrangements. The second section describes the role of fisheries advisory bodies (FAO and CRFM). The third section outlines the development of the Working Groups and includes the objectives and indicators for evaluating the results of the Groups.

4.1 National Institutional Arrangements: Scientists, Fisheries Managers, Policy Makers

In Trinidad and Tobago, the Fisheries Division of the Ministry of Agriculture, Land and Marine Resources (MALMR) has the responsibility for managing the sustainable development of the fisheries sector of Trinidad and Tobago. This responsibility is governed by the Fisheries Act of 1916. In June 1995, a draft Fisheries Management Act and Policy Directions for Marine Fisheries in Trinidad and Tobago in the 1990s were prepared with technical assistance from FAO. In 2003, a revised draft Act was developed, and still awaits adoption (Fisheries Division, 2008). This new Act will provide for the movement from an open access fishery towards a system of controlled access. Policy would be dependent upon the preparation of Fishery Management Plans based on the best available scientific and socio-economic information (Chakalall, Cochrane, & Phillips, 2002).

In Venezuela, fisheries research is delegated to specialised agencies such as the Fondo Nacional de Investigaciones Agropecuarias (FONAIAP), which is a specialized research agency under the Ministry of Agriculture with responsibility for fisheries research (Phillips, Mahon, & Chakalall, 2007; Chakalall, et al., 2002). The FONIAP is now called the Instituto Nacional de Investigaciones Agrícolas (INIA). In Venezuela, consultative structures already exist with the participation of all stakeholder categories, including a specific group for the shrimp trawling industry (FAO, 1999). The trawl fisheries have been regulated by the joint resolutions of the Ministry of Agriculture and Ministry of the Environment in 1980 (Chakallal et al., 2002). These resolutions are presently under study, in order to establish up-to-date norms for this fishery.

In Trinidad and Tobago and Venezuela, the scientists performing assessment of the shrimp and groundfish resources are employed primarily by the Ministry of Agriculture. Likewise, the fisheries managers and policy makers also work within the Ministry of Agriculture. Due to the nature of coastal and marine resource management, policy makers are also located within other state agencies The national agencies that play a lead role in the administration of the fisheries sector, and resource and coastal zone management, include government agencies, Inter-Ministerial and Inter-Sectoral Committees (Soomai, 2006).

4.2 Mechanisms for Management at the National and Regional Levels

4.2.1 International and Regional Fisheries Advisory Bodies A number of public and private sector agencies and committees at the national level, and regional and international organizations provide support for the fisheries sectors in both Trinidad and Tobago and in Venezuela. Fisheries administration, in both Venezuela and Trinidad and Tobago, falls under the mandate of the Ministry of Agriculture. The respective governments interact with the FAO in implementing programmes and meeting its responsibilities with regard to ongoing national, bi-lateral and regional initiatives involving the joint assessment and management-oriented research under the FAO/WECAFC Working Groups. The same practice applies to Trinidad and Tobago's interaction with the CRFM.

The FAO provides financial and technical support for a number of fisheries projects related to management and sustainable development of fisheries resources. A number of sub-regional working groups are maintained by FAO under the WECAFC, among which is the FAO/WECAFC ad hoc Working Group on Shrimp and Groundfish Resources of

the Guianas-Brazil Continental Shelf. Both Trinidad and Tobago and Venezuela are contributing members of the FAO and also members of the Working Group on Shrimp and Groundfish Resources. Joint assessment and management-oriented research with Venezuela was initiated under the FAO/WECAFC Shrimp and Groundfish Working Group beginning in 1986.

The CRFM was formally established in 2003 and is the successor to the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP) which promoted sustainable use and conservation of the fisheries resources of CARICOM Member States from 1991 to 2003. CFRAMP was funded mainly by the Canadian International Development Agency (CIDA), with contributions by member states of CARICOM. The CRFM's mission is to promote and facilitate responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of current and future populations of the region (Haughton et al, 2004). CFRAMP (and then the CRFM) supported the activities of the FAO/WECAFC after 1996 (MALMR, 2008; Haughton, 2004). As a CARICOM member, Trinidad and Tobago is a member of the CRFM, while Venezuela has observer status. Special provisions are made for other countries in the region, such as Venezuela, to become associate members.

The CRFM consists of the Ministerial Body, the Caribbean Fisheries Forum, the main technical and scientific decision making unit, and the Caribbean Fisheries Technical Unit which serves as the Secretariat. The CRFM also functions as a project management agency on behalf of the region. Policy and activities are approved by the Council on Trade and Economic Development (COTED) which operates as the Ministerial Body (Dundas & Mitchell 2004).

4.2.2 The Shrimp and Groundfish Working Groups – Description and Evaluation

The Terms of Reference of the FAO and then the CRFM Shrimp and Groundfish Working Groups were developed by the respective fisheries advisory bodies in association with the member governments. There is some overlap between organizations, through CFRAMP, with respect to involvement in the Working Groups. The formal Working Groups comprise the technical staff of the FAO/CRFM, technical consultants hired by FAO/CRFM, and national scientists. Industry representatives, including relevant NGOs, fisheries managers, and policy makers, are invited to attend Working Group meetings. The working groups have specific terms of reference and are time bound.

The evaluation of the CRFAMP project concluded that it had achieved its goal in enhancing the region's capability to perform stock assessments, had contributed to the creation of a body of knowledge on the status of fish and shrimp resources and engendered regional co-operation among fisheries management units (Saul, 1998; Haughton, 2004). Although fisheries management capabilities were improved, fisheries management measures in the region had not. The project did not focus on economic assessments and it was believed that the lack of knowledge on the economic importance of the fisheries may have been the reason why inadequate government attention was given to the industry (Saul, 1999).

5.0 RESULTS

This section presents the results of the survey in relation to the three research questions set out in Section 1.0:

- What is the role of the stakeholders (fishing industry, scientists, fisheries manager, policy maker, fisheries advisory body) in the creation, distribution and use of information?
- How is scientific information being used for decision making?
- What are the opportunities and barriers for using scientific information for decision making and how does this compare with the literature on communication and use of scientific information?

Baseline data are provided in Sections 5.1, 5.2 and 5.3. Using literature searches, Section 5.1 includes a description of available reports produced by the scientists in collaboration with the FAO and CRFM Shrimp and Groundfish Working Groups. Using responses from the survey, Section 5.2 outlines the role of each stakeholder group in the creation and distribution of information. Section 5.3 describes the overall distribution mechanism, for conveying scientific management advice to stakeholders, when information is received within the country. The accessibility of the information (print, digital, online access), its frequency (annual, ad hoc), and type (grey literature, primary) are described there. Section 5.4 presents the results of the content analysis of the survey responses and is organized under three broad themes concerning the use and influence of information, which were developed based on the literature. This section also sums up the model of the flow of information, pathways and connections between the players and discusses how the information is used by the different stakeholders.

The flow of information described can only be applied to Trinidad and Tobago. In the case of the fisheries advisory bodies, fisheries managers and scientists, actual responses are reported for Venezuela. However, as noted earlier, the responses received from Venezuela were insufficient to develop a complete analysis of the flow of information.
5.1 Available Scientific Information and Advice - Baseline Data

Analyses conducted under the Working Groups have addressed research/management issues regarding the current status of the major shrimp and groundfish stocks and questions about the appropriate level of fishing effort to avoid over-exploitation of the resources and attain economic efficiency in the operation of the fleets. The Working Groups' main documents are scientific reports and technical meeting reports. Reports of national and regional stakeholder meetings have also been prepared, in addition to reports of bilateral meetings between Trinidad and Tobago and Venezuela. A total of 21 main documents were produced over the period 1992 to 2008 (see Appendix 3). The reports were prepared on an annual basis, since the Working Groups held annual scientific meetings, and were published by the FAO and CRFM in their technical report series. The information is available in print, circulated to Working Group participants and to all participating countries. Reports are also available for download from the FAO and CRFM Web sites. On a national level, the publications are deposited in libraries.

5.2 Role of Stakeholders in the Creation and Distribution Information

5.2.1 Fishing Industry

Based on responses to questions 1 and 2 (see Appendix 4), fishermen became aware of the FAO and CRFM working groups only through participation in the research with the fisheries administration. "We know about the FAO only from the Fisheries Division, when the officers describe why they [were] collecting information." (fishing industry, FI1). In addition the average participant had worked at least 37 years in the fishing industry of Trinidad and Tobago.

In response to questions 3 through 5, the fishing industry's role in the creation of information is through cooperation with scientists in the collection and provision of data, in field activities, participation in stakeholder meetings and as a liaison between the scientists and fishing industry (fishermen and vessel owners): "We assist field officers in

data collection and provide vessel and time; we attend meetings to discuss results; we speak to other fishermen to encourage them to attend meetings" (fishing industry, FI2).

Based on responses to questions 6 through 9, fishermen play a minimal role in the distribution of information, and the activities can range from representing stakeholder interests in advisory groups to verbal communication of information to other fishermen to encourage them to attend meetings and cooperate with the fisheries administration: "I tried to encourage cooperation among fishermen and for them to consider the information being presented by Fisheries Division" (fishing industry, FI2).

According to responses to questions 6 through 9 (see Appendix 4), in spite of the fishing industry participation in research and advisory groups, they do not receive feedback on the Working Group publications and they see no real changes in fisheries management based on the Working Group reports. "[We] don't know what information is being collected so we don't know what purpose the publications can have. We ask for information but very little comes back to us" (fishing industry, FI3). Even when stakeholder meetings are held, the information is still too technical to be fully understood by the fishing industry: "most times I think that I am not qualified to understand them" (fishing industry, FI4).

5.2.2 Scientists

Based on responses to questions 1 and 2 (see Appendix 5), the average scientist in Trinidad and Tobago had at least 15 years of experience in research and with the Working Groups. In Venezuela, the scientist had 25 years of experience in research.

Trinidad and Tobago

Based on responses to questions 3 through 7 (see Appendix 5), scientists interpreted the requests for 'creation of information' as a request for 'available information'. Scientists stated that they respond to requests for information from a wide range of stakeholders both from within and outside of their organization, namely, "the fishing industry, fisheries manager and policy makers, fisheries advisory bodies as well as students and persons involved in conducting EIAs, persons wanting to get into the fishing industry;

media personnel; financial institutions; NGOs; general public" (scientist, SC1). These requests are based on the existing scientific information and not requests to 'create' information. There was no clear statement to indicate that scientists were directly advised by fisheries managers and policy makers with regard to species to be assessed. However, scientists stated that the 'driving factors' in the provision of the information were "Motivated officers, involvement in FAO, CFRAMP, CRFM and other such externally funded projects; involvement in FAO, CRFM scientific working groups" (scientist, SC1).

