Towards a more holistic marine management paradigm

Ten years of ICES changes to meet tomorrow’s need for science and advice

Kari Stange
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Master’s Thesis, 60 p.
Ecosystems, Governance and Globalisation (EGG)
Stockholm Resilience Centre
Stockholm University
June 2010

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Abbreviations
ACE Advisory Committee on Ecosystems
ACFM Advisory Committee on Fishery Management
ACME Advisory Committee on the Marine Environment
ACMP Advisory Committee on Marine Pollution
ACOM Advisory Committee
ASC Annual Science Conference
CBD Convention on Biological Diversity
CFP Common Fisheries Policy
ConC Consultative Committee
DG ENV Directorate-General for the Environment
DG MARE Directorate-General for Marine Affairs and Fisheries
DG RES Directorate-General for Research
EC European Commission
EG Expert Groups
EU European Union
FAO Food and Agriculture Organisation of the United Nations
FWS U. S. Fish and Wildlife Service
GBRMPA Great Barrier Reef Marine Park Authority (Australia)
HELCOM Helsinki Commission
ICES International Council for the Exploration of the Sea
IMR Institute of Marine Research (Norway)
NASCO North Atlantic Salmon Conservation Organization
NEFAC North-East Atlantic Fisheries Commission
MCAP Management Committee for the Advisory Process
OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic
Q Quote
SCICOM Science Committee

Acknowledgements
Thanks to: My advisors PO and HÖ for sharing ideas and being available and supportive; all the interviewees for being generous with their time, experiences and insights; staff at the ICES Secretariat for making me feel welcome and being so helpful; HL for providing contacts and opening doors; SL, MS, and KHH for giving me access to ICES meetings; MS for useful feedback; DW and PH for reminding me of the challenges of transdisciplinary research; EGG fellow students for feedback on several drafts and for their friendship during two fun years at the Stockholm Resilience Centre; and EG for everything else.
Abstract

This case study investigates change processes in the International Council for the Exploration of the Sea (ICES) over a 10-year period. It aims to increase the understanding of the dynamics of change processes in organizations which operate at the science-policy interface at the international level. ICES plays a key role in supplying policymakers and marine management agencies with scientific advice. The challenges facing governance of oceans and coastal areas have led these actors to embrace an ecosystem-based approach. This study takes a qualitative, transdisciplinary approach to investigate if and how ICES has responded to this shift towards a more holistic management paradigm. Resilience theory, combined with organizational change theory, is used to analyze several change processes identified. The ICES advisory program and the ICES science program have both undergone major reforms during the last 10 years. The ICES Secretariat has been reorganized, and strategic planning has given ICES new guiding documents. While the ecosystem-based approach was important as a backdrop for the reforms, it was not manifested as a dominating driver behind the changes. The major drivers were the need to improve efficiency and a striving for better integration between different components within the organization. The findings show that the international network structure of ICES gives a different dynamics of change compared to similar processes in traditional hierarchical government organizations. Implementation of change requires time to allow for broad consultations, which are important to ensure support and a sense of ownership within the ICES community. Changes are implemented incrementally to align with opportunities and constrains embedded in the complex institutional landscape within which ICES resides. These insights can contribute to the development of strategies aiming to enhance the capacity to govern marine ecosystems and build resilience of social-ecological systems.
Introduction

The management of natural resources in western developed countries has traditionally been carried out by sector-specific agencies. This approach reflects a worldview where nature can be controlled and organized, where exploitation and economic growth are the leading principles, and where humans are seen as separate from nature (Holling and Meffe 1996; Ludwig 2001). The Millennium Ecosystem Assessment (MEA 2005) brought attention to the degraded status of ecosystems around the world, indicating that current management practices are failing. The recently coined term ‘the anthropocene’ reflects the recognition that human activities are influencing biogeochemical processes on a global scale (Steffen, Crutzen, and McNeill 2007). This increasing awareness of large-scale negative human impact on ecosystems also includes marine environments (Halpern et al. 2008). Humans depend on ecosystem services from the oceans and this dependence is likely to increase as populations in coastal areas grow (MEA 2005). In Europe, fish stocks are overexploited and consumers are depending heavily on imported seafood (EC 2009).

Governance of the oceans is challenged by the lack of institutions with authority to address problems across sectors and at appropriate spatial scales (Crowder et al. 2006), a dilemma recognized as ‘the problem of fit’ (Galaz et al. 2008). Ecosystem-based approach to management has been recommended as a way to address the challenge of governing marine resources sustainably (Levin and Lubchenco 2008; Arkema, Abramson, and Dewsbury 2006). This refers to an integrated approach focused on balancing societal needs, economic growth, and environmental protection. This approach is characterized by letting ecological principles, rather than political jurisdictions, guide the management process. It acknowledges that management should be based on scientific understanding generated by several disciplines (e.g. ecology, economics, sociology). It recognizes the need for systematic evaluation which allows improvements of management actions. Language including varieties of the term ecosystem-based approach to management is now common in steering documents influencing marine governance in Europe (e.g. CEC 2002; EU 2008; HELCOM 2007).

Making the ecosystem approach concept operational, however, remains a challenge. A shift from a traditional approach to ecosystem-based management involves reforming management structures, formulating new objectives, and redefining boundaries (Lamont 2006). Organizations involved in natural resource management are challenged to adjust to new realities, and this often necessitates organizational change. Examples of changes driven by the
striving for implementation of an ecosystem-based approach are the 1995-1997 reorganization of the U. S. Fish and Wildlife Service (FWS) (Danter et al. 2000), the 1998-2000 reorganization of the Great Barrier Reef Marine Park Authority (GBRMPA) in Australia (Olsson, Folke, and Hughes 2008), and the 2002-2003 reorganization of the Institute of Marine Research (IMR) in Norway (Misund and Skjoldal 2005). The Norwegian case was triggered by policy developments at national and international levels which led the IMR management to address the lack of ability to deliver the science and advice needed for holistic ecosystem based marine management. The IMR process was also influenced by the International Council for the Exploration of the Sea (ICES) implementing a strategic plan in 2002 which acknowledged challenges ahead for the marine science community in producing science and advice within an ecosystem context (ICES 2002b).

ICES is a more than 100 years old intergovernmental organization which coordinates and promotes marine science in the North Atlantic, including the North Sea and the Baltic Sea. Figure 1 illustrates ICES as one actor among many in the complex marine institutional landscape within which it resides. It is a knowledge network which produces science and advice which feed into the management of marine resources in the North Atlantic through 20 Member Countries and through the European Union (EU). ICES advice on fish stocks is the major scientific component feeding into the management of the Common Fisheries Policy (CFP), and ICES plays a key role in the science-policy interface of European fisheries management. As the EU Marine Strategy Framework Directive (MSFD) is being implemented, further emphasis is put on the need for moving away from sector-specific approaches (e.g. fisheries) to integrated marine management. This highlights the changing needs of managers and policymakers, and raises questions of the ability of ICES as well as other actors to respond to these changing needs.

Wilson (2009) recently contributed with an in-depth analysis of ICES with focus on its role at the science-policy interface of European fisheries management. Inspired by the Global Environmental Assessment Project’s use of the concepts saliency, credibility and legitimacy, he analyzed the trade-offs between these attributes of science in the context of the ICES fisheries advisory process. He found evidence of adaptive learning in the way ICES had taken on the challenge of implementing an ecosystem approach to fisheries management. This could be attributed to “creative tensions” within the ICES system, accompanied by pressures to address and resolve such tensions (2009, 259). He also found that constant negotiations between power centers within the ICES network generated mechanisms for transparency.
These processes helped ICES evolve to meet the challenge of adaptive, ecosystem-based approach to marine management. Wilson based his analysis on Communicative Systems Theory, which he states “suggests the possibility of a meaningful approach to understanding hybrid natural and social phenomena that has a systematic place for an analytical distinction between nature and society” (2009, 273).

Figure 1: ICES in its multi-level marine governance surroundings. The 20 ICES Member Countries each have their national priorities. Clusters of members are united by guiding documents at similar geographical scale. See list of Abbreviations for full name of examples given.

This study takes a step back from the frontiers of the science-policy interface and focuses on the dynamics of ICES change processes. The research approach taken is inspired by an emerging framework for analyzing the transformative capacity of social-ecological systems which recognizes that organizational change theory can contribute to the understanding of change in such systems (Folke, Chapin, and Olsson 2009; Olsson, Bodin, and Folke forthcoming). The recognition that systems go through phases, and that such phases have different characteristics linked to opportunities and constrains, can be useful when selecting a strategy for implementation of change (Dorado 2005; Westley et al. in preparation). The fact
that ICES is an international scientific network makes it different from the government agencies (FWS, GBRMPA, and IMR) mentioned above, implying different mechanisms for implementing change. By gaining a better understanding of the dynamics of change processes in different systems at different scales, tools and strategies can be developed so that changes towards more holistic management approaches can be stimulated and facilitated.

**Aim and research questions**

The aim of this study is to contribute to the understanding of how organizations involved in the governance of ecosystems change. It builds on the assumption that a shift towards more holistic approaches to marine management in the area of interest to ICES has brought the issue of ecosystem-based management to the ICES agenda, and triggered a response. Through an in-depth case study of 10 years of change processes, the mechanisms for picking up signals of the need for change and implementing change in ICES will be elucidated.

The following overarching question is addressed:

> How has ICES responded to new challenges as the marine management landscape is changing?

The following sub-questions guided the empirical case study:

a. What triggered ICES to initiate a strategic planning process in 1998? How has the change process evolved since then?

b. How is ICES as an organization different in 2009-2010, as compared to in 1998?

c. How are signals of need for changes picked up? Who takes on roles in making change happen?

d. What were the drivers of change? Which factors helped enable change? Can barriers to change be identified? Which strategies were used to overcome such barriers?

**Scope and limitations**

This study is not intended to be an assessment of whether ICES has succeeded in implementing an ecosystem approach. The focus is on the dynamics of change in ICES as an organization. Internal change processes are mapped out and analyzed to elucidate elements of such dynamics. It has been an ambition to identify major change processes illustrative of how ICES evolve. However, ICES is a large and multifaceted organization and activities at many different levels contribute to its development. The fact that other processes are left out does
not indicate their lack of importance. A 10 year perspective was chosen to capture the time period during which the ecosystem approach has been established as a guiding principle for marine resource management in the ICES area. The decade-long time frame allowed for a study of the most recent changes while at the same time allowing a certain degree of historical context.

ICES is one actor among many in the marine management landscape of the North Atlantic (Figure 1). This study does not attempt to evaluate whether the developments over the last decade have improved the way marine environments are managed. A successful outcome of a change process in this case would imply ICES being well positioned to fulfill its mission.

**Structure of thesis**
The next chapter describes the analytical framework. This is followed by a case study description which introduces ICES and its major structural components. The Methods chapter outlines the research approach, the methods used, and the analytical process. The Results chapter presents five major change processes identified; a strategic planning process, two reforms of the advisory structure, reform of the science structure, and reorganization of the ICES Secretariat. This chapter is written as a chronological narrative of each process and it includes several quotes from the interviews. It also includes perspectives on ICES as a network organization. This is followed by a Discussion chapter where the findings are related to literature and concepts introduced in the analytical framework, concepts that are also used to structure the analysis. Finally, the Conclusions chapter summarizes the major findings.
Analytical framework

This chapter outlines the conceptual frameworks which form the basis for the analysis in this study. Concepts related to resilience and transformation of social-ecological systems are described with a view of applying terminology found useful in addressing change in natural resource management systems when exploring the change processes of ICES. Additional concepts from organizational change theory are then described with a view of seeking a deeper understanding of change at the organizational level. This dual framework approach is inspired by recent work which suggests that insights from studies of how organizations evolve can help understand the dynamics of change in complex social-ecological systems, and vice-versa (Olsson, Bodin, and Folke forthcoming; Westley et al. in preparation). It is emphasized that this framework is not an established theory, but rather a transdisciplinary attempt to create analytical tools which can enhance our understanding of change in different systems.

ICES is a network organization and thus different from both complex social-ecological systems, for which the resilience-related framework is developed, and traditional government or business organizations which are in focus in much of the literature on organizational change. Concepts addressing specific issues related to network-based governance are mentioned to allow for exploration of how these can contribute to understanding the dynamics of ICES change processes.

Resilience and social-ecological systems

Resilience-related concepts are in development within a young branch of multidisciplinary research which is based on viewing ecological and social systems as interlinked. Walker and co-workers (2004) defines resilience as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks”, while Folke (2006) describes it as a perspective, a way of thinking, an approach, which can provide guidance for exploratory research and analysis of social-ecological systems.

The term social-ecological systems was used by Berkes and Folke (1998) to emphasize that humans are part of nature and to highlight that the separation of social systems and ecological systems is arbitrary and artificial. Such systems consist of interacting and interdependent physical, biological, and social components and can be defined at scales ranging from local to global (Chapin, Folke, and Kofinas 2009). The systems perspective implies defining boundaries and identifying factors of interest at the relevant scale. Setting boundaries,
however, does not signify that such systems are closed. Rather, they have porous interfaces allowing exchange with their surroundings.

