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Report of the Study Group on Biodiversity Science (SGBIODIV)

11–14 March 2008

Gent, Belgium

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

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Executive summary

The components of biodiversity are still consistently undervalued in both private and public decisions. There is an urgent need to bridge the gap between science and policy to take action. Because the components of biodiversity span across the levels of biological organisation (genes, species, communities, ecosystems) there is no single, universal, indicator of biodiversity. As a major international organisation, with responsibility for the protection of the marine environment and assessment of human impacts, ICES needs to be able to rationalise its activities in terms of its contribution to understanding and conserving the components of marine biodiversity.

In order to increase ICES capacity to understand and provide advice on the effects of natural and human induced environmental change on marine biodiversity components, SGBIODIV has:

- identified ways in which ICES can capitalise on partnerships with European and international initiatives addressing marine biodiversity components,
- evaluated the current contributions of ICES expert groups to understand and provide advice on the components of marine biodiversity, and
- prepared an inventory of the current and future ICES science needs related to the components of biodiversity.

Our approach to addressing these tasks was two-fold: We determined what portions of the different ICES Study and Working Groups are addressing biodiversity issues and analysed how ICES expert groups fit in the over-arching theme of marine biodiversity. Our general recommendation is that ICES expert groups should be organised within a single framework based on the components of marine biodiversity. Specific recommendations address:

- a fundamental shift in ICES' perspective on biodiversity components, i.e. from being a cross-cutting to an over-arching theme and
- the need for ICES to capitalise on existing scientific advisory networks, research and information management initiatives and funding agencies in order to benefit from and be of benefit to the European and international scientific community.

1 Opening of the meeting

The Study Group on Biodiversity Science (SGBIODIV) met from 11–14 March 2008 at the University of Gent, Belgium. The chair Michaela Schratzberger (Cefas) welcomed nine participants from five countries (Annex 1) and recorded apologies from Melanie Austen (PML), Ruth Callaway (University of Swansea), Lovrenc Lipej (MBSS), Heye Rumohr and Uwe Piatkowski (University of Kiel), Isabel Sousa Pinto (University of Porto), Emma Verling (JNCC), Jean-Sebastien Houziaux (Royal Belgian Institute of Natural Sciences), Yann Maubras (Institut Francais de la Biodiversite) and Pedro Martinez Arbizu (Senckenberg Institute).

2 Appointment of Rapporteur

Dr Stephen Widdicombe (UK) was appointed as Rapporteur.

3 Adoption of the agenda

The agenda for the SGBIODIV meeting (Annex 2) followed the Terms of Reference adopted as a resolution by the ICES 2007 Annual Science Conference and Statutory Meeting.

4 Introduction

The twin themes of Biodiversity and Sustainability have now become the driving forces of environmental research and management. In fact, these are the foundational pillars of Sustainable Environmental Management, an emerging modern multi-discipline that must guide the behaviours of present and future generations of humankind. For ICES to consider Marine Biodiversity simply as a 'cross-cutting' theme (ICES, 2008) is therefore outdated.

The term 'Marine Biodiversity' – with which our Study Group is charged – is an over-arching theme that encompasses the whole array of life forms in the oceans, their interactions and life support systems. Marine Biodiversity Science and management can be considered as the study and wise stewardship of this diversity of life and its environmental support systems. This new emphasis on biodiversity as a foundation for policy and of decision-making in the marine environment can be viewed as the product of the evolution of global environmental priorities, and a paradigm shift from regional and national to global philosophies and perspectives.

Historically, biological scientific interest in the oceans was partly concerned with the management of fish stocks as single-species entities; indeed this continues unabated today as a fisheries science responsibility. This mono-specific obsession has gradually given way to research and management of multi-species fisheries, as the significance of trophic interactions and consequences of fishing pressures and environmental change led to the realisation that there was more to fisheries science than just assessment by spawning-stock biomass. In turn, dawning awareness of the significance of the environment and environmental changes, led to the concept of Ecosystem Approach to environmental and fisheries management (= ecosystem-based management) though it is recognised that in reality this means the management of human actions within ecosystems (e.g. Gavaris *et al.*, 2005).