Responses to question 7 describe how scientific information is produced by the scientist. Stock assessments are conducted by scientists who request technical assistance through the fisheries advisory groups. The reports are generated after a long process in which the FAO and/or CRFM plays an integral role in providing technical advice from the creation of sampling plans, to data collection, monitoring and verification. Data collection is often a collaborative effort involving scientists and the fishing industry. Data computerization and analysis is conducted by scientists, with technical assistance from FAO and/or CRFM and the final report is prepared by the scientists with assistance from the FAO and/or CRFM. Guidance in providing scientific information comes mainly from involvement in FAO and CRFM scientific Working Groups. This role of the scientist in creation of information was also described in the responses to questions directed at the fisheries advisory bodies under section B of the survey form (see Appendix 7).

Based on responses to questions 8 through 17 (see Appendix 5), the scientist plays an important role in the distribution of scientific information. Scientists distribute the scientific information from the Working Group reports to a wide range of stakeholders, "the findings and recommendations are presented at stakeholder meetings (fishing communities, representatives of research institutions), fellow scientists, fisheries managers and policy makers, administrators, other Government agencies, NGOs, Fisheries Division staff" (scientist, SC1). Reports are produced for the fisheries managers who in turn pass summarized information on to policy makers. The data and information are considered to be valuable baseline data and remains mainly in the scientific realm and is used to guide future assessments. The information is only made available to the fishing

industry through stakeholder meetings. Attempts are made to incorporate the scientific information, in a less technical form, into other documents meant for the general for the public (such as brochures, posters, booklets, exhibits, statistics) and these documents are sent to libraries, research institutes, government agencies, NGOs, schools, administrators and the general public.

With regard to assessing the use of the information, responses to questions 18 through 22 generally state that there is a lack of an established means of tracking usage of the reports produced under the Working Groups. However, accession lists and library records of all requests for literature searches, including the search results and the responses, are maintained. Scientists include this information on usage "in annual and other achievement and progress reports, to maintain support for library and information services" (scientist, SC2).

<u>Venezuela</u>

In Venezuela, based on the response of one scientist to questions 3 through 7 (see Appendix 5), the role of the scientist in creation and distribution of information was similar to the role of the scientist in Trinidad and Tobago. A main difference, however, was that particular focus was given to requests from the fishing industry. The fishing Industry in Venezuela believe that "New government regulations on trawling is a threat to their regular work and actively request help from researchers, in terms of having a scientific basis for making decisions" (scientist, SC3).

5.2.3 Fisheries Managers

Based on responses to questions 1 and 2 (see Appendix 5), the average fisheries manager surveyed in Trinidad and Tobago had between 12 and 15 years of experience in this post. However, these individuals had between 25 and 35 years experience in the fisheries department, spending earlier years assigned to research and administration. In Venezuela, the fisheries manager had 21 years of experience.

Trinidad and Tobago

Based on the responses to questions 3 through 7 in Appendix 6, fisheries managers view the role of the FAO and CRFM as "the provider of information, guidance and advice on the status of the fishery to promote sustainability and best practices." Three main reasons were given for the production of scientific information:

- to update current information on resources to inform management measures and bilateral fishing negotiations;
- to support regional fisheries management initiatives like the FAO and CRFM; and
- to respond to external pressures, exerted by national environmentalists, due to the impacts of demersal trawling.

With regard to their role in the creation of information, the fisheries managers stated that: "Managers do not ask specific research questions of the scientists, but use the available information provided by the scientists to present advice to policy makers." (fisheries manager, FM3). Requests for information are submitted to the fisheries managers and generally came from stakeholders, both within and outside the organization, including the fishing industry and other fisheries managers from both Trinidad and Venezuela.

Fisheries managers state that the level of technical detail provided in the reports completed by the scientists at the Working Group meetings are not utilized for policy making, "policy makers at the level of the administrative and political directorate do not request such technical information but are guided by the recommendations derived from such information [stock assessments]" (fisheries manager, FM1). The recommendations from reports provided by the scientists have facilitated the development of management plans, resource conservation initiatives and triggered associated areas of research.

From the responses given by fisheries managers to questions 13, 16 and 18 (see Appendix 6), it seems that little focus is given to the information needs of the policy makers in contrast to the information needs of the fishing industry and other stakeholders. The fisheries managers focused on the distribution of summarized information to stakeholders through meetings and responses to requests for information. The following is a description from a fisheries manager:

The publication is perused and recommendations read and noted. The scientists may decide to convene a meeting of industry stakeholders to disseminate the information. This is the case if the industry stakeholders were in any way associated with the generation of information. The information is used to inform policy. There was a mechanism to inform agency personnel through the hosting of internal seminars but this cannot seem to maintain its momentum. (fisheries manager, FM2)

Based on responses to questions 16 through 20 (see Appendix 6), there are no formal means of recording the use of scientific information. The information requested by the policy maker and the fisheries manager, from the scientists, has been used to inform fisheries negotiations and interactions with the fishing industry. Also the information was included in proposals for participation in external projects which are often donor driven by bodies such as FAO and CRFM.

Venezuela

The main drivers for the production of scientific information in Venezuela were:

- The demand from fishers to operate in the areas where shrimp or fish are abundant, and
- The need of the Venezuelan Fisheries office for baseline information on the exploited resources in order to establish relevant regulations to assure sustainable exploitation of resources.

The fisheries managers in INSOPESCA, Venezuela only receive publications from the FAO, and expressed interest in those from the CRFM, since the continued assessment of the shared resources is relevant to them.

5.2.4 Policy Makers

The policy makers surveyed in Trinidad and Tobago ranged from having 2 years to 10 years experience in their posts. Based on responses to questions 3 through 7 (see Appendix 6), policy makers, in general, do not officially request scientific publications and policy makers may respond to internal requests for fisheries information. The use is described as:

Most requests for fish information are internal, either from the Agricultural Data Information Unit (ADIU) or the Fisheries Division of MALMR. A rare request for statistics may go to the Central Statistical Office (CSO) of Trinidad and Tobago. In terms of publications, nothing is officially requested by me. However, on some occasions, a publication or two pertaining to fisheries might come along my way sporadically. The statistical information requested from the fisheries administration is used in budget preparation reports by the Ministry of Agriculture. These [latter] reports are usually forwarded to the Central Bank of Trinidad and Tobago for the National/Annual Budget. (policy maker, PM1)

Based on responses to question 7 (see Appendix 6), policy makers use statistics, mainly import and export figures, in reports to highlight trade data for local fish production. Policy makers see their role as advising government on current trends in fish catches, whether stocks are declining or increasing, and where recommendations can be proposed to safeguard ocean stocks. "FAO Working Group documents are used primarily in the preparation of evaluations of fisheries projects, comments on projects/ issues relating to and affecting the fisheries sector, and reports on ways of improving the fisheries sector. The CRFM publications are used to a lesser extent" (policy maker, PM1).

5.2.5 Fisheries Advisory Bodies

The surveyed members of the FAO and CRFM had between 4 and 16 years of experience, working directly with the Working Groups. Responses to questions 3 (see Appendix 7) show that the main objective of both advisory bodies is to assist the countries in strengthening their stock assessment and management capacity. The publications of the Working Groups have been seen as an integral part of strengthening assessment and management of the fisheries, by the countries involved in the creation of the reports and as serving as a record of the work and the results achieved.

Based on responses to questions 4 and 5 (see Appendix 7), requests for assistance to these bodies come from the countries themselves. In the case of the FAO, requests for the provision of scientific information for management may also come either directly and/or through recommendations from the WECAFC to FAO. The Commission meets every two years and decides on priority issues to be addressed by the Secretariat. In the case of the CRFM, requests come directly and/or through the CARICOM Secretariat to the CRFM.

According to responses from questions 6 and 7 (see Appendix 7), decisions on what species are assessed is usually left up to the Working Group members to determine based on what is needed. The assessments are initiated by local scientists and managers. The fishing industry has not made any specific requests for information. The responses to question 7 are summarized and the creation and distribution of the reports completed at FAO and CRFM scientific workshops are described in the following steps.

- The need for an assessment workshop is agreed upon by the participating countries (usually involving managers and scientists) and the fisheries advisory body (FAO and/or CRFM).
- The objectives are set through consultation with the same groups, usually with the fisheries advisory body taking the lead coordinating role.
- If funds are available, the dates of the workshop are set and, based on the funds, a series of yearly meetings are projected over a fixed period of time. International consultants may be hired to assist countries in preparing data for the workshop or

to conduct preliminary analyses of available data. This may be done through electronic means or the consultant is sent to countries needing assistance.

- The workshop takes place with scientists selected by the participating countries, working on the agreed objectives, with assistance from FAO and/or CRFM technical staff and invited international consultants.
- Participants prepare initial species assessment reports or updated assessments as a means to develop management advice. During the first week of the workshop, the scientists work with a consultant to complete the analyses and prepare a draft report. Fisheries managers, policy/decision makers, fishers and fisher groups and members of NGOs are invited to the last day of the meeting to discuss the results of the analyses and the management recommendations.

The workshop reports containing scientific analyses and management recommendations are published. In the case of the FAO Working Group, they are published in the WECAFC Series as FAO Fisheries reports and digital versions are placed on the FAO Web site. Similarly for the assessments completed by the CRFM, they are published in the CRFM series and digital versions placed on the CRFM Web site. For both fisheries advisory bodies, copies are distributed to countries by post and electronically.

The outputs of the working groups are published and placed in the public domain, with the intention to promote decision making based on scientific information and to influence and enable decision makers to make decisions on fisheries management. The aim is also to create a body of literature on the subject. The stages in the distribution of scientific information by the fisheries advisory bodies are generally similar. A description of the distribution processes for the FAO and CRFM are outlined below, based on responses to questions 8 through 14 (see Appendix 7).

<u>FAO</u>

Technical information shared or generated at working group meetings is contained in either a Meeting Report or a formal Technical Report, which are largely created as monographs. The reports are also available in digital format but documents are generally informally distributed in print format. The reports of meetings and workshops are usually published as FAO Fisheries Reports. Some are published as the FAO Technical Reports series but these are peer reviewed and are of a much higher technical quality. A decision to publish documents in the FAO series is made by experts on the subject within the FAO fisheries department.