A central metaphor in the resilience framework is the adaptive cycle, in which four phases termed exploitation, conservation, release, and reorganization forms a figure 8 loop (Gunderson and Holling 2002). The term panarchy refers to how several such loops are interconnected, capturing the multi-phase and multi-level aspects of complex adaptive systems. The adaptive cycle links the resilience framework with organizational change theory (below) in recognizing that different phases are important aspects of change processes. The capacity of a system for renewal and development are additional important dimensions of resilience. Integrating the social dimension puts focus on adaptive capacity, learning, and transformability.

**Changes as adaptive or transformative processes**

The three attributes resilience, adaptability, and transformability determine the future trajectories of social-ecological systems (Walker et al. 2004). Adaptability, or adaptive capacity, is defined as “the capacity of actors, both individuals and groups, to respond to, create, and shape variability and change in the state of the system” (Chapin, Folke, and Kofinas 2009, 23), while transformability is “the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable” (Walker et al. 2004). The distinction between an adaptive process and a transformation is that a transformation aims for a fundamentally altered system which is defined by new state variables and supported by new feedback mechanisms.

Chapin and co-workers (2009, 23) summarized important aspects of adaptive capacity as follows: “(1) biological, economic, and cultural diversity that provides the building blocks for adjusting to change; (2) the capacity of the individuals and groups to learn how their system works and how and why it is changing; (3) experimentation and innovation to test that understanding; and (4) capacity to govern efficiently by selecting, communicating and implementing appropriate solutions”.

The learning aspect of adaptive capacity has been described as a multiple-loop process (Pahl-Wostl 2009). Single-loop learning refers to a process where actions to improve performance are refined, but without changing the underlying assumptions or questioning established routines. Double-loop learning implies questioning of goals and the framing of problems. Priorities and boundaries of system analysis change, but changes are still within the given
structural constrains. In triple-loop learning, the whole structural context is transformed. This implies a whole new way of doing things, including changed norms and values. There is thus a link between transformation and triple-loop learning in that both refer to fundamental changes which involve re-conceptualizations at the system level (Folke, Chapin, and Olsson 2009).

For analytical purposes, separating change processes into phases can facilitate the understanding of their dynamics and help identify factors which are important as processes evolve. In a study of transformation towards ecosystem management of a wetland landscape in Sweden, Olsson and co-workers identified a preparation phase and a transition phase, linked by a window of opportunity (Olsson, Folke, and Hahn 2004). The next phase involves mechanisms for stabilizing the new system. Capacity building involving knowledge, networks, and leadership was identified as important when preparing a natural management system for change (Olsson et al. 2006). Understanding where you are, figuring out where to go, and developing a strategy for how to get there are important leadership tasks in navigating transitions (Olsson, Bodin, and Folke forthcoming). In a study of a shift towards ecosystem-based management of the Great Barrier Reef in Australia, detailed mapping of the chain of events helped identify drivers of change, barriers encountered along the way, as well as strategies used to overcome such barriers (Olsson, Folke, and Hughes 2008). Internal organizational change in the Great Barrier Reef Marine Park Authority (GBRMPA) which led the process was part of the strategy which facilitated transformation.

These broad descriptions of processes of change in social-ecological systems have many similarities with modern systems theory including the dynamics of complex adaptive systems as described in the 1960s and 1970s (Buckley 1998). Other scholars with background in studies of societal changes have developed a transition management framework which also has many similarities with resilience theory. Rotmans and Loorbach (2009) define a transition as “a radical, structural change of a societal (sub)system that is the result of a coevolution of economic, cultural, technological, ecological, and institutional developments at different scale levels” (2009, 185). Though they use the word “radical” to describe change, such change can be manifested in incremental steps which allow the system to adjust to the new circumstances. Rotmans and Loorbach suggest that their framework can contribute most within “nonenvironmental domains” (2009, 194), thus indicating a demarcation between their transition theory and the resilience framework. Van der Brugge (2009) analyzed similarities and differences between the resilience and transition frameworks. He concluded that they both
contribute to the understanding of structural change and renewal and thus can support management. However, the fact the frameworks have grown out of different disciplines; ecological conservation and sustainability science, respectively, gives different focus: “The resilience framework tends to focus on preserving the functioning of the social-ecological in the system and protecting it against external and internal disturbances. The transition framework focuses on transforming systems that are not desirable or sustainable” (van der Brugge 2009, 74). This thesis draws on concepts from both the above mentioned transformational frameworks in the analysis of ICES change processes. Given that the system in focus is an organization, organizational change theory can also provide useful analytical tools.

Organizational change

In their study of the organizational change of the U. S. Fish and Wildlife Service (FWS) as a component of ecosystem-based management mentioned above, Danter and coworkers (2000) used Kotter’s “eight steps for transforming your organization” (Kotter 1995, 61) as basis for the analysis. This framework highlights the importance of leadership in making change happen. In the early stages of a transformation, leaders are needed to create a clear vision. Next, efficient communication of the vision and empowering others to act on it become crucial leadership tasks. The FWS analysis showed that the implementation of ecosystem-based management increased the need for leadership, not only during the transition period, but also as the organization settled into the new management regime.

Richards and Smith (1997) studied change processes in three British government departments. They could identify circumstances where external and internal pressures combined to create windows of opportunity for change. Several of their interviewees compared departments to supertankers; “both take time to turn around” (1997, 63). Yet, change could happen if ministers with strategic intentions made use of windows of opportunity to instigate a ‘critical juncture’, i.e. a distinct and lasting change. ‘Agenda setters’ who could think strategically, enjoyed support from top level, and who had the ability to work with the grain of external and internal pressures, were found to play key roles. The above mentioned study draws on a theoretical framework for domestic structural change described by Cortell and Peterson (1999). They question the views that institutions are sticky and that change is episodic and characterized by crisis and punctuated equilibrium (Krasner 1984). In contrast, they see incremental change as an important mechanism for institutional transformation.
Mintzberg and Westley (1992) describes organizational change as a system of moving cycles, within which distinct aspects of change can be framed; contents and levels, means and processes, episodes and stages, and sequences and patterns. Their description of the various stages of organizational evolution; development, stability, adaption, struggle, and revolution, bears resemblance to the adaptive cycle mentioned above, a central metaphor in the resilience framework. Exploration of barriers and bridges between the resilience framework and organizational change theory has stimulated collaboration between scientists from different disciplines (Westley 1995). Further links between these schools of thoughts are emerging as a theory around transformation of social-ecological systems is evolving (Olsson, Bodin, and Folke forthcoming; Westley et al. in preparation). The insight that the different phases imply different opportunities and constrains when influencing change can be useful when selecting a strategy. For example, consultations with stakeholders to encourage innovation may be more fruitful in a development phase than in a phase characterized by stability. Dorado (2005) describes phases as organizational fields which can be either opportunity opaque, hazy, or transparent. In an opportunity opaque field resources and bound up and this gives limited opportunities for change. A field that is opportunity hazy is characterized by unpredictability and volatility, e.g. following a crisis or collapse. Finally, an opportunity transparent field implies possibilities to reconfigure well defined existing parts into new constellations. In adaptive cycle terminology this mirrors conservation, release, and reorganization phases, respectively. Strategic leadership becomes an issue of recognizing phases and navigating the system into a phase where change can happen. Such tasks require entrepreneurial skills.

Network-based governance
The network aspect of ICES as an organization influences how change processes are manifested. Adaptive capacity of different governance types including network-based governance has been described by Duit and Galaz (2008) as an interaction between exploitation and exploration. Exploitation is associated with activities which keep transactions costs low, while exploration involves more costly activities such as trial-and-error and learning. Governance types can be characterized as rigid, robust, flexible, or fragile based on the balance between these two attributes. Network-based governance scores low on exploitation and high on exploration, which makes such arrangements flexible compared to other government types. This flexibility is created by informal arrangements combined with actor diversity and opportunities for interactions. However, the same factors which provide adaptive capacity in one context may be limiting in others. As flexible network-based
governance depends on repeated interactions in order to develop a shared understanding of complex tasks, the capacity for quick responses to sudden disturbances is limited.

**Applying the analytical framework to understand ICES change processes**

Mintzberg and Westley (1992) argue that understanding of organizational change require analysis within a rich context. This study exemplifies developments in this direction. ICES as an organization defines the boundaries of the system analyzed. The analytical approach taken is to identify and map out several change processes over a 10-year time period. Drivers of change, barriers to change, as well as strategies to overcome such barriers are studied to elucidate the dynamics of ICES change processes. Concepts mentioned above are used to structure the discussion and are referred to when found appropriate to describe and help understand the observed dynamics of change.
**ICES as a case study**

There were several reasons for selecting ICES as a case study of change. Ongoing activities on the political arena including the implementation of new directives within the EU (e.g. the MSFD) and the reform of the CFP generate attention on the need for scientific advice on the status of the marine environment. ICES’ key role in the marine science-policy landscape in Europe in times of change justifies a closer look at its adaptive capacity, as the ability of ICES to continue to deliver what its clients need becomes crucial. The international dimension adds complexity, which is illustrative of the challenges facing governance of large marine ecosystems. A more than 100 years of well documented history allows for research from a wide variety of perspectives. These factors open up for a multitude of analytical approaches on the dynamics of change.

**ICES facts and figures**

A wealth of information about the components and activities that make up ICES are found at the website http://www.ices.dk. Some facts and figures are summarized in Table 1. ICES was formed in 1902 as an international organization promoting marine science. The Convention is the formal steering document which defines the scope of ICES activities, which is: “(a) to promote and encourage research and investigations for the study of the sea particularly those related to the living resources thereof; (b) to draw up programmes required for this purpose and to organise, in agreement with the Contracting Parties, such research and investigations as may appear necessary; (c) to publish or otherwise disseminate the results of research and investigations carried out under its auspices or to encourage the publication thereof” (ICES 1964). As ICES celebrated its Centenary, the development from when it all started to a modern intergovernmental organization at the turn of this century was well documented. Rozwadowski (2002), a historian, recounts a detailed story of how ICES has evolved and navigated through a changing political landscape including two World Wars and a Cold war. Collaborations on hydrographic measurements and fisheries-related issues were on the agenda from the beginning, when eight countries were part of the initial initiative. Today, ICES has 20 Member Countries including all countries with a coastline to the Northeast Atlantic and the Baltic Sea, plus Canada and the United States.

ICES provides scientific information on a broad range of marine science issues, including oceanography, fisheries, and environmental pollution. The customers of ICES advice are the governments of the Member Countries and the so-called Client Commissions (see Table 1).
The European Commission (EC) regularly requests fisheries advice from ICES on approximately 40 species through the Directorate-General for Marine Affairs and Fisheries (DG MARE) (EC 2007). Recently ICES has also received requests through the Directorate-General for the Environment (DG ENV) concerning a need for indicators to support an ecosystem-based approach to marine management, a development which highlights the need

Table 1. Facts and figures about ICES

<table>
<thead>
<tr>
<th>Issue</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governing document †</td>
<td>ICES Convention (1964), registered with the Secretariat of the United Nations by Denmark as the depository Government</td>
</tr>
<tr>
<td>Geographical Area †</td>
<td>North Atlantic and adjacent seas</td>
</tr>
<tr>
<td>Vision ‡</td>
<td>To be an international scientific community that is relevant, responsive, sound, and credible, concerning marine ecosystems and their relation to humanity</td>
</tr>
<tr>
<td>Mission ‡</td>
<td>To advance the scientific capacity to give advice on human activities affecting, and affected by, marine ecosystems</td>
</tr>
<tr>
<td>Member Countries</td>
<td>Belgium, Canada, Denmark (including Greenland and Faroe Islands), Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, the United Kingdom, and the United States of America</td>
</tr>
<tr>
<td>Affiliate Countries</td>
<td>Australia, Chile, Greece, Peru, and South Africa</td>
</tr>
<tr>
<td>Institutions in the ICES network ¶</td>
<td>Ca. 200</td>
</tr>
<tr>
<td>Scientists in the ICES network ¶</td>
<td>Ca. 1600</td>
</tr>
<tr>
<td>Expert Group activities 2009 ††</td>
<td>60 EGs were involved in the provision of ICES advice 40 EGs were responsible of review and drafting of advisory text 430 meeting days, 1510 participants, and 5700 person days were invested by science and advisory groups</td>
</tr>
</tbody>
</table>

† (ICES 1964); ‡ (ICES 2008a); † (ICES 2008a); | http://www.ices.dk/aboutus/ourmembers.asp (verified 2010-05-16) ¶ http://www.ices.dk/aboutus/aboutus.asp (verified 2010-05-16); # (ICES 2009b); †† http://www.ices.dk/InSideOut/jan10/structure.html?WT.mc_id=Newsletter_2010_1 (verified 2010-05-16).
for scientific advice to support the MSFD. Advice requested by the Commission for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) typically concerns monitoring guidelines for pollutants and biological effects of contaminants.

