Integration of fisheries surveys and environmental monitoring

The Council Steering group on the Marine Strategy Framework Directive (CSGMSFD) has as one product prepared the enclosed paper: Integration of fisheries surveys and environmental monitoring (annex 1).

The EU Member States have to establish and implement monitoring programmes by 2014 in order to implement the Marine Strategy Framework Directive (MSFD). Revision activities of existing programmes within Member States and the Regional Sea Conventions are now being initiated.

ICES has at present a major role as a scientific/technical coordinator of international fisheries surveys. The integration between fisheries and environmental surveys in support of the ecosystem approach to management (EAM) is an important strategic issue for ICES as it touches on ICES core activities.

It seems natural for ICES to support its EU member countries in the implementation of the MSFD. Based on the experience with fisheries surveys ICES should demonstrate the potential efficiency improvements and resource savings which may result from integration of the fisheries and environmental surveys. That aspect is of importance for all ICES member countries and not only for those being members of the EU.

The paper outlines practical considerations and project activities including a range of existing ICES expert groups with relevant knowledge and activities which should support such a project. The aim is to illustrate the theoretical considerations with a few real cases.

An informal meeting to discuss the ideas was arranged during ASC in Bergen where about 24 chairs of relevant ICES expert groups and other stakeholders participated. The minutes of the meeting are included in annex 2 for information.

The EC has just published a call for proposals: "New knowledge for an integrated management of human activity in the sea". The CSGMSFD feel that the ideas about integrated ecosystem monitoring fits perfectly to the call and that ICES in one or the other way should be involved in the action due to the special position as survey coordinator and data user.

It is proposed that ICES should be ready to cooperate with the regional seas conventions as well as national institutes as a non-exclusive partner thereby not competing but supporting interested national institutes.

Integration of fisheries surveys and environmental monitoring

Objective

ICES plays a unique role as coordinator of fisheries surveys in the North-East Atlantic. With the adoption and implementation of the European Marine Strategy Framework Directive (MSFD) there is a need to integrate fisheries surveys and environmental monitoring into proper ecosystem surveys. This is necessary both from a practical and resource saving point of view and to enable better integration of data from the two perspectives.

Member states have to implement MSFD monitoring programmes in 2014, so action has to be taken now to develop proposals for integrated monitoring programmes. These activities should also ensure that the capacity and expertise of ICES is made use of, in cooperation with Regional Sea Commissions.

ICES has therefore decided to take a leading role in the development of integrated surveys. The aim of this communication and possible project is to demonstrate possibilities, challenges, and the resource saving potential offered by integrated surveys. Eventually this may lead to a publication (CRR) describing the concept and demonstrating in practical terms how to integrate fisheries surveys and environmental monitoring.

Context and aims

ICES is an international science organization that coordinates and promotes cooperation in marine and fisheries research. ICES advises the European Commission, marine conventions and its member countries in relation to the common fisheries policy and the marine environment. ICES coordinates research activities underpinning the generation of advice. ICES is unique for its ability and mandate from member countries to coordinate large scale international surveys at sea, and therefore well positioned to play a leading role in the integration of fisheries and environmental surveys for the implementation of an ecosystem approach to management (EAM) as required by the Marine Strategy Framework Directive (MSFD).

The integration between fisheries and environmental surveys in support of the EAM is considered an important strategic issue for ICES as it touches on ICES core activities and is listed as a research priority in the ICES Science Plan.

Such integration is of major importance for EU Member States and their MSFD implementation. It is also of great relevance to ICES Member States who are not members of the European Union as the implementation of EAM is a high priority issue in almost all North Atlantic countries. For the EU Member States also the monitoring in relation to NATURA 2000 (Habitats and Birds Directives) and other international agreements should be taken into consideration when integrating the programmes.

The Council Steering Group on MSFD (CSG MSFD) has therefore decided to promote and guide the development of integrated and internationally coordinated monitoring initiatives within ICES as a contribution to strengthening the ICES position in the MFSD implementation process.