A distinction between meeting reports, technical reports and meeting documents can be made. Meeting documents provide information to facilitate and stimulate discussion on subject matters at meetings. These could be documents either already published by FAO or prepared specially for the meeting and are normally available on the relevant meeting's page of the FAO Web site.

FAO has a policy for the distribution of reports which is followed by WECAFC. In accordance with FAO's formal communication protocol, a print copy of the report is officially submitted to the government of a country with a covering letter. This communication goes to the Permanent Secretary of the Ministry of Agriculture. The covering letter, which highlights the main results and recommendations, serves as a briefing note and at the same time requests the recipient to report on follow-up actions taken.

FAO, as well as the member governments, decides on a list of recipients of all FAO reports within the country. Print copies are mailed to the meeting participants, relevant government agencies, universities, research institutes and WECAFC members. Copies are also sent to the Ministry of Trade and Industry, the Director of Fisheries, Sea Food Industry Cooperative, and to educational institutions. The distribution pattern has changed to increased digital distribution over time. This initiative was taken in order to make material available to more stakeholders, at an affordable cost and to save paper. This practice also recognizes that more people are reading documents online and are also developing digital libraries.

Dissemination of the information to resource users at national levels is the responsibility of the member countries. FAO can provide assistance as a facilitator, if requested.

Sometimes this step is completed through meetings and workshops and WECAFC may be requested to act as a facilitator. The FAO's Web site has the capability to track downloads of shrimp and groundfish documents but has not extracted the information.

<u>CRFM</u>

Due to the smaller scale of the CRFM, the distribution protocol of its documents is less formal than the FAO. Copies of the scientific reports go to the scientists and fisheries managers within the countries. The scientific staff of the CRFM provides technical advice to the scientists but does not liaise directly with the fishing industry or policy makers at the national levels. The CRFM Secretariat communicates with the senior policy makers but rarely on scientific Working Group issues. The CRFM does not currently monitor usage of the documents and does not track downloads from its Web site.

5.3 Distribution Mechanism for Conveying Scientific Management Advice to Stakeholders

5.3.1 Trinidad and Tobago

The description of the distribution process is based on responses by the fisheries managers responses to question 13 (see Appendix 6). The print copies of reports from the FAO, therefore, reach the Permanent Secretary, Director of Fisheries and Scientists. These individuals send their copies of the documents to the library of the Fisheries Division. When the library of the Fisheries Division receives a report, it is listed in the accessions list for the month and circulated to staff. There is no bulletin to broadcast the accession of any individual report. Since the FAO is a leading fisheries advisory body which supports fisheries management work in Trinidad and Tobago and the Caribbean, the library maintains and aggressively builds a collection of the reports generated by these agencies. However, there is no formal, national framework for systematic information dissemination to stakeholders so as to promote awareness of any technical report. As stated, "from time to time technical reports are shared with related agencies, as it is also in the interest of these agencies to use their own mechanisms to promote and distribute their documents" (fisheries manager FM2).

Reports are usually distributed in print; however, more documents are now being made available in digital format which can be downloaded from the FAO or CRFM Web sites. Documents in digital format can be distributed more widely than print. However, draft documents which would have been sent to the government departments may not be available on the Web site and there is a time lag before the final meeting and technical reports are available to the public. Increasingly, individual requests are referred to CRFM and FAO Web sites for the technical reports, and working group reports. "Publications of FAO or CRFM shrimp and groundfish Working Groups are perhaps the most comprehensive reports of the resources in this region" (fisheries manager, FM2).

Fisheries managers receive reports in print from scientists who were actively involved in the Working Groups. Information is conveyed when a report is published, usually as the meeting report, and there is no summary or interpretation of the original report. Stakeholder meetings may be scheduled to disseminate information. Section 5.2.3 described how information was distributed. There is no formal system to measure usage of the publications except for "infrequent analysis of references in the bibliographies of other agency reports relevant to shrimp and groundfish" (fisheries manager, FM5).

No formal systems exist for recording usage of this information in policy making contexts, nor has there been any updating of systems for monitoring document usage or circulation in the last five years. Moreover, there has been no formal evaluation of the usefulness of the fisheries scientific information.

5.3.2 Venezuela

The distribution process was described in responses to Appendix 8. From the Office of the President of the Socialist Fisheries and Aquaculture Institute (Instituto Socialista de la Pesca y Acuicultura, INSOPESCA), the documents are sent to the different administrative offices according to the subject area. The heads of each office are

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responsible for notifying the regional offices in the country about the arrival of a particular document that may be of interest to them. Printed or digital documents can be sent to the regional offices. Copies are saved in the INSOPESCA Library in Caracas for general access. Documents are only distributed to INSOPESCA personnel; however, in some cases, reports are also sent to the National Agriculture Research Institute (El Instituto Nacional de Investigaciones Agrícolas, INIA) researchers when there are particular interests.

INIA is a research institute under the government agency, INSOPESCA. There is a list of users within INIA called 'Pesca-l' and also a list of fishery and aquaculture researchers in Venezuela. The distribution is described as:

Through e-mail, the community of fishery related researchers and technicians of INIA and universities are informed about publications or web pages that may be of general or particular interest. The digital or printed materials are distributed to the community using internal e-mail and/or regular mail system. Since 'Pesca-l' is a public list, anyone with information that may be of interest can also publish new findings. (scientist, SC3)

5.4 Perceptions of Stakeholders on the Use and Influence of Information

Three main themes, related to the usefulness and influence of information, were evident in the responses of the stakeholders:

- Contribution to knowledge
- Credibility of information
- Accessibility and use of the information.

Issues under these three themes were identified in the views of all stakeholders and are described in detail below.

5.4.1 Contribution to Knowledge

In summary, the survey responses state that the production of information from the Working Groups increased the knowledge base for the fishery. However, apart from this main benefit, two issues which affect the usefulness of the information and its maximum contribution to knowledge were identified. The first issue deals with the need to communicate information to stakeholders and the second issue describes the need for tailoring information for different stakeholders.

The benefits of the Working Group reports are summarized from the responses to question 6 by the scientists (see Appendix 5), fisheries managers (see Appendix 6) and the fisheries advisory bodies (see Appendix 7). These three stakeholder groups view the preparation of scientific publications as an important means of strengthening assessment and management of the fisheries, and the publications serve as a record of the work completed and results achieved. Scientific information has been used by fisheries managers and policy makers, to some extent, to draft fisheries management regulations, develop fisheries policy, develop fishing agreements among stakeholders in the fishing industry, and to guide regional maritime boundary delimitation talks with neighboring countries.

Summaries of the scientific information from the Working Groups were produced in collaboration with technical and administrative departments. For instance, one fishery manger described the production of information packages containing bibliographies and prints of appropriate reading material to guide negotiations. The result is a compilation of research, management, policy and financial documents for all stakeholders involved. "Particular management documents are prepared by locating available information resources compiled from a library and available databases. Thereafter, the necessary information is extracted, critically appraised and summarized for use in management planning or preparation of management reports." (fisheries manager, FM1). These summaries however are mainly for use by the policy makers. Summaries are produced in a similar manner for guiding meetings with the fishing industry.

The overall view, however, of members of the fishing industry was that they did not know the reason that stock assessments were being conducted since the assessments did not answer the real issues affecting the livelihoods of fishermen. The general view on the usefulness of the data was that it helps the fisheries administration understand how

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fishermen operate. In spite of their support for data collection, fishermen feel that there is insufficient feedback of results to them. Fishermen felt that they did not benefit from the information and were not motivated to change fishing practices. These views are summed up in the response "I have a lot of information from the meetings with fisheries staff to present results. But the information is in my head only. Even knowing this, I have not changed my way of fishing" (fishing industry, FI1).

The first issue regarding communication of the information is exemplified in the case of the fishing industry. Overall, fishermen want to receive more regular feedback, and more information from the fisheries administration. With regard to awareness of the FAO, CRFM and Working Group publications, one fisherman stated, "To a very little extent and spasmodically. [since] There was never any organized system of making these available to me." (fishing industry, FI4). In spite of the fishing industry's request to receive more information, fishermen only want to know the key points. Fishermen view stakeholder meetings as being too technical with too much information. "We ask for information but very little come [*sic*] back to us. Too much information is prepared but the fishing industry only want [*sic*] to know the main points" (fishing industry, FI4).

With regard to the second issue, the need to tailor information for all stakeholders was stated in most responses to the last question (see Appendix 4 through 8). Fisheries managers and policy makers requested information that was less technical. The overall view was that there is a need for technical documents, but it is also important to produce summaries of the findings in a manner that would appeal to fisherfolk and stakeholders within the fisheries administration. "There is a great need to translate the technical information of assessment reports into a language that can be better understood by all stakeholders" (fisheries manager, FM3). The fisheries managers were also aware of the information does not get to the fisherfolk because it is not presented in a manner that would allow for easy reading and understanding by these stakeholder groups" (fisheries manager, FM3).

Based on responses to questions 8 through 21 (see Appendix 5), scientists made attempts to summarise and simplify the information that was distributed to other stakeholders. The fishing industry still wanted less technical information, and as one fisherman stated, "Most times I think that I am not qualified to understand them [summaries]." (fishing industry, FI4). The fisheries managers and policy makers stated the following:

Reports should identify the issues and recommendations in a form that outlines the measures to take in the form of a policy statement. Usually it is only the recommendations that are considered with respect to the reports. A report is considered to be useful if there are existing plans to implement policy changes. (fisheries manager, FM3)

It [scientific information] helps in the sense that it attempts to provide a knowledge (science) based foundation for action in interaction with policy makers, politicians, the fishing industry, other users ('impacters') of aquatic resources. However the information has to be distilled, summarized, simplified in interaction with these. (fisheries manager, FM1)

5.4.2 Credibility

Credibility was identified as an issue both with regard to the producer of the information and in terms of the information itself.

The fisheries managers saw the production of information as a means of maintaining credibility. Apart from the reasons for the production of information as listed in Section 5.2.3, one fisheries manager explained that a driving factor in the provision of information was the need "to demonstrate that the national fisheries authority is responding in a positive way to concerns from the industry about the status of fish stocks, environmental impacts of demersal shrimp trawling, and levels of bycatch and discards" (fisheries manager, FM1).

Based on responses from the fisheries advisory body, the Working Groups were supported by sound technical advice as described in the production of the scientific publications (see Section 5.2.5). The FAO and CRFM staff referred to the project "Training in Fish Stock Assessment and Fishery Research Planning", which was funded by the Danish International Development Agency (DANIDA) and led to the creation of the Working Groups. This capacity building made the information credible in the eyes of the scientists and fisheries managers. Credibility was reflected through the "citation of Working Group publications in relevant reports and presentations and promotion [of reports] at various fisheries governance, management, scientific and related fora" (fisheries advisory body, FAB5).