Finally, the time has come to acknowledge that these twin themes of Biodiversity and Sustainability have now superseded the older concepts (but that the new concepts

still encompasses the old); that traditional fisheries must now be viewed simply as one among many human activities in marine environments; that regulation of human activities in marine environments should be judged against their impacts on all the components of biodiversity; and that the twin themes must shape our thinking and actions within the oceans as a whole. This requires a fundamental shift, not just in our attitudes and activities, but also in our fundamental thinking, paradigms and frameworks.

Our thinking in this Study Group has therefore been grounded in the basic descriptions of marine biodiversity. We took as our starting point the paper by Zacharias and Roff (2000), which presented a comprehensive working definition of Marine Biodiversity, and we expanded upon their framework to define its components (Annex 5). Note that we do not consider that the contents of this table are necessarily complete, nor do we insist that it is inclusive or exclusive of other components that others might conceive. The table merely presents a set of components of marine biodiversity that would occur to many marine scientists presented with the thought experiment of filling out such a table. This conceptual foundation to the components (or elements) of marine biodiversity is consistent with the broad philosophical approach of the Convention for Biological Diversity (CBD, http://www.biodiv.org), and also encompasses other authors who link sustainability and biodiversity (e.g. Cracraft, 1995).

Using this framework as a guide, our prime objective was to assess the activities of the present ICES expert groups, and to define their contributions in terms of the components of marine biodiversity that they represent. In this way we can establish an inventory of ICES Biodiversity Science. We believe that such exercises - if carried out conscientiously and in concert by international agencies, to define their activities and responsibilities - could lead to global plans for the conservation of marine biodiversity that would be: systematic, sufficient and sustainable.

5 Approach and Terms of Reference

We specifically thought to define:

- What ICES is actually doing currently in terms of Biodiversity Science and management (ToR a, b, d);
- Whether these current activities of ICES represent a coherent and comprehensive set of science activities in terms of Biodiversity Science (ToR c, d);
- Whether the current activities of ICES could be considered as adequately directed towards the mission, mandate and responsibilities of ICES, i.e. 'Advancing the capacity to give advice on human activities affecting, and affected by, marine ecosystems' (ToR e);
- What activities (in terms of Biodiversity Science and management) may be missing from ICES expert groups (ToR c, d, e).

ToR a) Define and report on the term 'Biodiversity Science', as it is applied within ICES.

The term, 'Biodiversity Science', is defined in a variety of ways in the marine science community. It is important to clearly understand what SGBIODIV understands under this term.

ToR b) Review and report on the remit of the Study Group on Biodiversity Science in support of ICES science and advice.

It is important to have assurance that the SG's products are useful in support of ICES scientific and advisory activities, and that appropriate Terms of Reference are being developed. How are the SGBIODIV ToRs linked to provision of advice for 2008?

ToR c) Review and synthesise the current and emerging European and international marine biodiversity initiatives.

A number of initiatives have been successful in networking and integrating marine biodiversity research and data at a pan-European scale. This data and information is extremely valuable in supporting the assessment and conservation of biodiversity within the ICES area. By linking with existing infrastructures and maximising the use of existing standardised vocabularies in Europe (e.g. ERMS, NARM etc.), ICES can continue to play a key role in long-term safeguarding of biodiversity data.

ToR d) Prepare an inventory of the contribution of existing Study and Working Groups to Biodiversity Science and how this information is currently taken up by Advisory and Science Committees.

Currently, Biodiversity Science does not feature strongly in the Science or Advisory Committees of ICES. Although none of the existing Committees explicitly addresses the issue of Biodiversity Science, it does form an important component of several active Study and Working Groups within ICES.

ToR e) Identify the current and future ICES Biodiversity Science needs, explore how these needs can be addressed by existing and new groups and propose mechanisms for communication and integration.

In order to address ICES' fundamental goals, it is vital that Biodiversity Science be addressed in an integrated way. Achieving a cohesive and structured approach is expected to help consolidate and further develop ICES' role as important end user of, and advocate for, Biodiversity Science.