For a successful implementation of an EAM as required by the MSFD we need a better and more complete mechanistic understanding of ecosystem functioning and how ecosystems change under variable environmental and anthropogenic

forcing. We need to define ecosystem targets and develop comprehensive indicator frameworks with risk adverse indicator thresholds and targets as well as methodologies to warn of drastic system changes known as ecological regime shifts. Elements of these needs are currently being defined by Member States in the setting of their environmental targets to achieve GES.

Assuming that publically funded resources available for science underpinning the EAM will not increase over the next decade but rather may decrease; these goals can only be achieved by increasing the efficiency of science, monitoring, processing and analysing data and related advisory systems. Integrating environmental and fisheries surveys is well matched with these requirements and helps to reach the overall goal of making best use of limited scientific resources.

Integration of fisheries and environmental monitoring will also require the development of new technologies for obtaining and analysing the appropriate data, and to address the appropriate temporal and spatial scales with greater efficiency. Over the last decades observation technology has advanced at tremendous rates in physical oceanography, chemistry, and marine geosciences. Glider fleets autonomously measure and report physical data, remotely operated or autonomous vehicles sample and observe the deep sea, lander systems carry various instruments to the seabed and connect arrays of instruments to swarms and integrated underwater observatories.

Now is the time to make use of these developments and adapt technology and methodology for application in fisheries and marine environmental monitoring and research. Only if we manage to increase the efficiency of the cost and labour intensive traditional methods will we be able to adequately respond to the new challenges brought by the MSFD and thus the implementation of an ecosystem approach, i.e. to collect and analyse information covering entire ecosystems rather than only targeting fishery relevant species.

This paper aims to discuss the different aspects of integrated surveys (ecosystem surveys) and the possibilities for establishing one or several ICES driven demonstration projects illustrating advantages and disadvantages of integrated surveys.

Marine Strategy Framework Directive and Fisheries Data Collection

The Marine Strategy Framework Directive 2008/56/EC (MSFD) states in article 11 (Monitoring programmes):

"1. On the basis of the initial assessment made pursuant to Article 8(1), Member States shall establish and implement coordinated monitoring programmes for the ongoing assessment of the environmental status of their marine waters on the basis of the indicative lists of elements set out in Annex III and the list set out in Annex V, and by reference to the environmental targets established pursuant to Article 10.

Monitoring programmes shall be compatible within marine regions or subregions and shall build upon, and be compatible with, relevant provisions for assessment and monitoring laid down by Community legislation, including the Habitats and Birds Directives, or under international agreements."

The Data Collection Framework (DCF) Regulation (199/2008/EC), Section 2 (Requirements for the data collection process) states in Article 9 (Sampling programmes):

1. Member States shall establish multi-annual national sampling programmes.

2. Multi-annual national sampling programmes shall include, in particular:

(a) a sampling design for biological data following fleet-fishery based sampling including, where appropriate, recreational fisheries;

(b) a sampling design for ecosystem data that allows the impact of the fisheries sector on the marine ecosystem to be estimated and that contributes to monitoring of the state of the marine ecosystem

(c) a sampling design for socio-economic data that permits the economic situation of the fisheries sector to be assessed and enables its performance over time to be analysed, and impact assessments of measures undertaken, or proposed to be carried out.

The first approach to MSFD monitoring programmes shall be established and implemented by 15 July 2014. In doing so, Member States sharing a marine region or subregion shall ensure coherence and coordination in their region.

It is evident that a coordination of monitoring activities under the MSFD, the DCF, NATURA 2000 and other international agreements is desirable, but also a challenging opportunity.

ICES role

Presently ICES has a role as coordinator of international fisheries surveys (trawl, acoustic, and icthyoplankton surveys) and offers training courses on fisheries survey design. In addition to these activities current ICES niches such as development of guidelines, technical standards and monitoring techniques, are of relevance for the development of integrated surveys.