The fisheries managers stated that they sometimes judge the credibility of the information based on the views of groups outside of their organization. "Usefulness is gauged on the technical review from external entities, stakeholder view and international support for the work being done" (fisheries manager, FM3).

The fishing industry was more concerned with the credibility of the content of the scientific publications mainly because they were either not directly involved or were not consulted.

The involvement of fishermen has always been on an individual basis and instead there should be a collective response from fishermen. This way we will feel that the overall views of the industry are incorporated and then the reports will be more acceptable. We also tend to believe that the information collected by the fisheries division is not correct because they are not keeping enough tabs on the fishery and still target only industrial and not artisanal fishermen. (fishing industry, FI3)

The fishing industry does not consider the publications to be credible since they perceive that the fisheries administration is not directly involved in the production of scientific information, while the FAO and CRFM are considered as external bodies to the country. "Foreign organizations like the FAO and CRFM ... the local fisheries administration [Fisheries Division] absorbs this information and does not question it" (fishing industry, FI4). Fishermen also have little confidence in the roles of the fisheries administration and this contributes to their concern that the scientific information is not credible. "I believe

that it is a no win situation since government does not even enforce rules and cannot properly monitor fisheries and illegal activities" (fishing industry, FI2).

5.4.3 Accessibility

Accessibility of information is based on responses to the questions in section B of the fishing industry questionnaire (see Appendix 4) and section D of the other questionnaires (see Appendix 5 through 8). As a result of the output from Working Group meetings, "members of participating countries were able to create and leave with more information" (fisheries advisory body, F4). While the distribution methods of the FAO and CRFM have also contributed to the accessibility of print and digital versions of Working Group reports, there are issues within the countries that can act as barriers to the distribution of the information and are discussed below.

In general, fisheries managers, scientists and fisheries advisory bodies state that advances in technology, making the internet more accessible to a wide range of users, have greatly assisted the distribution of publications and the promotion of new publications or publications in press. Acknowledgement was made of the usefulness of the internet in facilitating mechanisms, such as blogs and wikis, for engaging discourse between scientists on finalizing scientific documents, as well as getting relevant stakeholders involved in the process. "These mechanisms, by their very nature, will keep relevant issues current and encourage well-needed feedback and involvement as well as keep issues in the forefront" (fisheries manager, FM1). One fisheries manager encouraged "the use of the online Carib-Agri Network, co-ordinated by the FAO for the Caribbean region, as a form of communication among scientists, fisheries managers, policy makers and FAO staff." (fisheries manager, F2).

The fisheries administrations in both countries are responsible for the dissemination of information to resource users at the national level. Sometimes dissemination occurs through meetings and workshops and FAO's assistance as a facilitator was requested in some cases. Recommendations were made by the fisheries managers:

The documents should not only occupy the shelves in the libraries but should be actively used as reference documents in internal discussions at meetings designed to share this information. In this way the fisheries manager would have a better grasp of the technical details which would lead to a better understanding. A mailing list of those with some interest in the subject area can be established to ensure that the information is disseminated. An occasional Workshop or Seminar may also be useful. (fisheries manager, FM2)

The main issue that became apparent from the responses was the absence of formal mechanisms to measure usage of information which meant that the fisheries administration was not aware of the extent of accessibility of reports. Based on the responses from the fisheries advisory bodies, there are no explicit mechanisms at regional or national levels for measuring information use except for the participation of managers at meetings. This is articulated in the following two responses from the fisheries advisory bodies:

The manager's workshops at the end of each workshop were intended to both inform the managers and to receive feedback from them on the quality and relevance of the work being done. (fisheries advisory body, FAB2)

The managers plenary in the Working Group Meetings comprised mainly scientists, a small number of fisheries managers, and no policy makers. The degree of success for information to be transferred to the fisheries managers and policy makers was therefore reduced. The turnover rate of personnel in fisheries departments is quite high and common to most countries in the Working Group. (fisheries advisory body, FAB6)

Based on the responses, particularly for the fisheries managers, many may have started their careers as scientists but are now operating at the administration/manager level, and as a result, the capacity building in term of research is not being used. This however, may increase the fisheries managers' acceptance of scientific information. The fisheries advisory bodies raised a concern that:

Workshop meetings became "individualised participation" for some country participants who do not share results after the meetings. "Scientists from a public service background are more inclined to share information as opposed to scientists from a university or other research oriented organization. Maintaining institutional memory within the Working Groups became a concern as well in terms of continuity of work started. (fisheries advisory body, FAB5)

The usefulness or influence of reports produced by the advisory bodies on policy and decision-making requires evaluation of the Working Groups and their output. Even if the analysis is rigorous, determining the role that scientific information plays in the management of the shrimp and groundfish fishery is complicated by many external factors that can influence decision making. Decisions are ultimately made, by senior public servants, politicians, and the industry and can have positive or negative consequences.

5.5 Information Flow

The flow of information among stakeholder groups shown in Figure 2 (p. 20 above), is theoretical and a broad framework for the creation, distribution and use of information. The flow of information is summarized in Figure 3 and the direction of the flow of information is ranked as strong or weak, based on the numbers of positive and negative responses to the flow of information between the stakeholders. A strong response (wide arrow) is characterized by having a positive response of over 75% from the relevant stakeholder groups. A weak response (narrow arrow) is characterized as receiving a negative response from over 75% of the responses from the relevant stakeholder groups.

The flow of information, or the communication, is strongest between the fisheries advisory bodies and the scientists. The responses stated that the focus of activities coordinated by the FAO and the CRFM was on the scientist and the fisheries manager.



Figure 3. Information flows between the stakeholders, incorporating survey responses. (Adapted from the initial pathway shown in figure 2)

The flow of information, in terms of provision of data, is strong from fishermen to scientists. The distribution of information is also strong between the scientists and fisheries managers. In spite of not directly advising scientists on the types of assessments that are needed, fisheries managers still report findings of scientists to the policy makers. Policy makers, in spite of receiving reports from fisheries managers and fisheries advisory bodies, still rely on economic statistics and not scientific information on the biological status of resources, to include in policy making activities. Based on the responses in the study, the output of the process of publishing scientific information is to inform the policy maker. The recommendations in the scientific publications are still too technical and, in their current form, are suitable only to the scientist.

There appears to be a gap in communication between the policy makers and scientists and the policy makers and the fishing industry. The scientific information produced by the Working Groups circulates mainly at the level of the scientist and manager. The possible reasons for the gaps are discussed in the following section.

6.0 DISCUSSION

This study sought to investigate baseline information about available scientific information (published largely as grey literature), the processes by which information was created and distributed, the drivers in these processes, and how the information was utilized by stakeholders. Overall, participants viewed the scientific information produced by the Working Groups as available information and not as grey literature. The issues pertaining to information use were therefore not considered to be characteristic of grey literature, but considered instead to be relevant to all fisheries scientific information.

With reference to the responses from the survey, some key points were frequently raised with regard to how the information was produced and the way in which the information was communicated. In summary, these points were:

- 1. Scientific information can be more useful if it is factored into or builds on existing government policy.
- 2. Scientific information should be tailored in a less technical way so as to be understood by all stakeholders.
- 3. The use and influence of information in decision making is still uncertain since there are no formalized measurements.

The flow of information (see Figure 3) is strongest between the scientist, the fisheries advisory bodies and the policy maker. A fundamental question to be asked is: were the opportunities and barriers for using information produced by the Working Groups affected by the overall assessment process? That is, was the process focused too much on providing a final output for the policy makers and in the course of this, ignored other stakeholders such as the fishing communities, managers and other stakeholders within the Ministry of Agriculture, and the general public as targets for information dissemination as well? What were the links made between the research effort and alternative audiences?

under the areas of the organizational structure for fisheries management, the target audience, and tracking information use.

6.1 Organizational and Community Culture with regard to Communication

The organizational structure of the Ministry of Agriculture, community culture and societal aspects, while outside the scope of this study, may be contributing to communication gaps. It is important to note that the respondents from the fishing industry generally spent the most time in their unique stakeholder role. This means that almost all scientists, fisheries managers and members of the fisheries advisory bodies have interacted with the same group of fishers over a long time period. In spite of this, the fishing community has little regard for the fisheries administration and issues of credibility. One common view is that "Information, no matter how much is produced, is not being used because fishing is not important to politicians" (fishing industry, FI1). Why then does a divide in communication still exist? This long-term relationship between stakeholders, theoretically, may be ideal to increase the perception of credibility among managers, scientists and advisory bodies. However, this was not the case with the fishing industry and in spite of familiarity, information was still not accepted. This familiarity between FAO and scientists may have contributed to exchange of information and the progress of work. The policy makers, however, were relatively new and spent the least period of time in their role within the Ministry of Agriculture.

The focal point of the FAO and CRFM for information dissemination was the fisheries administration with its scientists and fisheries managers. Therefore, the target audience of the advisory bodies seems largely to be the scientists and fisheries managers. The advisory bodies are aware of the need to reach other stakeholders.

In future, greater efforts need to be made to make policy-makers, stakeholders and the public more aware of work of this nature. This will require specialist publications that convey the key messages and target the different audiences (e.g. from, perhaps, semiliterate fishers through to well-educated (but not necessarily in science) politicians and senior government officials. Our strategy was probably too focused on scientists and their managers and neglected the wider, but still very relevant and influential audiences. (fisheries advisory body, FAB 1).

More attention needs to be put on communicating with the other stakeholders, but is that the FAO's or CRFM's responsibility? Partnerships can be formed between the FAO and CRFM to assist countries to tailor scientific information to reach the fisherfolk and the general public. Given the concerns of the fishing industry, this may be a further challenge since the fisherfolk may not be accepting of more information coming from the FAO and CRFM. Another major drawback can be the growing reliance on the electronic media to distribute reports and the fact that individuals who are not computer literate, or who do not having access to computers or to the Internet, will still have limited access to the information.

Essentially, the scientists state that the creation of information is dependent on "…having motivated research staff within the fisheries department" (scientist, SC1). Guidance to prepare scientific reports did not come from within their organization but from external sources such as the FAO and CRFM. The FAO and CRFM respond to requests from scientists and fisheries managers; scientists use the facilitating role of the FAO and CRFM to obtain support from fisheries managers and policy makers for research and generation of scientific information. Yet, for protocol reasons, FAO (especially) and CRFM reports may go directly to senior administrators in the relevant Ministry or Division and " [they] take time to trickle down to users who need them [the] most (fisheries manager, FM2). This process may be due to organizational and cultural aspects that prevent managers and policy makers from being proactive in using information to guide decision making.