SGBIODIV will report by 18 April 2008 for the attention of the Marine Habitat and Living Resources Committees, BEWG and ACE.

6 Definition of the term 'Biodiversity Science' as it is applied within ICES (ToR a)

The principal scientific objective of biodiversity studies has traditionally been to establish a catalogue of life on Earth. Challenging this view, the Convention for Biological Diversity (CBD, http://www.biodiv.org) reshaped the resonance of biodiversity. The objectives of this convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. Consequently, Biodiversity Science and biodiversity issues (e.g. declining fish stocks, invasive species, habitat destruction etc.) received a political mission, crossing the boundaries between fact and value (i.e. biodiversity exists, is good, has to be conserved) and bridging the gap between 'is' and 'should' (what is the state of biodiversity versus what should it be). As a result, the past two decades have seen a wealth of new Biodiversity Science, developing new concepts on the causes of biodiversity loss, its potential consequences for ecosystem functioning and its human dimensions

(International Council for Science 2002). International programmes have been playing a major role in initiating and facilitating these efforts (link to ToR c).

To address the concepts of conservation and sustainability, the term 'Marine Biodiversity' encompasses the whole array of life, life support systems and their interactions in the marine environment (including structural and functional aspects of biodiversity from genes through individuals, taxa, populations, communities and ecosystems). With respect to ICES, as prime source of advice on the marine ecosystem to governments and international regulatory bodies, the term 'Biodiversity Science' can thus be defined as 'scientific research into the understanding, conservation, restoration and sustainable use of the marine biodiversity of the North Atlantic Ocean and adjacent seas'.

7 The remit of the Study Group on Biodiversity Science (SGBIODIV) in support of ICES science (ToR b)

As outlined in the 2006 report of the Marine Habitat Committee, SGBIODIV should address issues including (a) applications of biodiversity knowledge to the ICES community, (b) biodiversity for the purposes of environmental conservationism, (c) marine genomics, (d) functionality, (e) data management issues and (f) public outreach.

In line with the ICES mission statement, the remit of SGBIODIV should be to recommend mechanisms that will advance ICES' capacity to understand and provide advice on the effects of human activities and natural change on marine biodiversity. This will be achieved by:

- reviewing the current and emerging European and international marine biodiversity initiatives and making recommendations for linking ICES activities with these initiatives to deliver integrated advice on the long-term safeguarding of biodiversity (ToR c),
- documenting the contribution of existing ICES expert groups to Biodiversity Science and establishing how this information is currently taken up by the Advisory Committee (ToR d) and
- preparing an inventory of the current and future ICES Biodiversity Science needs, exploring how these needs can be addressed by existing and new groups and proposing mechanisms for communication and integration (ToR e).

8 Current and emerging European and international marine biodiversity initiatives (ToR c)

A rapidly growing number of pan-European and international initiatives contribute to our understanding of marine biodiversity components. Making an inventory of these initiatives is extremely valuable in order for ICES to capitalise on existing scientific advisory networks, research and information management initiatives, and funding agencies (Annex 3). EU-funded Networks of Excellence (e.g. MarBEF, Marine Genomics etc.), Integrated Projects (e.g. HERMES etc.), ERA-Nets (e.g. BiodivErsA etc.) and Specific Targeted Research Projects (e.g. ELME etc.) are being instrumental in organising biodiversity-related science and sharing data (see SGBIODIV report 2007). It is important that EU member states and the EC further this structuring to ensure the continuation of effective cooperation mechanisms and infrastructure development.

Infrastructures need to be in place to manage data beyond the life time of individual projects. Data need to find their way into repositories so as to give future generations of scientists a possibility to have access to these data without having to spend unnecessary resource on discovering and mobilising data. ICES Data Centre can play a key role by contributing to over-arching scientific data infrastructures such as SeaDataNet, the Ocean Biogeographic Information System (OBIS).