Some applied work towards integrating surveys has already been done/is being done by ICES expert groups such as:

WGECO	Working Group on Ecosystem Effects of Fishing Activities
WGIAB	ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea
WGINOSE	Working Group on Integrated Assessments of the North Sea
WGISDAA	Working Group on improving use of survey data for assessment and advice
WGISUR	Working Group on Integrating Surveys for the Ecosystem Approach
WGOOFE	Working Group on Operational Oceanographic Products for Fisheries and Environment
WKECES	Workshop on evaluation of current ecosystem surveys (November 2012)

In particular, WGISUR is leading the development of ecosystem surveys in ICES. Two scenarios are studied in detail by WGISUR: 1) requirements for an ideal fisheries ecosystem survey and 2) adaptation of existing surveys. The group has developed methodology for starting an ecosystem survey, which helps to guide the process. Further recommendations for additional tasks, which can be added to existing surveys, were made. However, many of the ICES coordinated surveys carry a burden of multiple additional sampling, which has evolved over time. The result of these additional sampling requests is that the surveys are no longer specifically designed towards clearly defined fishery-related objectives, but are rather something that is not too well defined – at least beyond the original purpose of monitoring specific fish stocks.

Consequently, the focus of this ICES initiative on survey design and integration should be the development of new, targeted surveys and data processing and analysis tailored to the questions they are designed to answer.

Whereas the Common Fisheries Policy and related monitoring activities fall under the direct governance of the European Commission, and are thus coordinated internationally, this is not the case for environmental policy, where Member States have to translate European law and regulations into national law. In effect, this can lead to greater differences in regional coordinated environmental monitoring programmes compared to fisheries, although the MSFD specifically requires coordination and consistency of methods across the region/subregion.

Regional aspects

Regionally coordinated monitoring programmes have been established within the framework of the Regional Sea Commissions, such as the HELCOM COMBINE Programme and the OSPAR CEMP Programme. These coordinated programmes lay down guidance for regional monitoring.

There are, however, examples of a lack of transboundary coordination of environmental monitoring cruises where two countries sample close to each other in both space and time. Better planning could have ensured better coverage over the year in the given area. As MSFD demands coherence and coordination at regional or sub-regional scales, ICES should actively offer a role as a technical/scientific coordinator stressing the importance to consider compatibility and planning between Member States in the design and execution of their monitoring programmes.

Activities to update the regionally coordinated programmes have been initiated within HELCOM (e.g. the HELCOM MORE project) and OSPAR (Task Group on OSPAR Monitoring Framework and the proposed KISS project). Cooperation between ICES and the regional sea Commissions is vital for the success of any integrated monitoring under the MSFD.

The approach

If environmental monitoring can be integrated with fisheries surveys it is logical to assume that there may be resources gained through greater efficiencies. Efficiencies can be gained through the following routes:

Over Precision – Fishery surveys need to deliver data of a statistical precision that is fit for purpose for the assessment they are supplying. In some cases

assessments are overly precise for the advice they support. Put simply, in some surveys too many trawl stations are preformed for the precision needed (i.e. the data is overly precise), hence time can be saved by doing fewer trawls.

Duplication – Fishery surveys and environmental surveys of neighbouring Member States can overlap in space and time, or in parameters measured, leading to unnecessary duplication and wasted resources.

Redundancy – On some surveys individual types of data and station positions are no longer used in assessments and could be eliminated in order to gain survey time. Redundant monitoring can be relicts from studies that have terminated. Data from some trawl locations, and in some cases from whole surveys, do not get used in the eventual stock assessments and are hence redundant.

Down Time – Fishery surveys are often carried out in daylight hours only in order to standardize the catch-ability of species, especially on the continental shelf. Hence there may be unused vessel time at night.

Multi Annual – Some fishery surveys, and environmental surveys, may be able to move to multi-annual assessment frequencies rather than annual. This would release significant vessel time.