It is very difficult to determine the influence of the publications. Management decisions, when taken, are not normally referenced to scientific or other reports. Fisheries governance in the region is not proactive and thus there is no systematic use of scientific information in decision making. Decision makers do not demand regular, scientific information on their fisheries from their managers and so there is no culture/tradition in this regard (fisheries advisory body, FAB2).

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The Ministry of Agriculture's Fisheries Division in Trinidad and Tobago has a central role to play in information dissemination and therefore should be given the capabilities for a formal extension programme to reach the fishing communities and the general public. Information in the reports produced by the advisory bodies must be translated into simpler language to reach fishermen and other audiences. The Fisheries Department must take this responsibility to enhance its community extension functions. Funds are spent on research and the information would be more useful if it could contribute to the education of fishermen. Receiving information from the fisheries administration may also increase the credibility of the information and the Ministry of Agriculture since fishermen had concerns that the information was coming from an external source (FAO and CRFM). According to Myers et al (2000) and Brooks and Smith (2001), within the Caribbean, the lack of regional governmental and institutional support for research suggests that trends of declining biological diversity will continue over the next several decades.

6.2 Science-Policy Divide

As described in Section 6.1, scientists receive little guidance within their organization. "The process is therefore internally driven by the [FAO or CRFM] secretariat, and also internally driven at the national level by the scientists. Managers have yet to play a more active role." (fisheries advisory body, FAB6). There were no clear management plans for the shrimp and groundfish fishery and scientists use the broad policy directions outlined for the sector by the Ministry of Agriculture, Land and Marine Resources in Trinidad and Tobago and the Ministry of Science and Technology in Venezuela as the context within which assessments are conducted. The management goals for Trinidad and Tobago are given as (1) Long-term conservation of the resource and (2) Controlling access (proposed in new draft legislation, 1995) (Chakalall et al, 2000).

This scenario often reduces the usefulness of the reports produced since as a result of this limited guidance, the recommendations or the status of the stock given in the scientific reports of the Working Group (FAO, 2001a, 2001b), often had no clear link to action. Any existing plans were too broadly stated and were more structured as status reports. Although documents contained priority projects or areas for research, there was rarely a

clear and logical process linking the status review and analysis, through to the goals and objectives, and down to the actions to be taken.

In addition, based on the responses and the review of the scientific reports, it seems that already a vast amount of information is not being adequately and efficiently used. The real issues to be dealt with are poverty and food security, as articulated by the fishing industry:

Too much information is being prepared but the fishing industry only want[s] to know the main points. Fishermen need the basics i.e. ice, fuel, space to fish, money at the end of the day. Only when they have these basic necessities, then they will be prepared to listen to [and] accept scientific information. Only then they will be able to understand what sustainability means. (fishing industry, F3).

The available fisheries scientific information can help, however, it is not framed in a manner that it can be included easily into policy initiatives to alleviate poverty and increase food security. In spite of all the technical information that is available, policy makers still use fisheries statistics, such as trade data to determine the health of the fishery. To positively influence policy-makers, research and results must be relevant to policy issues and framed in ways that policy makers and stakeholders can understand.

6.3 Targeted Audience and Technical Content

The reports published by advisory bodies are often too technical and not appropriate for all stakeholders, especially the fishermen. Senior officials in government did not request scientific information and the scientists and the Working Group were left to decide the focus of fisheries assessments and what policy makers needed. The assessments were driven largely by the local scientists and managers. The managers also did not address specific questions to the scientist and therefore were not able to fully comprehend the reports due to the high level of technical details. The managers however, summarized the available information to present advice to policy makers. Similarly, the fishing industry did not make any specific requests to the scientists or advisory bodies and the recommendations in the reports were too technical for the industry as well. The Working Groups were, therefore, not meeting the demands of either the managers or the industry. The responses from the fisheries advisory bodies were: "Our strategy was probably too focused on scientists and their managers and neglected the wider, but still very relevant and influential, audiences." (fisheries advisory body, FAB2). "Publications under my charge are intended to advise about research and resource assessment issues, and to advise about options for improving the scientific foundation required for generating management advice." (fisheries advisory body, FAB6)

Within the Working Groups a clear articulation as to who is the target audience of reports was not made, except that the reports enhanced capacity for stock assessment and fisheries management and increased the knowledge base. The high technical language in the reports, however, clearly made the reports useful within the scientific community. The summary documents given to the managers were still too technical which severely compromised the usability of the information reaching other stakeholders, for instance the fishing industry and policy makers. "There is need for technical documents but it is also important to produce summaries of the findings in a manner that would appeal to fisherfolk and primary stakeholders."(fisheries manager, FM1). Very often the information did not reach the fisherfolk because it is not presented in a manner that would allow for easy reading and understanding by this stakeholder group. "Most FAO and CFRM scientific reports are not designed for the Fishing Industry, or even Fisheries Managers or Policy Makers in the Caribbean. The reports are too full of jargon and too long" (fisheries manager, FM2).

The digital age is influencing how information is disseminated. Web site downloads are a common feature, and access to electronic files increases awareness, especially when there are limited number of print copies. However, the digital age and emerging web technologies may prevent some stakeholders, who are not technologically equipped, from accessing information. But, producing reports as digital publications has the potential to ensure that that information is easily accessible and accommodates the cost-cutting measures of both advisory bodies. Responses show however that in most cases the official Web site information was not being regularly updated to include the new information.

6.4 Evaluation of Scientific Projects, Working Groups and Management Regimes

To be able to determine the value of scientific information in policy development and management, that value must be measured. Currently, there are no formal mechanisms for measuring the usefulness of the reports of the CRFM Shrimp and Groundfish Working Group. A set of indicators for evaluating the results of the Working Group has not been established.

Instead the reports were considered the output and final product. Even though it has a limited capacity to monitor usage, the FAO has not evaluated the usefulness and influence of its scientific reports. There are two main issues to be examined with regard to evaluation mechanisms for management at the national and at the regional levels.

Firstly, it appears that the fisheries advisory bodies assumed that Trinidad and Tobago or Venezuelan officials and industry would accept results of technical analyses and make the appropriate changes to fishing and management. The responses from the advisory bodies clearly state that the primary aim of the technical publications on shrimp and groundfish was to increase the knowledge base and strengthen the capabilities for stock assessment within the Working Groups. Therefore, the objectives of the Shrimp and Groundfish Working Groups do not seem to include an evaluation of the usage of the publications. As a result there are no indicators for evaluating the results of Working Groups. At the meetings of the working group, countries often report on follow-up actions taken however "usually very few responses are received from the managers and policy makers on actions taken to implement the recommendations and on outcomes" (fisheries advisory body, FAB1).

Secondly, when the FAO/WECAFC and CFRAMP developed the Working Group agenda, in the early 1990s, the common objectives for management of fisheries may not have been clear. Trinidad and Tobago did not have fisheries management plans, and therefore scientists in the Working Group were not being clearly guided by policy directives and the objectives for management were not clear. This impacted on the ability of information to move from the scientific arena to policy makers. It is not known

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whether the FAO and CFRAMP/CFRM provided guidance and support to countries on how to use the results of fisheries assessments. The responses describe the technical assistance in preparing reports but there is no mention of initiatives after the working group analyses were completed and reports prepared. Responses from the survey indicate that dissemination of information is not the responsibility of the FAO or CRFM. Is it the responsibility of the fisheries advisory bodies to go further?

Given the experience of the Shrimp and Groundfish Working Group, the question to be asked by the scientists, managers and policy makers is 'how can information use and influence be realistically improved, based on the previous experience?' One answer provided by a fisheries manager, is through "the use of networking/partnerships, education, economic and social valuations, and the FAO and CFRM need to change their approaches so that these aspects are included in the mandate of advisory bodies." (fisheries manager, FM3). The literature on project evaluation is starting to examine the usefulness of data (Williams et al, 2009). The feasibility of networks and partnerships in increasing use and influence of information is, however, outside the scope of this paper.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The barriers to effective use of fisheries information (published as grey literature) in policy and decision making, that have been identified from the survey responses are consistent with those already identified in the literature on the use and influence of information. These barriers include issues dealing with: credibility of information and the organizations producing information; the ability to target multiple stakeholder audiences; and communication of scientific information. The following sections summarize the findings and make recommendations for future work.

7.1 Conclusions- Opportunities and Barriers to using Scientific Information in Policy and Management

The results of the survey questions show how information produced by the Working Group was utilized by fisheries managers and policy makers. The overall benefits are therefore seen to be a contribution to scientific knowledge of resource status and trends. A body of literature on the status of resources in the region now exists. The documents have been published and placed in the public domain and are readily available in print and electronic versions. In spite of being considered grey literature, it is credible and sound, and the most comprehensive source of information for the resources of the region. The annual scientific meetings, the publications of reports and the involvement of stakeholders at these meetings, have increased awareness on the issues regarding the shrimp and groundfish resources. There is an enhanced technical capability within countries to conduct scientific fisheries assessments.

The intention was to promote decision making based on scientific information and to influence and enable decision makers to make decisions on fisheries management. However, there is still a limited management response. There is still limited 'effective' information sharing between scientists and managers.

7.2 Recommendations and Future Work

This study shows various gaps in information flow primarily between the scientist and policy maker and between the policy maker and fishing industry. The two-way flow of information between the fisheries advisory bodies and the scientists is strongest. However, for all other stakeholders, the direction of information flow is usually stronger in one direction.

The following are recommendations for improving the use and influence of information.

