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The Ecosystem Approach to Fisheries Management: High Seas Fisheries Management and the Northwest Atlantic Fisheries Organisation

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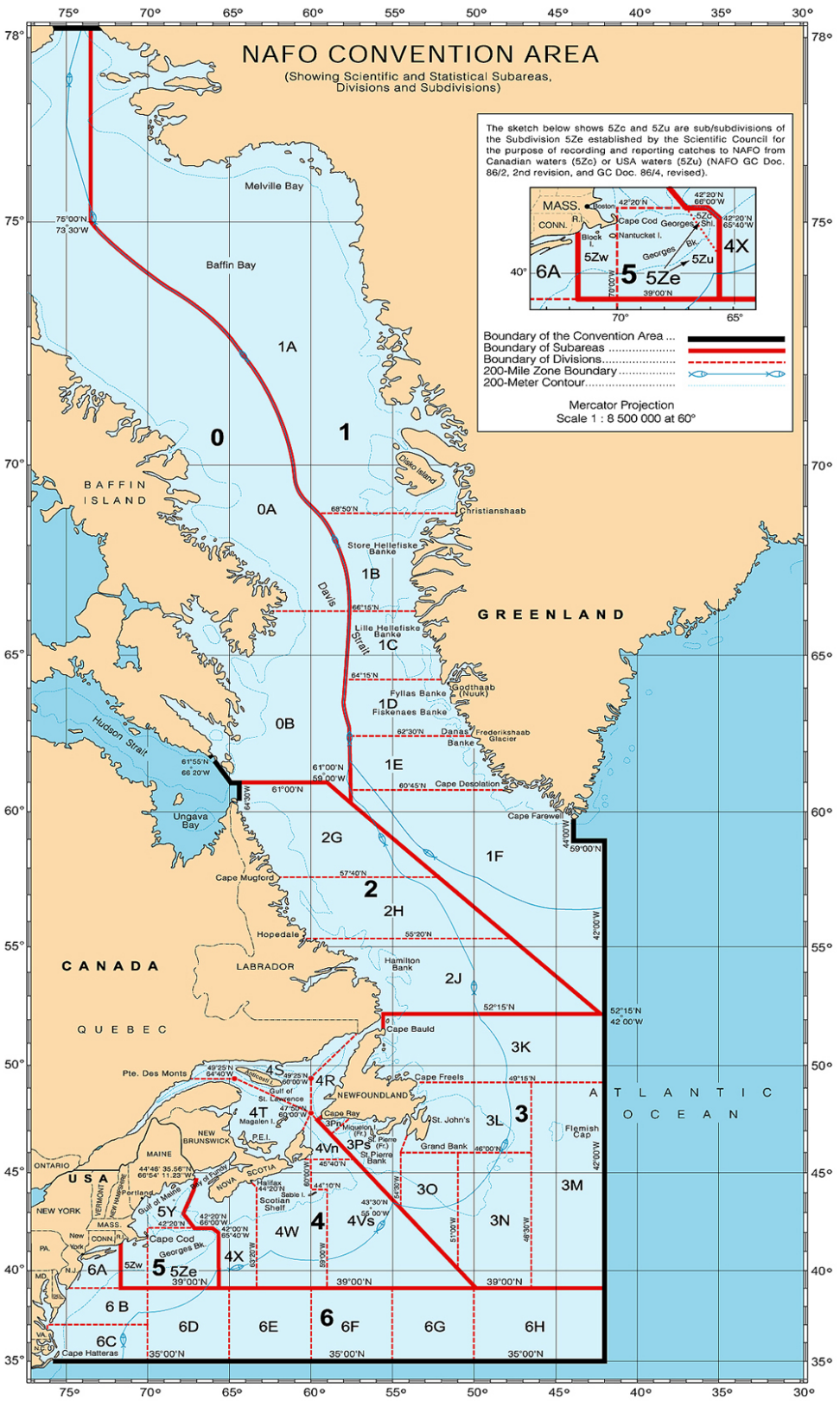
Preparation of this document

This overview of fisheries management organisations and the ecosystem approach to fisheries management was initially prepared as an MSc Thesis for the University of York, UK. The review was conducted in cooperation from the NAFO Secretariat and the Scientific Council and the full report was also submitted to the Secretariat. Research was conducted at the NAFO Secretariat, Dartmouth, Nova Scotia, Canada between June – August 2008.

The Author

Bethan O'Leary has a BSc degree in Physical Geography from the University of Southampton, UK and is currently studying for an MSc in Marine Environmental Management at the University of York, UK. In addition, Bethan is planning to begin a PhD in October 2008 to investigate the insurance value of marine reserves to fisheries management. Bethan has acquired extensive experience in coral reef conservation and environmental education and is keen to work within high seas management in the future.



The Convention and Regulatory Area of NAFO.

The black line delineates the Convention Area. Pale blue lines indicate Exclusive Economic Zones. The area outside of these are the NAFO regulatory area.

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EXECUTIVE SUMMARY

"How inappropriate is it to call this planet Earth when it is quite clearly Ocean" – Arthur C. Clarke[1]

This report contains the findings from an independent review of the integration of the ecosystem approach by the main actors within fisheries management undertaken during June – August 2008. The purpose of the review was to provide suggestions to the Northwest Atlantic Fisheries Organisation (NAFO) to ease their application of the ecosystem approach to fisheries management (EAFM) within the Scientific Council.

The methodologies used during this study were:

- Interviews.
- SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.
- Desk study.

Key lessons that may be learned from fisheries management and the integration of the ecosystem approach include:

- The need for a strong mandate, clear definitions and targets.
- A simple structure, with well-defined departmental roles, allowing integration and communication between departmental initiatives is essential.
- Regional ocean governance and ecosystem management plans enable fisheries management to be adaptive and integrated into local needs.
- Supporting external projects may help to overcome problems of expertise, manpower, funding and time.
- EAFM needs to be implemented in a step-wise manner, complimenting current management practices, not replacing them.
- Environmental impact assessments allow more comprehensive approaches to the management of multiple activities and place the onus on those conducting the activities to show that their actions will have minimal effect.

Proposals contained within this report aim to strengthen NAFO's organisational structure and enable the further integration and evolution of EAFM within its activities. In line with considerations of budgetary control and financial limitations changes proposed can be instigated over a period of time and aim to build capacity over both the short and long term.

[1] http://www.esf.org/research-areas/marine-board.html

ABBREVIATIONS

ACOM	Advisory Committee (ICES)
AFMA	Australian Fisheries Management Authority
ASAP	As Soon As Possible
C-STACECO	Coordinating Standing Committee on the Ecosystem Approach to Fisher Management (suggestion to NAFO)
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEMP	CCAMLR Ecosystem Monitoring Program
CFP	Common Fisheries Policy (EU)
ConC	Consultative Committee (ICES)
CP	Contracting Party
DE	Designated Expert
DFO	Department of Fisheries and Oceans (Canada)
DG-MARE	Directorate-General for Maritime Affairs and Fisheries (EU)
EA	Ecosystem Approach
EAFM	Ecosystem Approach to Fisheries Management
EBFM	Ecosystem Based Fishery Management
EIA	Ecosystem Impact Assessment
ERA	Ecological Risk Assessments
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organisation
FC	Fisheries Commission (NAFO)
FEP	Fisheries Ecosystem Plan
FIRMS	Fishery Resources Monitoring System (FAO)
FRCC	Fisheries Resource Conservation Council (Canada)
FSA	United Nations Fish Stocks Agreement
GC	General Council (NAFO)
GFCM	General Fisheries Commission for the Mediterranean
GSAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
ICES	International Council for the Exploration of the Seas
ICFA	International Coalition of Fisheries Associations
ICNAF	International Commission for the Northwest Atlantic Fisheries
ICSF	International Collective in Support of Fishworkers
IMP	Integrated Maritime Policy (EU)
IPOA	International Plan of Action
IPOA-Capacity	International Plan of Action for the Management of Fishing Capacity
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported a Unregulated fishing
IPOA-Seabirds	International Plan of Action for Reducing Incidental Catch of Seabirds in Longli Fisheries
IPOA-Sharks	International Plan of Action for the Conservation and Management of Sharks
IUCN	World Conservation Union
IWC	International Whaling Commission
MoU	Memorandum of Understanding
MPA	Marine Protected Area
NAFO	Northwest Atlantic Fisheries Organisation
NAMMCO	North Atlantic Marine Mammal Commission
NEAFC	North-East Atlantic fisheries Commission
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration (US)
NRA	NAFO Regulatory Area
PA	Precautionary Approach
PECMAS	Permanent Committee on Management and Science (NEAFC)
RFB	Regional Fishery Body
RFMO	Regional Fishery Management Organisations
RG	Review Group (suggestion to NAFO)
ROG	Regional Ocean Governance
SC	Scientific Council (NAFO)

SEAFO	Southeast Atlantic Fisheries Organisation
SG	Study group
STACFAD	Standing Committee on Finance and Administration (NAFO)
STACFEN	Standing Committee on Fisheries Environment (NAFO)
STACFIS	Standing Committee on Fisheries Science (NAFO)
STACPUB	Standing Committee on Publications (NAFO)
STACREC	Standing Committee on Research Coordination (NAFO)
STACSEC	Standing Committee on Social and Economic Conditions (suggestion to NAFO)
STACTIC	Standing Committee on International Control (NAFO)
SWOT	Strengths, Weaknesses, Opportunities and Threats
TAC	Total Allowable Catch
TOR	Terms of Reference
UNCLOS	United Nations Convention on the Law of the Sea
UNGA	UN General Assembly Resolutions
UNCED	United Nations Conference on Environment and Development
VME	Vulnerable Marine Ecosystems
VMS	Vessel Monitoring System
WG	Working Group
WGEAFM	Working Group on the Ecosystem Approach to Fisheries Management (NAFO)
WG-EMM	Working Group on Ecosystem Monitoring and Management (CCAMLR)
WGDEC	Working Group on Deep-Water Ecology (ICES and NAFO)
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation

1. INTRODUCTION

1.1. Background and Context

Interest in the ecosystem approach to fisheries management (EAFM) has been strengthened as a result of the failure of traditional, single-species management to incorporate sustainability into fishing activities and development. International agreements and targets (e.g. the United Nations General Assembly (UNGA) Sustainable Fisheries Resolution 61/105[2]) have led to the implementation of EAFM being a priority initiative of regional fisheries bodies (RFBs) and organisations.

The Northwest Atlantic Fisheries Organisation (NAFO) is an intergovernmental fisheries science and management body responsible for the management and conservation of most stocks outside of national jurisdiction within the Northwest Atlantic. NAFO are seeking to reform their structure, convention, practices and considerations in order to be able to incorporate EAFM into their scientific advice and management and consequently, mechanisms for the implementation of EAFM are being reviewed and considered. This study aims to provide such a review for NAFO.

The work took place during the period June – August 2008 and was carried out by Ms. Bethan O'Leary, an MSc student from the University of York, UK in collaboration with Dr. Anthony Thompson.

1.2. Purpose and Scope of the Study

The purpose of this study was: a) to provide NAFO with a review of current, and future, organisational changes being made within similar fisheries management organisations around the world in response to EAFM b) to evaluate the current organisational structure of NAFO c) to develop proposals to strengthen NAFO's organisational structure. The original Terms of Reference (TOR) are attached in Appendix 1.

Ocean governance and fisheries management fall under the auspices of, or are influenced by, organisations such as RFBs, United Nations organisations, non-governmental organisations (NGOs), the European Union and national organisations.

RFBs deal with the status of commercially exploited marine living resources outside of national jurisdiction (Figure 1)[3]. They include advisory bodies with a scientific and/or management mandate and RFMOs with a management remit.

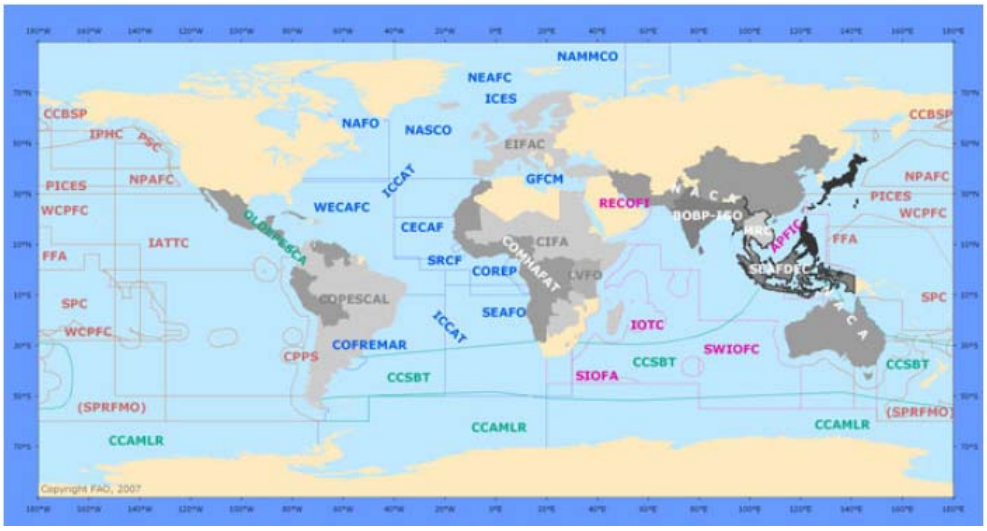
Few bodies incorporate both scientific responsibility and management capabilities, or have regulatory competence over all, or almost all, species within a particular area of the high seas. Those which do include:

- Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)
- General Fisheries Commission for the Mediterranean (GFCM)
- International Council for the Exploration of the Seas (ICES)
- Northwest Atlantic Fisheries Organisation (NAFO)
- North-East Atlantic fisheries Commission (NEAFC)
- Southeast Atlantic Fisheries Organisation (SEAFO).

Whilst ICES has a purely scientific and advisory role it has been included due to its relationship with NEAFC which may be seen as similar to that of the Scientific Council and the Fisheries Commission within NAFO.

[2] UNGA 61/105: http://daccessdds.un.org/doc/UNDOC/GEN/N06/500/73/PDF/N0650073.pdf?OpenElement
[3] FAO RFB factsheets: Source: http://www.fao.org/fishery/rfb/search

Figure 1. World map depicting areas of jurisdiction for RFBs



Source: ***http://www****.fao.org/fishery/rfb/search*

1.3. Methodologies

The methodologies used within this study were:

- Interviews
- SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis
- Desk study

Interviews were conducted with NAFO Secretariat staff members, SC scientists and external organisations wherever possible. All organisations and persons responsible for initiatives discussed were contacted via email.

A SWOT analysis was carried out between 8th – 15th August 2008. Several members from the SC, Contracting Parties (CP) and Secretariat were invited to comment. Eight people participated (Appendix 2). The analysis was conducted via email with information circulated together with the session table. The analysis was centred around the structure of NAFO for effectively implementing EAFM.