A large number of national and international initiatives, established following the adoption of the CBD in 1992, focus on the inventory and classification of biodiversity. Some of these programmes focus on the discovery of species and clades, and others on databasing museum specimens, taxonomic names, or phylogenetic knowledge. High priority is given to identifying species under threat of global extinction or experiencing rapid declines in population. Even in those taxonomic groups and locations where diversity has been described, diversity is changing rapidly following increasing human activities. Habitat degradation and loss, biological invasions, habitat fragmentation and over-exploitation are major drivers of biodiversity loss, so that there is an important need to monitor and assess changes in marine biodiversity at appropriate spatial and temporal scales.

Our inventory of biodiversity initiatives (Annex 3) is certainly incomplete and does not include national initiatives in Europe. It includes most multi-national European initiatives, most Canadian initiatives and a few international ones. The inventory focuses on marine biodiversity but also includes key initiatives addressing terrestrial and freshwater biodiversity. In order to summarise the inventory, initiatives were categorised with respect to three levels of biodiversity components (genetic, species and ecosystems, including community and habitat) and five types of activity:

- Clearing House – Initiatives that disseminate information on biodiversity components to users (e.g. decision makers, managers, public, other agencies);
- Policies and strategies – Initiatives that define the drivers and policies relevant to the components of biodiversity;
- Research – Initiatives that comprise research activities addressing biodiversity components;
- Networks – Initiatives that enhance the capacity of its partners and their collaboration through communication, meetings and workshops, mobility and training programmes, public outreach etc;
- Databases and registers – Initiatives that manage information, including quality assurance, quality control, storage and dissemination.

The European inventory (Annex 3) shows that current initiatives evenly address the different types of activity, but that there is an overall bias towards initiatives working at the species level of organisation, i.e. 86% compared to < 62% for the other two levels (Table 1). However, this bias is not present in all types of activity. A strong bias towards the species level is indeed observed in networking activities, but strategic and Clearing House activities evenly address the three levels of biodiversity. We conclude from this inventory that the political will to evenly address biodiversity at several levels has not yet been implemented in Europe.

Table 8.1. Summary of European initiatives (only multi-national ones) addressing the three levels of biodiversity for each of the five types of activity.

		BIODIVERSITY COMPONENT		
Activity type	**Number of activities observed**	**Genetic**	**Species**	**Ecosystem**
Clearing House	4	3	4	3
Policies and strategies	5	4	4	4
Research	10	5	8	8
Networks	14	8	13	12
Databases and registers	17	2	15	4
Funding	1			
Total	51	21	44	31

The Canadian inventory of biodiversity initiatives (Annex 3), although less explicit to identify areas where ICES should engage is highly relevant to identify how ICES can engage internationally outside Europe. In summary (Table 8.2), the levels of biodiversity and the types of activities addressed by Canadian initiatives are similar in some respects to the European inventory. Overall, Canadian activities are predominately networking initiatives (i.e. 38% of all initiatives). The remainder are evenly distributed among Clearing House, strategic, research and database activities. As with the European inventory, there is an overall bias towards initiatives addressing the species level of biodiversity. In Canada, contrary to the European inventory, the research and networking activities are spread across all levels of biodiversity while the Clearing House, strategic and database initiatives seem to be biased against the genetic level of biodiversity. This could reflect that in Canada, the implementation of biodiversity initiatives across all levels of organisation has happened before its recognition by Clearing House and strategic initiatives.

Table 8. 2. Summary of Canadian initiatives addressing the three levels of biodiversity for each of the five types of activity.

		COMPONENT OF BIODIVERSITY		
Activity type	**Number of activities observed**	**Genetic**	**Species**	**Ecosystem**
Clearing House	3	1	3	3
Policies and strategies	6		5	5
Research	2	2	2	2
Networks	11	7	9	5
Databases and registers	7		7	3
Total	29	10	26	18

Further examination into policy and strategy initiatives developed as a Canadian response to the CBD illustrates a dichotomy of drivers for biodiversity information. Legislative requirements arising form Canada's Species at Risk Act seek to conserve biodiversity one species at a time. Delivering science information and advice has relied on adapting the existing data and assessment approaches for single species distribution and abundance for the most part utilise existing data gathered through stock assessment research. Some weakness in this approach is apparent in that data sources are not specifically designed for assessing distribution and abundance of non-commercial or rare species that are often candidates for concern and assessment.