Accessibility and use

- 1. The Ministry of Agriculture in Trinidad and Tobago has an important role to play in dissemination of information to its stakeholders. The organization must enable common linkages between the work of its scientists, policy makers and fisheries managers. This information sharing can also be seen as a means of accountability for funds spent on research. Appropriate mechanisms can also be put in place to measure the use of information that is distributed. The organization needs to increase the capability for the fisheries administration to conduct extension activities to fishing communities to facilitate transfer of information. Attention should be placed on empowering fishermen, through education, as a means of increasing the involvement of this group and empowering them to demand and use relevant information to improve their livelihoods. Education is the key to facilitate effective communication both within the organization, and with its stakeholders. Education is also a means of facilitating a change in the current views and perceptions of the stakeholders on information use. While a detailed study of social and organizational structures were outside the scope of this project, results still show the need to modify existing structures to facilitate the flow of information. It is recommended that the aforementioned activities should be given priority in the Ministry's long-term strategic and work plans.
- 2. The focus of the FAO/WECAFC and CRFM Working Groups can shift to education and enhancing strategies for communicating fisheries scientific information. This can involve working with the main groups: scientists, managers, policy makers and

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fishing industry. The result will be capacity building that directly benefits the fishing industry. The FAO and CRFM can assist Working Group members to prepare focused versions of reports for non-technical audiences. This can take the form of short briefing documents and media presentations. Preparation of reports of this type will have the advantage of developing a common message as opposed to adapted versions for various individuals or agencies. This step will however involve extra work for the FAO and the CFRM and will require extra resources.

- 3. The FAO and CRFM can consider modifying the current process of assessing the shrimp and groundfish resources by incorporating the development of strategic plans for species. The type of publications that are currently produced may not be suitable for their intended use. The recommended strategic plans may be more useful in guiding policy than 'stand-alone' fisheries assessments. Such plans involve a process that starts with the provision of a status review, a vision and goals for managing species across all or part of the range of a species. These types of plans are being proposed by the International Union for Conservation of Nature for conservation of species (IUCN/SSC, 2008).
- 4. Apart from current uses for fishing or trade negotiations, there should be promotion of other uses of scientific information such as in supporting environmental lobbying. This can be a means of increasing the usefulness and influence of information. There is, for example, potential use of the stock assessment reports for shrimp and groundfish by countries in the region wanting to obtain Marine Stewardship Council (MSC) certification. Obtaining access to foreign markets as an ecolabelled product can be beneficial to the fishing industry and could result in a change in attitude towards the scientific work if MSC continues to grow in the region.

<u>Credibility</u>

 The fishery advisory bodies can use their existing protocols for dealing with senior and political staff to continue promotion of the credibility of information and facilitate the communication between scientists and fisheries managers, as well as between managers and policy makers. The FAO and CFRM can describe the results of scientific studies, in terms of the importance, implications and consequences, in the briefing note accompanying the scientific report that is sent to senior fisheries managers and policy makers. This should replace the short briefing note that is sent to Directors, Permanent Secretaries and Ministers of Agriculture. The results of the scientific studies can also be linked to global issues relevant to fisheries, ecosystems, biodiversity, and even climate change. Including these perspectives will increase the credibility of the results for some audiences and increase the potential of the science being used to guide decision making.

- Collectively, scientists should develop capabilities and mechanisms to communicate science more effectively to non-technical stakeholders. Scientists should be able to tailor information to specific audiences. Communicating existing knowledge is as important as conducting new research.
- 3. Formal arrangements and mechanisms for stakeholder involvement in the production of information can be established. This is particularly recommended for the fishing industry, since fishermen had concerns that the scientific information was coming from an external source (FAO and CRFM). Engagement in these activities can increase the credibility of the scientific information produced and the credibility of the Ministry of Agriculture.

Recommendations for future work:

 The information pathways (see Figure 2 and Figure 3) may be limited as there may be stakeholders and external factors that are not known at this time. This study can be extended by taking a sample of reports that have been published by the Working Group and tracking them more thoroughly to investigate the influence of their research on policy. The methodology for this type of study is described in the literature for 'episode studies' (Start & Hovland, 2004). The study can focus on a clear policy change and tracks back to assess what impact research had among the variety of issues that led to the policy change The advantage of using such a study is that the process of working backwards in time gives a view of the range of factors – other than research – that can influence policy.

- 2. A more detailed content analysis of the survey data can be performed using quantitative analysis software packages such as NVivo8 (QSR International, 2009), described by O'Flaherty & Whalley (2004). The current survey could also be modified in areas, particularly, the questions directed at the policy makers which can be reconsidered to ensure more complete responses. The questions dealing with the creation and distribution of information were not applicable to the policy maker since they may operate outside of the roles. The questionnaire developed for the policy maker may need to be very brief and focus only on how information received on the status of resources is dealt with and when the policy maker requests information on the subject.
- 3. Research into policy processes is needed to understand why the recommendations for managing the shrimp and groundfish resources have not been implemented. The study paper can benefit from an analysis of how policy is defined in the case of Trinidad and Tobago. This study should also include a detailed look at how social and cultural characteristics influence policy.

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APPENDICES

APPENDIX 1: Map of the geographic region of the Caribbean Large Marine Ecosystem (including Trinidad and Tobago and Venezuela)



APPENDIX 2: Approval letter from Dalhousie University's Social Sciences and Humanities Research Ethics Board



Social Sciences and Humanities Research Ethics Board Letter of Approval

Date: June 2,2009.

To: Suzuette Soomai, Marine Affairs Program Peter Wells, School for Resource and Environmental Studies

The Social Sciences Research Ethics Board has examined the following application for research involving human subjects:

Project # 2009-1997 (version 2)

Title: Information and Influence in Fisheries Management: The Opportunities and Barriers for using Scientific Information to Manage Shrimp and Groundfish Resources in the Brazil-Guianas Continental Shelf

and found the proposed research involving human subjects to be in accordance with Dalhousic Guidelines and the Tricouncil Policy Statement on *Ethical Conduct in Research Using Human Subjects*. This approval will be in effect for 12 months from the date indicated below and is subject to the following conditions:

- 1. Prior to the expiry date of this approval an annual report must be submitted and approved.
- 2. Any significant changes to either the research methodology, or the consent form used, must be submitted for ethics review and approval *prior to their implementation*.
- 3. You must also notify the Office of Research Ethics Administration when the project is completed or terminated, at which time a final report should be completed.
- 4. Any adverse events involving study participants are reported immediately to the REB

Effective Date: June 2,2009. Expiry Date: June 2,2010.

signed: <u>Uay Cahen</u> Fay Cohen (Chair SSHREB)

IMPORTANT FUNDING INFORMATION - Do not ignore

To ensure that funding for this project is available for use, you <u>must</u> provide the following information and <u>FAX</u> this page to <u>RESEARCH</u> <u>SERVICES</u> at 494-1595

Name of grant /contract holder	Dept.
Signature of grant / contract holder	· · · · · · · · · · · · · · · · · · ·
Funding agency	
Award Number	Dal Account # (if known)

Research Services · Research Ethics Admin Office · 5248 Morris Street · Hallfax, NS, Canada · B3J 164 Tel: 902-494-1462 · Fax: 902-494-1595 · Email: Patricia.Lindley@dal.ca · www.dal.ca/~research

APPENDIX 3: Technical and Meeting Reports on the Shrimp and Groundfish Fishery

ITEM	YEAR	REPORT NUMBER	TITLE
		/ AUTHOR	
1	2008	CRFM Fishery	Report of Fourth Annual Scientific Meeting –
		Report -2008, Vol. 1	Kingstown, St. Vincent and the Grenadines,
			10-20 June 2008.
2	2006	CRFM Fishery	Report of Second Annual Scientific Meeting
		Report - 2006, Vol. 1	– Port of Spain, Trinidad and Tobago, 13-22
			March 2006. 188 p.
3	2005	CRFM Fisherv	Report of the First Annual CRFM Scientific
5	2000	Report No. 11	Meeting Kingstown St Vincent and The
			Grenadines June 22-30, 2004, 318n
			Grenaumes, June 22-30, 2004. 518p.
4	2005	Medley, Alió,	Assessment of shrimp stocks shared by
		Ferreira, and	Trinidad and Tobago and Venezuela.
		Marcano 2006	FAO/WECAFC Report of Workshop on the
			Assessment of Shrimp and Groundfish
			Fisheries on the Brazil-Guianas Shelf. Port
			of Spain, Trinidad and Tobago, 11-22 April,
			2005. Rome: FAO
5	2004	FAO/FishCode	Die, D.L., J. Alió, L. Ferreira, L. Marcano,
		Review. No. 3.	and S. Soomai. 2004. Assessment of
			demersal stocks shared by Trinidad and
			Tobago and Venezuela. Rome: FAO. 21p.
6	2002	FAO Fisheries	FAO/WECAFC Report of the first Regional
		Report No. 676	Conference on the Sustainability of Fisheries
			Resources in the Brazil-Guianas Shelf.
			Paramaribo, Suriname, 5-7 March 2002.
			Rome: FAO. 27p.
			•

ITEM	YEAR	REPORT NUMBER	TITLE
		/ AUTHOR	
7	2001	FAO Fisheries	FAO/WECAFC Report of the Meeting of
		Report. No. 650	Fisheries Managers and Ministers of the ad
			hoc Working Group of the Brazil-Guianas
			Shelf, Port-of-Spain, Trinidad and Tobago,
			26-29 March 2001 Rome: FAO, 381pp.
8	2001	FAO Fisheries	FAO/WECAFC Regional reviews and
		Report. No. 651	national management reports. Fourth
			Workshop on the Assessment and
			Management of Shrimp and Groundfish
			Fisheries on the Brazil-Guianas Shelf.
			Cumaná, Venezuela, 2-13 October 2000.
			Rome: FAO. 152p.
9	2000	FAO Fisheries	Report of the third FAO/WECAFC/CFRAMP
		Report. No. 628	Workshop on the Assessment of Shrimp and
			Groundfish Fisheries on the Brazil-Guianas
			Shelf. Belém, Brazil, 24 May - 10 June 1999.
			Rome: FAO. 206p.
10	2000	GCP/INT/648/NOR	Report of the National Workshop on
		Field Report F-12	Fisheries Management in Suriname and
			Follow-up Meeting, Paramaribo, Suriname,
			21-22 June 2000 & 11 July 2000.
			FAO/FISHCODE Project,
			GCP/INT/648/NOR. Rome: FAO. 23pp.
11	2000	GCP/INT/648/NOR	Rapport de la Réunion Nationale sur les
		Field Report F-11	Pêcheries de Crevettes et de Poissons de
		(From al.)	Fond du Plateau Guyano-Brésilien, Cayenne,
		(r rencn)	16 juin 2000. Programme de Coopération
			FAO/Norvège, GCP/INT/648/NOR. Rome:
			FAO. 6pp.