Automation of data processing and analysis – Resources to process data is generally limited compared to resources for data collection. Standardizing and automation of procedures to analyse data e.g. acoustic analyses, flowcam automated image recognition procedures, software for producing indicators etc. may save resources.

All of the above require considerable research, coordination, communication, and policy change in order to implement the changes needed to use vessel time more efficiently to gain more fit for purpose and integrated data. For example, the working groups that deliver fishery advice must consider the minimum precisions their assessments need in terms of survey data, and need to consider the issues of redundancy and moving to multi-annual assessments. The recipients of advice, which in the European context is the Directorate-General for Maritime Affairs and Fisheries (DG-MARE), need also to consider their own requirements such as the frequency of advice and its precision, and they need to be prepared to alter monitoring funding mechanisms such as the Data Collection Framework (DCF).

Thus, the potential for synergies is often high, but are often missed opportunities due to a lack of coordination - often in combination with different governance systems in the countries. Depending on the amount of parameters to be measured an integrated survey may take longer than the single discipline survey, but the alternative of using two vessels will lead to significantly increased vessel time and associated costs (fuel and staff working hours).

A precondition for integrating disciplines within a single survey design is that the vessel can accommodate the necessary activities onboard (equipment, qualified staff, and space for working up or preserving and storing samples and data). This means vessels of sufficient size must be used and the issue of sharing costs between disciplines and clients needs to be resolved. The survey planning may therefore depend on a smaller pool of vessels that are able to carry out interdisciplinary work.

Staff skills should also be considered. Carrying staff in order to carry out one specialism is no longer an efficient use of resources. Staff who has multiple skills may well be needed in future integrated surveys, and hence there may be a need for new training programmes. Additionally, sharing staff between organizations and between Member States may be necessary, hence standards of training are needed which cross traditional institutional and national boundaries.

Although vessel time can be released by the considerations suggested above, keeping valuable time-series programmes must also be considered. We must not lose valuable time-series by integrating surveys, but at the same time we must be open about what can and cannot be terminated.

The WGISUR has described that changes to existing fisheries surveys may fall into three broad categories:

- "Status quo", where appropriate ecosystem data were already collected but not necessarily made full use of;
- "Light", where such data could be collected with minimal changes and additional resources;
- "Major", where such data could be collected but at substantial additional costs and changes.

> Intersessional work had indicated that this type of evaluation could only be done at the level of a particular survey and eventually vessel, as different research vessels have different capabilities. Alternatively the monitoring needs could be consider at an area level (subregion/part of a subregion) and then how individual surveys can be used to cover the range of monitoring needs. This would ensure a fully ecosystem-based approach

Taking into account these preconditions it is not realistic in most cases that all required monitoring can be combined in a given survey, but it will still be possible to develop an "environment light" programme to be added to the fisheries surveys - in particular when the spatial and temporal coverage is equal. In that case additional surveys are needed to fulfil the remaining requirements of the MSFD. It is important that all such programmes have well defined objectives against which the results of the programmes can be evaluated. Clear objectives also help to prevent collection of additional data that are not being used either because the sampling was not designed for the purpose or data are not really required. WGISUR has broadly concluded that significant improvements can be made for data/material collection in the light category, but that most of the required additional post-processing would involve additional resources. To comply with the demands of the MSFD mobilizing such additional resources is inevitable. Options regarding how to meet the requirements in a cost and time efficient way will thus be studied in the ICES demonstration project(s).

Complementary to integrated surveys, and in order to bring down the costs (mainly staff time), smaller fast running vessels for specific aspects of environmental monitoring may be used. However, to ensure data compatibility in such an approach, good coordination is required. Moreover, such surveys will to a certain degree be dependent on weather conditions.

Finally, other data collecting platforms such as remote sensing from satellites, data collecting buoys, ARGO probes, underwater observatories and increased use of ships of opportunity should be considered when developing integrated monitoring programmes, along with emerging new technologies such as autonomous underwater vehicles and gliders.