![ICES structure diagram]

Figure 2. ICES structure 2010. Shaded boxes indicate structures that have been reorganized during the time period in focus in this study. Source: Redrawn from http://www.ices.dk/aboutus/images/structurediagram.htm (verified 2010-05-16).

**ICES structure and actors**

An overview of the current organizational structure of ICES is shown in Figure 2. The Council is the major decision-making body of ICES. Each Member Country appoints two Delegates to the Council. The Council meets once per year and is chaired by the ICES President. The Bureau is the executive branch of the Council which forms the link between the Delegates and the Secretariat. It consists of five Delegates elected among the Council members in addition to the President and First Vice-President. The Finance Committee has five Delegates including Denmark’s representative in the role of host country for the Secretariat. The Council, the Bureau, and the Finance Committee have not undergone structural changes during the decade in focus of this study. However, the working procedures
of the Bureau and Finance Committee have been adjusted and authority has been delegated from the Council to the science and advisory programs as part of the reform process.

The Advisory Committee (ACOM) has the overall responsibility for preparation and dissemination of ICES advice to clients. Each Member Country appoints one member to ACOM. The SCICOM Chair, the General Secretary, and the Head of Advice at the ICES Secretariat are ex-officio members. The advisory structure has been reformed twice during the period in focus of this study. The current advisory program has been in place since January 1, 2008.

The Science Committee (SCICOM) is charged with the responsibility of enabling the delivery of the ICES Science Plan (ICES 2009d). Each Member Country appoints one member, and SCICOM can appoint up to five additional members. The ACOM Chair, the General Secretary, and the Head of Science at the ICES Secretariat are ex-officio members. The science structure has recently been reformed. The current science program has been in place only since 1 January 2009.

The Expert Groups (EG) are in many ways the backbone of ICES. EGs encompass working groups (WG), study groups, as well as various planning groups and groups affiliated with workshops. EGs are populated by scientists from the ICES community. WGs typically meet once per year for a period of a few days to discuss and report back to their parent committee on predefined Terms of Reference. There are currently around 100 active EGs in the ICES structure (see Table 1 for statistics which illustrate EG activities during one year). Examples of the wide range of topics that are covered by the EGs include; deep water ecology, marine chemistry, effects of extraction of sediments on the marine ecosystem, fish stock assessments, integrating surveys for the ecosystem approach, data and information management, and fisheries acoustics science and technology. The evolution of ICES includes initiation of new EGs and restructuring or closing down existing ones. This aspect of ICES changes will not be further elaborated on in this study.

There are currently around 1600 scientists involved in ICES activities, representing around 200 different institutes. These are typically national government research institutes with focus on fisheries and marine science. The cost of the scientists’ engagement in ICES activities including participation in EGs and time spent on intercessional work is covered by the Member Countries through the scientist’s home institution. It is an ongoing discussion within
ICES around how to attract expertise from a broader base, including researchers at universities from both natural sciences and social science disciplines.

Each Member Country pays an annual fee to cover the expenses of running the ICES Secretariat, which is located in Copenhagen and is led by the General Secretary. The Secretariat is responsible for the day-to-day operations, ensuring that the Council decisions are put to life. This involves providing support to all ICES committees and EGs. At the time of this study there were 53 staff members working at the Secretariat, including the ICES Data Center. The Secretariat was reorganized during the time period in focus of this study.

ICES produces a number of publications, including the scientific journal ICES Journal of Marine Science, ICES Advice, research and symposia reports, and newsletters. ICES organizes the Annual Science Conference (ASC), a week-long event with presentations of scientific papers and posters which serves as a meeting place for several hundred scientists and stakeholders affiliated with the ICES community.
Methods

This chapter describes the research approach of this study. The investigation was carried out as an exploratory, in-depth case study using qualitative methods which have their disciplinary affiliation within the social sciences.

A case study

A case study is an appropriate methodological approach when studying real-life, contemporary phenomenon or events, including organizational and managerial processes (Yin 2009). Additional criteria guiding researchers to the application of a case study approach include having research questions in the form of “why” and “how”, and that the phenomenon in focus is outside of the control of the investigator (Yin 2009). Application of a case study approach requires a clear definition of the boundaries of the case. The focus of this study is on ICES as an organization, specifically on the changes this organization has been through in a 10-year perspective. The considerations described in the Analytical framework chapter guided the formulation of research questions. This study aspires to contribute to the evolution of the analytical transformation framework by adding insights based on empirical data. It was thus a goal to design the study in a way which encouraged new perspectives to evolve and to not be limited by a pre-defined theory.

Data collection

Semi-structured interviews were chosen as the primary approach of empirical data collection, complemented by observations and review of ICES-related documents. The three approaches supplied different kinds of information and provided opportunities for triangulation. The interviews were used to identify recent change processes which were considered important among the ICES community. Subsequently, descriptions of the processes and events alluded to in the interviews were identified in ICES documents. Observations gave an opportunity to relate the data from interviews and documents to the real-life operations of ICES.

Interviews

Kvale and Brinkman describe a semi-structured interview as an “interview with the purpose of obtaining descriptions of the life world of the interviewee in order to interpret the meaning of the described phenomena” (2009, 3). By life world they mean “the world as it is encountered in everyday life and given in direct and immediate experience, independent of and prior to explanations” (29). In this study it was the phenomenon, i.e. ICES change
processes and their dynamics, that was in focus. The interviewees served as informants providing insights based on their own experiences.

An interview guide (Appendix 1) with open-ended questions was designed to help focus the interviews on issues related to the research questions. The guide served as a support tool for me as investigator but was not strictly followed in all interviews. Instead, the interviewees were encouraged to bring up additional issues and to elaborate on aspects that they felt were particularly important. A picture of the change processes that were considered most important emerged after the first few interviews. Some of the later interviews focused on getting in-depth insights into these particular processes to help understand the dynamics around how they evolved.

Interviewees were selected using snowball, i.e. chain referral, methodology (Bernard 2006). An informant familiar with ICES suggested a few names that were judged to be useful starting points. These were contacted via e-mail asking whether they would be available for a face-to-face interview during the Annual Science Conference (ASC) in Berlin 21-25 September 2009. They were also asked to suggest others who could provide insights into recent ICES change processes. A second point of entry for a snowball sample was initiated based on my own personal contacts from previous professional engagements in marine research. The names suggested by the two alternative entry points overlapped to a large degree after only two rounds of chain referral. This was taken to indicate that the people identified in these initial stages were regarded as closely associated with processes and events that were of interest to this study.

A total of 17 interviews were conducted during the ASC and three during a visit to the ICES Headquarters in Copenhagen. One informant was interviewed via telephone. The average length of the interviews was 50 minutes. The interviewees are listed in Appendix 2. The list includes officials at the ICES Secretariat and representatives from one of the Client Commissions as well as scientists in current or past roles as ICES Presidents, Delegates, and chairs of science and advisory committees. Several of them were directly engaged in the change processes analyzed in this study.

The interviewees were given a brief oral introduction about the study including information on how the collected material would be used. All the face-to-face interviews were recorded and transcribed, yielding a total of 15 hours of recordings and nearly 200 pages of transcripts. With a few exceptions, the interviews were conducted in English. Interviews with informants
whose mother tongue was Norwegian or Swedish were conducted and transcribed in these languages and only translated into English if quotes were used.

**Observations**

I participated as an observer at the first SCICOM-ACOM joint meeting and a SCICOM meeting which took place adjacent to the ASC in September 2009. The role as observer in this context meant taking a seat in the back of the room and not participating in the discussions. Being an observer provided opportunities to learn about the issues that were on the agenda and gave insights into the dynamics of ICES committee meetings.

I also participated as an observer at the meeting of the Working Group on Fisheries Systems at the ICES Headquarters 12-16 October 2009. This WG is somewhat unique in the ICES system in that it attracts participation of both natural scientists and social scientists. The role as observer in this context meant being part of the group and participating in the discussions. It provided an opportunity to gain an understanding of how an ICES WG addresses its Terms of Reference and produces a report, though recognizing that the 100 EGs all have their own unique dynamics.

**Review of documents**

ICES produces a large amount of business documents every year. There is a tradition to give detailed written accounts of the discussions held in workshops, committees, and Council meetings which greatly enhanced the usefulness of such documents as empirical material for this study. Information provided by the interviewees helped guide the search for documents which were of interest to this study. Events and processes mentioned could be identified in minutes from committee and Council meetings. This made it possible to map out the timelines and identify milestones such as Council resolutions representing decisions on how the processes in question were to proceed.

Annual Reports 2000-2008 which contain minutes and resolutions from Council meetings as well as documents from the science and advisory committees were at the time of this study available online via the ICES website. Older documents were obtained from the Swedish EPA library. Digital copies of additional documents of interest were kindly supplied by the ICES librarian. One of the informants brought documents to the interview which provided useful background for the process which is described below as the first part of the advisory reform.
Analysis

The transcripts were analyzed using ATLAS.ti qualitative data analysis software (http://www.atlasti.com). The software facilitates working with coding of text, which again can facilitate extraction of meaning from a large amount of material. The generation of a coding scheme was inspired by examples described by Miles and Huberman (1994), who define codes as “tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study” (56). No pre-defined list of codes was used from the start. Instead, codes were allowed to evolve organically as I worked with the data. This was to allow the empirical data to stimulate thinking about theoretical aspects, rather than letting a pre-set theory constrain the data analysis. This approach is inspired by grounded theory (Glaser and Strauss 1967) in which theory is developed ‘bottom-up’ from observations and interviews. The aspects outlined in the Analytical framework chapter provided input for a ‘top-down’ approach, allowing the empirical data to also be analyzed with a view to existing or emerging theory. The aim of this dual approach was to allow the richness of the data, which was based on meaning generated in the interview process, to contribute to further development of theoretical aspects.

The research questions provided a framework for choosing the codes to be linked to the transcripts. The texts were revisited several times and codes were added and altered in an iterative process. A total of 43 codes were assigned to the transcripts, exemplified by the following terms; barriers, strategy, leadership, people, events, urgency, ecosystem approach, integrated advice, science-advice dynamics, and national representation. Business documents were not coded, as these were not analyzed with a view of generating new meaning in the same sense as the interview data. Rather, the documents served primarily to establish time lines and to add details to the events and processes mentioned by interviewees.

Reliability, validity, and generalization

Qualitative methods require transparency in all steps of the research process to allow for critical evaluation of the findings. The details provided above concerning research design, data collection, and analyses contribute to such transparency. This section addresses further issues related to the methods used and my role as investigator with focus on reliability, validity, and generalization.

Reliability addresses whether the outcome of the research is consistent and trustworthy. Reliable scientific findings imply that they are reproducible, either by the same investigator
repeating the study or by other researchers arriving at similar outcomes when performing similar studies (Kvale and Brinkmann 2009). Using semi-structured interviews as part qualitative methodology raises several issues related to reliability. Skills are needed to avoid bias which can be introduced in all stages of the investigation, e.g. by leading questions during interviews or by lack of objectivity when coding transcripts (Kvale and Brinkmann 2009; Miles and Huberman 1994). My background as a natural scientists meant acquiring new skills in order to design and conduct this study. Guidance was sought in the literature as well as from researchers at the Stockholm Resilience Centre and the Stockholm Environment Institute who had experience with qualitative interviewing. Prior to conducting this study, I was already familiar with ICES from being a member of the Working Group on Environmental Assessment and Monitoring and Strategies in the mid 1990s and from presenting a paper at the 1995 ASC. However, I had very little pre-knowledge of the recent change processes which were the focus of this study. To limit the effect of interviewer bias, an effort was made to pose open-ended questions with support from the interview guide (Appendix 1) and let the interviewees tell their story without interruptions other than for clarifications. All transcribing and coding was done by me. Files of transcripts and coding schemes are stored as part of the research material, contributing to transparency.

Validity in the context of social science research refers to whether the method used investigates what it intends to investigate (Kvale and Brinkmann 2009). Validation should be incorporated into every step of the research process by questioning the credibility and trustworthiness of the findings. Combining semi-structured interviews with review of documents and observations was seen as a way to allow for both data triangulation and method triangulation. The selection of interviewees raises the question of representativeness. Informants were chosen based on their involvement in recent ICES change processes. There was thus no attempt made to sample randomly in order to capture diverging views. Only one of the Client Commissions was represented among the informants, which limited the possibility of including external stakeholder perspectives on the ICES change processes in the analysis. As scientists engaged in the ICES community reside in 20 different countries around the North Atlantic, presence at the ASC 2009 served indirectly as a selection criterion for face-to-face interviews. With one exception, all those who were suggested as informants during the first two rounds of snowball sampling were present at the ASC and served as informants. Later interviews provided opportunities to address issues that had been mentioned by other informants and which needed clarification. One of the informants reviewed a draft of
the thesis to help identify any factual errors and omissions. In addition, two of the
interviewees were contacted for follow-up dialogue to ensure that their contributions had been
understood correctly and that the use of quotes was acceptable.