The alternative policy and strategy driver requires information to report on Ecosystem Status and Trends. This requires data at multiple levels (genetic, species, community and ecosystem). This level of information is not readily accessible either because it has not yet been gathered, is not fully understood or has not been brought together for assessment on this holistic scale. This requires data and register initiatives to combine information from a range of information sources and networks to enhance understanding of this information.

9 Contribution of existing ICES Study and Working Groups to Biodiversity Science and uptake of this information by Advisory and Science Committees (ToR d)

Prior to the restructuring of the ICES Advisory Committees in October 2007, three Advisory Committees provided advice on marine ecosystem issues; Advisory Committee on Fishery Management (ACFM), Advisory Committee on the Marine Environment (ACME) and Advisory Committee on Ecosystems (ACE). This work is now carried out by a single Advisory Committee (ACOM). Together with the eight Science Committees, the Advisory Committee pulls together scientific advice from the work of the 100 or more Study and Working Groups that ICES coordinates. Although none of the existing Committees explicitly addresses the issue of Biodiversity Science, it does form an important component of several active Study and Working Groups within ICES.

Biodiversity issues addressed by expert groups include (Annex 4):

- impacts of alien species on native aquatic biodiversity;
- changes in the distribution of biodiversity as a result of climate change;
- development of indicators to assess ecosystem health;
- biodiversity of ecosystem components (fish, seabirds, plankton, benthos etc.);
- improvement of fishing surveys to provide information on the wider ecosystem (incl. biodiversity of non-target species);
- biodiversity and nature conservation of exploited ecosystems;
- relationship between fishing practices and impact on biodiversity;
- fishing-induced changes to marine biodiversity; and
- utility of genetic monitoring for evaluating intraspecific biodiversity in fishes.

The contribution of various ICES Study and Working Groups to research activities or information on the components of marine biodiversity and to the management of the components of marine biodiversity are listed in Annex 6 and 7. This summary is based on the approach of Zacharias and Roff (2000) who listed components of marine biodiversity from genetic to ecosystem level by structure and process (Annex 5). SGBIODIV reviewed reports from relevant expert groups produced in 2007 (and in some cases 2006). Only three working groups investigated the genetic component of marine biodiversity. Expert groups reviewed existing information on the fitness of genetically altered stocks of alien species, fishing-induced selection/evolution and genetic diversity of marine fish and shellfish. The majority of groups (10) reviewed scientific knowledge on structural and functional aspects of species and their populations. Efforts focussed on the distribution and numbers of alien and native, target and non-target species. Process-orientated issues included growth,

reproduction and recruitment of plankton and deep water fishes, vulnerability of marine mammals and feeding and habitat requirements of fishes. Information on community structure of major ecosystem components has been reviewed as have inter-specific competition and function and productivity of selected taxa. A total of nine expert groups have addressed ecosystem-level questions, including climate change, habitat mapping, impact of sand and gravel extraction and seasonality of plankton distributions. Effects of hydrodynamics and sea temperature on species distributions presented a cross-cutting theme for various expert groups in 2007.

At present, ICES approaches biodiversity-related questions with a mixture of topics primarily addressing inventories of structures (i.e. species and habitat mapping) and fish ecology. Work on ecosystem structure and processes operating at all ecosystem levels are less well represented within ICES (Annex 5). The majority of scientific information reviewed relates to species distribution patterns and human pressures leading to changes in biodiversity. Activities directed at the capture, review and evaluation of mechanisms by which drivers affect components of biodiversity is missing at present.