The desk study involved the review of documents covering current guidelines and practices of EAFM. Extensive web sources were also used. All documents used are listed in Appendix 4.

1.4. Untangling the Ecosystem Approach, the Ecosystem Approach to Fisheries, Ecosystem Based Fisheries Management and the Ecosystem Approach to Fisheries Management

The ecosystem approach (EA), as defined during the Rio Earth Summit (1992), is considered to be "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"[4]. The EA focused on encompassing essential processes, functions and interactions among organisms, including humans, and their environment within decision-making and management.

The FAO Technical Guidelines on the ecosystem approach to fisheries (EAF) (FAO 2003) consider that EAF "strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries."

"Ecosystem management defines a paradigm that weaves biophysical and social threads into a tapestry of beauty, health, and sustainability. It embraces both social and ecological dynamics in a flexible and adaptive process." (Cornett 1994, cited from Lackey 1998).

[4] CBD: http://www.cbd.int/programmes/cross-cutting/ecosystem/

There is no absolute definition of ecosystem based fisheries management (EBFM) or the ecosystem approach to fisheries management (EAFM) and it is not clear whether the differences of wording within documents reflect an intention of real distinction between different terms. EAF, EBFM and EAFM have been used interchangeably in a variety of literature (e.g. Mathew 2001; Degnbol 2002; FAO 2003; Hartje 2003; Sissenwine and Murawski 2004; Frid *et al.* 2006; Commission of the European Communities 2008). For the purpose of this report, EA is considered to be the overarching principle of EAF, EBFM and EAFM. It is a general term essentially meaning the inclusion of all relevant knowledge regarding the effect of actions on ecosystems and their functioning so as to make informed decisions.

EAF is a branch of EA, striving to turn its generalist principles into a useful, practical and focused set for use within fisheries. Ecosystem management integrates the EA applying it within the real world. EBFM and EAFM may therefore be viewed as management tools that need to be supported by, and based on, the best scientific advice. Within this report EAF, EBFM and EAFM are considered to be essentially the same concept and these terms are used interchangeably whilst the term EA is used to refer to more general principles.

1.5. Calls for an Ecosystem Approach to Fisheries Management

EAFM "is a new direction for fishery management, essentially reversing the order of management priorities to start with the ecosystem rather than the target species"
Pikitch et al. *2004*

Depleted fisheries and degraded ecosystems have been documented worldwide and the ecosystem impacts from fishing activities have been much studied (e.g. Gislason 2003; Kaiser *et al.* 2003; Myers and Worm 2005; Pauly *et al.* 2005; Worm *et al.* 2005; Worm *et al.* 2006; FAO 2007a). Fishery management to date has largely been conducted on a single-species approach aiming to maintain fisheries production and target stocks using a variety of controls on fishing effort (Sutinen and Soboil 2001). However, this approach has failed to incorporate sustainability into fishing activities and development (Sutinen and Soboil 2001).

The potential use of EAFM has been driven by observed impacts of fishing on ecosystems and resources along with increased understanding and knowledge regarding the marine environment (Sutinen and Soboil 2001; García *et al.* 2003). In addition, public awareness has increased substantially over recent decades and the seafood industry is seeing an increase in the demand for sustainable seafood products that include a clear ecosystem approach. Growing demand for MSC[5] is perhaps the best example of this (Jacquet and Pauly 2007). Action from NGOs such as Greenpeace (Hunter and King 2008) and Seachoice[6] also add pressure.

EAFM integrates two concepts, ecosystem management and fisheries management, and is a way of implementing sustainable development within the context of fisheries (FAO 2003; FAO 2005). Ecosystem management focuses on conserving ecosystem integrity by managing biophysical components while fisheries management focuses on managing fisheries activities to provide food and income for humans (FAO 2003; García *et al.* 2003).

EAFM is essentially an integrated and holistic approach where decision-making considers the entire ecosystem recognising the interconnectedness within and between systems, whilst integrating ecological, social and economic positions (McLeod *et al.* 2005). The objective is to maintain ecosystem health and productivity.

The FAO considers that fishery management under the EA should follow 5 key principles (FAO 2003):

- "Fisheries should be managed to limit their impact on the ecosystem to the extent possible.
- Ecological relationships between harvested, dependent and associated species should be maintained.
- Management measures should be compatible across the entire distribution of the resource (across jurisdictions and management plans).
- The precautionary approach (PA) should be applied because the knowledge on ecosystems is incomplete.
- Governance should ensure both human and ecosystem well-being and equity".

The concepts of EAFM are not new and have been included in a number of international agreements and conferences over the last four decades (see Appendix 3). Specifically, the Reykjavik Declaration (2001) requires that scientific advice should be based on an EA by 2010[7], and at the WSSD it was agreed to "develop and facilitate

[5] MSC: Marine Stewardship Council http://www.msc.org/
[6] Seachoice: http://www.seachoice.org/
[7] The 2001 Reykjavik Declaration: http://www.fao.org/DOCREP/MEETING/004/Y2211E.HTM

the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive practices, the establishment of marine protected areas"[8].

There remains considerable uncertainty regarding the practicalities of integrating EAFM into fisheries management despite wide-scale recognition of its importance (FRCC 1998; Barnes and McFadden 2007; Rice in press). Guidance in EAFM practice is available (e.g. FAO 2003; Garcia and Cochrane 2005; Rice *et al.* 2005). However, EAFM is likely to increase the complexity of management through the identification of challenges previously not considered within policy and management (Rice in press). In addition, EAFM is limited by current knowledge and understanding of complete ecosystems and their linkages, as well as the multiple interacting direct and indirect impacts that human activities have on the aquatic environment (García *et al.* 2003; Pikitch *et al.* 2004).

EAFM is often not an integral part of fisheries policy and legislation, rather the requirement for its implementation is mainly included in voluntary agreements such as the 1995 FAO Code of Conduct for Responsible Fisheries (from here on referred to as 'the Code'). Few RFBs explicitly recognise EAFM in their conventions and in order for its wide-scale application legislation may need to be reviewed and adapted. Despite uncertainty, it is still possible to develop operational goals and implement EAFM according to the best available knowledge (FAO 2003; FAO 2005; Murawski 2007; Rice in press). While EAFM is not always a requirement of fisheries management this should not be used to avoid its consideration. Several RFBs are now considering mechanisms for its implementation through legal, structural or management changes (Swan 2004).

2. APPLYING THE ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT: CURRENT GUIDELINES

The 1995 Code provides a non-binding, voluntary framework aimed at increasing sustainable fisheries development[9]. Based on the provisions of the 1982 Law of the Sea (UNCLOS), and supported by several international agreements including the Convention on Biological Diversity (1992), the FAO Compliance Agreement (1993) and the Fish Stocks Agreement FSA (1995), it has been described as "the most complete and operational reference for management" (García *et al.* 2003). It has global relevance to capture fisheries and aquaculture, in marine or inland waters, and in the high seas or exclusive economic zones (EEZs) (FAO 2003), and implies that stakeholders in a fishery should take responsibility and be socially accountable for their actions.

EAFM is not specifically mentioned within the Code as the term did not evolve until 2001 at the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem[10]. However, it does incorporate a holistic approach to fisheries management and contains many elements of EAFM including: the obligation to conserve[11] and restore[12] ecosystems; to monitor anthropogenic impacts and resulting ecosystem changes[13]; to conserve biodiversity and endangered species[14]. It emphasises the importance of the ecosystem, environmental, species interactions and interdependences[15].

EAFM is not a replacement for current fisheries approaches. Rather its development is likely to follow a series of modifications to current practices becoming an extension of fisheries governance today (Sutinen and Soboil 2001; FAO 2003; García *et al.* 2003; FAO 2005; Murawski 2007). To facilitate the implementation of the Code and associated instruments, the FAO has published a series of Technical Guidelines[16] and Technical Papers[17]. The Code itself is not open to revisions but is updated through these guidelines and papers. Consequently, Technical Guidelines on the PA (FAO 1996) and EAF (FAO 2003) have been devised.

[8] The 2002 WSSD agreement 32.c: http://www.un.org/esa/sustdev/sdissues/ocean/ocean_decisions.htm
[9] FAO Code of Conduct, Introduction: http://www.fao.org/fishery/ccrf/2/en
[10] Reykjavik Conference 2001: ftp://ftp.fao.org/docrep/fao/005/y2198t/y2198t00.pdf
[11] FAO Code of Conduct, para. 6.1.
[12] FAO Code of Conduct, para. 6.8.
[13] FAO Code of Conduct, para. 12.5.
[14] FAO Code of Conduct, para. 7.2.2.d.
[15] FAO Code of Conduct, para. 7.2.3.
[16] FAO Technical Guidelines for Responsible Fisheries: http://www.fao.org/fi/oldsite/eims_search/advanced_s_result.asp?series=116&lang=en&sortorder=5&form_c=AND
[17] FAO Fisheries Technical Papers: http://www.fao.org/icatalog/search/result.asp?subcat_id=36

The Code is complemented by a number of other instruments relating to marine capture fisheries including IPOAs[18]. To date, four IPOAs have been formulated: IPOA-Seabirds (1999), for reducing the incidental catch of seabirds in longline fisheries; IPOA-Sharks (1999), for the conservation and management of sharks; IPOA-Capacity (1999), for the management of fishing capacity; IPOA-IUU (2001), to reduce, prevent, deter and eliminate illegal, unreported and unregulated (IUU) Fishing. In addition, the Strategy-STF (2003) – a strategy for improving information on status and trends of capture fisheries was developed in order to 'invigorate data collection and research' and encourage the dissemination of information and knowledge[19].

Currently, two new related instruments are being developed: the international guidelines for the management of deep-sea fisheries in the high seas (FAO 2008), and an IPOA on safety-at-sea with regards to fisheries management (FAO 2007b).

3. THE NORTHWEST ATLANTIC FISHERIES ORGANISATION

3.1. Background

NAFO is an intergovernmental fisheries science and management body[20]. It was established in 1979 by the Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries, and it replaced the International Commission for the Northwest Atlantic Fisheries (ICNAF) (1949-1978). There are currently 12 Contracting Parties (CPs) or member states to the Convention (Box 1).

Box 1. NAFO Contracting Parties

Canada
Cuba
Denmark (in respect of Faroe Islands and Greenland)
European Union (EU)
France (in respect of St. Pierre et Miquelon)
Iceland
Japan
Republic of Korea
Norway
Russian Federation
Ukraine
United States of America

NAFO is responsible for fisheries management and the conservation of most stocks outside of national jurisdiction in the Northwest Atlantic. Its overarching objective is "*to ensure the long term conservation and sustainable use of the fishery resources in the Convention Area and, in so doing, to safeguard the marine ecosystems in which these resources are found*"[21].

The Convention Area includes both national waters and high seas while the NAFO Regulatory Area (NRA), where NAFO has full jurisdiction over the management and conservation policies relating to fisheries, only covers those areas straddling and lying beyond EEZs (see page IV).

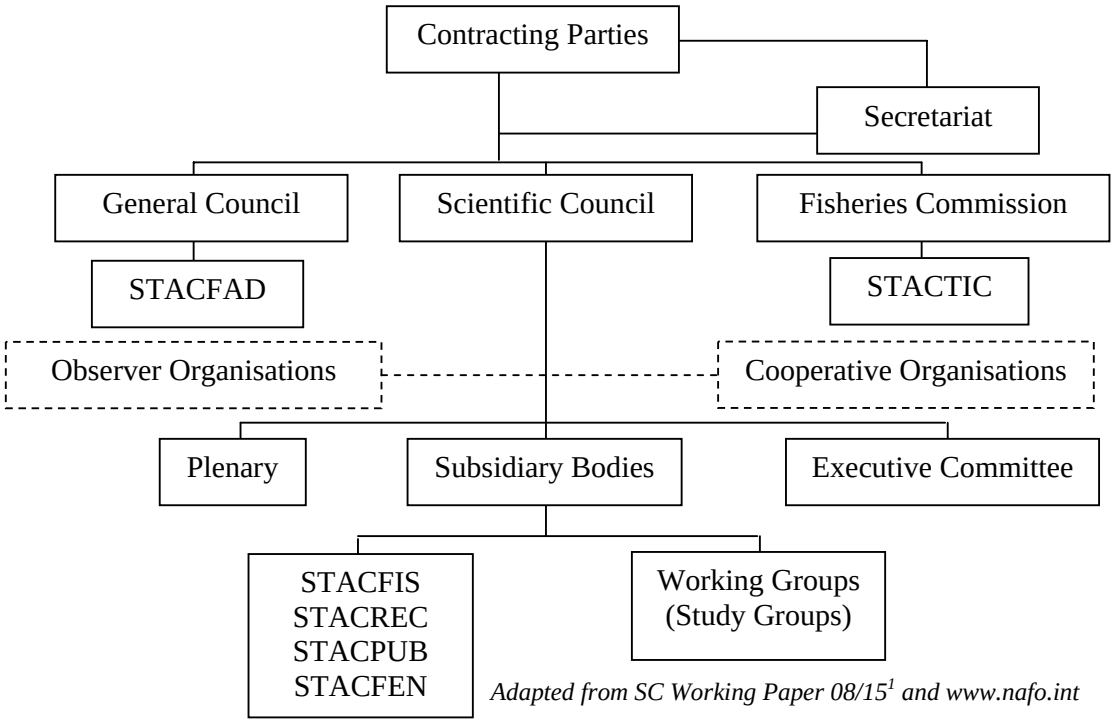
The NRA is delineated into geographic Subareas and Divisions for the purpose of collecting fisheries statistics (see page iii). Subareas (e.g. area 1, 2, etc) were determined based on territorial claims and political aspirations. Divisions (e.g. 1a, 1b, etc) were decided according to uniformity of subdivision size, the location of important fishing grounds and in order to simplify the collection and submission of complete landings and effort statistics. With the introduction of total allowable catch (TAC) regulations the Divisions began to be used for regulatory purposes. Consequently, Divisions are now used to estimate stock and ecosystem statuses as well as to administer management regulations despite having no biological significance. See Halliday and Pinhorn (1990) for a full explanation of the delimitation of areas.

[18] FAO IPOA: http://www.fao.org/fishery/ccrf/2,3/en
[19] FAO Strategy-STF: ftp://ftp.fao.org/docrep/fao/006/y4859t/y4859t01.pdf
[20] NAFO: http://www.nafo.int/about/frames/about.html
[21] Amendment to the Convention on Future Multilateral Cooperation. Article II. Adopted but not yet ratified.

3.2. Current Organisational Structure

The constituent bodies of NAFO are currently the General Council (GC), Scientific Council (SC), Fisheries Commission (FC) and the Secretariat (Figure 2) [22,23,24].