ITEM	YEAR	REPORT NUMBER	TITLE
		/ AUTHOR	
12	2000	GCP/INT/648/NOR	Seminário Nacional sobre Pesca de Camarão
		Field Report F-10	e Peixes Demersais na Costa Norte do Brasil
			(Report of National Workshop on Shrimp
		(Portugese)	and Groundfish Fisheries of the Brazil-
			Guianas Shelf), Belém, Brazil, 14 June 2000.
			FAO/FISHCODE Project,
			GCP/INT/648/NOR. Rome: FAO. 22pp.
13	2000	GCP/INT/648/NOR	Informe del Taller sobre Pesquerías de
		Field Report F-9	Camarón y Peces de Fondo en la Región
			Atlántica de Venezuela, Cumaná, Venezuela,
		(Spanish)	5 de mayo de 2000. Programa de
			Cooperación Gubernamental FAO/Noruega,
			GCP/INT/648/NOR. Rome: FAO. 9 pp.
14	2000	GCP/INT/648/NOR	Report of National Workshop on Shrimp and
		Field Report F-8	Groundfish Fisheries of the Brazil-Guianas
			Shelf, Couva, Trinidad and Tobago, 2-3 May
			2000. FAO/FISHCODE Project,
			GCP/INT/648/NOR. Rome: FAO. 22pp.
15	2000	GCP/INT/648/NOR	Report of National Workshop on Shrimp and
		Field Report F-7	Groundfish Fisheries of the Brazil-Guianas
			Shelf, Mon Repos, Guyana, 27-28 April
			2000. FAO/FISHCODE Project,
			GCP/INT/648/NOR. Rome: FAO. 16pp.
16	1999	GCP/INT/575/DEN	CFRAMP/FAO/DANIDA Stock Assessment
			Workshop on the Shrimp and Groundfish
			Fishery on the Brazil-Guianas Shelf.
			Georgetown (Guyana), 18-29 May 1998.
			Rome: FAO. 1999.

YEAR	REPORT NUMBER	TITLE
	/ AUTHOR	
1999	FAO Fisheries	FAO/WECAFC National reports presented
	Report. No. 600	and stock assessment reports prepared at the
		CFRAMP/FAO/DANIDA Stock Assessment
		Workshop on the Shrimp and Groundfish
		Fisheries on the Guiana-Brazil Shelf. Port-of-
		Spain, Trinidad and Tobago, 7-18 April
		1997. Rome: FAO. 200p.
1996	FAO Fisheries	Report of the Fourth Meeting of the
	Report. No. 544	WECAFC Ad hoc Shrimp and Groundfish
		Working Group of the Guianas-Brazil
		Continental Shelf and CFRAMP Shrimp and
		Groundfish Subproject Specification
		Workshop, Port-of-Spain, Trinidad and
		Tobago, 8-12 January 1996. Rome: FAO.
		43pp.
1997	FAO Fisheries	National Report and selected papers
	Report. No. 544,	presented at the Fourth Meeting of the
	Suppl.	WECAFC Ad hoc Shrimp and Groundfish
		Working Group of the Guianas-Brazil
		Continental Shelf and CFRAMP Shrimp and
		Groundfish Subproject Specification
		Workshop, Port-of-Spain, Trinidad and
		Tobago, 8-12 January 1996. Rome: FAO.
		248pp.
1992	FAO Fisheries	National reports and selected papers
	Report No. 526	presented at the Third Workshop on the
	Suppl.	Biological and Economic Modelling of the
		Shrimp Resources of the Guianas-Brazil
		Shelf. Paramaribo, Suriname, 22-25 June
		1992. Rome: FAO. 200 pp.
	YEAR 1999 1996 1997 1997	YEARREPORT NUMBER / AUTHOR1999FAO Fisheries Report. No. 6001996FAO Fisheries Report. No. 5441997FAO Fisheries Report. No. 544, Suppl.1992FAO Fisheries Report No. 526 Suppl.

ITEM	YEAR	REPORT NUMBER	TITLE
		/ AUTHOR	
21	1992	FAO Fisheries	Report of the Third Workshop on the
		Report. No. 526	Biological and Economic Modelling of the
			Shrimp Resources of the Guyana-Brazil
			Shelf, Paramaribo, Suriname, 22-25 June
			1992. Rome: FAO, 24pp.

APPENDIX 4: Survey Questionnaire used for the Fishing Industry in Trinidad and Tobago

A. Role with the fishing industry in Trinidad and Tobago or Venezuela

- a What is your affiliation within the fishing industry? (small scale/ industrial fisherman, processor, exporter, other)
 - b. How long have you fulfilled this role? (Number of years? Over what period?)
- 2) a. Are you aware of the UN Food and Agriculture Organization (FAO) and the Caribbean Regional Fisheries Mechanism (CRFM) Shrimp and Groundfish Working Group publications?
 - b. If so, when and how did you become aware of the publications?

B. Knowledge of FAO or CRFM and its publications

- 3) In your opinion, what drives the generation of scientific information on the shrimp and groundfish fishery?
- 4) Have you been involved in the creation of any shrimp and groundfish technical or meeting reports? What was your involvement?
- 5) What is the purpose of FAO or CRFM publications from the standpoint of your role as in the fishing industry?

C. Mechanisms for distributing and evaluating FAO or CRFM publications

- 6) Have you been involved in the distribution of any of the FAO or CRFM reports? Can you name any?
- For the report discussed in question # 6, outline to what types of individuals or organizations a report was distributed.
- 8) Are you aware of any evidence of the use of FAO or CRFM publications in terms or management recommendations and the fishing industry?
- 9) Finally, with regard to my research topic are there aspects of distribution, use, and influence of FAO or CRFM publications that you think would be of benefit to the fishing industry?

APPENDIX 5: Survey Questionnaire used for the Scientists in Trinidad And Tobago and Venezuela and members of the Shrimp and Groundfish Working Group

A. Role with FAO or CRFM Working Group on Shrimp and Groundfish Resources

- What is your affiliation with the FAO or CRFM Shrimp and Groundfish Working Group?
- 2) How long have you fulfilled this role? (Number of years? Over what period?)

B. Production of Scientific Information under the Shrimp & Groundfish Working Group of the FAO or the CRFM

- 3) What drives the generation of scientific information on shrimp and groundfish by your organization?
- 4) Do requests for generation of information come from within and/or outside of your organization?
- 5) Who requests the information? Scientists, Fishing Industry, Fisheries Managers, Policy Makers?
- 6) What is the intended purpose of FAO or CRFM publications from the standpoint of your role as a scientific working group member?
- Describe the technical stages in the production of scientific information by your organization.

For example, select a recent shrimp & groundfish report (identify by name) and outline the technical stages involved in its preparation and publication.

Please indicate the stakeholder groups involved at each stage (FAO and/or CRFM, Scientists, Fishing Industry, Fisheries Managers, Policy Makers).

C. Distribution of Scientific Information produced under the Shrimp & Groundfish Working Group of the FAO or the CRFM

- Outline your role in the distribution of scientific information published by the FAO or CRFM.
- 9) Upon the release of an FAO or CRFM publication, are personnel within your organization advised about the technical report? Who Scientists, Fisheries Managers, Policy Makers?
- 10) What mechanism(s) is used to inform personnel in your organization about the technical report?
- 11) Select a particular report [your choice] and outline the steps you took to distribute that report within your agency and outside of your agency?
- 12) What types of external organizations are these publications distributed to? (Libraries, Research institutes, Government Agencies, NGOs)
- 13) Outline the categories of individuals to which the report was distributed within your agency and outside of your agency? (Scientists, Fishing Industry, Fisheries Managers, Policy Makers)
- 14) Is this process typical for how you distribute FAO or CRFM reports?
- 15) Have you made a distinction between the distribution of technical reports and meeting reports? If so, to what types of individuals or organizations have you distributed copies of meeting documents? What types of individuals or organizations have you distributed copies of technical documents?
- 16) Is a summary (briefing note) prepared to accompany each report?
- 17) Do your distribution methods vary depending on the geographic location of the recipient organization or individual?(Scientists, Fishing Industry, Fisheries Managers, Policy Makers)
- 18) In the distribution process for the reports, does it matter whether reports are available in print and digital format? If so, how are the reports distributed differently?
- 19) Is the distribution method adjusted based on interest or demand for a report?

For instance, would you request an additional print run of a report from FAO or CRFM to meet demand? Or would you refer inquiries to your organization's Web site or the Web site of the FAO or CRFM?

- 20) Is the distribution process, that you described, applicable to all scientific publications produced by the FAO and CRFM, or does the method depend on the subject of the publication?
- 21) Have the distribution methods applied by your organization changed since the last publication for shrimp and groundfish? If so, please explain the rationale for the change?

D. Assessing the use of scientific information produced by the FAO and the CRFM Shrimp and Groundfish Working Groups

22) a. Does your agency keep a record of requests for Shrimp and Groundfish publications from stakeholders? (Stakeholders: Scientist, Fishing Industry, Fisheries Manager, Policy Maker)

b. If so, is this information used to provide feedback on the use of the publications?

- 23) Are you aware of any other evidence of the use of these shrimp and groundfish publications?
- 24) Does your organization track any evidence of the use of these publications within your organization or outside your organization?
- 25) Does your organization monitor traffic on its Web site? Do you have statistics that show access to and/or downloading of shrimp and groundfish publications?
- 26) As a member of the working group and having been involved in the production of scientific reports, have you taken any steps to promote awareness of shrimp and groundfish publications? If yes, please describe the method(s).
- 27) Finally, with regard to my research topic, are there any other aspects of distribution, use, and influence of FAO or CRFM publications that you think would be of benefit to your agency?

APPENDIX 6: Survey questionnaire used for the Fisheries Manager and Policy Makers in Trinidad and Tobago

A. Role with the fisheries administration in Trinidad and Tobago or Venezuela

- 1) a. What is your affiliation within your Ministry or Institute?
 - b. How long have you fulfilled this role? (Number of years? Over what period?)
- 2) When and how did you become aware of the FAO and CRFM Shrimp and Groundfish (S&G) assessments?

B. Production of Scientific Information under the Shrimp & Groundfish Working Group of the FAO or the CRFM

- 3) What drives the generation of scientific information on shrimp and groundfish by your organization?
- 4) Do requests for generation of information come from within and/or outside of your organization?
- 5) Who requests the information? FAO and/or CRFM, Scientists, Fishing Industry, Fisheries Managers, Policy Makers?
- 6) What is the intended purpose of FAO or CRFM publications from the standpoint of your role as a fisheries manager or policy maker?
- 7) What is your role in the generation of scientific information? For example, select a Shrimp & Groundfish report (identify by name) and describe your role in its preparation and publication. Please indicate which one of the stakeholder groups you interacted with (FAO and/or CRFM, Scientists, Fishing Industry, Fisheries Managers, Policy Makers).