The research approach, which includes analyzing several change processes within ICES
during a 10 year period, allows for some generalizations to be made in terms of the dynamics
of change within such a network organization. The in-depth case study approach provides
opportunities for follow-up comparative analysis, addressing similarities and differences
between ICES and other organizations.
Results
ICES change processes over the last 10 years have been manifested both as evolution of new guiding documents and as reform of several organizational structures. An overview of the time line of these processes and products is shown in Figure 3. Here these changes will be mapped out and presented chronologically, starting with the process which led to the first ICES Strategic Plan. The advisory structure has been reformed twice during the time period of interest to this study. This change will be described as two consecutive processes, separated by the reorganization of the ICES Secretariat. Next, the reform of the science structure will be presented. Following the structural changes, aspects of dynamics of change related to ICES being a network organization are highlighted.

![Diagram of ICES change processes 1998-2010](image)

Figure 3. Evolution of ICES change processes 1998-2010. Shaded boxes show processes which led to organizational change. White boxes refer to processes which led to new guiding documents. Arrows indicate how the processes influenced each other.

Strategic planning
The current ICES Strategic Plan ‘A vision worth sharing’ mentions ICES embarking upon its first strategic planning process in 1998 (ICES 2008a). This triggered the idea of letting that
event mark the starting point for this study. An interviewee commented on this choice of time frame for capturing ICES changes:

Q 1: I guess 10 years ago is an interesting change that occurred. Let me say that our change has been continuous probably throughout the history of the organization. It’s actually in some ways viewed as quite old ... and stagnant. It probably isn’t as much so as people might think. My experience is that things are changing constantly.

The backdrop of the initiation of a strategic planning process was the recognition by the Council of new challenges ahead following geopolitical developments and recent international agreements and events (ICES 1998a). The 1992 Rio Summit, the 1995 adoption of the FAO Code of Conduct for Responsible Fisheries, and the 1997 Intermediate Ministerial Meeting on the Integration of Fisheries and Environmental Issues were examples of international developments that had highlighted the need for integration of scientific disciplines to facilitate more holistic approaches to environmental management. Sustainable development, conservation of biological diversity, application of the precautionary approach, and the need to develop an ecosystem approach to management were on the agenda at international, regional, and national levels, with implications for the future work of ICES (ICES 1997a, 1998a). It was also recognized that the launching of large international collaborative research programs as a response to large-scale complex problems such as climate change would have increasing impact on ecosystem modeling and forecasting, i.e. tasks that were central to ICES work. In addition, the European Union (EU) membership was expected to expand. This would lead to increased overlap between EU and ICES membership and EU’s environmental and fisheries policies were expected to get increased significance (ICES 1998b).

When the Council assembled for their 1997 meeting in Baltimore, the science committees had just been restructured to facilitate integration between disciplines. A recent effort to restructure the advisory committees had not resulted in any organizational changes. The need for stronger ties between the core science program and the advisory process was recognized, as was the need for clearer priorities of issues to be considered “core”. Financial implications of increased expectations on ICES deliverables highlighted the need for prioritization and long-term planning. In light of these challenges, the Delegates agreed that the need for strategic planning had never been greater and that the strategic planning process should proceed “with a sense of urgency” (ICES 1998a, 56).
The Council decided to establish a Bureau Working Group on Strategic Planning, which was given the tasks of (1) drafting a vision statement and long-term goals; (2) providing guidelines for preparation of a strategic plan; (3) identifying ways of obtaining input from stakeholders; (4) linking a strategic plan to the ICES budget; (5) linking a strategic plan to national plans and priorities; (6) ensuring communication about the plan with stakeholders; and (7) presenting a timetable for a strategic planning process (ICES 1998a). The group was chaired by the U.S. Delegate who had initiated the Council discussions regarding the need for defining priorities. The resulting working group report was well received by the 1998 Council Meeting, and it provided guidance for the subsequent development of a Strategic Plan (ICES 1999). The group acknowledged the need for quick progress towards an initial document. However, engaging stakeholders both within and around ICES in the process to ensure a sense of ownership of the final product was also considered crucial and the time table allowed for extensive consultation. The upcoming Centenary was recognized as window of opportunity for reflection and renewal for ICES (ICES 1999). A draft plan was adopted by the 1999 Council meeting in Stockholm and subsequently widely distributed as part of the consultation process (ICES 2000b). An Open Forum was arranged adjacent to the year 2000 ASC in Brugge to further stimulate dialogue around the draft plan. At this stage the idea of creating two separate documents was launched; one Strategic Plan with overarching goals and priorities, and one Action Plan addressing how the Strategic Plan would be implemented. This separation helped solve dilemmas around defining the target audience for a strategic plan and level of detail needed. The first ICES Strategic Plan was adopted by the Council 2001 (ICES 2002a). The proposed Action Plan was subsequently drafted by the Consultative Committee (ConC) and adopted by the Council 2002 (ICES 2003). It was recognized that both plans would need updating at appropriate time intervals.

The first Strategic Plan signaled new ways of operation for ICES. It acknowledged the importance of an ecosystem approach in broad terms by stating that “the need for scientific advice to manage marine living resources in an ecosystem context to ensure sustainability has never been greater, and this advice will require a stronger and more comprehensive scientific foundation than ever before” (ICES 2002b, 5). The ecosystem approach was only explicitly mentioned when specifying activities to meet the goal of providing advice on the sustainable use of living marine resources and protection of the marine environment, i.e. to “further develop practical ways of applying the precautionary approach and the ecosystem approach,
including the possible use of indicators of sustainability for fisheries” (ICES 2002b, 9). This reflects the challenge of making the ecosystem approach operational in the ICES context.

A few years after implementation of the 2002 Strategic Plan both positive and negative aspects could be identified. While it was recognized that it had been useful in stating goals for ICES (ICES 2006b), the strategy to involve stakeholders within and around the ICES community in the evolution of the plan also had its drawbacks. An interviewee commented:

**Q 2: Between the number of iterations that went on between the Bureau and the Delegates for the top-down input, and going to the science committees to get the bottom-up input, the Strategic Plan became one of these vague documents where everything that anybody cared about had a home. And as soon as you create a Strategic Plan like that you don’t help priority setting at all. You give everybody a niche where everybody can say: We have a Strategic Plan and see, the things that I do can be found in it! It became a security blanket rather than a hard nose look at where should we be putting the marine science talents of Europe.**

A revision was initiated 2006 and a new ICES Strategic Plan ‘A vision worth sharing’ was adopted by the Council 2007 (ICES 2008a). The ICES vision and mission were reaffirmed. The new Strategic Plan outlined a structure for ICES guiding documents consisting of separate plans for the science and advice programs as well as for the Secretariat. These three multiyear plans have now been produced; ICES Science Plan (2009-2013) (ICES 2009d), ICES Advisory Plan (2009-2011) (ICES 2009a), and Secretariat Plan 2009-2011 (ICES 2009c). Together, these documents give an overview of current priorities for ICES.

**Reform of the advisory program 1999-2000**

This section describes the first of two reforms of the advisory structure which occurred during the period of interest to this study. The history of the evolution of advisory activities within ICES prior to 1999 is documented by Rozwadowski (2002). Figure 4 illustrates the advisory structure before and after the 1999-2000 reform described here. At the outset, the structure consisted of two committees; the Advisory Committee on Fishery Management (ACFM) and the Advisory Committee on Marine Environment (ACME).

When the Council discussed the advisory process and structure at the 1999 meeting in Stockholm the issue was a familiar item on the agenda. A Bureau Working Group on the Restructuring of ICES Advisory Committees had recently suggested improvements (ICES 1997b). However, this had not led to any major changes. A Coordinating Group on ICES Advise had been implemented, but this was not felt sufficient to address the problems facing
the advisory structure (ICES 2000a, 2000b). An interviewee commented on how the Council struggled to find a common vision of what an improved advisory program might look like:

**Q 3: ICES had spent 1997-1998-1999... saying: We need to change the advisory structure and the processes. How do we do it? And a proposal would come up. And people; Delegates and members of the Committees were saying: No we want something different, not that proposal, we want this idea! And the first one would say: No, we don’t want that, we want this! And then the third idea would come forward. And the whole subject kept being tossed around in endless discussions for three years. And then the President... would say: This is ridiculous! We have got to do something. It may not be the best thing, but we want to do something. Let’s find out what the key issues are and address those in the best way we can. It may not be perfect, but let’s do something to get it started.**

Figure 4. ICES advisory structure before and after the 1999-2000 reform process. Expert Groups (EGs) produce the science foundation for the advice. Source: Redrawn based on ICES 2002a.

The Council decided to establish yet another working group, this time the Bureau Working Group on the ICES Advisory Process. The group was given the task to “advise on modifications to the ICES Advisory Process that will: (1) Improve the management of the Advisory Process and Committees and address questions of their programme and workload, and those of their Working Groups, and (2) Facilitate the efficient and flexible delivery of quality integrated advice of fisheries and environmental issues” (ICES 2000a, 63). The group started out by identifying 10 key problem areas, which after consultation with Delegates and feedback from advisory committee members could be condensed to five key issues and
problems: (1) workload, (2) management of the advisory process, including strategic leadership, (3) integration, (4) flexibility, and (5) quality (ICES 2000b). An interviewee who was part of the group explained what the five key issues were about:

(1) Q 4: Chairing an advisory committee was about half a year of full time work. And by definition, it has to be a pretty senior scientist. And senior scientists are busy! ... So to take six months full time work out of that is quite an imposition.

(2) Q 5: [We needed to tell] the Client Commissions: Listen, that question is the wrong question! Nobody can answer that question. You should break the question down into these parts. Then ICES on its own, or ICES and somebody else can begin to address it. But it may need five-six years of research before we can actually come up with an answer. And nobody was really saying that, giving that kind of message effectively to the customers, who - as a result - were disappointed, because ICES had - correctly in my opinion - sold itself to the customers as being able to tackle virtually any questions to do with marine science. So we could! We did! Over many decades! But by the 2000s ... there were questions straddling the specializations. The ecosystem questions of interaction between different species groups and so on, that were so highly specialized, new specializations, that neither of the existing Advisory Committee on Environment or Advisory Committee on Fisheries could really tackle them adequately. The customers needed to be told that.

(3) Q 6: Integrated advice on fisheries and environment is increasingly needed by the recipients. And the group realized that that led back to how national research programs are organized. Integrating the advice is difficult because there is little or no integrated research! No bark, no answers.

(4) Q 7: The customers, Member Countries and the regulatory Commissions, were all saying: We need the advice earlier, earlier! But, they didn’t understand at first - and then we had to explain to them - that we cannot just think up this advice by getting people around the table.

(5) Q 8: A quality control of policy was badly needed. We had quality control through the system, but not in a sufficiently transparent way.

Based on this inventory of key problems, the Bureau Working Group concluded that the existing advisory process was not functioning satisfactorily, that substantial improvements were urgently required, and that achieving these improvements would probably necessitate structural change (ICES 2000b). This was a clear message to the Council, highlighting both the urgency and the need for action.

The working group proceeded with drafting several alternative models for a new advisory structure including a subject model, a regional model, and a single advisory group model. The alternatives were then evaluated based on a set of pre-defined criteria. The final proposal suggested keeping ACFM and ACME, and adding two new committees to the advisory
structure (Figure 4). A new Advisory Committee on Ecosystems (ACE) would be given responsibility for advice that would integrate marine environment and fisheries considerations. ACE was also envisioned to be at the forefront of developing advice on ecosystem management. A new overarching Management Committee for the Advisory Process (MCAP) would be empowered to coordinate the advisory process and manage the work of ACFM, ACME, and ACE (ICES 2000b). During lengthy elaborations around this proposal at the 2000 Council meeting in Brugge, many of the familiar concerns were again raised. On several occasions during the discussions the President reminded the Delegates of the thorough analysis done by the Bureau Working Group. He pointed out that the proposal represented their consensus view and that the report highlighted the urgent need for a reform. Finally, the proposed structure was adopted (ICES 2001).

The major achievement in this first round of the advisory reform process was possibly the change itself, getting past the deadlock in the Council. However, as the new structure got settled and the advisory work proceeded, it became clear that several of the old problems remained. The envisioned role for the new ACE in meeting the clients’ need for integrated advice and in driving the development towards advice for ecosystem-based management looked good on paper. In practice, however, this proved to be a difficult task. An interviewee commented:

Q 9: [The new] Advisory Committee on Ecosystems, ACE, [was] intended to fill a gap. But what happened of course is that as soon as you create an entity which is supposed to fill a gap, then you have got a gap on each side. So you have created two gaps! ACE, ACFM, and ACME coexisted in a moderately harmonious status for about five years before it became clear that many things coming to ICES couldn’t be neatly packaged to one or the other. Questions ACE had to answer couldn’t be answered without ACFM expertise. ACME - the same thing.

The last phase of the first advisory reform was thus partly overlapping with the first phase of the next one, implying a growing awareness of a need for more change. However, before the next round of reform the Secretariat was reorganized. Some interviewees highlighted this as instrumental for the onset and outcome of the second advisory reform process.