Figure 2. An overview of NAFOs organisational structure
See Box 2 for abbreviations and main roles of Standing Committees.



Adapted from SC Working Paper 08/15[1] and www.nafo.int

[22] NAFO: http://www.nafo.int/about/frames/con-index.html
[23] SC Working Paper 08/15 The Scientific Council of NAFO (Available on request)
[24] NB. This structure will be altered once the Amendment to the Convention is ratified. See section 3.3. NAFO and the EAFM

Box 2. Abbreviations and main roles of the Standing Committees within NAFO

STACFAD - Standing Committee on Finance and Administration

- Advises the GC on budgetary and organisational issues

STACFIS - Standing Committee on Fisheries Science

- Responsible for assessing stocks and the effects of fishing techniques and management actions on stocks upon request from the SC.
- Continually looks for ways to improve the robustness of stock assessments.

STACREC - Standing Committee on Research Coordination

- Aims to provide recommendations on the procedures for compilation and dissemination of statistical and sampling information regarding the marine living resources of the Convention Area.
- Coordinates international cooperative research.

STACPUB - Standing Committee on Publications

- Develops and reviews the publication and editorial policy of the SC.

STACFEN - Standing Committee on Fisheries Environment

- Reviews environmental conditions and their effects on fish stocks and fisheries within the Convention Area.
- Encourages scientific research where recommended by the SC.

STACTIC - Standing Committee on International Control

- Responsible for providing recommendations on enforcement and control to the FC by reviewing control measures, inspections and violations.

The GC is the main administrative body for NAFO, organising and coordinating internal affairs and external relations as well as annually reviewing FC membership. The GC has one Standing Committee, STACFAD (Box 2).

The SC promotes cooperation among CPs in the study, appraisal and exchange of scientific information, supervises the collation and maintenance of statistics and records, publishes reports and provides scientific advice to both coastal states and the FC[25]. One of its main roles is to provide scientific assessments of the status of species. Designated Experts (DEs) conduct the assessments which are then discussed by SC and quotas recommended. The SC is comprised of plenary, subsidiary bodies and the Executive Committee. Subsidiary bodies are responsible for more technical issues and may be further divided into Standing Committees, of which there are four (Box 2), and 'other' bodies, such as working groups and workshops. SC discussions regarding scientific data and advisory decision occur in plenary. The Executive Committee is responsible for reviewing the planning and execution of the SC program as well as assessing its progress towards fulfilling the needs of the scientific program.
The FC is responsible for the management and conservation of the fisheries of the NRA proposing measures for control and enforcement based on advice from the SC. The FC has one Standing Committee, STACTIC (Box 2).

3.3. NAFO and the EAFM

NAFO is reforming its structure, Convention, practices and considerations in order to re-focus scientific advice and management towards EAFM as required by UNGA Resolutions (particularly 61/105 and 61/222), FAO international agreements and guidelines on the management of deep-sea fisheries and NGO activities and reports (e.g. WWF: Rosenburg *et al.* 2005; Rosenburg *et al.* 2006)[26].

[25] Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries. Article VI.
[26] Dr. F. Serchuk *pers. comm.*2008

In September 2007, NAFO adopted an Amendment to the Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries constituting the first formal step towards creating a reformed Convention[27]. This amendment must be signed by three-fourths of the CPs to become legally bindng and is currently in the process of passing through the governmental system of each[28].

The amended Convention simplifies the structure of NAFO by merging the GC and FC and places greater responsibility onto CPs. For example, CPs will, amongst others, be "committed to apply an ecosystem approach to fisheries management in the Northwest Atlantic that includes safeguarding the marine environment, conserving its marine biodiversity, minimising the risk of long term or irreversible adverse effects of fishing activities, and taking account of the relationship between all components of the ecosystem"[7].

Ecosystem components such as the consideration of bycatch, discards and basic food web interactions are becoming integrated into the SC its advice to the FC[28]. Complimenting this, the FC have made provisions for the reduction of bycatch[29].

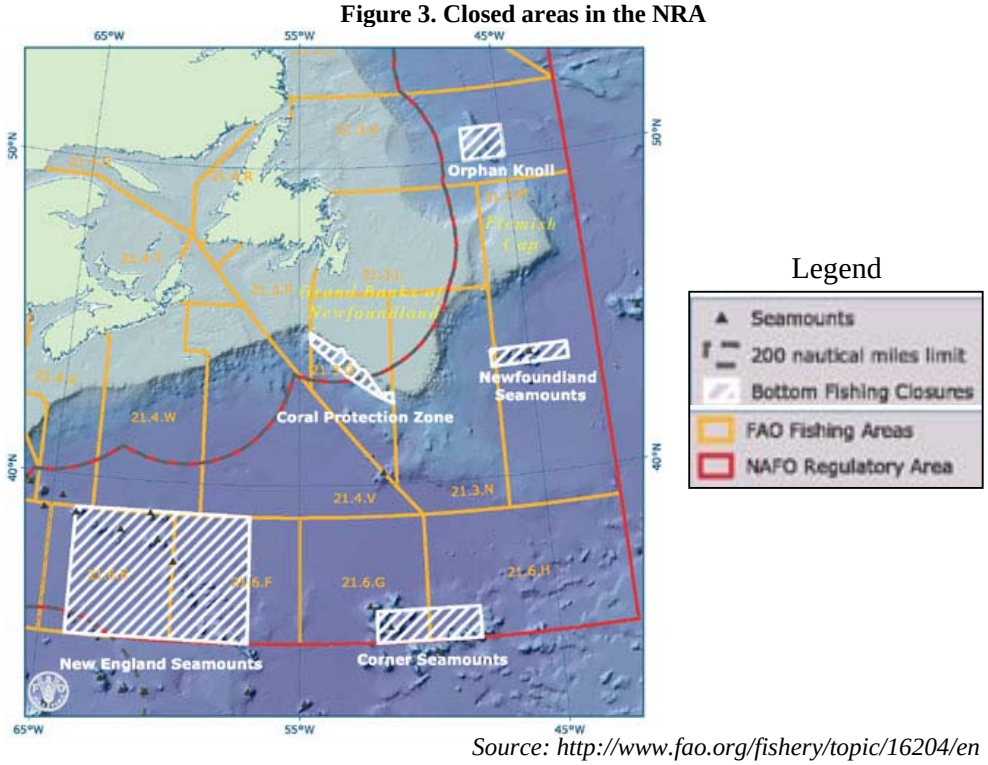
NAFO is currently operating several closed areas. Four seamounts have been closed to all fishing activities involving demersal gears: Orphan Knoll; Corner Seamounts; Newfoundland Seamounts; New England Seamounts (Figure 3), and the SC is assessing the habitats of the area[30]. In addition, a 'Coral Protection Zone' (Figure 3) has been closed to bottom fishing between 1st January 2008 and 31st December 2012[31].

From January 2009 encounter provisions will be implemented, which specify that vessels encountering evidence of VMEs must inform the Executive Secretary so that appropriate measures may be adopted by the FC[32]. The ad hoc WG of Fishery Managers and Scientists on VMEs are also considering exploratory fishing protocols[33]

Implementation of EAFM commonly includes closing areas to fishing, the aim being to provide spatial refuges for species by protecting a designated ecosystem within a defined area. However, the closed areas within the NRA do not prohibit all fishing activities and, effective January 2008, the FC has the provision to open small (<20% of the fishable area) exploratory fisheries within these areas[30]. As a result, while some protection to vulnerable marine ecosystems (VMEs) is offered, there are significant weaknesses in NAFO's application of closed areas.

[27] NAFO: http://www.nafo.int/about/frames/about.html
[28] Mr. B. Brodie *pers. comms.* 2008
[29] NAFO Conservation and Enforcement measures, Article 11
[30] NAFO Conservation and Enforcement measures, Article 14
[31] NAFO Conservation and Enforcement measures, Article 15
[32] NAFO Conservation and Enforcement measures, Chapter Ibis, Article 5
[33] NAFO Conservation and Enforcement measures, Annex I to Chapter Ibis

Figure 3. Closed areas in the NRA



Source: http://www.fao.org/fishery/topic/16204/en

The SC has developed links with the ICES working group (WG) on deep-water ecology (WGDEC) and formed a WG on the EAFM (WGEAFM) [34] in response to the increasing importance of EAFM.

The aims of the WGEAFM are to:

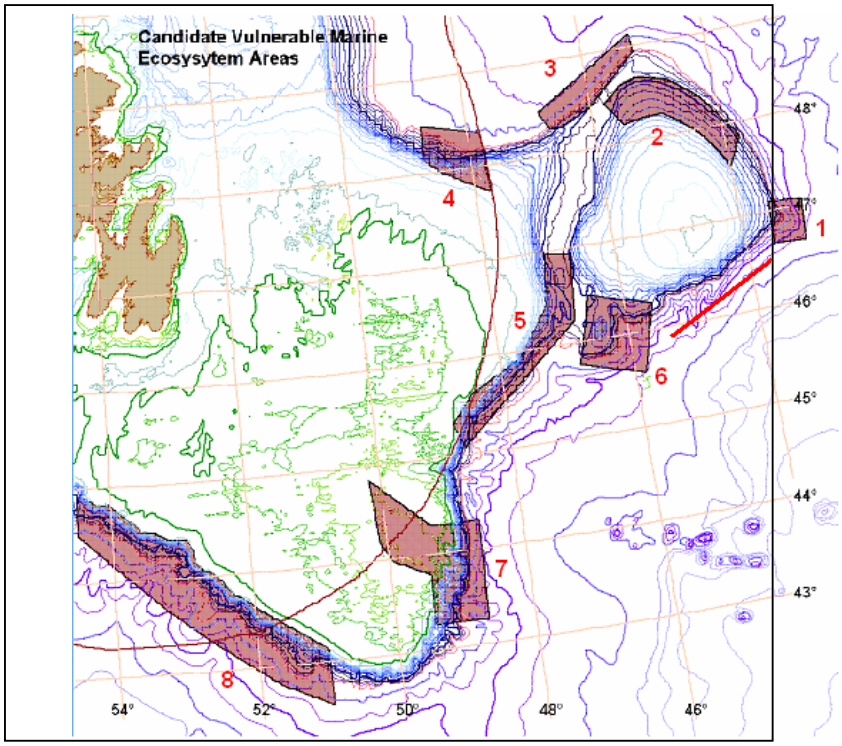
- Identify regional ecosystems in the NAFO Convention Area;
- Compile an inventory of current knowledge regarding the ecosystems and their component parts;
- Consider various tools that could be used by NAFO in the implementation of EAFM (e.g. ecosystem indicators/modelling).

The focus of the group thus far has been the identification of VMEs within the NRA so as to provide better protection and management against anthropogenic activities (Figure 4) (Durán Muñoz *et al.* 2008). A VME is considered to be any deep-sea ecosystem with a high vulnerability to one or more kinds of fishing activity (e.g. coldwater corals, sponge grounds, vent communities) (FAO 2008).

[34] NAFO WGEAFM: http://www.nafo.int/science/ecosystem/eawg/wg-ea.html

Figure 4. Candidate vulnerable marine ecosystem areas

Pink shaded areas are identified VMEs, red line represents Canada's EEZ



Source: WGEAFM 2008

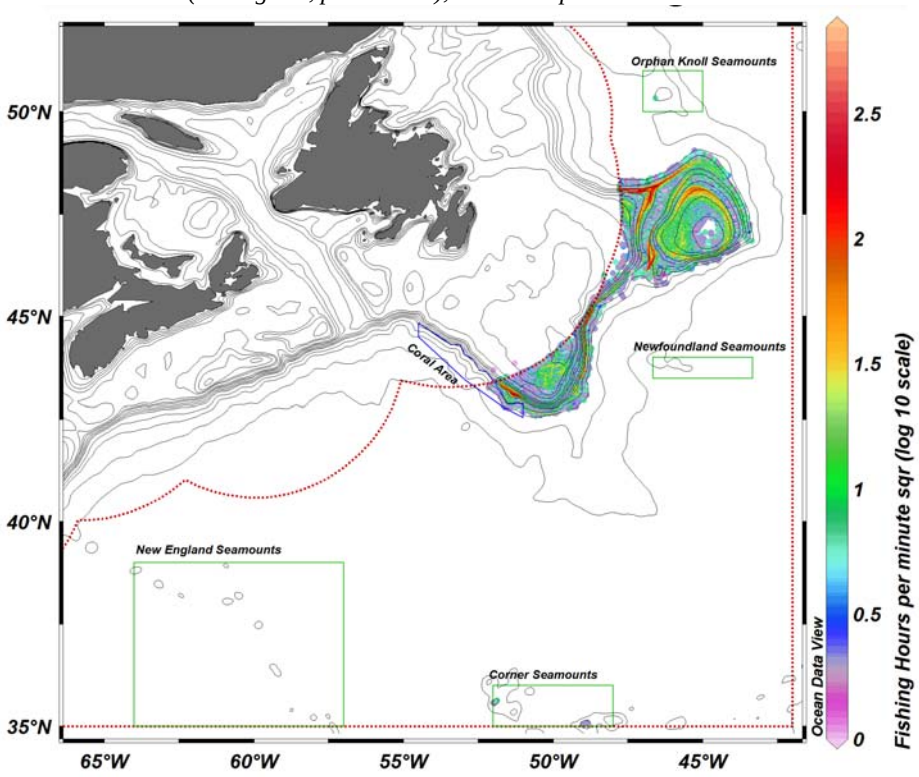
VMEs are identified through available data, which is largely collected by the fishing industry. Consequently, if areas have never been targeted there is no data available for their assessment (Rogers *et al.* 2008). To overcome this, NAFO combine this approach with an 'ecological footprint' approach.

All fishing vessels in the NRA are required to be equipped with a Vessel Monitoring System (VMS) which routinely transmits positional data[35]. This is being used to assist in the identification of infringements to area closures but also to provide information on the 'ecological footprint' of fisheries (Figure 5).

[35] NAFO Conservation and Enforcement measures, Article 25

Figure 5. NAFO closed areas and bottom trawling (2003-2007)

Green boxed areas are closed areas, bottom trawling effort is represented in colours according to number of fishing hours (red highest, pink lowest), red line represents Canada's EEZ



Source: WGEAFM 2008

CPs have been asked to submit the whereabouts of their fishing fleet efforts over the last 20 years by the end of 2008. This information will be collated and used to define historical and present day fishing areas[Error! Bookmark not defined.].

Once fishing areas have been defined by the Secretariat the information will pass through the SC and onto the FC to decide on appropriate management actions. All areas outside of these defined fishing grounds will only be open to fisheries on an exploratory basis with encounter provisions in place[36].