Proposal for a Project

The aim of the intended project is to demonstrate possibilities, challenges, and the resource saving potential offered by integrated surveys and data processing by practical cases. Eventually this may lead to a publication (CRR) describing the concept and demonstrating in practical terms how to integrate fisheries surveys and environmental monitoring. This would be beneficial also for non-EU countries and countries not directly involved in the project.

The CSG MSFD aims to stimulate development of concrete proposals for integrated survey/monitoring demonstration projects, possibly with transnational elements e.g. starting with International Bottom Trawl Survey (IBTS). The aim of the proposal outline below is to stimulate agreements towards a draft proposal by the time the EC/DG ENV call for proposals is made public[1].

Even if the starting point would focus on more theoretical issues building e.g. on the on-going WGISUR work and activities in the Regional Sea Conventions, practical projects between ICES and one or more Member States are the main interest for illustrating the possibilities for resource savings. Hence the CSG MSFD put forward the following ideas for potential components of a project. These are intended to stimulate discussion:

Lessons Learnt:

- There are already integrated surveys in Europe (e.g. in France, Germany, Norway, and UK)
- What can they tell us about what to do / what not to do
- Note ICES WKECES Workshop on Evaluation of Current Ecosystem Surveys (20 -–22 November 2012, Bergen)

European Skills Base:

- What personnel do we have and with what skills
- How can we best train staff
- Can we introduce cross-institute training standards

Institutional Environment:

- An important aspect is to develop an overview of how European institutes may work together in the future with respect to integrating surveys – i.e. the institutional ownership and governance, institutional business models (e.g. full cost recovery), funding mechanisms, planning timetables and potential conflicts and limitations to combining resources and interest.

Data Collecting Platforms and Emerging Technologies:

- Identify aims/objectives of programme and data needs for specified assessments
- Identify automatic data collecting possibilities before heavy resource demanding solutions are applied (e.g. vessel borne surveys)

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1 There may be a possibility for financial support for a pilot project financed by the European Parliament (2 million € will be available for projects to stimulate integration across disciplines and between member states) on "New knowledge for an integrated Management of Human Activity in the Sea" administered by DG ENV.

European Vessel Base:

- What vessels do we have and what are they capable of in terms of multidisciplinary sampling. A starting point is the European research vessel infobase: www.rvinfobase.eurocean.org/index.jsp. This work package needs to consider the total available ship time, by function (e.g. trawling capability, environmental sampling capability) and match that to the minimum survey requirement as defined by the next work package.

Statistical Survey Design:

- *Coordinated Surveys* are where two surveys are placed on the same vessel, each survey having its own objectives and survey design which are not related. An example would be carrying out a benthic survey at night during a fish stock survey. The fish survey design is a random stratified design based on water depth. The benthic survey is a random stratified design based on sediment type. Survey stations do not coincide.
- *Integrated Surveys* are where one survey has a single objective of monitoring an ecoregion. The survey design is unified and aims to optimise the collective monitoring aim, not the aim of one component.
- This work package will bring together statisticians and practitioners to discuss how survey design could be used to optimize ecosystem monitoring in terms of the best use of vessel time.

Necessary Steps:

- An exercise on paper – a thought experiment. It would include representatives from all of the groups listed below. Could we do this as a workshop with role playing?
- Define what is needed to implement and integrate surveys in Europe (or a test area – e.g. the North Sea)
    - *Step 1* – Fisheries Science (e.g. WGNSSK – consider assessment precision, redundancy of data, multi-annual advice: Objective – Define minimum level of fish sampling)
    - *Step 2* – Environmental Science (e.g. WGECO / WGINOSE etc – define minimum environmental sampling for MSFD) based on Member States planning
    - *Step 3* – Combine these minimum requirements into an integrated survey design of a test eco-region e.g. the North Sea or the Kattegat (see previous work package)
    - *Step 4* - Management Advisers (e.g. STECF, EEA, HELCOM and OSPAR) – review proposal of minimum integrated survey, and make recommendation to DG-MARE and DG-ENV on its suitability to deliver policy requirements, i.e. CFP and MSFD.
    - *Step 5* – Managers (e.g. European Fishery / Environment Ministers) – accept recommendations and implement changes in their member states through national institutes)

- *Step 6* – Funders (e.g. DCF, national institutes) – change the way surveys are organized and funded.