Reorganization of the ICES Secretariat 2004

Figure 5 shows the organization of ICES Secretariat before and after the 2004 organizational change. The operation of the Secretariat is the responsibility of the ICES General Secretary. Considered an internal business issue, this organizational change could be implemented by
Figure 5. Organizational charts of the ICES Secretariat before and after the reorganization year 2004. Some modifications have been made after 2004. A simplified version of the current structure is also shown. Sources: Modified from ICES 2004a, 225, 2006a, 282 and http://www.ices.dk/aboutus/images/structurediagram.htm (verified 2010-05-16).
the General Secretary in collaboration with the ICES President. The changes required the approval of the Bureau, but did not require the formalities associated with Council resolutions. The former Environmental Processes section, which dealt with oceanography and environmental issues, and the Living Resources section, which dealt with fisheries, were abolished. Two new sections named Science Programme and Advisory Programme were created. All data handling which had previously been divided between sections was integrated into a new Data Centre (ICES 2005a). An interviewee who was involved in this reorganization process mentioned increased efficiency, the moving away from the stove-pipe culture of the former sections, and fostering integration as the major aims of the change. In hindsight, he saw the creation of the two science and advisory programs in the Secretariat as influential for how the upcoming advisory and science reforms evolved. A united Data Centre further stimulated integration. The current overall structure of the Secretariat is similar to the outcome of the 2004 reorganization. A Secretariat Plan (ICES 2009c) specifies the role and goals of the Secretariat in supporting the science and advisory committees as well as other groups.

Reform of the advisory program 2005-2008

The recent reform of the advisory process was a dominating issue brought up during the interviews in September 2009, illustrating its importance for the ICES community. Figure 6 shows the structure before and after this latest reform.

Client satisfaction had been addressed in the 1999-2000 advisory reform process described above. Informing the clients about the way ICES operates as well as prerequisites necessary for ICES to be able to answer questions satisfactorily was thought to be part of a solution (Q 5 and Q 7). Two interviewees commented on how the issue of client satisfaction reemerged with increasing intensity:

Q10: ACFM would meet twice per year; May and October. ACE and ACME would only meet once per year; end of May or early June ... The way decision-making happens has changed so much. [The Client Commissions and the Member States] can no longer wait ... If you have a question in October you are not going to wait until May to get an answer to it.

Q 11: [When] we were at a Delegates meeting the European Commission held a meeting on the fringes, and basically said they will not ask ICES for advice anymore. It had become irrelevant. This was a major jolt for ICES.... A major client who pays considers ICES irrelevant. It was something wrong with the organization.
The increasing pressures emerging from frustrations with ICES not being able to handle requests properly were felt by the committee chairs:

*Q 12: This is just not working ... there had to be a radical overhaul with the advice. So when I met the ConC Chair...we got talking about this. And he wanted to do the same job in science. He felt science wasn’t relevant anymore. It wasn’t talking to advice. I totally agreed. What happened was that momentum started to build for change.*

Previous advisory reform attempts including the 1999-2000 process described above had formally been initiated by the Council in a process involving establishing a working group which got its Terms of Reference specified in a Council resolution. This next round followed a slightly different path. A committee chair recalled:
Q 13: I gave a presentation at an MCAP meeting, and it was just an aside in the presentation: There needs to be reform. And then the question was raised: How would you do this reform? So I presented a paper at the next Bureau meeting on how I would see a new structure. It was pretty much along the lines it has come to now, but not quite. It involved having an advisory committee. And people began to support this idea.

Without the formalities of a Council resolution to support the process, the next steps developed as an activity within MCAP while keeping an open dialogue with the Bureau. The committee chair continued:

Q 14: I had to ask: Could we have a special meeting? In Dublin, in the summer of 2006 ... two days. And we invited not alone the MCAP people, but people from the Bureau to support it, plus people we knew were dead against it. It is the old Roosevelt thing: Bring them into the tent! To me that was the meeting that built up the momentum of change, because the Delegates who were against it got there to put in their proposals. We looked at various models. We began to change and evolve the model. And it was gaining support from that meeting. What we came with from that meeting was: Yes, this could work! We now have a model that people could buy into.

A detailed roadmap on how to bring the process forward from the July 2006 meeting to a final implementation of the new model in 2008 was created (ICES 2006e). This involved informing the Delegates, the ConC, and EG Chairs prior to and during the upcoming ASC in Maastricht in September 2006. It also involved engaging in dialogue with the clients. A committee chair explained how this was a strategy not only to ensure input from clients to improve the process, but also to show clients that something was happening and to gain their support:

Q 15: … from an early stage the major clients saw that ICES wasn’t this old organization looking back. They saw that ICES was open to reform. They saw the reasons for the reform.

Getting a formal approval from the Council was seen as crucial in order for MCAP to bring the process forward according to the time schedule as outlined in the roadmap (ICES 2006d). The 2006 Council meeting did adopt the MCAP proposal in principle (ICES 2007a). This meant a green light for the MCAP members to go out and “sell” the proposed reform to stakeholders, facilitating for a decision to be made at the 2007 Council meeting. ACFM was seen as a strong trademark of ICES advice and preparing ACFM for the proposed changes was a challenging task. A committee chair commented:

Q 16: [The ACFM Chair] did a terrific job on the fisheries side. He laid down the laws [and said]: We are not going to meet for all those days in the future, and you are not going to talk about these things! It kind of worked. He is a good salesman. He went and sold it to all groups.
The MCAP Chair sent regular progress reports to the Delegates, but very little feedback was received during this preparatory period. The bumpy road ahead thus came as a surprise to the MCAP members who had spent more than a year preparing the proposal for implementation. A committee chair recalled:

Q 17: What ultimately happened was; coming up to when the decision was going to be made at the Council in 2007, that’s when they would vote for this for it to change the next year. Within months before, I came to the Science Conference and I presented the results to the Delegates. ... And suddenly, a group of Delegates formed another group and came up with a new model. ... And I said; it is now time for me to let go of this, because there is no point in me pushing and pushing. I will keep behind it, but they have to take ownership of this now and say; we are going to support it and go for it. So the new group added something to the model, which in hindsight was a good thing. But they now began to take it on, really push and discuss it. At that meeting of Delegates in October 2007 there was absolute uproar, it was a terrible meeting. The people who supported the model as it was saw a new model and couldn’t deal with that. So, the debate went away from the reform to which model is best, which I didn’t want to happen. But ultimately they agreed.

The new ICES Advisory Services, referring to both structure and process, was adopted by the Council in October 2007 (ICES 2007d). Implementation was set to 1 January 2008. However, as there were still disagreements in the Council around certain issues, further discussions were needed. One such issue concerned allowing observers to participate in the various stages of the advisory process. Some Delegates saw the presence of observers as a threat to the integrity of the advisory process. Others argued that openness and transparency could contribute to the credibility of ICES advice. The final structure allows observers in four out of the five stages of advice generation (Figure 6). This structure was formally approved in an Extraordinary Council meeting in February 2008 (ICES 2008c), signifying a milestone in a multi-year process of reforming the ICES advice to meet new needs while at the same time balancing interests. Mechanisms for review and revision were considered as part of implementation of the new program. Such a process is already underway (ICES 2009e).

Looking back at the process of getting to the finish line, several interviewees reflected on the roles played by the people involved. Good leadership provided by the MCAP Chair was mentioned by several interviewees as instrumental in bringing the process forward. Many talented people contributed with their time and effort. An interviewee who saw this process from the side-line described a committee chair who had made important contributions as follows:
Q 18: [He is a] ‘bottom-up’ person ... He is a good listener, seeks compromise, understands the links between science and advice ... He is modern, handles the technique well. A ‘one stop shop’!

The advisory chairs highlighted the importance of a working environment characterized by constructive collaboration. One of them commented:

Q 19: I think we were very fortunate. Over that time, the three [advisory] chairs ... we got along very well together. And we would sit down in the evening and we would talk about this in a very positive way. All three of us were absolutely convinced that something had to be changed, that what we were doing was trying to fix something that was in fact broken. We weren’t just changing for the sake of change.

When asked what kind of characteristics that make individuals influential in the ICES systems, an interviewee pointed to the following qualities of a committee chair:

Q 20: [He] is a very good political operator. He knows how everyone adjusts. He is also an extremely good person. He understands what motivates people.

At the time of the interviews for this study, ACOM had been operational for 18 months. The interviewees felt that it was too early to evaluate the outcome of the advisory reform but offered their initial observations. A committee chair who was part of the reform process commented:

Q 21: I think the ACOM has worked well. When you take something from paper and try to implement it there are always problems. But one thing was when [a past ICES President] took the chair of ACOM then that was huge, as you had a high prestige guy with tremendous ability to implement change. And he bought into it, wanted it. So it was off to a good start. Lots of hiccups; you have people leaving an old system, coming into a new one, the different perceptions they had on how the new should work. It takes a while to settle down.

From a client perspective, the reform improved the timeliness of advice. A representative from a Client Commission commented:

Q 22: ICES has been extremely responsive in changing the ACOM structure to also set up processes whereby it is possible for ICES on a fast track to respond to request for advice. So, that’s another very important change from the viewpoint of the clients.

The need for broad and balanced competencies among ACOM members was an issue raised during the advisory reform process. There was concern that a majority of the Member Countries would nominate fisheries experts to ACOM, while the ambition to produce integrated advice would require experience from a healthy mix of disciplines. An interviewee expressed his observations about the dominance of fisheries issues in ACOM:
Q 23: [There] is very much a scientific, technical review of the fisheries advice going on in the ACOM ... We have to understand why this is happening ... ACOM is ACFM right now ... If this is where we want to be and it works, well that fine. But let’s admit that. And then if we will have to make adjustments in other parts of the system, that’s fine. Let’s do that.

Another interviewee expressed concern about the challenge of integration in the light of new drivers of change:

Q 24: The Marine Strategy Framework Directive ... What does that mean to fisheries advice and the system? I think that will be another driver to push things. But we do need the integration, integration is absolutely essential. And we just don’t have it enough at the moment. We don’t have the ways of doing it.

The need for integration is addressed in the ICES Advisory Plan, which is the new guiding document for the ICES Advisory Services. The striving to meet the need for advice in support of more holistic approaches to management is reflected in one of the six thematic objectives: “Integrated advice based on advances in scientific knowledge and ecosystem considerations” (ICES 2009a, 5-6). Here, integrated advice means “advice that both takes (a) account of the impact of fisheries, other human activities, and natural change on marine ecosystems, and (b) full advantage of existing and emerging scientific research results”. Activities given priority to meet this goal include benchmarking workshops to advance advice to encompass ecosystem issues, method development to address ecosystem changes, development of environmental status indicators, and collaboration with SCICOM and the wider science community to improve tools for managers in assessing the status of ecosystems. Such collaboration can be an element in improving communication and collaboration between the advice and science pillars of ICES.

Reform of the science program 2005-2009

The new science structure was in the process of being implemented at the time of the ASC 2009, during which most of the interviews for this study were conducted. The fact that the advisory program was reformed during partly the same time period influenced the dynamics of the science side change process. Differences between the two reform processes are eluded to in this chapter and elaborated on in more detail in the Discussion chapter. The history of the evolution of the science structure up until 1999 has been thoroughly documented by Rozwadowski (2002) and Griffith (2003). The Science Committees had been reorganized 1997-1998. The structure before and after the reform analyzed here is shown in Figure 7.
Figure 7. ICES science structure before and after the 2005-2009 reform process. The current structure shown to the right was established during the transitional year 2009. The Expert Groups (EGs) report to a parent committee/steering group. Source: Redrawn based on Labonté 2009.

At the outset, there was one regional and seven subject-based Science Committees, coordinated by the Consultative Committee (ConC).

In early 2005, the ConC and MCAP Chairs both questioned the efficiency of the structure of the programs for which they were responsible, i.e. the science and advisory sides, respectively (see also Quote 12). A committee chair recalled his first months in his new role:

**Q 25:** The first thing I did as I became Chair of ConC was to have a meeting with the Secretariat, with the General Secretary. And we discussed what to do. I mentioned; perhaps
we have too many Expert Groups? They are not all responding. Some are not performing well enough. We should evaluate that and consider changing the EGs. Then I was at a meeting with MCAP ... [The Chair] said ... that he was thinking about restructuring advice. And I mentioned my thoughts about restructuring science. So we agreed to proceed together.

The next steps involved discussions within ConC and getting a green light from the Bureau to take their ideas to the Council (ICES 2005b). ConC acknowledged the recent restructuring of the Secretariat 2004 which had made the two pillars of ICES - science and advice - more visible. The emerging ideas on reform of the advisory side also gave reason to reflect on possible needs for reform on the science side. In addition to questioning the efficiency of the EGs, ConC also identified problems at the science committee level. Lack of participation and commitment could possibly be attributed to the fact that these committees were mostly serving as administrative units, while the interesting science - which would imply incentives for participation - was going on at EG level. ConC decided to proceed carefully and concluded that “we should be cautious about repairing something that was not broken” (ICES 2005b, 11).