4. ACTORS IN FISHERIES MANAGEMENT AND EA INTEGRATION

4.1. Regional Fishery Organisations

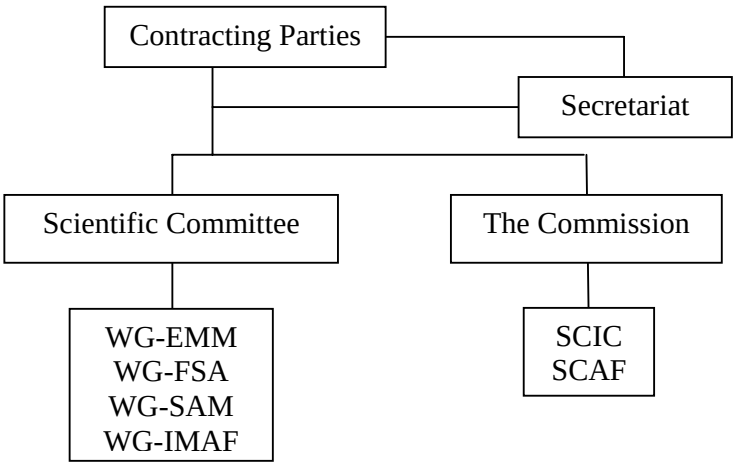
CCAMLR (www.ccamlr.org)

Overview:

- Established 1982 as part of the Antarctic Treaty System.
- Considered to be a precursor to EAFM, conducting management based on two central concepts – PA and EBFM (Kock 2000).
- Widely cited as being at the forefront of ocean governance in the application of these approaches (Guerry 2005; Mace and Gabriel 1999; Ruckleshaus *et al.* 2008).

[36] NAFO Conservation and Enforcement measures. Chapter Ibis, Article 3

Figure 6. The organisational structure of CCAMLR



Working Groups

WG-EMM - Working Group on Ecosystem Monitoring and Management
WG-FSA - Working Group on Fish Stock Assessment
WG-SAM - Working Group on Statistics, Assessments and Modelling
WG-IMAF - Working Group on Incidental Mortality Associated with Fishing

Standing Committees

SCIC - Standing Committee on Implementation and Compliance
SCAF - Standing Committee on Administration and Finance

EA integration:

- CCAMLR Ecosystem Monitoring Program (CEMP)
  - Monitors changes in ecosystems and attempts to distinguish the causes (anthropogenic or environmental variability)[37].
  - Identifies key ecological relationships between predator and prey species (e.g. krill) (Constable 2000).
  - Data collected using indicator species and submitted to WG-EMM for preparation of advice to the Scientific Committee.
- Bioregionalisation
  - The Convention Area has been divided into sub-areas, divisions and small-scale management units based on known ecology and biology (Grant *et al.* 2006)[38].
- Measures
  - WGs (e.g. WG-EMM and WG-IMAF).
  - TACs set annually for target species linked to bycatch TACs[38]. Once the bycatch TAC has been reached the fishery may be closed even if the target species TAC has not been[38].
  - Gear restrictions are used to limit bycatch.
  - MPAs (e.g. the Heard and McDonald Islands Marine Reserve[39]).
  - Exploratory fishery procedures

[37] CEMP: http://www.ccamlr.org/pu/E/sc/cemp/intro.htm
[38] CCAMLRs Management of the Antarctic: http://www.ccamlr.org/pu/e/e_pubs/am/man-ant/synopsis_final_all.pdf
[39] Heard Island and McDonald Islands Marine Reserve Management Plan. Australia, 2005: http://www.heardisland.aq/protection/management_plan/documents/FINAL_HIMIMR_MP.pdf

Lessons Learned:

- A strong mandate incorporating the use of EA is essential.
- A clear understanding of goals and deadlines are needed.
- Bioregionalisation allows management objectives and approaches to be framed within the spatial boundaries of ecosystems (Grant *et al.* 2006).

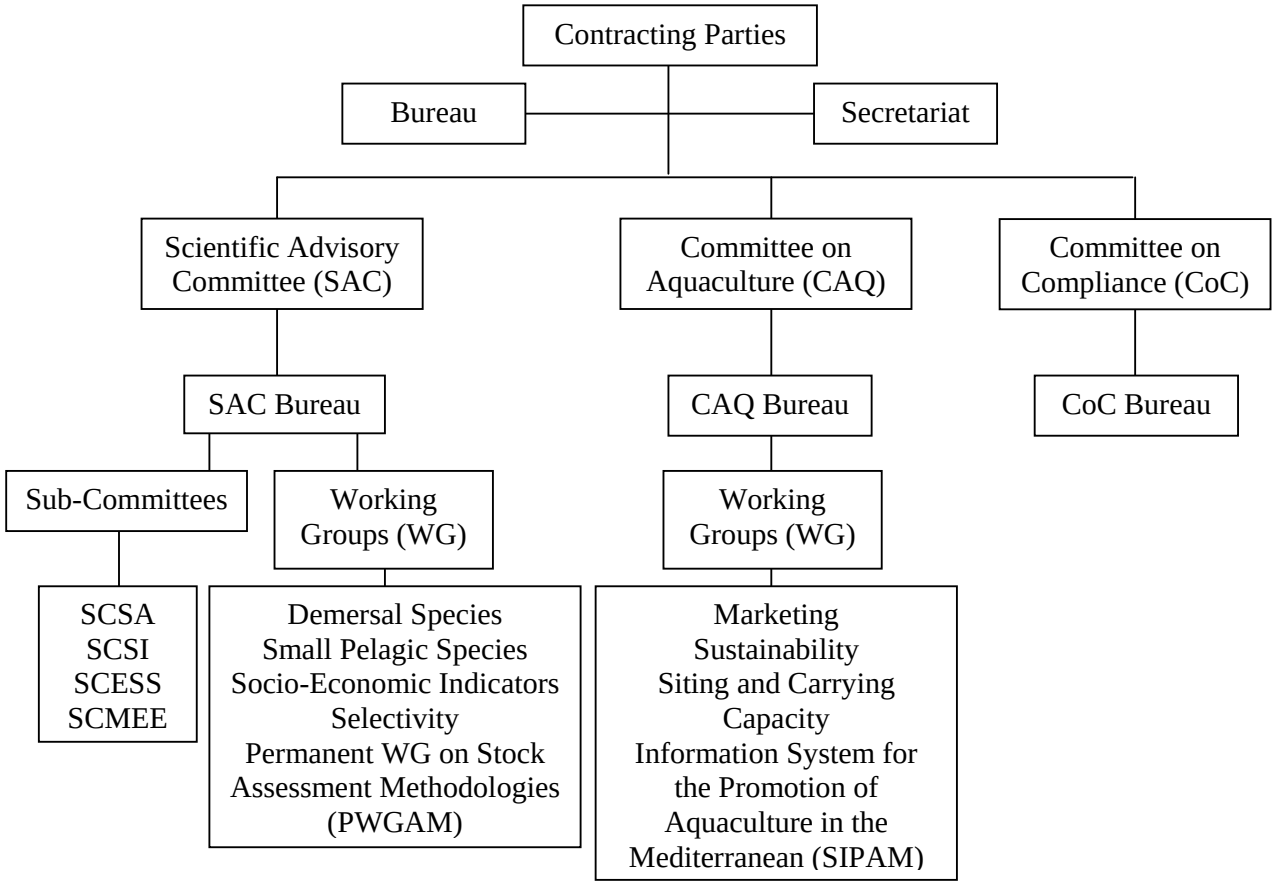
GFCM (www.gfcm.org)

Overview:

- An agreement within the Mediterranean region existing since 1952.
- Amended 1963, 1976 and 1997 (entered into force April 2004).
- The latest Amendment does not fully reflect EA, failing to include species interactions and interdependences, or the cosystem, although it does include PA and consideration of socio-economic aspects.
- The FAO (2003) framework for EAFM implementation was adopted[40] at the Transversal Workshop on Ecosystem Approach to Fisheries in 2007.

[40] Report of the Transversal Workshop on Ecosystem Approach to Fisheries, Salammbô (Tunis), Tunisia, 22 and 23 May 2007: ftp://ftp.fao.org/FI/DOCUMENT/gfcm/eaf/2007/Report_EAF_2007.pdf

Figure 7. The organisational structure of GFCM



Sub-Committees

SCSA - Sub-Committee on Stock Assessment
SCSI - Sub-Committee on Statistics and Information
SCESS - Sub-Committee on Economics and Social Sciences
SCMEE - Sub-Committee on Marine Environment and Ecosystems

- (see
- Box 3 for list)
    - Coordinated by the FAO with funding from CPs.
    - Through this partnership GFCM gain expertise by recommending research needed on specific technical issues necessary for the improvement of fishery management.
- Measures
    - Prohibition of the use of towed dredges and trawl net fisheries at depths greater than 1000 metres[41].
    - MPAs[42].
    - SCMEE.

Lessons Learned:

- Supporting external projects helps overcome problems of expertise, manpower, funding and time.

[41] GFCM Recommendations on Mediterranean fisheries management 2005: ftp://ftp.fao.org/FI/DOCUMENT/gfcm/web/GFCM_Recommendations2005.pdf

[42] Recommendation GFCM/2006/3: ftp://ftp.fao.org/FI/DOCUMENT/gfcm/web/GFCM_Recommendations2006.pdf

- Regional cooperation allows the formulation of recommendations and the definition of scientific criteria leading to better management.

Box 3. FAO regional projects currently adopted by GFCM[43]

ADRIAMED - Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea

Aims to promote scientific cooperation among the Adriatic nations, to improve the management of fishing activities in accordance with the Code and to improve information on shared fishery resources.

COPEMED - advice, technical support and establishment of cooperation networks to facilitate coordination to support fisheries management in the Mediterranean (COPEMED II is currently in the pipeline as a continuation of COPEMED)

Aims to widen scientific knowledge and regional cooperation for the sustainable management of the Mediterranean fisheries.

EASTMED – Eastern Mediterranean

Currently starting the implementation phase.

MEDSUDMED - Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily

Aims to support the development of a monitoring system for studies relating to fisheries resources and ecosystems so as to increase scientific knowledge, strengthen national and regional expertise and to promote standardisation of research methodologies.

MEDFISIS – Mediterranean Fishery Statistics and Information System

Aims to enable participation in the fishery statistics and information system of the Mediterranean

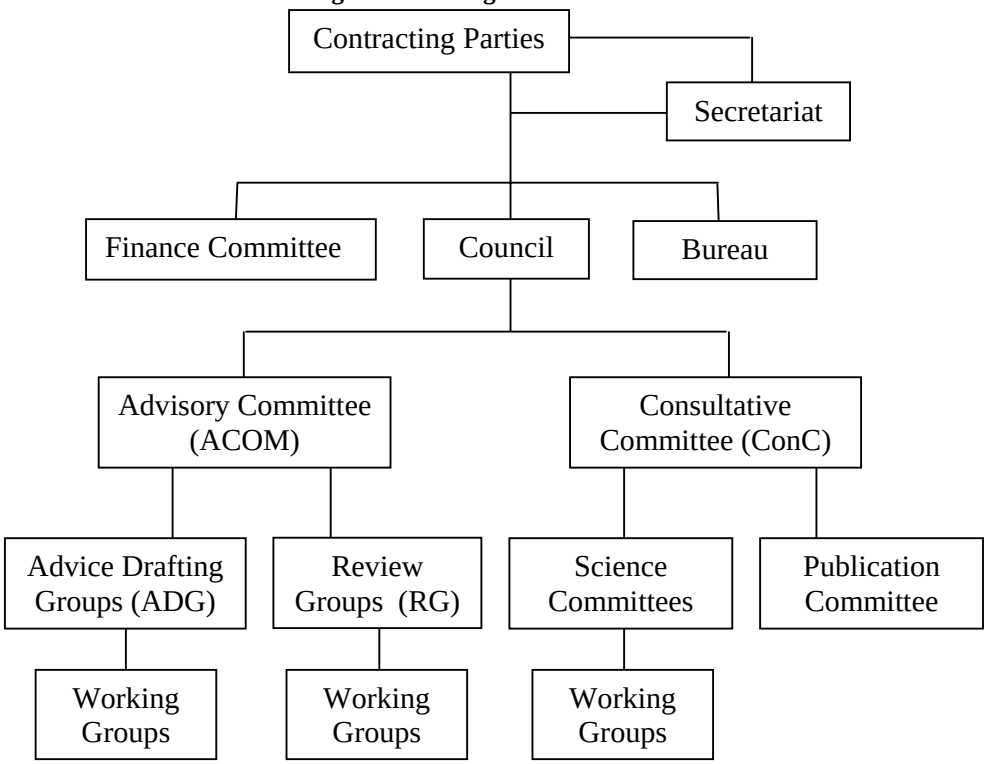
ICES (www.ices.dk)

Overview:

- Coordinate and promotes marine research in the North Atlantic and adjacent seas (e.g. North Sea) to fill gaps in existing knowledge.
- Scientists provide advice on the management of the marine environment which is distributed to member countries and international bodies.

[43] GFCM Regional Projects: http://www.gfcm.org/gfcm/topic/16108

Figure 8. The organisational structure of ICES



EA integration:

- Continuous reviews of the application of EAFM within ICES
  - Since its 13th Dialogue meeting in 2004 ICES has conducted reviews of its use of EAFM (ICES 2004).
  - Conclusion - EAFM needs to be implemented in a stepwise manner.
- Structural changes
  - 2004 - Restructured the Advisory Report into a comprehensive single report for all topics - "ICES Advice" and introduced ecosystem overviews to provide integrated advice
  - (

- Box 4)[44].
- 2007 - The original three advisory committees, together with the Management Committee on the Advisory Process, have been streamlined into the Advisory Committee (ACOM) [45] (Box 4)).
- 2008 – Planning changes for reforming the structure of the science branch (Box 4)[46].

- Measures
  - ICES Strategic Plan[47] and the Integrated Action Plan[48] (particularly Goals 3 and 4).
  - WGs and Study Groups (SG) (e.g. WG on Ecosystem Effects of Fishing Activities; SG on Mapping the Occurrence of Cold Water Corals).
  - Annual science conference (ASC) theme sessions and scientific symposia (e.g. The ecosystem approach: what is the impact on marine science, science based advice and management of marine ecosystems, ASC 2007; ICES Symposium on the Ecosystem Approach with Fisheries Acoustics and Complementary Technologies, Bergen, Norway, 16-20 June 2008).

[44] ICES Advice: http://www.ices.dk/products/icesadvice2004.asp
[45] Reform of the ICES Advisory Programme into the ICES Advisory Services. October 2007: http://www.ices.dk/iceswork/recs/2007%20Resolutions/ACOM/ACOM%20resolutions%202007.pdf
[46] ICES Bulletin Board: http://www.ices.dk/iceswork/bulletin.asp
[47] The ICES Strategic Plan, 2002: http://www.ices.dk/iceswork/Strategic%20Plan-final.pdf
[48] The ICES Action Plan: http://www.ices.dk/iceswork/actionplan.pdf

Box 4. Complementary Information:

2004 – ICES Advice

Integrated advice provided from all three original Advisory Committees – Advisory Committee on Fishery Management (ACFM), Advisory Committee on Ecosystems (ACE) and Advisory Committee on the Marine Environment (ACME). Provided the first step for the 2007 reform.