C. Distribution of Scientific Information produced under the Shrimp & Groundfish Working Group of the FAO or the CRFM

- 8) How are FAO or CRFM documents received by your office? Which group of individuals is it received from? (FAO and/or CRFM, Scientists, Fishing Industry, Fisheries Managers, Policy Makers)
- 9) Does your office receive information about forthcoming technical reports or is information about a report only conveyed when the report is published?
- 10) In what form is scientific information received? Please indicate if it is a Meeting Report, Technical Report, Is it accompanied by a summary/briefing note? Is it in print and/or digital copy?
- 11) What happens to an FAO or CRFM publication when it reaches your agency? In your response select a recent technical report (identify by name) particularly relevant to your agency and describe:
 - how that report is documented and/or used within your agency
 - who uses the information?
 - how you inform personnel in your agency about each technical report.
- 12).Does your agency maintain a collection of FAO or CRFM documents in its library?
- 13) For the FAO or CRFM report described in question 11, indicate:
 - -what method(s) is used by your organization to distribute that report to stakeholders? (hardcopy, digital copy, summary report, referral to the FAO or CRFM Web site?
 - who are the stakeholders involved? Scientists, Fishing Industry, Fisheries Manager, Policy Maker, others?
 - what types of organizations are involved? Libraries? Research institutes?
- 14) Is the process that you have just described for receiving reports and dissemination of information typical for all technical and meeting reports published by FAO or CRFM?

15) Have the methods of receiving and distributing information by your agency changed over the past five years? If so, please explain the rationale for the change?

D. Assessing the use of scientific information produced by the FAO and the CRFM Shrimp and Groundfish Working Groups

- 16) a. Is the scientific information useful for management and policy making in the form that it is received by your office?
 - b. How do you determine that the information was useful?
- 17) Does your office keep a record of how shrimp and groundfish publications are used by fisheries managers/policy makers within your organization or outside your organization? Please describe the methods used.
- 18) Do you use this information (from question 17) to provide feedback to stakeholders (FAO and/or CRFM, Scientists, Fishing Industry, Fisheries Manager, Policy Maker) on the usefulness of the publications?
- 19) Does your organization monitor traffic on its Web site? Do you have statistics that show access to and/or downloading of shrimp and groundfish publications?
- 20) As a fisheries manager or policy maker, have you been able to use the information from FAO and CRFM documents in fisheries management and policy development? If yes, please describe the method(s).
- 21) Finally, with regard to my research, are there any other aspects of distribution, use, and influence of FAO or CRFM publications that you think would be of benefit to your agency?

APPENDIX 7: Survey questionnaire used for the staff of the UN Food and Agriculture Organization (FAO) and staff of the Caribbean Regional Fisheries Mechanism (CRFM)

A. Role with the FAO or the CRFM

- 1) What is your affiliation with the FAO or CRFM?
- 2) How long have you fulfilled this role? (Number of years / Over what period)

B. Production of Scientific Information under the Shrimp & Groundfish Working Group of the FAO or the CRFM

- 3) What drives the generation of scientific information on shrimp and groundfish by your organization?
- 4) Do requests for generation of information come from within and/or outside of your organization?
- 5) Are requests received from Trinidad and Tobago and Venezuela?
- If so, who requests the information? Scientists, Fishing Industry, Fisheries Managers, Policy Makers?
- 6) What are the intended purposes of your organization's publications on shrimp and groundfish?
- Describe the technical stages in the publication of scientific information by your organization.

For example, select a recent shrimp & groundfish report (identify by name) and outline the technical stages involved in its preparation and publication.

Please indicate the stakeholder groups involved at each stage (FAO/CRFM,

Scientists, Fishing Industry, Fisheries Managers, Policy Makers).

C. Distribution of Scientific Information produced under the Shrimp & Groundfish Working Group of the FAO or the CRFM

- 8) What is the process by which your organization distributes scientific information on shrimp and groundfish assessments to Trinidad and Tobago and to Venezuela?
- What types of organizations are these publications distributed to in the two countries? (Libraries, Research institutes, Government Agencies, NGOs)
- 10) Who is a report distributed to in the two countries? Scientist, Fishing Industry, Fisheries Manager, Policy Maker?
- 11) Is a summary (briefing note) prepared to accompany each report?
- 12) Do your distribution methods vary depending on the geographic location of the recipient organization or individual?
- 13) Is a distinction made between technical reports and meeting documents in terms of their production and distribution? If so, how?
- 14) In the distribution process for the reports, does it matter whether reports are available in print and digital format? If so, how are the reports distributed differently?
- 15) Is the distribution method adjusted based on interest or demand for a report? For example, would an additional print run of a report be completed to meet demand or would you refer inquiries to your Web site?
- 16) Is the distribution process, that you described, applicable to all scientific publications produced by your organization, or does the method depend on the subject of the publication?
- 17) Have the distribution methods applied by your organization changed since the last seven years? If so, please explain the rationale for the change?

D. Assessing the use of scientific information produced by the FAO and the CRFM Shrimp and Groundfish Working Groups

18) a. Does your agency keep a record of requests for Shrimp and Groundfish publications from Trinidad and Tobago and Venezuelan stakeholders? (Stakeholders: Scientist, Fishing Industry, Fisheries Manager, Policy Maker)b. If so, is this information used to provide feedback on the use of the publications?

- 19) a. Are you aware of any other evidence of the use of your organization's publications on shrimp and groundfish by these countries?b. What types of evidence are there?
- 20) Does your organization track any evidence of the use of these publications within your organization or outside your organization?
- 21) Does your organization monitor traffic on its Web site? Do you have statistics that show access to and/or downloading of shrimp and groundfish publications?
- 22) Does your organization take any steps to promote awareness of shrimp and groundfish publications? If yes, please describe the method(s).
- 23) Finally, with regard to my research topic, are there any other aspects of distribution, use, and influence of FAO or CRFM publications that you think would be of benefit to the FAO or CRFM?

APPENDIX 8: Survey questionnaire sent to the Fisheries Managers and Policy Makers in Venezuela (Spanish)

A) Papel en la Administración Pesquera en Trinidad y Tobago o Venezuela

- 1) a. ¿Cuál es su cargo en el Ministerio o Instituto?
 - b. ¿Cuánto tiempo tiene cumpliendo ese papel? (¿Número de años? ¿Durante qué período?)
- 2) ¿Cuándo y cómo estuvo usted en conocimiento de las evaluaciones efectuadas por los grupos de Recursos de camarones y peces de fondo de la FAO (COPACO) y del Mecanismo Regional Caribeño para Pesquerías (MRCP)?

B) Conocimiento de las publicaciones sobre camarones y peces de fondo de la ONU-FAO y del Mecanismo Regional Caribeño para Pesquerías (CRFM)

- Describa, por favor, su opinión sobre el mandato y proceso de trabajo de los grupos científicos de la FAO-COPACO y del MRCP?
- ¿Cómo funciona el proceso de publicación de su institución? Por ejemplo, seleccione un reporte reciente sobre manejo pesquero y describa las etapas en su preparación y publicación.
- 5) ¿Cuál es el propósito de las publicaciones de la FAO y MRCP desde el punto de vista de su organización?

C) Mecanismos para recibir, distribuir y evaluar las publicaciones del grupo de la FAO o MRCP sobre camarones y peces de fondo

6) a. ¿Cuál es el proceso mediante el cual se reciben los documentos de la FAO o MRCP en su institución?

b. ¿Tiene su institución una colección de documentos de la FAO o MRCP en su biblioteca?

7) ¿Es el reporte o resumen distribuido a los decisores sobre políticas pesqueras en su institución?

- 8) Al recibir los documentos de la FAO o MRCP ¿Se hace alguna distinción entre copias impresas o digitales? De ser así, ¿Cuál distinción?
- 9) ¿Qué pasa con una publicación de la FAO o MRCP cuando llega a su institución? En su respuesta seleccione un reporte reciente que fuera particularmente relevante para su institución y describa la manera como se documenta dicho reporte y es usado en su institución.
- 10) a. Luego que la FAO o el MRCP emiten una publicación ¿Se avisa a las personas en su institución are sobre tal reporte técnico?

b. ¿Cuáles mecanismos se usan para informar al personal de su institución sobre tales reportes técnicos?

c. ¿Recibe su institución alguna información sobre reportes técnicos en preparación o la información solamente es proporcionada cuando el reporte se publica?

- 11) a. ¿Considera usted que el proceso descrito para recibir reportes es típico para todos los reportes técnicos publicados por la FAO o MRCP?
 b. ¿Se emplea el mismo proceso para recibir documentos de la FAO o MRCP en su institución?
- 12) a. Para los reportes de la FAO o MRCP descritos en la pregunta 9, qué métodos se usan en su organización para distribuirlos a los usuarios y productores? (en forma impresa, digital, se refieren a los portales web de la FAO o al MRCP?
 b. ¿Es el método aplicado a todos las publicaciones de la FAO o MRCP, o depende

del tópico de la publicación?

- 13) Seleccione un reporte técnico sobre camarones o peces de fondo en particular que sea relevante para su institución e indique a que tipos de organizaciones o individuos se distribuyó esa publicación. ¿A Bibliotecas? ¿Instituciones de investigación?
- 15) ¿Han cambiado los métodos de distribución aplicados en su institución durante los últimos cinco años? De ser así, por favor explique las razones de dicho cambio.
- 16) a. ¿Mantiene su institución un registro de solicitudes informales de publicaciones a la FAO ó MRCP?

b. De ser así, ¿Es esta información utilizada para proveer retroalimentación o apoyo técnico de FAO o MRCP?

- 17) a. ¿Tiene usted evidencia del empleo de las publicaciones de la FAO o MRCM?
 b. ¿Registra su institución alguna evidencia del uso de las publicaciones de la FAO ó MRCP dentro de la propia institución? ¿Qué tipo de evidencia puede usted proveer para describir el uso de estos reportes en su institución?
 c. ¿Se lleva un registro de alguna evidencia sobre el uso de las publicaciones de la FAO o MRCP fuera de la institución misma?
- 18) ¿Ha divulgado su institución la información sobre las publicaciones de la FAO o MRCP? De ser así, le agradezco que describa los métodos empleados.
- 19) Finalmente, en lo que respecta a mi proyecto de investigación, ¿Hay aspectos de distribución, uso e influencia de las publicaciones de la FAO o MRCP que usted piense que debo destacar o abordar en beneficio de la FAO o MRCP así como de su institución?