The Bureau welcomed ConC’s initiative to review the EG performance and structure. However, at the 2005 Council meeting, the scope was widened. ConC and MCAP were assigned the task of collectively arranging a Workshop on Review of the ICES Committee and Expert Group Performance in light of the emerging process of reforming the advisory side structure. The Council stressed that wide attendance from many stakeholders groups should be encouraged (ICES 2006a). The March 2006 workshop was chaired by the ICES President who challenged the participants to identify key problems as well as workable solutions. Ideas on mechanisms for implementing changes were also encouraged, i.e. “fine tuning or big changes?” (ICES 2006f, 10). The outcome was summarized as 10 issues for ConC to consider in the follow-up process: “(1) Communication: responsiveness is crucial between the science and advisory bodies as well as within and across disciplines; (2) Commitment: excellent contents and attractiveness is needed; (3) Identification of needs: implementing the Ecosystem Approach to Management requires new layers of knowledge and a new culture of communication; (4) Flexibility: a new structure to be able to cope with future challenges and new issues; (5) Innovation: from the bottom up; (6) Continuity: protecting corporate knowledge and experience; (7) Don’t rush things; (8) Need for cross-disciplinary approach; (9) Align science priorities with Member Country priorities and with ICES Strategic Goals; (10) Concern about ConC’s performance: more strategic thinking is necessary” (ICES 2006f, 4).
In their meeting the days immediately following the workshop, ConC struggled to reach a common understanding of the problems which needed solving, thus no conclusion on the best way forward was reached (ICES 2006c). A subgroup was established to formulate recommendations on a possible new science structure based on the outcome of the workshop. This ConC proposal was presented to the Council meeting in October 2006. The Council adopted resolutions with specific recommendations on how the process should proceed from there (ICES 2007a). The importance of an open consultation process within the ICES community was again stressed, and elements which should be given priority in the design of a new structure were outlined. The issue of national representation was mentioned, suggesting that “serious consideration be given to national representation at the highest science committee level” (ICES 2007a, 29). Similar thoughts had been brought up by the ICES President in his closing statement during the ASC the month before (ICES 2006b).

The ConC Chair returned to the Council a year later with a proposal for a new science structure (ICES 2007c). The suggested structure was similar to the existing one with three layers; ConC on top, an intermediate level, and the EGs. A new element was introduced at the intermediate level which would consist of both science committees with responsibilities for core activities, and science programs which would deal with cross-cutting, interdisciplinary issues. Balancing national representation with meeting the need for expertise in the top-level committee created a dilemma. ConC expressed concern that such alternatives would result in a group too large to manage. The Council minutes reflects general support for ConC’s proposal (ICES 2007b). However, the meeting was far from smooth sailing. A committee chair recalled how the proposal was received by the Council:

Q 26: The President wanted to close down the science side reform process. He stated that we had not done enough, that there were few new ideas; that it was not interesting enough to proceed with this. He said: I will close this discussion.

The committee chair did not want to see this be end of the process which ConC had started and mobilized support from Delegates:

Q 27: At that time there were three members of ConC that were Delegates ... So I went to them and said: .... You have been part of the discussions in ConC and we were in agreement then. Now I need your support ... In addition, I talked to other Delegates that I knew were positive to the science reform. So I tried again the next day to discuss the science issue. [The President] said no! Then they stood up, those I had talked to the night before. And [the President] had to give in. And we got a very fruitful discussion.
The Council ended up outlining a number of issues that ConC should consider when taking the process forward. The advisory side reform had just been on the agenda at the same meeting, establishing ACOM with national representation. The way MCAP had involved and informed the science community in their process was mentioned as a good example to be followed by ConC (ICES 2007b). The follow-up was carried out by a group co-chaired by the ConC Chair and the First Vice-President. They aligned their activities with the ongoing preparation of an ICES Science Plan. The final steps of getting a new science structure to the Council for approval was carried out by a Bureau Working Group on the Science Reform Process (ICES 2008d). This group shifted focus from discussing details of committees and program structure to finding ways or empowering ConC to deliver the new ICES Science Plan. Their proposal included creating a new committee which would replace ConC and which would mirror ACOM in having national representation.

The Council’s 2008 resolution on creating the Science Committee (SCICOM) formally marked the end of a more than three year reform process (ICES 2008e, 2008b). The tasks remaining to make the new SCICOM fully operational would be carried out by this committee itself during the transitional year 2009. Empowered to make decisions on structures and processes, SCICOM proceeded with establishing five Steering Groups and allocating EGs to each of these. In addition, four Operational Groups were established (Figure 7). The importance of having regular reviews of the science program was discussed during the reform but the mechanism is not yet in place.

The new science program was presented to the ICES community at the ASC 2009 (Labonté 2009). A first joint SCICOM-ACOM meeting was arranged adjacent to the ASC as part of the effort to facilitate dialogue between the science and advisory programs. Some interviewees saw the outcome of the science reform as primarily a name change; ConC becoming SCICOM, and the old Science Committees reshuffled and renamed to become new Steering Committees. Others pointed to the importance of empowering SCICOM through national representation and expressed the view that the latest advisory and science reforms seen together represented significant changes for ICES. One suggested that the recent hectic period of reforms should now be followed by a period of calm to allow for their implementation.

The ICES Science Plan (ICES 2009d) is the guiding document for SCICOMs work. The scientific needs for an ecosystem-based approach to management are stated as the overarching motive for the plan. It specifies 16 broad research topics which are considered strategically
important, assembled under three thematic areas: (1) Understanding ecosystem functioning; (2) Understanding interactions of human activities with ecosystems, and; (3) Developments of options for sustainable use of ecosystems. One of the tasks for the new SCICOM will be to identify and promote the niche where ICES can make a significant contribution. Establishing partnerships with other organizations and collaboration with clients and other stakeholders are highlighted as important elements.

**ICES as a scientific network**

Establishing working relationships with other international organizations is stated in the ICES Convention as one of the tasks to be fulfilled by the Council (ICES 1964). One of the first initiatives from SCICOM when it became operational in January 2009 was to initiate a Study Group on Science Cooperation. The group was asked to review and evaluate current collaborations, explore the potential for new strategic alliances, and draft an ICES Cooperation Strategy. The review showed that ICES currently has some form of collaboration with almost 100 organizations. The group has recently delivered its draft cooperation strategy to SCICOM. It suggests four long-term strategies: (1) Strengthen R&D collaboration with the EU; (2) Enhance the visibility of ICES research to other fields than fisheries advice; (3) Promote cooperation in training of experts, and (4) Encourage participation in ICES by academics (Begoña Santos, April 28, 2010, e-mail message to the author).

While ICES as an organization itself represents a network, it is also one among many in the network of actors in the marine institutional landscape. Several interviewees mentioned ICES’ current engagement in an EU initiative informally named “Network of Networks” and gave the ICES Secretariat credit for taking this pro-active approach to extend collaboration. The Network of Networks is a project which will develop a communication forum to connect marine and maritime research networks in Europe. It aims to support the European Commission in setting research priorities in response to societal needs. The project unites networks from sectors including renewable energy, marine conservation, mining, oil and gas, fisheries and aquaculture, and military defense. ICES represents the science sector and has been awarded a grant to coordinate this consortium. This initiative illustrates an effort to bring different sectors together, based on the recognition that cross-cutting structures are needed to address marine management issues more holistically. Science is one piece in this puzzle.
One of the aims of this study was to elucidate how the network structure of ICES influences how change can be planned and implemented. One interviewee reflected on the differences between ICES and his home institution when managing groups and people:

**Q 28:** *The hierarchical government type of system isn’t as easy to change as you think it is if you read a corporate organization book ... And in ICES, the fact that the people who actually do the science and work in ICES aren’t salary employees [make] ICES much easier to change in that way. And it is much easier to form new groups ... So you can change faster in an organization like ICES because of the impacts on the lives of people. The type of commitment to change is different.*

Another interviewee reflected on how scientists, even at highest levels within the ICES community, sometimes miss to see the opportunities for change which are embedded in the structure:

**Q 29:** *There is a tendency for some people to see ICES as a disembodied entity, something else, something different from us who are talking about it ... as a matter of somebody else being responsible. But the reality is that ICES is ourselves! It is the Member Countries and the participating scientists ... who are ultimately responsible for bringing about the improvements. ... People were saying, at the Delegate’s table: Oh ICES should do this, and ICES should do that. Well, do it! Stop arguing, just do it!*

The network structure was seen as an important underlying factor influencing the choice of strategy for implementing change. One interviewee highlighted the importance of being alert to windows of opportunities and of being prepared to make use of them when they emerge:

**Q 30:** *You have to have a comprehensive vision about all sorts of things and be able to think about it as a network of elements. But then after that, almost in all cases when it does happen, it just requires that you recognize an opportunity and take that one for that part of the puzzle. Don’t worry about the parts that still aren’t there yet. So the science opportunity starts, or the advisory side opportunity starts to come together... We happened to basically step in and started to talk to people in DG Environment about the same time that they put out the Marine Strategy Framework Directive. And just opportunistically, because we happened to be there talking to them, this raised the possibility of ICES leading some of the development of the Marine Strategy Framework Directive. You know, there was no particular strategy on how to make that go forward. But there was a realization when opportunities came up; that we needed to take that. I think that is important actually. Because I don’t think that you will ever have a workable strategy to deal with such a tangled web all at once.*

These reflections illustrate that the network structure of ICES represents both opportunities and constrains for implementing change. Such insights are important when selecting a strategy for responding to changes in the environment.
Discussion
In this chapter, the findings are analyzed with the aim of increasing the understanding of how ICES responds to changes in its surroundings. Drivers of change are analyzed, including perspectives on how the different processes influenced each other. Strategies used to overcome barriers encountered in the reform processes are identified. Factors which influence the capacity for change are discussed in light of ICES being an international network organization. Resilience theory is used to analyze transformative processes. Finally, ideas for further research are presented.

Drivers of change
The ICES vision (Table 1) reflects an ambition to be a relevant and responsive actor in the international marine governance community. Being relevant and responsive requires mechanisms for picking up signals from the outside world as well as from the inside, and translating such signals into a message that is meaningful for the organization (Westley 1995; Westley et al. in preparation). The changes studied here give insights into how such signals from social-ecological systems are picked up and translated within ICES. Signals in the form of external and internal drivers that influenced the processes are listed in Table 2.

External drivers of change were clearly manifested in the strategic planning process. Geopolitical developments were picked up by a well-positioned visionary who could facilitate the translation of such signals into meaning in terms of a need for ICES to develop as an organization. The recognition that a more focused scope for ICES could contribute to generation of more funding for marine science and give more valuable output for the money spent by the Member Countries fed into the strategic planning as an internal driver of change.

The two advisory reform processes were strongly influenced by pressure from the outside in the form of client dissatisfaction. This signal kept increasing in strength and contributed to the initiation of a second change process only a few years after implementation of the first advisory reform. Client requests for advice helped define problems which needed to be addressed and guided the process of identifying what the end product of a reform might be. This aspect makes the advisory process unique among ICES activities, as the Client Commissions are paying customers of ICES advice. This means that there are well-defined actors waiting for the output from this process. Without such an external force, the science reform evolved differently, driven instead by internal needs and ideas.
Table 2. Drivers influencing the ICES change processes

<table>
<thead>
<tr>
<th>Process</th>
<th>External drivers of change</th>
<th>Internal drivers of change</th>
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</thead>
<tbody>
<tr>
<td>Strategic planning</td>
<td>Geopolitical developments including UN and ministerial declarations calling for sustainable use of natural resources and holistic approaches to environmental management</td>
<td>Priorities and commitment needed to meet new challenges while working and evolving within the limits of available resources</td>
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<tr>
<td>Advisory reform, part 1</td>
<td>Client dissatisfaction with timeliness of advice</td>
<td>Better management of the advisory process needed</td>
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<td></td>
<td>A need for integrated advice</td>
<td>Dual structure preventing constructive collaboration between fisheries (ACFM) and environment (ACME)</td>
</tr>
<tr>
<td>Secretariat reorganization</td>
<td></td>
<td>Move away from stove-pipe, sector-specific thinking and foster better integration between disciplines</td>
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<tr>
<td></td>
<td></td>
<td>Improve efficiency in providing support to the ICES community</td>
</tr>
<tr>
<td>Advisory reform, part 2</td>
<td>Client dissatisfaction with timeliness of advice, now with a sense of urgency</td>
<td>Realization that the committee structure (ACFM, ACME, ACE + MCAP) was not well suited to meet client needs</td>
</tr>
<tr>
<td></td>
<td>Increased focus on the need for integrated advice</td>
<td>Quality, efficiency, and cost considerations</td>
</tr>
<tr>
<td>Science reform</td>
<td>Efficiency of EGs and science committees questioned. Strategic body on the science side needed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reorganization of the Secretariat emphasized science and advice as the dual pillars of ICES</td>
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<tr>
<td></td>
<td>Advisory side reform suggesting empowering committees through national representation</td>
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</table>

No external drivers for the science reform are listed in Table 2, reflecting statements by several interviewees of this being the case. However, the emerging need for a different kind of science to facilitate a more holistic approach to marine management acted indirectly as a driver. The advisory program is the only official channel for delivering advice to the clients and the advisory program acts as an internal client for the output from the science program. How to address an ecosystem approach to management in the context of producing scientific advice has been much discussed within the ICES community (ICES 2004b; Rice and Rogers 2006). The March 2006 ConC-MCAP workshop mentioned addressed the need to improve communication between the science and advisory sides of ICES as well as the changing needs.
of the advisory process in light of a shift towards more holistic marine management. However, these aspects were not clearly manifested as drivers of the science reform.