2007 - ACOM

The structural reforming process began in order to improve the fluency of communication between departments and to provide a better framework for incorporating the EA. ACOMs mandate includes the dissemination of advice, based on peer reviewed scientific analysis prepared by ICES groups, according to the following criteria:

1. "Objectivity and integrity;
2. Openness and transparency;
3. Quality assurance and peer review;
4. Integrated advice – based on an EA;
5. Efficiency and flexibility;
6. National consensus."

2008 - Reform of the science branch:

Proposals include the formation of a higher-level committee mandated to establish scientific priorities including two objectives: to identify priority science areas producing a science plan and to implement high-level science. This single higher-level committee would replace the current disciplinary WGs.

Drivers for restructuring

1. Currently a bottom-up approach is being taken by many ICES scientists, conducting research at the working science level The result is an annual package of fragmented activities and reports with no clear vision of achievements and aims.
2. There is a desire to change the emphasis of ICES from a network of separate disciplines to a more integrated approach. This would make it easier to address particular scientific problems through improved communication.

Source: Dr Joe Horwood pers. comm. 2008 and www.ices.dk

Lessons Learned:

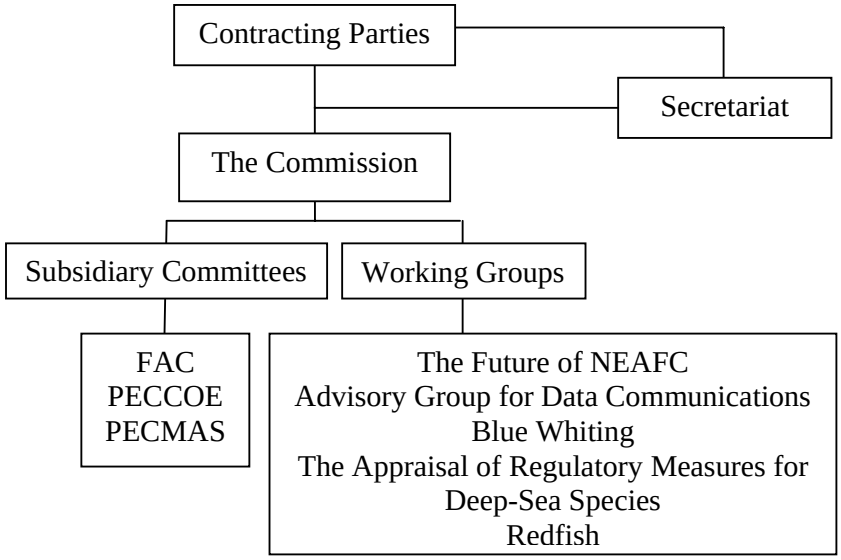
- ICES conducts and directs vast amounts of research in the north Atlantic – a source that could potentially be tapped into further by NAFO.
- EAFM needs to be implemented in a step-wise manner, building on current management practices.
- Definitions, goals and targets are essential when considering EAFM integration.
- A simplified structure with well-defined roles for each department may increase coherence and dialogue between management and science.
- Conferences, themed sessions and symposia form an important collation and dissemination of information and provide a forum for discussion.
- EAFM needs to be applied from all angles (social, economic, ecological) and integrated.

NEAFC (www.neafc.org)

Overview:

- NEAFC largely has a management mandate although some scientific evaluation and assessment is carried out.
- ICES provide the majority of scientific advice to NEAFC[49].

Figure 9. The organisational structure of NEAFC



FAC - The Finance and Administration Committee
PECCOE - Permanent Committee On Control And Enforcement
PECMAS - Permanent Committee on Management and Science

EA integration:

- Structural changes
  - 2005 - The 1982 Convention was amended to include the application of PA[50], EA (although not specifically stated)[51] and the conservation of biodiversity[52] (Adopted; not yet ratified).
  - 2005 – PECMAS was established so as to better identify gaps in scientific knowledge[53] and to close the gap between management and science improving communication and co-ordination between ICES and NEAFC[54].
- Measures
  - 2006 - the use of gillnets, entangling nets and trammel nets was prohibited in the NEAFC Regulatory Area at depths greater than 200 metres.
  - Moratorium on basking shark (*Cetorhinus maximus*) and White shark (*Carcharodon carcharias*) fishing[55].

[49] Memorandum of Understanding between the North-East Atlantic Fisheries Commission and the International Council for the Exploration of the Sea: http://www.neafc.org/about/docs/ices_mou_2007.pdf
[50] NEAFC Convention, Article 4.2.b
[51] NEAFC Convention, Article 4.2.c
[52] NEAFC Convention, Article 4.2.d
[53] Performance Review Panel Report of the North East Atlantic Fisheries Commission, NEAFC: http://www.neafc.org/news/docs/performance-review-final-edited.pdf
[54] Report Of The Meeting Of The Working Group On The Future Of The North-East Atlantic Fisheries Commission 30-31 January And 1 February 2007: http://www.neafc.org/reports/future-neafc/docs/wgfn_2007.pdf
[55] Council Regulation (EC) No 41/2006 of 21 December 2006 fixing for 2007 the fishing opportunities and associated conditions for certain fish stocks and groups of fish stocks, applicable in Community waters and,

- Closed areas to bottom fishing (e.g. Altair and Antialtair seamounts).
- Seasonally closed fisheries (e.g. the pelagic redfish (*Sebastes mentella*) fishery is closed between 1 January to 31 August and 16 November to 31 December 2008[56]).

- Reviews
  - The WG on the Future of the North-East Atlantic Fisheries Commission continuously evaluates the role of NEAFC in taking a broader EAFM approach, examines how to strengthen that role and considers the role of other regional and global organisations involved in ocean issues in the Convention Area[57].
  - A performance review was conduced in 2006[53].

Lessons Learned:

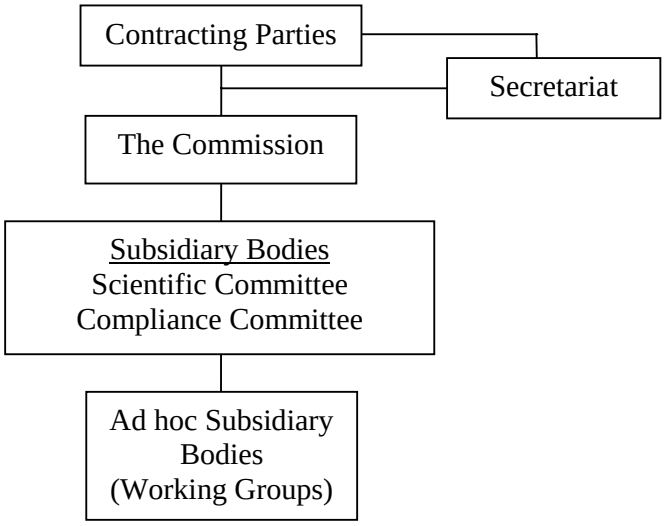
- Periodically reviewing an organisation against the aims and objectives set out by its members is a useful practice in determining its effectiveness and where improvements can be made.
- Coordination between science and management within an organisation improves communication and the identification of gaps in knowledge.

SEAFO (www.seafo.org)

Overview:

- Established in 2004.
- The Convention states that SEAFO should: adopt measures based on the best available scientific evidence; use the PA; take into account the impact of fishing activities on living marine resources as a whole considering ecologically related and interdependent species; and protect marine biodiversity[58].

Figure 10. The organisational structure of SEAFO



for Community vessels, in waters where catch limitations are required, Article 5.6: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007R0041:EN:NOT

[56] NEAFC: http://www.neafc.org/measures/current_measures/4_redfish_icesiandii-08.html

[57] Terms of Reference for the Working Group on the Future of NEAFC: http://www.neafc.org/about/docs/future-wg_terms.pdf

[58] Convention on the Conservation and Management of Fishery Resources in the South East Atlantic Ocean, Article 3: www.seafo.org

EA integration:

- Measures:
  - Fully closed areas[59].
  - Exploratory fishing procedures.
  - Shark finning is prohibited[60].
  - 2007 - the Scientific Committee recommended prohibiting all forms of trawling and gillnet fishing in the SEAFO area to take a precautionary view towards the VMEs that are not currently closed areas[61], consistent with UNGA 61/105. This has still to be acted on by the Commission.

Lessons Learned:

- Even taking into account that SEAFO is a relatively young organisation, little has been accomplished as yet. More robust approaches and clear targets are required.

4.2. UN Organisations

The direction of fisheries management is often strongly influenced by UN resolutions, agreements, advice and actions and the incorporation of EAFM within these mechanisms is an important process in the progression from single-species management. Acceptance of resolutions by Member States are statements of international cooperation and have the capacity to evolve into national and international practices, policies and law (Cole 2003).

Key actors within the UN include UNGA, The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) and the FAO.

UNGA[62] is the principal deliberative, policy-making and representative division of the UN dealing with major fisheries issues. Significant resolutions and actions include:

- The requirement of member nations to apply the EA to the conservation, management and exploitation of highly migratory and straddling fish stocks by 2010 (A/RES/57/142) (Jahnke 2003).
- The international ban on large-scale pelagic driftnet fishing (A/RES/55/8).
- The agreement to halt the loss of marine biodiversity (A/RES/57/L.48).
- The adoption of UNCLOS and FSA.
- The sustainable fisheries Resolution (A/RES/61/105).

GESAMP[63] is an advisory body that considers the scientific aspects of marine environmental protection and acts to influence UN recommendations and decisions. The function of GESAMP is to conduct, support and review marine environmental assessments and to identify emerging issues. Currently, two active WGs are looking at the EA and its application: WG 35 – Deepwater fisheries habitat and related ecosystem concerns, and WG 36 – Development of an EA to offshore mariculture.

The *FAO*[64] is a UN Agency whose overall objective is to raise levels of nutrition and standards of living. It is responsible for the collection, analysis, interpretation and dissemination of data but also co-ordinates national and international scientific, technological, social and economic research. The FAO is responsible for 27 regional fisheries organisations and the adoption of the 1995 Code (see section 2). The FAO focuses on creating an integrated approach to the collection, availability, and dissemination of fishery statistics – FIRMS (Fishery Resources Monitoring System)[65], and on improving regional EAFM knowledge and application.

[59] SEAFO Conservation Measure 06/06: http://www.seafo.org/Cons%20&%20Mngt%20Measures/2006%20conservation%20measures/conservation%20measure%2006_06.pdf

[60] SEAFO Conservation Measure 04/06: http://www.seafo.org/Cons%20&%20Mngt%20Measures/2006%20conservation%20measures/conservation%20measure%2004_06.pdf

[61] Report of SEAFO Scientific Committee 2007, Agenda item 8: http://www.seafo.org/Scientific%20Committee/reports/SC%20Report%202007.pdf

[62] UNGA: www.un.org/ga

[63] GSAMP: http://gesamp.net

[64] FAO: http://www.fao.org/fishery/topic/2014/en

[65] FIRMS: http://firms.fao.org/firms

4.3. Non-Governmental Organisations

NGOs have major influence in the public arena and their campaigns are beginning to impact on fisheries management. As a result increasing transparency in decision-making is being promoted with Observers from these organisations attending meetings of regional fishery organisations.

International NGOs involved with fisheries including Greenpeace, the International Coalition of Fisheries Associations (ICFA), the International Collective in Support of Fishworkers (ICSF), the World Conservation Union (IUCN) and the WWF.

Greenpeace[66] is a global environmental campaigning organisation It has repeatedly highlighted the failure of fisheries management and the organisations responsible for ocean governance and is campaigning for the application of EAFM (Greenpeace 2005a; 2005b; 2007).

ICFA[67] consists of the national fisheries associations of the world's leading fishing nations. They promote a science-based, fully participatory fishery conservation and management process, and believe that management and use should be conducted according to EAFM.

ICSF[68] works towards the establishment of equitable and sustainable fisheries. They have been influential in the development of international instruments including the Code and FSA, trying to better integrate fishworkers interests into fisheries management. As part of EAFM social aspects should be considered and therefore ICSF is instrumental in bringing these issues to light.

The *IUCN*[69] supports scientific research and attempts to bridge the gap between stakeholders and decision-making agencies in order to develop and implement policy, laws and best practise. They consider the ecosystem to be an important focus of environmental management and have developed a Commission of Ecosystem Management (CEM). CEM has collated examples of the application of the EA (Shepherd 2004) and during 2009-2012 plans to work with governments to develop practical guidelines for the use of the EA[70].

WWFs[71] goal is to stop and reverse the degradation of the natural environment by protecting biodiversity, promoting sustainable use and the use of EAFM. WWF develops solutions for sustainable fishing, provides political advice for governments, and conducts campaigning through media and lobbying decision-makers.

4.4. National Initiatives

At the national level many nations including Australia, Canada, the EU and the USA have incorporated ecosystem principles in their laws and policies.