9.1 Uptake of Biodiversity Science in ICES advice

ICES provides advice with reference to a number of international agreements and codes of practice that are used as over-arching guidelines including (a) the Precautionary Principle, (b) the Precautionary Approach, (c) the Convention on Biological Diversity (CBD), (d) Ecosystem Approach and (e) Maximum Sustainable Yield (ICES, 2006). The Ecosystem Approach puts emphasis on a management regime that maintains the health of the ecosystem alongside appropriate human use of the environment, for the benefit of current and future generations. For example, the CBD defines the Ecosystem Approach as: 'ecosystem and natural habitats management to meet human requirements to use natural resources, whilst maintaining the biological richness and ecological processes necessary to sustain the composition, structure and function of the habitats or ecosystems concerned' (ICES, 2006). In order to achieve effective scientific, ecosystem-based advice, these rather generic and conceptual commitments need to be translated into specific ecosystem management objectives, including biodiversity components. Whilst moving to an Ecosystem Approach has inevitably led to greater uncertainty in analyses and scientific advice compared to single-species approaches, some examples of changes to fisheries and environmental management (e.g. reduction of bycatch of non-target species, spatial management) represent significant contributions to allowing human activities to exist in harmony with conservation of biodiversity (Rice, 2005).

In recent years, the Advisory Committee on Ecosystems (ACE) has translated an OSPAR request related to climate change effects on marine biodiversity into relevant ToRs for several Working Groups. The response to ICES has been coordinated by the Working Group on Ecosystem Effects of Fishing Activities (WGECO, see Annex 4 – 7). To date, biodiversity-related requests from OSPAR requiring an integrated approach across Study and Working Groups have been rare. These include, for example, requests to:

- review a proposal for a marine protected area for the Mid-Atlantic Ridge/Charlie Gibbs Fracture Zone (including a review of ecological criteria, potential damage by man-made activities and the value of the site for scientific research); and to

- carry out a scoping study on possible approaches ICES would use to prepare a set of expert summaries of the quality status of the main components of biodiversity in each of the OSPAR regions (including seabed habitats and their associated communities; plankton, fish communities, marine mammals, seabirds and reptiles) to contribute to the QSR 2010.

According to their Terms of Reference, several Science Committees are well placed to address these requirements (Annex 4). The ICES reply to these recent OSPAR requests is expected end of January and end of March 2008, respectively.

10 Current and future ICES Biodiversity Science needs (ToR e)

The development of increasingly robust databases on species distribution and analytical tools made substantial progress toward understanding biodiversity distribution and rates of change. Likewise, synergies between the drivers of biodiversity change are being explored, leading to greater understanding of the relationships between biodiversity and ecosystem functioning. However, although compelling, these findings and knowledge are still being interpreted in isolation from one another, and this has been one of the major problems in achieving the goals of protecting biodiversity. The biodiversity scientific community is fragmented among types of ecosystems, types of organisms and among disciplines (e.g. taxonomy, molecular biology, ecology, socio-economics). Consequently, Biodiversity Science has been undervalued by the policy sectors (Dirzo and Loreau, 2005).

Marine ecosystems have traditionally been subject to separate policies dealing with specific uses (fisheries, maritime transport and pollution at sea, tourism and recreational uses, waste disposal and land-based pollution, etc.). These policies are based on the development of scientific knowledge about different components of marine ecosystems, and usually focus on sector-based management objectives. However, it is recognised by ICES that the ecosystem must be taken as a whole for these policies to be implemented effectively. Managing the impacts of human activity on marine biological diversity implies bringing together different fields of knowledge on marine ecosystems and their uses, and different areas of policy. As stated in the draft ICES Science Plan (ICES, 2008) 'global problems require global approaches'. This requires the scope of established sectorial advice to become more holistic and integrated. A debate on marine biodiversity conservation within ICES could promote this integration.

10.1 Current ICES Biodiversity Science needs

ICES provides advice on a range of issues relating to marine policies and management with clients including governments of ICES' member countries, the European Commission (EC) and international intergovernmental organisations dealing with marine affairs (e.g. HELCOM, NEAFC, OSPAR). ICES may also, on its own initiative, draw the attention of clients to marine matters which may require policy and management attention (ICES, 2006).