The panarchy metaphor mentioned capture how multiple processes of change at different scales are linked (Gunderson and Holling 2002). Arrows in Figure 3 illustrate how the different change processes analyzed here influenced each other and acted as internal drivers of change. Internal drivers identified are listed in Table 2. The strategic planning process helped identify priorities for ICES and highlighted the need for a strategic body within the organization. It stimulated thinking about efficiency and how better integration between disciplines could be achieved. These factors were considered important when restructuring the Secretariat. The science reform addressed efficiency through questioning the structure of EGs and science committees. The need for efficiency was also manifested as an internal driver of the advisory reforms, as an optimized management structure was needed to reduce workload and be able to deliver advice appropriate for client needs. The structure resulting from the first advisory reform was resource-intensive in terms of many scientists being involved in many committees, i.e. demanding time and generating costs. The new ACE did not have clear a home in the Secretariat, which prior to the 2004 reorganization had evolved to support the old ACME and ACFM. The reorganization of the Secretariat emphasized integration between disciplines and contributed to a shift in perception of ICES; from an organization with dual focus on fisheries and environment to an organization built on the two pillars of science and advice. This shift facilitated the building of support for a new advisory model with a single advisory committee. Once the new advisory structure was adopted, the science reform process converged and a similar solution to the top-level committee membership was chosen. The science reform was also linked to the process of creating a Science Plan. Interestingly, the parallel developments of the science and second advisory reform processes also created barriers for the progress of the science reform, manifested by the Council giving priority to the advisory process.

**Barriers to change**

Barriers encountered in the change processes, as well as strategies used to overcome them, are listed in Table 3. In both advisory reform processes, and to some degree in the science reform process, the role of the Council appeared to be more of a barrier to change than a facilitator of development. In its role as the principal decision-making body of ICES, the Council can be compared to a board of directors, which would imply responsibility for strategic thinking and future planning. The Council meets once per year and the Delegates are only required to
invest a few days of their time annually on ICES issues. Signals of need for changes were picked up at the committee level. The translation of these signals and ideas into new structures and processes for ICES required dedicated individuals who put a lot of effort into convincing the Delegates of the need for reforms. Several interviewees commented on the conservatism in the Council and expressed concerns about its slow uptake of new insights that are emerging in the wider ICES community. They questioned the ability of the Council to fill the role as a strategic body preparing ICES for future challenges. One interviewee suggested that a next reform will need to address efficiency at this level in the organization.

Table 3. Barriers, strategies, and enabling factors influencing the ICES change processes

<table>
<thead>
<tr>
<th>Process</th>
<th>Barriers</th>
<th>Strategies</th>
<th>Enabling factors</th>
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<tbody>
<tr>
<td>Strategic planning</td>
<td></td>
<td>Stakeholders engaged to encourage sense of ownership</td>
<td>Process led by visionaries with support from Council</td>
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<tr>
<td></td>
<td></td>
<td>Centenary used as a window of opportunity for reflection and renewal</td>
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<tr>
<td>Advisory reform, part 1</td>
<td>Resistance in Council</td>
<td>Presenting a detailed proposal with options, addressing both pros and cons</td>
<td>President supportive, communicating a sense of urgency</td>
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<tr>
<td>Secretariat reorganization</td>
<td></td>
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<tr>
<td>Advisory reform, part 2</td>
<td>Resistance in Council</td>
<td>Inviting skeptics to be part of the process at an early stage</td>
<td>Leadership provided by MCAP Ex-ACFM Chair in new role at DG MARE facilitated constructive dialogue with the major client</td>
</tr>
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<td></td>
<td>ACFM strong trademark</td>
<td>Generating a detailed proposal that people could buy into</td>
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<tr>
<td></td>
<td>National interests; fisheries advice high</td>
<td>Building support through an open process including stakeholder consultations</td>
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<tr>
<td></td>
<td>stakes</td>
<td></td>
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<tr>
<td>Science reform</td>
<td>Lack of vision of what the end product of a</td>
<td></td>
<td>Committee Chair determined to finish what ConC had initiated</td>
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<tr>
<td></td>
<td>reform might be</td>
<td></td>
<td>Advisory reform paving the way for a similar empowered structure on the science side</td>
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<td></td>
<td>Focus on structure rather than on process</td>
<td></td>
<td>Bureau taking ownership and driving the final proposal through</td>
</tr>
<tr>
<td></td>
<td>Resistance within ConC</td>
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<tr>
<td></td>
<td>Council gave priority to the advisory reform</td>
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The changes described in this study have led to delegation of authority from the Council to ACOM and SCICOM. SCICOM is empowered to be a strategic body and ACOM is empowered to act independently from the Council on advisory issues. These developments are likely to reduce the problems alluded to regarding the functioning of the Council. Conservatism as a barrier to change is also manifested at other levels in the organization, e.g. fisheries scientists holding on to the old ACFM ways of working. Addressing the psychology of fisheries scientists has even been suggested as an element of multidisciplinary efforts needed to overcome barriers to implementation of an ecosystem-based approach to fisheries (Koeller 2008).

The challenge of getting the Council’s approval triggered strategic thinking in order to identify the best ways of implementing change within the ICES system. A strategy used to build momentum for change was to engage stakeholders in the reform process. This was most clearly manifested in the second advisory reform. Feedback from both internal critics and external stakeholders was taken into account when building the new model. Openness and transparency were seen as factors contributing to the credibility of the ICES advisory process.

A barrier for the science reform process was resistance within ConC, the committee which initiated and led the process. A “don’t fix it if it ain’t broken” concern was expressed, preventing the building of momentum for change. This stands in clear contrast to the sense of urgency expressed by those who were involved in the advisory reform (Q 19). Without a consensus view of what the end product of a science reform might be, it was challenging for ConC to build a strategy for driving the reform process forward.

**Opportunities for change**

Table 3 also lists enabling factors; factors without which the changes described above might not have been initiated at all, or allowed to evolve to become strategic documents or new organizational structures. Several of these enabling factors highlight roles played by individuals who were instrumental in making change happen. The strategic planning process happened because of an initiative taken by an individual who was able to build support for his idea at appropriate levels within the ICES community. The first part of the advisory reform could have been trapped in endless discussions within the Council, had the President in his role as Chair of the meeting not put pressure on the Delegates to arrive at a decision. In the second round of advisory reform, the MCAP Chair provided leadership which included a detailed roadmap for how to bring the process forward. An Ex-ACFM Chair in a new role as
advisor at DG-MARE facilitated communication with the major client commission. At a critical moment when the science reform was nearly put to rest, the ConC Chair mobilized support which allowed the process to evolve.

Several studies have addressed the importance of a variety of leadership skills when implementing organizational change as an element of shifting towards an ecosystem-based approach to management (Olsson, Bodin, and Folke forthcoming; Danter et al. 2000; Olsson, Folke, and Hughes 2008; Westley 1995). Westley and co-workers (in preparation) suggest that the role of leaders in these contexts is better described as entrepreneurs, given the challenge of fostering innovation as part of making change happen in complex systems. Richards and Smith (1997) pointed to the importance of knowing how the system works in order to make use of windows of opportunity created by internal and external pressures. Q 20 and Q 30 illustrate such skills at work in the ICES context. When asked about strategies for bringing good ideas forward within the ICES system, one of the interviewees explained: “You just have to keep talking.” This highlights that a talent for efficient communication can be crucial for a successful outcome of a change process.

Phase characteristics of change processes can help understand organizational evolution (Dorado 2005; Mintzberg and Westley 1992). As described above, the interaction between processes analyzed here acted as internal drivers of change, which contributed to building momentum for change. This made it possible to overcome barriers and facilitated the creation of new organizational structures. In the terminology suggested by Dorado (2005), such change dynamics would imply that the combination of events and the evolution of parallel processes shifted the organizational field from opaque to transparent. However, the findings do not indicate the presence of an overall strategy to navigate the organization into such a field in order to make change happen. Rather, the way one process facilitated the evolution of another can be seen as the opening of a window of opportunity, which made implementation of structural changes possible. The view expressed that ICES now needs a period of calm to allow for the recent changes to settle in would in adaptive cycle terminology (Gunderson and Holling 2002) indicate that ICES is proceeding into phases of exploitation and conservation, following phases of release and reorganization.
Dynamics of change in a scientific network

The processes described above give insights into the dynamics of change in ICES. Differences between ICES and other organizations referred to above (i.e. FWS, GBRMPA, and IMR) that are important for understanding such dynamics can be identified.

The network structure of ICES implies that nobody is entirely in charge or has the authority to direct how ICES should evolve. A long-term strategy is thus not likely to be of much value as a management tool in the ICES context as there is little control of the individual parts that constitutes the whole. Implementing change incrementally as new scientific insights evolve and windows of opportunity emerge is manifested as a workable strategy. ICES changes need to be aligned with priorities and processes at national, regional, and international scales.

As mentioned, the ICES community consists of 1600 scientists who are scattered among 200 institutions in 20 countries. Opportunities for face-to-face communication are for most of the participating scientists limited to annual EG meetings and the Annual Science Conference. Some of the committees meet more often, but much of the work still needs to be done intersessionally, aided by communication technology. Face-to-face communication by visionary leaders has been highlighted as instrumental for successful implementation of change (Danter et al. 2000; Westley 1995; Kotter 1995). Such opportunities are rare in the ICES context. Producing documents early in the process, which can subsequently be widely circulated among stakeholders to build a common understanding and ensure ownership of the outcome, is manifested here as a workable strategy to build momentum for change.

Specification of measurable management objectives has been identified as a necessary aspect of an ecosystem-based approach to management (Lamont 2006). ICES is firmly positioned at the science side of the science-policy interface. The vision for the advisory services is to supply clients with “scientific advice that is relevant, responsive, sound, and credible” (ICES 2009a, 1). ICES is not a management agency. Management decisions based on ICES advice are made by Member Countries and by the European Commission, actors which are guided by their specific management goals. This elucidate that the process of making the ecosystem-based approach operational for ICES is necessarily different, compared to similar processes in national government agencies with responsibilities for management of marine resources. Engaging in dialogues with the clients has been identified as a strategy for ICES to assure that the advisory process is aligned with client needs as their management goals are changing.
Adaptive and transformative change

The concept of transformation introduced earlier implies that the system after such a process is fundamentally different and is supported by new feedback mechanisms which stabilize the system in its new state (Walker et al. 2004). The findings do not suggest that to ICES has undergone a transformation during the period studied. I will link back to the concepts of multi-loop learning (Pahl-Wostl 2009) to elaborate on why I have come to this conclusion.

Normal operations of ICES involve single-loop learning processes within which new EGs and activities are initiated to address emerging challenges as new insights become available. At this level, changes are implemented incrementally without challenging the overall structure or the underlying assumptions. I would argue that the most recent reforms of the science and advisory programs involve a double-loop learning process. This is manifested by new structures and processes. These are implemented while staying within the same value-normative framework. Delegation of authority from the Council to ACOM and SCICOM empowers these new structures to operate in for ICES fundamentally new ways. It gives the system flexibility to more quickly address new challenges and make adjustments as needed.

The findings do not support that the changes reflect triple-loop learning. Such processes imply altered norms, institutions, and paradigms, and would require a fundamental change of governance (Folke, Chapin, and Olsson 2009). After the 10 years of changes described here, ICES is still guided by the same overarching values and goals, outlined in the ICES Convention. The overall governing structure of ICES remains unchanged. The wording of the Convention is arguably open and allows for adjustments to new realities. A 10 year time frame is short for a full transformation to take place. More importantly, a transformation was not called for as the existing system was not perceived untenable.

A current development, which may trigger a triple-loop learning process involving ICES, is the ongoing reform of the EU Common Fisheries Policy (CFP). The CFP is an instrument which supports sector-specific management (i.e. fisheries). As the EU strives to move towards more integrated approaches, ideas have been launched which illustrate what a new European fisheries policy might look like (EC 2009; Degnbol 2009). I speculate that a reformed CFP based on other management principles (e.g. results-based management, reversal of the burden of proof) will trigger fundamental changes in governance of marine resources in Europe. Such a transformation would be at the European scale. It would change the institutional framework
and challenge ICES to adjust to new realities. This turns focus to the capacity of ICES to respond to changes in the environment.