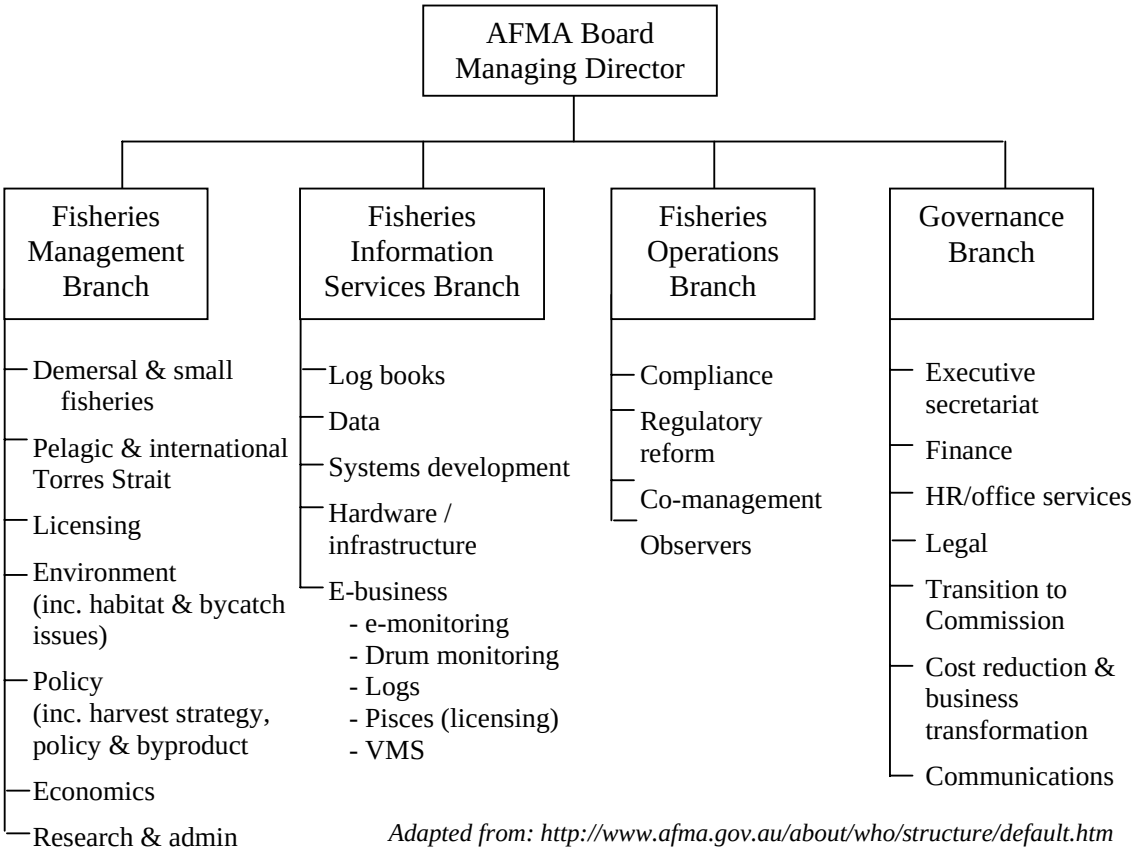
<u>Australia</u>

Overview:

- The Australian Fisheries Management Authority (AFMA) has legal responsibility for fisheries (Smith *et al.* 1999).
- The Department of Environment, National Oceans Office and Department of Agriculture, Forestry and Fisheries administer various other components of ocean management.
- AFMA has initiated a cost-recovery program with industry funding 80% of assessment research and 100% of fisheries management (Smith *et al*. 1999; DFO 2008).

[66] Greenpeace: http://www.greenpeace.org/international
[67] ICFA: http://www.icfa.net/index.cfm
[68] ICSF: http://icsf.net/icsf2006/jspFiles/icsfMain
[69] IUCN: http://cms.iucn.org
[70] Shaping a Sustainable Future: The IUCN Programme 2009-2012: http://cmsdata.iucn.org/downloads/iucn_programme_2009_2012_dfc.pdf
[71] WWF: http://www.panda.org

Figure 11. The organisational structure of AFMA



Adapted from: http://www.afma.gov.au/about/who/structure/default.htm

EA integration:

- Legislation
  - EAFM has been adopted within key legislation (e.g. the National Strategy for Ecologically Sustainable Development[72]).
- Measures
  - Environmental assessments and monitoring.
  - Ecological risk assessments (ERA) are used to assess the risks fishing poses to resource sustainability considering: target species; bycatch and byproduct species; threatened, endangered and protected species; habitats; communities[73].
  - Management strategy evaluation involves the use of the ATLANTIS computer model[74] to simulate how management rules perform relative to ecological, social and economic objectives[75].
- Structural changes
  - 2008 – AFMA restructured into four branches (Figure 11)[76].
  - These branches are responsible for data collection and providing advice to the Board through a General Manager. The branches are made up of discrete sections, each with specific responsibilities. Links between all sectors and branches are maintained through regular meetings and inter-disciplinary projects and ad hoc groups.

[72] National Strategy for Ecologically Sustainable Development, Chapter 2: http://www.environment.gov.au/esd/national/nsesd/strategy/fish.html
[73] ERA: http://www.afma.gov.au/environment/eco_based/eras/default.htm
[74] Atlantis: Considered to be the best ecosystem model in the world: http://www.csiro.au/science/ps3i4.html
[75] MSE: http://www.cmar.csiro.au/research/mse/
[76] AFMA: http://www.afma.gov.au/about/who/structure/default.htm

Lessons Learned:

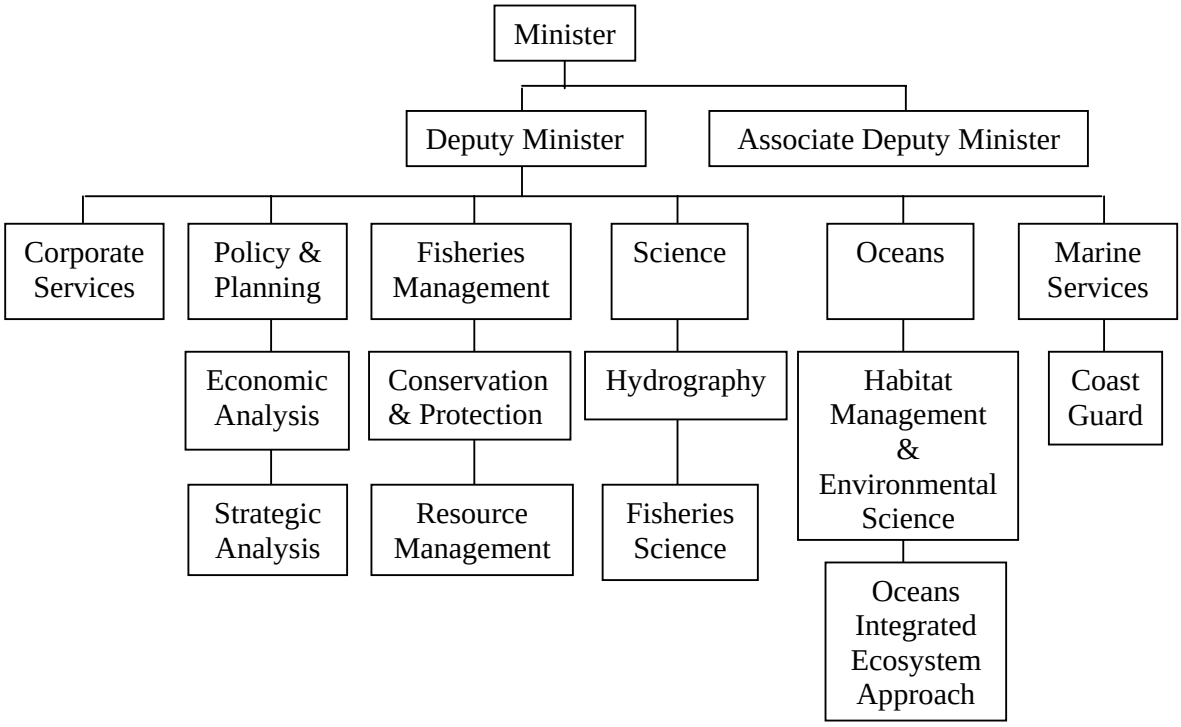
- The polluter pays principle and cost-recovery programs are an effective method for increasing management and science budgets.
- Environmental assessments and ERAs can provide important information regarding the marine environment.
- The investment into the ATLANTIS model has provided a powerful tool for analytical work and is useful for identifying the trade-offs of different management options (DFO 2008).

Canada

Overview:

- The Department of Fisheries and Oceans (DFO) is responsible for implementing EAFM within the Maritimes region (Lane and Stephenson 2000; DFO 2008) although federal, provisional and territorial governments also have some authority.
- DFO is made up of national headquarters based in Ottawa, and six regions. The Minister forms the head of DFO and there are six branches of expertise help to perform the functions of the department (Figure 12).

Figure 12. The organisational structure of DFO



Redrawn from Lane and Stephenson 2000

EA integration:

- Legislation
  - Key legislation guiding ocean management include the Oceans Act (1997), Ocean Strategy (2002), Oceans Action Plan (2005) and the Health of the Oceans Initiative (2007)[77]. These build on each other forming comprehensive legislation advocating PA and EA.
- Fisheries management plans
  - Now include the issues of bycatch, biodiversity conservation, the preservation of vulnerable species and habitats, the incorporation of EA and multi-species management (DFO 2008).
  - Large ocean management areas are used to deliver a regional ocean governance (ROG) approach[78].
- Integrated advice:

[77] DFO: http://www.dfo-mpo.gc.ca/oceans/management-gestion/governmentsrole-roledesgouvernements/index-eng.htm#key

[78] DFO: http://www.dfo-mpo.gc.ca/oceans/marineareas-zonesmarines/loma-zego/index-eng.htm

    - Different departmental initiatives are integrated, e.g. the Oceans Sector and the Science sector are currently mapping the location of ecologically and biologically significant areas. These will be overlapped with fishing and other human activity to help determine necessary management actions[79].
    - An independent ministerial advisory body the Fisheries Resource Conservation Council (FRCC) uses data provided by the Science branch to supply advice on fisheries management to the Minister of Fisheries and Oceans (Lane and Stephenson 2000).
    - FRCC forms a partnership between industry stakeholders and scientific expertise and provides interdisciplinary advice regarding the status of stocks and appropriate TACs (Lane and Stephenson 2000).
    - 2002 – FRCC's mandate was updated to include the requirement for producing frameworks for the conservation of species identified at risk of stock collapse (e.g. the Atlantic Snow Crab[80])[81].
- Review
    - DFO have developed a checklist system to help assess progress in implementing EAFM[82].

Lessons Learned:

- Involving industry within management can, when integrated in an independent setting, improve the coordination, formulation, application and compliance to management actions.
- Integration between different departmental initiatives is critical.

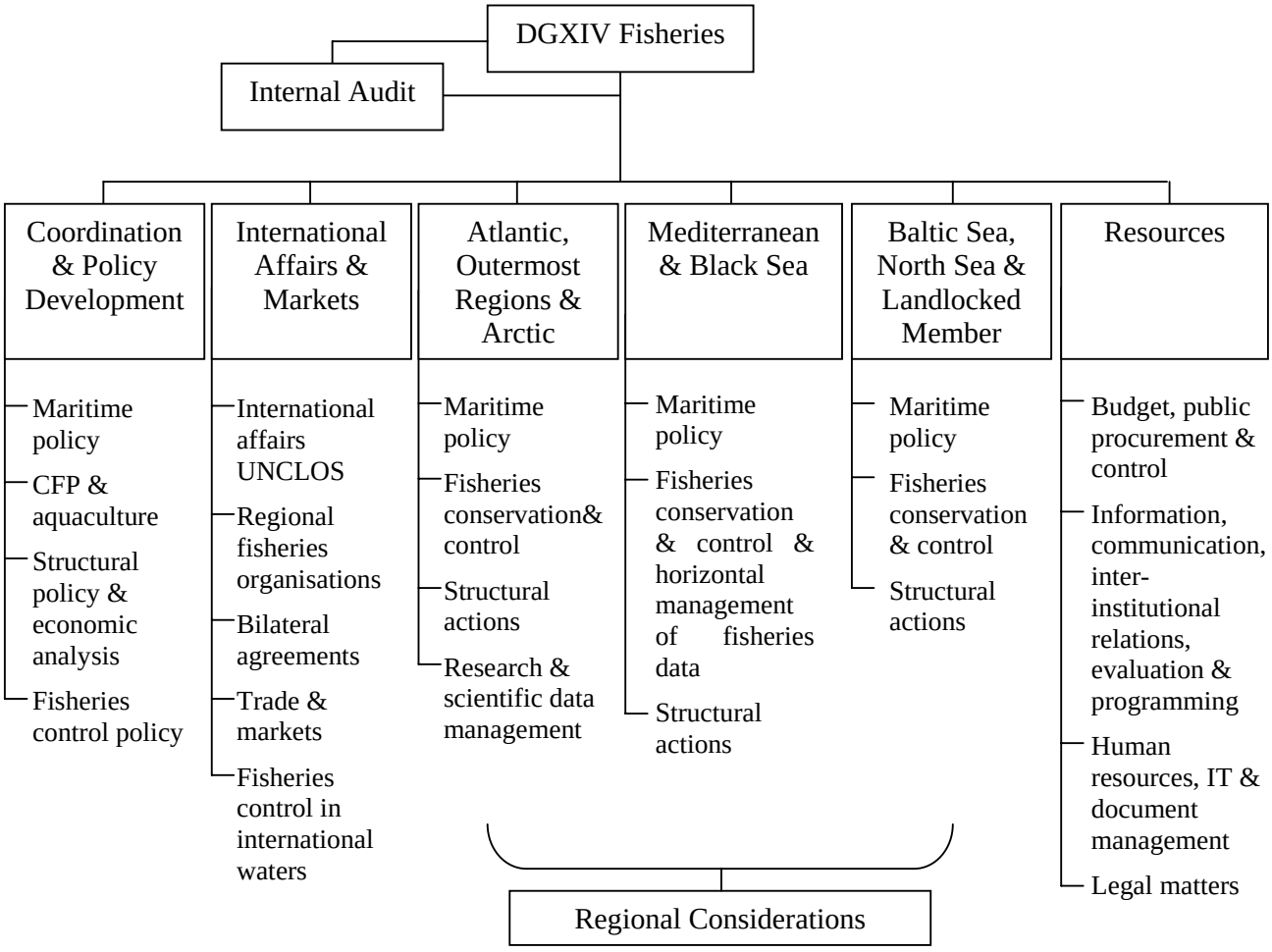
The European Union

Overview:

- The Fisheries Department, Directorate-General (DG)XIV, is responsible for formulating advice to the European Commission, which then passes proposals to the Council of the European Union. These recommendations are based on scientific advice provided by ICES[83].
- Within the fisheries sector, the Common Fisheries Policy (CFP) provides the legal framework for management and use.

[79] Mr B. Gilchrist *pers. comm.* 2008
[80] FRCC Strategic Conservation Framework for Atlantic Snow Crab: http://www.frcc.ca/2005/snowcrab.pdf
[81] FRCC: http://www.frcc.ca/mandate.htm
[82] Mr. B. Gilchrist *pers. comm.* 2008
[83] European Commission Fisheries Sector: http://ec.europa.eu/fisheries/cfp_en.htm

Figure 13. The organisational structure of the European Commission Fisheries Department



Redrawn and adapted from: http://ec.europa.eu/dgs/fisheries/organi/oganig_en.pdf

EA integration:

- Legislation
  - 2002 - The CFP underwent a reform to include the use of PA to protect and conserve resources and to minimise fishing impacts as well as the implementation of EAFM.
  - 2007 – The Integrated Maritime Policy (IMP) (COM(2007)575[84]) aims to develop synergies between sectoral policies and to improve or maintain the status of marine resources, guided by EA.
  - 2008 – The Marine Strategy Directive includes the EA as a fundamental element and will establish European Marine Regions on the basis of geographical and environmental criteria[85].
- Structural changes
  - 2002 - Regional Advisory Councils were formed to act as a forum for discussions among stakeholders and allow fisheries management to adapt to regional areas.
  - 2008 – The former "DG-FISH" was renamed and restructured, becoming the "DG for Maritime Affairs and Fisheries" (DG-MARE)[86]. The main change involved the creation of three geographic Directorates responsible for managing the CFP and IMP within a specific maritime region to improve ROG.