First ideas for project set-up:

Establishment of a Project Steering Group (PSG) in autumn 2012. Potential members could be:

- Member of CSG MFSD to steer the process (chair)
- Chair of the SCICOM Steering Group on Ecosystem Surveys Science and Technology (SSGESST)
- Chair of the Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR)
- Representatives of relevant ICES Expert Groups (involved at relevant steps in the process):
  - International Bottom Trawl Survey Working Group (IBTSWG)
  - Working Group on Beam Trawl Surveys (WGBEAM)
  - Working Group on Operational oceanographic products for fisheries and environment (WGOOFE)
  - Working Group on Ecosystem Effects of Fishing Activities (WGECO)
  - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB)
  - Working Group on Integrated Assessments of the North Sea (WGINOSE)
  - Working group on fisheries acoustics, science and technology (WGFAST)
  - Working Group on improving use of survey data for assessment and advice (WGISDAA)
  - Workshop on evaluation of current ecosystem surveys (WKECES, November 2012)
- Representatives from the country(ies) involved in the project. Both the environmental and fisheries sides must be involved
- Cruise leaders with hands-on experience and Technical experts as necessary
- Representatives from Regional Sea Commissions.

Council Steering Group on MSFD

Integrated Monitoring and Surveys Workshop

18th September 1400-1600, ASC Bergen

Background

A meeting was held, hosted by members of the CSG-MSFD and the Secretariat. Attendees included Chairs of ICES Expert Groups involved in developing and coordinating ecosystem surveys, ecosystem assessments and regional seas programmes. The Chairs of ACOM and SCICOM attended. The agenda included:

- Welcome and Introductions
- Brief introduction to the CSG-MSFD
- Presentation of the CSG Document "Draft Integration of fisheries surveys and environmental monitoring"
- Description of possible DG-ENV call this autumn.
- An open discussion of the meeting on follow up issues.

Summary of Discussion

- There was a clear wish that ICES should work on the integration of surveys
- WGISUR has documented what current surveys do and what they could potentially do. This would be a good starting point from which priorities, in terms of identifying immediate gains from surveys, could be developed.
- We should / need to look at ecosystems, drivers and rates of changes so that we can understand changes in the ecosystems and separate out effects/responses caused by climate change from those that are a response to anthropogenic forcing – this understanding will feed back into survey design. Many of these responses are correlated and hence a reduced set could be used to provide information on the drivers – we don't have to monitor all responses.
- We need to remember that from the MSFD perspective we are interested in monitoring not only the ecosystem status but also the indicators that relate to the pressure and impacts on the ecosystem components identified in the MSFD. In this way the monitoring contributes to the understanding of DPSIR (Drivers, Pressures, State, Impact and Response).
- The IBTS has evolved over a long period. It has changed in purpose over that time, from a young herring survey, to the multi-task survey it is now. However, the design has not particularly changed in response and is probably not what would be developed if given a blank page. From the discussions with DG-Mare and PGCCDBS /ACOM Leadership there was an indication from the EC that they are open to using the DCF funds in a

more efficient way and that changes to surveys, such as the IBTS, could be possible.