**Building capacity for an ecosystem-based approach**

Diversity is one aspect contributing to adaptive capacity. With its 1600 scientists from 200 institutions in 20 Member Countries in Europe and North America as its constituency, diversity is an inherent quality ICES. The sheer numbers provide this organization with an impressive pool of human resources to draw from. In spite of this richness, recent requests from clients have revealed limits in the capacity to produce advice which requires interdisciplinary approaches. The knowledge and competencies that scientists bring to the EGs reflect the science carried out by the research institutes in the Members Countries. Research which can underpin integrated approaches is a prerequisite for ICES to be able to produce integrated advice (Q 6). The need for interdisciplinary science is a part of this picture which has proved difficult for ICES to handle. Expanding the scope of ICES to encompass disciplines such as economics, sociology, and anthropology was discussed in a special session at the ASC already in 1994. The meeting was then held in St. Johns, and the recent Canadian moratorium on cod fishing had highlighted the limitations of traditional fisheries science (Rozwadowski 2002). When asked how the issue of expanding the disciplinary scope of ICES had evolved following this 1994 event, an interviewee explained how the initiative had faded due to the lack of demand and the fact that scholars representing social science and economics disciplines had no ICES-related institutional affiliation. As the EC now seeks advice, which requires socio-economic considerations, issues concerning disciplinary diversity are again emerging on the ICES agenda. Recent Council discussions reveal diverging views among the Member Countries on ICES building capacity within socio-economic fields (ICES 2009e). Challenges and dilemmas related to taking in socio-economic aspects when producing scientific advice are well described by Wilson (2009) and are further elaborated on in a recent report from the ICES Working Group on Fisheries Systems (ICES 2009f). Some see the risk of ICES advice being politicized if socio-political aspects are incorporated.

The future capacity of ICES to fulfill its mission as the requests for scientific advice at the science-policy interface change will ultimately be a question of commitment by the Member Countries. Facilitation for participation by scientists representing different disciplines and institutional affiliations in EGs and committees could be one way to enhance such capacity. Another capacity-building strategy for ICES is to engage in collaborations. SCICOM’s recent initiative to generate an ICES Collaboration Strategy shows that this is already on the agenda.
The Network of Networks project mentioned highlights that the ICES scientific network represents only one out of several competencies that are relevant for integrated management. Facilitating for collaboration between actors at different scales emerges as a key strategy for building capacity for ecosystem-based management of marine areas.

**Ideas for further research**

ICES changes at the overarching, organizational level have been in focus in this study. Most of the interviewees represented top-level management who provided valuable insights based on their many years within the ICES system. Insights into processes at other levels in the organization would be a valuable complement to elucidate additional mechanisms of change and factors which contribute to adaptive capacity. An investigation of the patterns of diffusion of ideas within ICES could be one way to address this. For example; how does a specific topic (e.g. cold water corals, discards, underwater noise) get established within the ICES structure? How are changing public perceptions influencing which topics that get taken onboard?

This study addressed factors that contribute to capacity for change. Using social network analysis as a tool to identify constellations that enable change could provide further insights into the dynamics of change in ICES as a network organization. Collaborations between ICES and other actors in the marine institutional landscape could be another network aspect to explore, addressing ocean governance challenges related to “the problem of fit” (Galaz et al. 2008).
Conclusions

Several ICES change processes have occurred during the 10-year period studied. The findings do not point to the ecosystem-based approach as a dominating driver behind these changes. However, a shift towards ecosystem-based thinking shines through as a backdrop for the changes that have occurred. A strategic planning process was driven by the need to identify priorities in order to balance ICES activities with available resources. Two consecutive advisory reforms were primarily driven by client needs, addressing timeliness of advice and more integrated advice. The reform of the science structure was driven by internal processes, addressing efficiency and the need for an empowered strategic body within ICES. The strategic planning process resulted in an overarching ICES Strategic Plan as well as multi-year plans for the advisory program, the science program, and the Secretariat. The science and advisory plans both address the challenge of making an ecosystem-based approach operational for ICES.

The recent reforms have made ICES a more flexible and open organization. SCICOM is empowered to be a strategic body, which can shift priorities for ICES activities as new scientific insights emerge. ACOM is empowered to act independently from the Council on advisory issues. This enables ACOM to establish working procedures that are better aligned with client needs. The new advisory program is more transparent and gives stakeholders access to parts of the process behind the generation of scientific advice.

The study has given insights into the dynamics of change in ICES. Signals of the need for ICES to respond and adjust in order to continue to fulfill its mission were picked up through a diversity of channels, including individual scientists, committee chairs, and Delegates. Diverging views in the Council created barriers to change, some which could be overcome by broad consultations. This strategy was more efficient when consultations encompassed both internal and external stakeholders. Such processes take time. Creating a detailed roadmap, outlining how different elements could feed into the change process, was an element of a successful strategy to build momentum for change and bring reforms to the finish line. Dedicated individuals, who understood how to navigate between the opportunities and constrains embedded in the network structure of ICES, played key roles in making change happen.

Disciplinary diversity is needed for integrated approaches to marine management. ICES has its strength within the natural sciences, especially within fisheries-related disciplines. The
lack of disciplinary diversity limits the ability for ICES to respond to client requests for integrated advice. It is the collective responsibility of the Member Countries to ensure that the disciplinary diversity of the ICES community match the changing needs of managers and policymakers as more holistic approaches evolve as a guiding principle for marine governance. The findings highlight the diversity of skills needed to make change happen in a network organization. In order to strengthen ICES’s adaptive capacity, Member Countries should also facilitate for engagement in ICES activities by scientists with a variety of leadership and entrepreneurial skills.

ICES share characteristics with complex natural management systems for which the transformation framework has been developed. The transformation toolbox, enriched with organizational change theory, contributed with a framework for analysis which included acknowledging different phases of change. It suggested addressing barriers to change and identification of workable strategies to overcome them and make change happen. Perspectives addressing diversity and learning helped elucidate elements contributing to adaptive capacity. A transformation at the level of ICES as an organization would be intimately linked to changes in the surrounding systems. Referring back to Figure 1, which places ICES in a context of multi-level governance of marine ecosystems in the North Atlantic, the complexity of such transformation becomes evident. Change processes in ICES need to be aligned with changing priorities and needs in Member Countries and international governance structures. This study has elucidated how the network structure of ICES provides both opportunities and constraints for such change. Collaboration between many actors is needed to achieve sustainable governance of the marine environment. By gaining a better understanding of the dynamics of change in social-ecological systems, strategies to facilitate such collaborations can be developed.
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Appendices

Appendix 1. Interview guide

Pre-Q formalities:
- Short intro to my research project, incl. my affiliation.
- Using a recorder. Timing.
- Anonymity/use of names. Products; Thesis, article.

General/Intro:
1. Q: What are your affiliations with ICES, past and present?
2. Q: How would you characterize ICES as an organization today?
   - How do you think others look at ICES?
     - e.g. Marine researchers from different disciplines, Policymakers in Members States, EU officials, NGOs, Others?
     - How important is it; what makes it important/not so important?
3. Q: What would you say are the major strengths and weaknesses of ICES?

Change processes and triggers:
4. Q: The ongoing changes in ICES; what is it about?
   - Can you see several change processes going on simultaneously?
   - Which ones?
5. Q: When did this change process start?
   - Were there any particular events that were important around that time?
   - Which events marked the start of this process?
   - How was that important for the developments?
7. Q: What made ICES want to change?
   - How is ICES tuned in to signals of a need for change?
   - How are these signals picked up?
   - What makes certain signals more important than others?
8. Q: Was it necessary; do you agree with the reasons and motives for change?
9. Q: Have the same signals of a need for change affected your home institution?
   - How did your institution respond to this?
   - How are the change processes different for an organization such as ICES?

Change processes and people:
10. Q: Can you mention some people who were important for picking up signals of a need for change? - at the very first stages?
   - How were they important?
   - Which role did they fill?

Developments, from sensing the signals to making things happen:
11. Q: How has ICES developed since then? – What happened?
    (1998, or other starting points identified)
    - Any major milestones along the way?
    - In what way were these important?
    - Any (side) tracks that were embarked upon, then abandoned? Why?
12. Q: How have the changes been communicated and debated within the ICES community?

13. Q: Were there any groups or persons that were especially enthusiastic and positive about the changes? What was their view?

14. Q: Likewise, any groups or persons that was particularly negative? What was their view?

15. Q: Any examples of the pendulum shifting, from – to +, or the other way around? What caused such shifts?

The results of the change process, settling into B.

16. Q: How have the changes influenced how ICES operates?

17. Q: Can you give examples of how relationships with other organizations are different now because of these developments? (Other actors on the MLG arena)

Looking ahead:

18. Q: How will ICES know if the change was successful?

19. Q: Are there any new areas or activities that ICES will need to get involved in? Any of the traditional ICES activities that may be discontinued?

Post Q formalities:

I have no further questions; Is there anything you would like to ask or to comment on?
Time line for my study. May I get back in touch for follow-up questions?
Exchange cards & Contact details, Thank You!

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## Appendix 2. Interviewees

<table>
<thead>
<tr>
<th>Interviewees</th>
<th>Institutional affiliation</th>
<th>Past and current roles in ICES of interest to this study</th>
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</thead>
<tbody>
<tr>
<td>Fredrik Arrhenius</td>
<td>Swedish Board of Fisheries, Gothenburg, Sweden</td>
<td>Delegate&lt;br&gt;Bureau member 2005-2009</td>
</tr>
<tr>
<td>Paul Connolly</td>
<td>Marine Institute, Galway, Ireland</td>
<td>MCAP Chair 2003-2007</td>
</tr>
<tr>
<td>Poul Degnbol</td>
<td>EC, DG MARE, Brussels, Belgium</td>
<td>Client Commission&lt;br&gt;Ex-ACFM Chair 2003-2005</td>
</tr>
<tr>
<td>Jacques Fuchs &amp; Philip Moguedet</td>
<td>EC, DG RES, Brussels, Belgium</td>
<td>Client Commission</td>
</tr>
<tr>
<td>David de G. Griffith</td>
<td>Marine Institute, Ireland (Retired)</td>
<td>Ex-ICES President 1991-1994&lt;br&gt;Ex-General Secretary 2000-2005</td>
</tr>
<tr>
<td>Neil Holdsworth</td>
<td>ICES Secretariat</td>
<td>Head of ICES Data Centre</td>
</tr>
<tr>
<td>Gerd Hubolt</td>
<td>ICES Secretariat</td>
<td>General Secretary</td>
</tr>
<tr>
<td>Adi Kellermann &amp; Jan Thulin</td>
<td>ICES Secretariat</td>
<td>AK: Head of Science Programme&lt;br&gt;JT: Special advisor, Baltic Sea issues</td>
</tr>
<tr>
<td>Paul Keizer</td>
<td>Bedford Institute of Oceanography, Dartmouth, Canada</td>
<td>ACOM Vice-Chair&lt;br&gt;Ex-Chair of ACME 2005-2007</td>
</tr>
<tr>
<td>Serge Labonté</td>
<td>DFO, Canada (Retired)</td>
<td>SCICOM Chair 2008-2009&lt;br&gt;Ex-Delegate</td>
</tr>
<tr>
<td>Hans Lassen</td>
<td>ICES Secretariat</td>
<td>Head of Advisory Programme</td>
</tr>
<tr>
<td>Harald Loeng</td>
<td>IMR, Bergen, Norway</td>
<td>Ex-ConC Chair 2005-2008</td>
</tr>
<tr>
<td>Tore Nepstad</td>
<td>IMR, Bergen, Norway</td>
<td>Delegate&lt;br&gt;Bureau member 2006-2009</td>
</tr>
<tr>
<td>Martin Pastoors</td>
<td>IMARES, Wageningen, Netherlands</td>
<td>Ex-ACFM Chair 2006-2007&lt;br&gt;Ex-ACOM Vice-Chair 2008</td>
</tr>
<tr>
<td>Jake Rice</td>
<td>DFO, Ottawa, Canada</td>
<td>Ex-ConC Chair 2002-2005</td>
</tr>
<tr>
<td>Michael Sinclair</td>
<td>Bedford Institute of Oceanography, Dartmouth, Canada</td>
<td>First Vice-President&lt;br&gt;Delegate</td>
</tr>
<tr>
<td>Michael Sissenwine</td>
<td>Woods Hole Oceanographic Institution, US</td>
<td>ACOM Chair&lt;br&gt;Ex-ICES President 2003-2006&lt;br&gt;Ex-Delegate</td>
</tr>
<tr>
<td>Mark Tasker</td>
<td>Joint Nature Conservation Committee (JNCC), Aberdeen, UK</td>
<td>ACOM Vice-Chair&lt;br&gt;Chair of ACE 2007</td>
</tr>
<tr>
<td>Wojciech Wawrzynski</td>
<td>ICES Secretariat</td>
<td>Network of Networks Consortium</td>
</tr>
<tr>
<td>Douglas C. Wilson</td>
<td>IFM, Aalborg, Denmark</td>
<td>Author of recent ICES case study&lt;br&gt;“The paradoxes of transparency”</td>
</tr>
<tr>
<td>Christopher Zimmermann</td>
<td>VTI, Rostock, Germany</td>
<td>ACOM member</td>
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</tbody>
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