[84] Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions: An Integrated Maritime Policy For The European Union: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0575:FIN:EN:PDF

[85] European Commission, Environment Sector: http://ec.europa.eu/environment/water/marine/index_en.htm

[86] European Commission, Fisheries Sector: http://ec.europa.eu/fisheries/press_corner/press_releases/2008/com08_28_en.htm

Lessons Learned:

- Strong legislation and targets allow the smoother integration of EAFM.
- ROG is an effective method at allowing fisheries management to adapt to local needs and conditions.

United States

Overview:

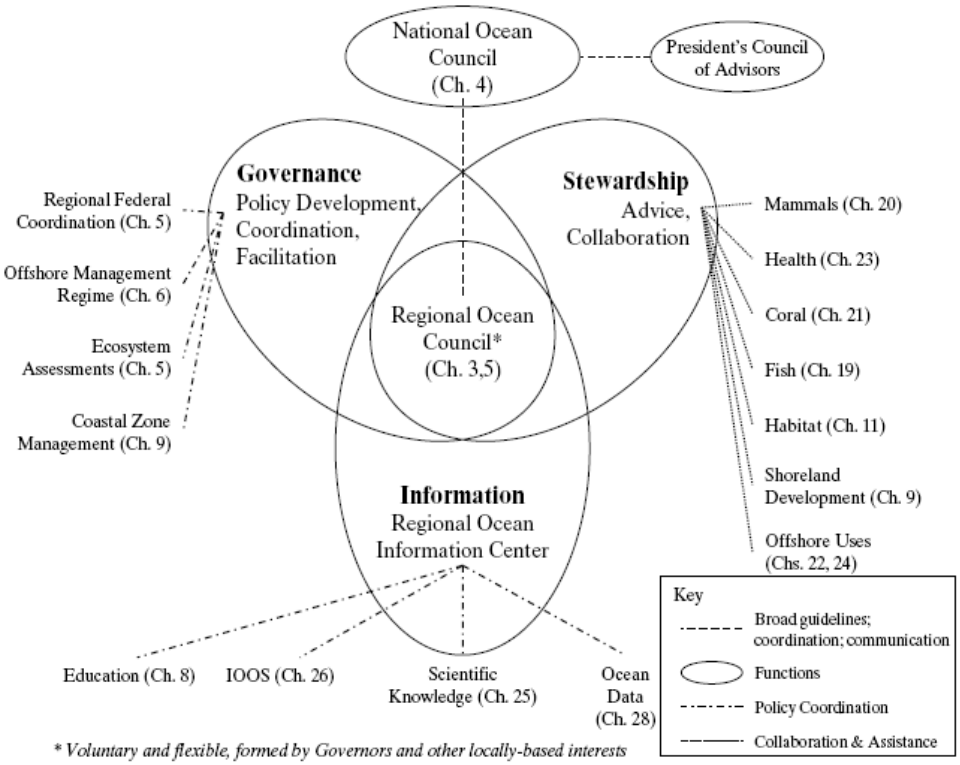
- Eight regional fishery management councils, consisting of representatives from commercial and recreational fishing interests, environmental organisations, state and federal government, and other interests, carry out fisheries governance.
- These councils develop and submit to the government for final approval management plans that address localised needs while satisfying the federal fisheries statute (GAO[87] 2006).

EA integration:

- Legislation
    - Key legislation mandates fisheries and ocean management to incorporate the EA, e.g. US Oceans Act (2000)[88], US Commission on Ocean Policy (2004)[89], Presidents Ocean Action Plan (2004)[90], Magnuson Stevens Fishery Conservation and Management Act (1976; 2007)[91].
- Measures
    - Ecosystem impact assessments (EIA) are required for proposed management activities by the National Environmental Policy Act (1969; 1982)[92].
    - The National Oceanic and Atmospheric Administration (NOAA) operate a large marine ecosystem (LME) approach, allowing regional, ecologically based, management (Sherman *et al.* 2007).
    - ROG is an important component of the National Ocean Policy Framework
    - (Figure 14) (Hershman and Russell 2006).
    - MPAs and gear closures.
    - Fisheries ecosystem plans (FEP) to continue to advance LME and ROG approaches.

[87] GAO: United States Government Accountability Office.
[88] US Oceans Act: http://www.sma.washington.edu/Research/pog/oceans_act.html
[89] US Commission on Ocean Policy: http://oceancommission.gov/
[90] Ocean Action Plan: http://ocean.ceq.gov/actionplan.pdf
[91] Magnuson-Stevens Act: http://www.nero.noaa.gov/sfd/MSA_amended_20070112_FINAL.pdf
[92] National Environmental Policy Act: http://ceq.hss.doe.gov/nepa/regs/nepa/nepaeqia.htm

Figure 14. The envisioned regional ocean governance concept



Source: Hershman and Russell 2006

Lessons Learned:

- EIAs enable more comprehensive approaches to the management of multiple activities and place the emphasis on those conducting the activities to show that their actions will have minimal effect.
- ROG allows managers to address issues on ecosystem scales. Regional efforts are often initiated through bottom-up processes and are complemented by federal support (Hershman and Russell 2006). ROG is therefore being used to help to move all levels of governance towards common ecosystem goals.
- FEPs may be an effective method to integrate fisheries and ecosystems into a single management plan.

4.5. Research Universities

Research universities around the world publish peer-reviewed material that pushes back the frontiers of knowledge (Altbach 2004). They are able to raise funds through a variety of means and provide high quality resources for their researchers (Altbach 2004). These may provide currently untapped resources for research within RFMOs and other fisheries/environmental organisations

5. SWOT ANALYSIS OF NAFO'S CURRENT ORGANISATIONAL STRUCTURE

Session: Structure of NAFO for allowing the effective implementation of EAFM
See Appendix 2 for a full description of the analysis and a list of participants.

Strengths	**Weaknesses**
• EAFM is included within the Amended Convention providing a legal framework. • NAFO has both a management and scientific remit and therefore has the ability to direct research and to act as both a conservation and management body. • NAFO can draw from the expertise base of th 12 CPs. • NAFO has the authority to implement management measures. • The FC, as a NAFO constituent body, has the authority to determine emergency measures.	• EAFM has not been defined – consequently ther is some confusion regarding what it actually is a its aim. • Targets and deadlines have not been set for the implementation of the stages of EAFM – progre and its assessment, are therefore difficult. • FC can work independently from SC. • There is no social or economic branch or experti within NAFO. • Current advice framework, and heavy workload provides little opportunity for SC to adequately address new and emerging issues, such as EAFM • NAFO must rely on CP scientists to allocate tim and resources to its research needs. • Limited funding. • Performance reviews or audits of progress are currently not conducted. • Poor ownership of topics by individual SC scientists
Opportunities	**Threats**
• The Convention could be rewritten to encoura greater discourse between the FC and SC. • MoUs[93] with outside organisations could help resolve problems of limited funds, expertise a time. • Public awareness regarding the status of fisheries and the need for effective manageme is increasing. Therefore NAFO needs to act to maintain its reputation and authority. • Examples of good practice in implementing EAFM and review procedures are increasing (e.g. AFMA, NEAFC)	• EAFM cannot be successfully implemented without clear definitions and goals. • If links with outside organisations are formed, th organisation must be chosen carefully to avoid bias or agenda to maintain NAFO's independen and credibility. • CPs have the ability to object and abstain from measures implemented.

[93] MoU: Memorandum of Understanding

6. CONCLUSIONS

Fisheries management has developed rapidly over the last few decades to incorporate sustainable development, PA, EA and fishery economics.

International targets for the identification and protection of VMEs by 2008, the implementation of EAFM by 2010 and the restoration of fish stocks to their maximum sustainable yield by 2015 are approaching rapidly.

As a consequence of these targets and advances in approaches to fisheries management, there is a need for rapid adaptation to allow the achievement of these goals, and EAFM is being hailed as the method of choice.

The successful implementation of EAFM will require integration of datasets, objectives, skills, disciplines, stakeholders, legislation and policy, and technical and methodological instruments. This is likely to increase management costs (Garcia and Cochrane 2005) and therefore more cost-effective delivery methods need to be devised.

NAFO and other international and national organisations must adapt in order to facilitate this multi-disciplinary integration. Weaknesses within organisational structures which limit effective EAFM implementation need to be resolved. This report identifies suggested areas where NAFO may wish to consider changes to enhance the integration and evolution of EAFM within the organisation.

7. SUGGESTIONS FOR NAFO: EASING IN EAFM

Based on the discussion and findings presented within this report, suggestions to NAFO are summarised below. This section is divided into 'Initial Steps', 'Overarching Vision' and 'Actions to Consider'.

Initial Steps:

1. Define EAFM and its objectives within the context of NAFO.

A great deal of confusion lies within the terms of EA and fisheries. Consequently, it would be beneficial if these terms were clarified, at least within the context of NAFO. An overarching vision for NAFO should be agreed and a process for achieving this identified. Goals and timelines should be developed. A checklist system to assess progress, such as DFO operates, would be beneficial.

Examples of goals that NAFO may wish to consider are:

- To identify and protect 65% of all VMEs and essential fish habitat in the NRA.
- To maintain biodiversity and ecosystem functionality.
- To ensure adherence to all scientific advice.
- To establish absolute bycatch limits of all species and juveniles.

Structural implications: None.

Personnel implications: None.

Timing implications: A request to CPs to consider definitions and goals should be circulated ASAP[94]. This could be added to the Agenda of the Annual Meeting 2008.

Cost implications: None.

2. Widen the remit of WGEAFM.

Increase the original TORs of WGEAFM to include investigation into the data, skills, and personnel needed to reach the shared vision of the CPs. WGEAFM could also be tasked with submitting potential new NRA statistical areas, based on identified regional ecosystems. Once passed through SC and FC this would allow management to be conducted on an ecological basis.

[94] ASAP: As soon as possible

WGEAFM may wish to consider holding a short conference on 'NAFO and EAFM: The way forward' to review the current application of EAFM and how NAFO could best be adapted to fully incorporate EAFM and adaptive management.

Structural implications: None.

Personnel implications: None.

Timing implications: To begin ASAP and to be ongoing.

Cost implications: None immediately. As the TORs are followed monetary costs will be incurred from: the re-analysis of currently held data to conform to new statistical areas; the design and reprinting of a new map of the NRA; the planning and execution of a conference. Additional time from the Secretariat staff time would also be required.

3. Establish stronger links between SC and FC.

Greater coherence and dialogue between managers and scientists should be established. Joint WGs should be established. For example, membership of the ad hoc WG of fishery managers and scientists on VMEs is currently limited to FC members. SC scientists should also be involved. Members of FC and SC should sit on both councils to directly influence decisions and activities. The Convention could be rewritten to encourage collaboration and discourse.

Structural implications: None.

Personnel implications: SC staff would be required to sit on FC and vice-versa thus increasing the time they must make available to NAFO.

Timing implications: To begin ASAP and to be ongoing.

Cost implications: None.
4. Establish a Review Group (RG).

A RG should be established to externally review the work of SC, Standing Committees and their respective DEs. This would increase the efficiency of both Standing Committee and SC meetings. In addition, the RG should provide regular audits of progress by NAFO with regard to the implementation of EAFM and other initiatives, and would be expected to perform Performance Reviews at defined time intervals.

It is suggested that the RG should be an independent group in order to avoid country, member or organisational bias.

Structural implications: None.

Personnel implications: Additional external personnel would be required during the committee meetings to conduct the reviews.

Timing implications: DEs would be required to submit their assessments prior to the Standing Committee meetings to the RG.

Cost implications: Five external, additional personnel would be required for 2-3 weeks per year.

5. Consider partnerships with other organisations.

Major issues commonly identified by SC personnel are limited funding, expertise and time. NAFO could undertake a similar exercise as GFCM, establishing links with other organisations or projects to expand their resource base and take advantage of external funding. Partners identified should be chosen carefully to avoid bias or agenda, should be credible to CPs, and should be able to provide balanced expertise and knowledge (e.g. Box 5).

An increased utilisation of MOUs, such as that currently adopted between NAFO and ICES[95], may provide the basis for these partnerships. Links could be formed between organisations responsible for conducting and collecting ecological, environmental, social and economic data. These data could be utilised by the appropriate Standing Committees and representatives from partnership organisations should be invited to become observers within SC meetings.

Box 5. Potential partnership organisations to NAFO

The Northeast Atlantic Fisheries Commission (NEAFC)
The International Whaling Commission (IWC) / The North Atlantic Marine Mammal Commission *(*NAMMCO)
Universities
Other RFBs and national initiatives

Links between STACFIS should be made with the ICES WG on methods of fish stock assessments in order to continually review current methods. Greater collaboration with NEAFC regarding broader issues of North Atlantic fisheries such as principles, procedures and approaches would be beneficial in streamlining fisheries management, and may help in combating IUU fishing. Links with IWC/NAMMCO may be beneficial as marine mammals may be used as indicators for ecosystem health (Livingston 2005). It may also be worth collaborating with particular research projects within universities.

Overarching Vision:

A potential overarching vision for NAFO is presented as follows. Two aspects form this vision, the creation of additional committees and the modification of the current advice formulation process by the SC.

1. Create two new committees: a Standing Committee on Social and Economic Conditions (STACSEC) and a Coordinating Standing Committee on the Ecosystem Approach to Fisheries Management (C-STACECO).

STACSEC

Responsible for the assessment and reporting of social, cultural and economic factors of relevance to fisheries (e.g. trade, employment, income).

DEs should be assigned by CPs or recognised organisations in partnership with NAFO, and should be social and economic scientists in a fisheries related field.

C-STACECO

Responsible for improving the knowledge: of ecosystem linkages and key ecosystem components; vulnerable species; VMEs and ecosystem indicators (of health, productivity, etc).

Responsible for the integration of advice provided by all Standing Committees using ecosystem and multi-species computer modelling in order to provide a number of management scenarios and advice to the SC.

DEs should be assigned by CPs, or recognised organisations, in agreement with the SC and should be competent in ecological food webs, ecosystem mapping and evaluation, and ecosystem, social and economic modelling.

The aim of establishing these committees would be to create a formal framework for the incorporation of human factors into decision-making and to allow EAFM to be fully developed within the SC.

Humans are identified as important components of ecosystems within EAFM and consequently socio-economic factors should be considered within policy, implementation and management (Murawski 2007). The formation of STACSEC would resolve the lack of socio-economic input currently within NAFO.

[95] MoU between NAFO and ICES: http://www.nafo.int/about/annrep/ar03/sec/mou.pdf

STACECO would replace WGEAFM. Ecosystem models such as ATLANTIS could be used to consider management actions within the wider remit of the EA.