- If we look at existing surveys to identify redundancies (care needed) we should identify how we could improve integration at the same time to ensure that the resources freed up could be moved directly into integration and not lost.
- A survey atlas might be useful. There are spatial overlaps in the use of the ships/time/money between Member State surveys and there is still a need for a coordinated design.
- We need to clearly identify what the objectives are of integrated surveys. WGISUR has listed the various objectives of existing surveys but more work is needed. WGISUR has also produced a comprehensive listing of everything that COULD be done on surveys.
- Ecoregions and their ecosystem overviews will inform the process of objective setting. The Ecosystem Overview Workshop in January 2013 to which OSPAR/HELCOM have been invited and the ICES integrated assessment groups will support that development.. There is a problem, in that the MSFD currently applies to administrative boundaries rather than eco-regions.
- The Workshop on Evaluation of Current Ecosystem Surveys (WKECES, November 2012) should go ahead, and it's outcomes reviewed by WGISUR planned for early next year. The WGISUR review meeting could be opened up to outside participants, e.g. OSPAR / HELCOM.
- There is some urgency for ICES to act as Member States have to decide on Monitoring Programmes by mid 2014 and the usual annual cycle of ICES meeting will not be sufficient to help with this requirement.
- The subject of integrated ecosystem surveys is not just of European Union interest. There is general interest to save or use our limited resources in the most efficient way. To that end the MSFD has pointed to the need of integrated monitoring.

Concluding Remarks

In summary, it appeared there were two strands of thought from the audience both focussing on what the objectives of an integrated ecosystem survey should be

"bottom-up, science led": integrated surveys should be designed using specific knowledge of the target ecosystem. The spatial and temporal scale of monitoring must be optimised using a full knowledge of the processes influencing the structure and function of the ecosystem under consideration. Ecosystem modelling is a key tool in such survey design. The scale and spatial distribution

of human activities impacting the ecosystems must be a fundamental part of understanding the influencing processes.

"top-down, policy led, resource constrained": The objectives of (ICES) integrated ecosystem monitoring programmes should be designed with the needs of client commissions and Member State commitments in mind and focused on (eco)regions/subregions. The aim of such surveys is to deliver the evidence base for implementation of policies such as the CFP, the MSFD, and the supporting DCF. Managers and policy customers should be involved in the design process. The survey design must use existing resources optimally rather than requiring new resource.

Note that:

1. These two separate approaches should not be incompatible.

2. The "bottom up, science led" has more chance in the long term to match customer need, as it will supply a more fundamental assessment of ecosystem health than the second approach. It is "future proofed" as and when specific indicators become redundant.

3. The "top-down, policy led" approach addresses Member States commitments more quickly. It will be more easily "sold" to managers and governments.

4. The "bottom-up" approach has associated requirements such as regional scale ecosystem modelling, ecosystem process studies. The "top-down" approach has associated requirements such as trans-national, trans-institute staff training, European / trans-national political and institutional negotiations.

ICES has a role in both approaches, and also a role in leading science forward so that both approaches may be implemented in the longer term.

Way Forward

Three strands of thought have emerged during and after the meeting:

- modify the objectives of WGISUR so that it evolves to lead the process of developing plans within ICES for integrated ecosystem monitoring schemes.

- maintain the CSG-MSFD as the overarching steering process, but allow WGISUR to develop a "bottom-up, science led" approach to designing integrated ecosystem surveys.

- ask the SCICOM Steering Group ESST to take on the coordinating role.

A compromise proposal would be:

- allow WGISUR to develop the "bottom-up, science led" approach.

- ask SSG-ESST to coordinate the work of WGISUR with the other Expert groups working on other aspects of integrated monitoring and integrated assessments.

- allow the CSG-MSFD, along with SCICOM and ACOM, to

1. Lead on the international coordination needed to implement Member States MSFD/CFP/DCF commitments.

2. Work with SSG-ESST to develop the Terms of reference and objectives of the various Expert groups so that ICES can deliver a coordinated package addressing Member States and the client Commissions needs with respect to the implementation of the MSFD.

Proposal

The CSG-MSFD, Chairs of SCICOM and ACOM and the Secretariat meet before or during the next ICES Council Meeting in order to make decisions about the future progress of this work and the overall coordination of MSFD-related science within ICES, particularly in the context of formulating the new ICES Strategic Plan, and Science and Advisory Work Plans. The Chair of SSG-ESST might also be asked to attend.