During the creation of these new bodies and the resulting changes to the advice framework it may be necessary to establish links with other organisations that have already implemented good practice in EAFM. For example, ecosystem modellers from the Australian Commonwealth Scientific and Industrial Research Organisation[96] could provide invaluable advice, support and/or computer models for EAFM. NAFO may also wish to engage consultants to design a model to suit the Northwest Atlantic. Expertise within CPs should be explored prior to this however.

Structural implications: The establishment of two new committees will result in changes to the framework currently used for the formulation of advice to the FC (see below).

Personnel implications: Additional, or new, personnel trained in ecosystem modelling as well as experts within social and economic fields would be needed.

Timing implications: Completion of this structure would be a longer-term goal. A process and timeline should be established by CPs.

Cost implications: Experts could be provided through joint partnerships and/or CPs at minimal cost to NAFO. Additional costs may be incurred through the purchase of ecosystem models or designers. Developing links and visiting other organisations/departments will also incur travel and accommodation costs.

2. Modify the framework for the formulation of advice to the FC

To improve the ability of SC personnel to incorporate EAFM into advice to the FC, the current advice-making framework could be adapted (e.g. Figure 15).

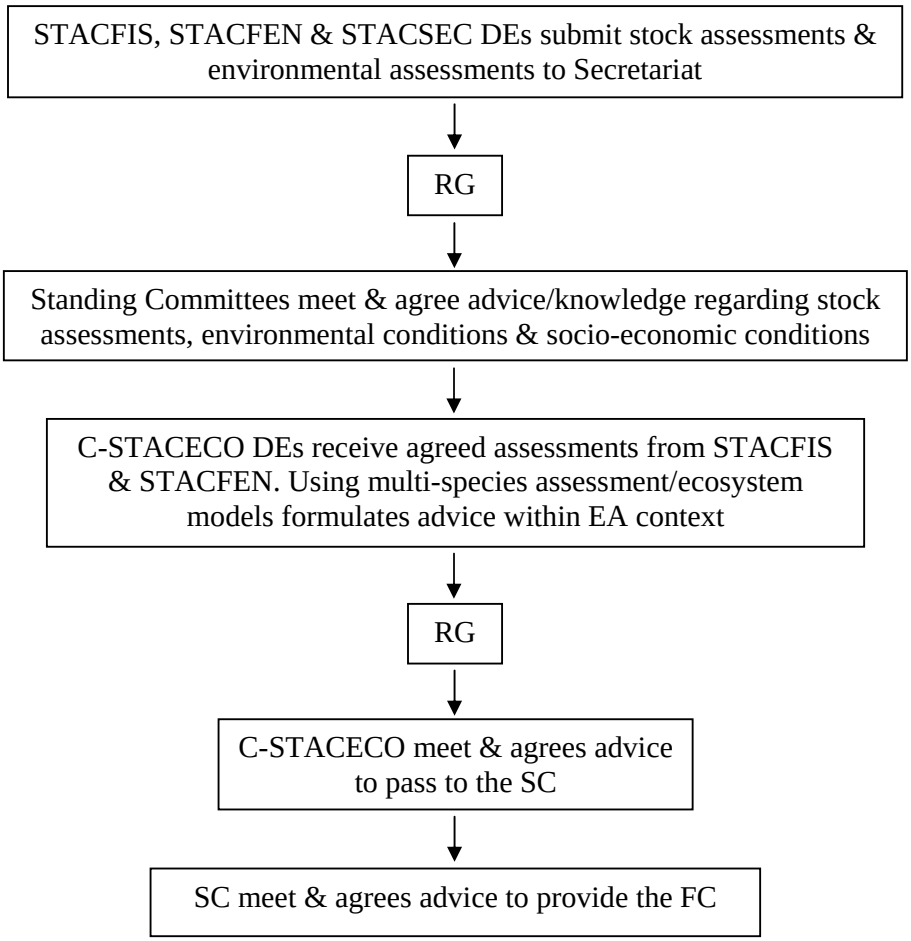
DEs would be required to submit assessments to the Secretariat prior to their respective Standing Committee meetings. The RG would review the methods and if accepted, the assessments would be submitted to the relevant Standing Committee. If questioned, DEs would be expected to review and adjust their work accordingly and submit again.

STACFIS, STACFEN and STACSEC may meet simultaneously to review assessments and to formalise knowledge. The RG would then review the output prior to submission to C-STACECO. C-STACECO would be responsible for formulating scenarios based on available knowledge. The SC would then review the various management scenarios and agree advice to provide to the FC.

Not all participants would be required for all meetings. It is envisaged that within STACECO and SC representatives from all Standing Committees (ideally at least the chair) would attend in order to ensure advice is not misunderstood and to clarify points of confusion. All personnel involved in the formulation of advice would be invited to attend SC and minutes and reports would be made available to all after the meeting.

[96] Australian Commonwealth Scientific and Industrial Research Organisation: http://www.csiro.au/science/ps3i4.html

Figure 15. Potential restructing of the SC advice formulation process to incorporate EAFM



Structural implications: A longer time period for advice formulation than the current two-week annual SC meeting would be required. The restructuring of the advice formulation process would also result in the decentralisation of power, enabling the SC to pass decision-making and advice formulating powers to Standing Committees.

Personnel implications: No extra personnel other than those noted above. The Chairs, or elected representatives of Standing Committees would need to be available for shorter periods over a longer time frame. Additional meetings will impact Secretariat personnel and a new staff member may be needed to assimilate the extra workload.

Timing implications: Completion of this structure would be a longer-term goal. A process and timeline should be established by CPs.

Cost implications: Meetings could be held at the Secretariat thus reducing hospitality costs. Increased costs may arise through additional travel expenses and management and administrative costs.

Actions to Consider:

1. CPs should be required to submit basic data (at a minimum) in a standard format on socio-economic aspects of their fisheries, starting wherever practical from 1979 (when ICNAF was established). The data could include statistics on; catch value, price/tonne, no. of vessels, no. of crew, profitability and subsidies. NAFO Secretariat could then compile a regular fisheries status report based on EAFM considerations.

2. Strengthen medium and long-term management plans for commercial stocks and key living resources according to the PA identifying target reference points (e.g. mortality, biomass). These should take into account recovery plans

and multispecies interactions. Where data is insufficient precautionary reference points should be established based on available data (e.g. exploitation history, life history characteristics and vulnerability).

3. Fully closed areas and the protection of VMEs with clearly defined management goals should be established (e.g. habitat restoration, protection of important areas for species such as spawning/nursery grounds).

4. Consider the application of ecological risk assessments as operated by AFMA applying the polluter pays principle and the burden of proof for environmental impacts.

5. Consider the establishment of a cost-recovery program such as AFMA operates.

6. Formulate fishery ecosystem plans for each ecosystem to allow the development of 'regional' governance as being advanced by initiatives in the US and the EU (section 4) as well as incorporating a more adaptive and ecosystem specific approach to fisheries management.

7. Encourage further study into the integration of EAFM within NAFO and approaches for strengthening the relationship between the FC and SC.

8. APPENDICES

Appendix 1. Terms of Reference

Background
Ms. B. O'Leary, a Master's student from University of York, UK, will undertake a ten-week study period with NAFO to look into the organisation's current and future application of the Ecosystem Approach to Fisheries Management (EAFM) as part of her course requirements. NAFO is the regional fisheries body covering the management of the fisheries in the northwest Atlantic. It has both management and scientific responsibilities with regulations being established by NAFO's Fisheries Commission (FC) utilizing scientific advice provided by NAFO's Scientific Council (SC). Further details can be found at www.nafo.int. Historically, NAFO emerged from a re-organisation of ICNAF at the time of the establishment of EEZ boundaries at the end of the 1970s. Since the beginnings, single species assessments have formed the main work of the Scientific Council and this is likely to remain so as long as TACs are used as the central management tool. However, over the last ten years or so, there has been an increasing requirement to consider the impact of harvesting commercial species in relation to the ecosystem in which they live, and to account for and involve the various stakeholders in the management and assessment process. NAFO now has adopted a new convention that embraces these concepts.

The work of Ms. O'Leary will focus on the adaptive changes necessary within SC in order to provide the best possible advice on the EAFM in relation to requirements of FC for managing the fishery in the northwest Atlantic.

Terms of reference

1) To review the application of EAFM by NAFO taking account of current guidelines and practises, particularly those provided by FAO on the Code of Conduct for Responsible Fisheries and the International Plans of Action (IPOA) http://www.fao.org/fishery/ccrf/1, and relevant NAFO documentation.
2) To review recent changes made by other regional fisheries bodies in their implementation of EAFM.
3) To compare the current organisational structure of NAFO, and the NAFO SC in particular, with other regional fisheries management organisations (RFMOs) and any other organisations having similar objectives.

Timing and expected output
Ms. O'Leary is expected to work for a defined period of approximately ten weeks during June to August 2008.
The expected output is a report summarising the student's findings and suggestions.

1) The student is required to provide a brief outline of the plan of work and progress made within two weeks of the start of the work period.
2) The student is required to provide a draft report no later than two weeks before the end of the work period.
3) A final report is to be submitted by 11 September 2008.

Reports should be electronic form and in MS WORD or equivalent format.

Supervision
The final report will be assessed both by a local supervisor at NAFO, Dr A. Thompson, and by her course supervisor at York, Dr J. Hawkins. The work needs to be designed to allow the student to work creatively and independently, but within a framework to meet the requirements of NAFO. The degree of local supervision given will depend on the needs of the student. The local supervisor is required to produce a report on the student's work.

Conditions of Service
The student will be based at the NAFO Secretariat, Dartmouth, and is expected to work a normal working week. NAFO operates flexible working hours with a core period between 10 am and 2 pm. It is realised that travel time to and from work may limit the ability of the student to work normal hours, and allowances will be made for this. It is recognised that this placement is on a 'voluntary' basis, and as such, all the above, including the TORs, are open for discussion and amendment at any time. Such discussions may be reflected in the report of the local supervisor. No salary is attached to this position and the student is not considered to be NAFO staff or employed by NAFO.

Dr A.B. Thompson
29 February 2008

Appendix 2. SWOT Analysis Report

Participants:

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Dr. Tony Thompson, SC Coordinator - athompson@nafo.int

Facilitator:

Ms. Bethan O'Leary – University of York

Process:

The SWOT analysis was conducted as part of the evaluation of the organisational structure of NAFO for implementing EAFM. All members of the Secretariat and several members from the SC and CPs were invited to comment.

The analysis was carried out via email with information on EAFM circulated together with the session table. The analysis was carried out via email in order to allow those who would not be able to attend a meeting at the Secretariat to participate. The analysis was centred around the views of the participants regarding the structure of NAFO for effectively implementing EAFM. All of the participants were familiar with the structure of NAFO prior to the SWOT analysis having either worked within the Secretariat or SC for a number of years or being a member of NAFO.

The email was circulated on the 8th August 2008 and those invited were asked to respond with a completed session table by the 15th August 2008.

The report in section 5 was written by the facilitator to serve as input into the overall study. It presents an edited version of the contents of the session tables received from participants and is a summary of the findings.

Appendix 3. Institutional Timeline to EAFM

Year	Important Agreements, Conventions, Commissions	Key Developments
1970	FAO Technical Conference on Marir Pollution and its Effects on Living Resources and Fishing	Identified the potential impact of land-based sources of pollution and degradation on fisheries.
1972	United Nations Conference on Huma Environment	Highlighted central concepts to the EA, e.g. participation; resource limitation; environmental degradation; demography; planning and management; international collaboration and equity.
1972	FAO Technical Conference on Fishe Management and Development	Emphasised the problems of overfishing and environment degradation from non-fishery sources. Called for the incorporation of precaution and multi-speci evaluation into management
1980	Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)	Considered a precursor to EAFM: mandate requires fisheries be conducted according to ecosystem conservatic and sustainable exploitation.
1982	United Nations Convention of the La of the Sea	Came into force in 1994. Provides the basis for conventional fisheries management and development. Highlights the need to consider the interdependence of stocks, maintenance of populations and the obligation to "protect and preserve the marine environment" (Article 193).
1984–87	World Commission on Environment and Development (WCED)	Led to the Brundtland Report (1987). Further developed the concept of sustainable developmen environmental assessments, consultation and precaution.
1992	United Nations Conference on Environment and Development (UNCED)	Led to the adoption of a number of conventions and agreements of relevance to EAF, e.g. the CBD and the FS Recognises: the right to exploit resources; the responsibili to protect the environment; the precautionary approach. Developed Agenda 21.
1992	Agenda 21, UNCED	Formulated an EA to ocean management through: integrating precautionary and anticipatory approaches; combining exploitation and conservation management; multi-species management; interdependence of species; species and habitat protection.
1992	Convention on Biological Diversity (CBD)	Emphasises biodiversity conservation, the sustainable use of its components and the fair and equitable sharing of benefits. Right to exploit, obligation to managing activities threatening biodiversity. Recommends establishing networks of marine protected areas (MPAs) to conserve biodiversity. Biodiversity important with regards to EAFM as it relates resilience (Worm *et al.* 2006). Maintained or enhanced diversity may act as 'insurance' against negative consequences of ecosystem changes.

1995	Jakarta Mandate on Marine and Coastal Biological Diversity	Elaborated further on EA; focused on MPAs, precautiona approach, scientific knowledge of actions and their impac
1995	United Nations Fish Stocks Agreeme (FSA)	Aims at long-term conservation and sustainable use of marine living resources. Recognises the importance of the precautionary approach; biodiversity conservation; species interdependences; economic factors; compatibility of management measure i different jurisdictional areas. Details how to apply the precautionary approach.
1995	FAO Code of Conduct for Responsib Fisheries	Provides a voluntary framework aimed at increasing sustainable fisheries development, with due respect for th ecosystem and biodiversity
1995	Jakarta Mandate on Marine and Coastal Biodiversity	Part of the Ministerial Declaration on the implementation the CBD. Promoted use of EA highlighting the need for integrated marine and coastal area management and protected areas.
1995	Kyoto Declaration on the Sustainable Contribution of Fisheries to Food Security	Highlights importance of fisheries as a world food source. Establishes sustainable development, fisheries assessment and multispecies and ecosystem management principles.
2001	Reykjavik Conference on Responsib Fisheries in the Marine Ecosystem	Addresses the issue of introducing ecosystem considerations (e.g. predator-prey relationships) into conventional fisheries management.
2002	World Summit on Sustainable Development (WSSD)	Political Declaration; where states agreed to “protect and restore” ecosystem integrity. Plan of Implementation; application of the EA by 2010, rebuild fish stocks to their maximum sustainable yield by 2015, the establishment of MPAs.
2001	UN General Assembly on Resolution on Sustainable Fisheries (61/105)	Encourages the use of the EA and precautionary approach no later than December 2008. Calls for States to sustainably manage fish stocks and protect vulnerable marine ecosystems from destructive fishing practices.

Adapted from FAO 2003 and multiple sources

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