EC: Services of ICES are sought for recurring advice on the state of the marine ecosystem to support the implementation of e.g. the EU merging Marine Strategy and Maritime Policy. Non-recurring advice requests for 2008 include advice regarding cetacean by-catch and the interactions between fisheries and seabirds in EU waters.

NEAFC: Among other fisheries assessment needs, advice is sought on the state and management of the main commercial stocks in the NEAFC convention area. More specifically, ICES shall provide advice regarding marine ecosystems and status of predominately finfish and elasmobranch stocks. ICES is also asked to offer recurring advice on the state of marine ecosystems and human impacts and give warnings of any serious threats from fishing activities alone or in conjunction with any other relevant activity to local ecosystems or species.

HELCOM: ICES provides recurring scientific information and advice based on specific requests. Within the Baltic Sea Action Plan (adopted in November 2007), information of ecological objectives for nature conservation and biodiversity will be retrieved from ICES. These involve the 'Spawning stock biomass of western Baltic cod and eastern Baltic cod compared to precautionary level' and the 'Fishing mortality level of western Baltic cod and eastern Baltic cod, compared to precautionary level'.

OSPAR: According to a Memorandum of Understanding between ICES and OSPAR, ICES provides scientific information and advice and serves as data centre for data collected under OSPAR environmental assessment and monitoring programmes. In turn, ICES data centre inter alia prepares data sets and products to be used by OSPAR for assessments and other products, for example in form of maps or tables, presenting the outputs of OSPAR assessments. In 2006 and 2007 ICES was asked to give advice mainly on environmental assessment measures and monitoring strategies for several ecosystem components as well as the effects of environmental changes and fisheries on these components.

In order to fulfil their roles and responsibilities for the protection, conservation and sustainable use of the marine environment, these organisations seek regular advice from ICES and other regional and international bodies. Advice is given in the context of international agreements and guidelines (including the CBD) and is based on the Ecosystem Approach to Management (see section 9.1). The Ecosystem Approach is being implemented incrementally so that any information on the interaction between human activities, (fish stocks) and the marine ecosystem is considered and incorporated in the advice. To date, requests have been directed at ecosystem impacts of human activities specific to those managed by each intergovernmental organisation. By and large, existing Study and Working Groups are in a good position to respond to current requests (Annex 4, 6 and 7).

10.2 Future ICES Biodiversity Science needs

ICES advice is directed primarily at the need for information regarding the status of commercial fish stocks. However, there has been a growing awareness of the impact that human activities, other than fishing, have on the marine environment and since the 1990s, ICES has been providing advice based on an Ecosystem Approach to managing human activities in marine waters. This has meant challenging many expert groups to undertake new research or to reconsider existing information in order to provide the scientific basis for this integrated advice. This shift in emphasis is reflected, for example, in the growing number of biodiversity-related articles published in the ICES Journal of Marine Science over the past decade (Figure 10.2.1).

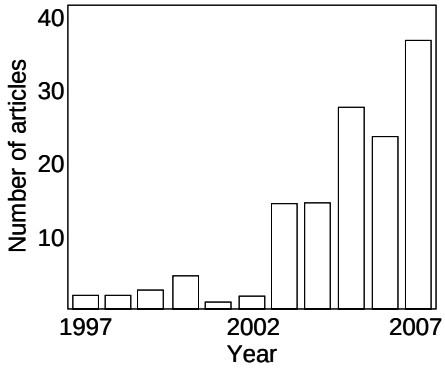

Figure 10.2.1. Number of biodiversity-related articles published in the ICES Journal of Marine Science between 1997 and 2007.

The journal serves as one of the sources for scientific advice across the broad spectrum of management and conservation issues related to the marine environment. Topics related to (fisheries) management, environmental indicators and ecology of major ecosystem components constitute the key elements of biodiversity-related articles published between 1997 and 2007 (Figure 2). Approximately 40% of articles deal with the effects of fishing-induced disturbance on marine biodiversity whereas about 30% address biodiversity issues irrespective of a specific link to anthropogenic pressures (Figure 3). Integrated studies that bridge gaps between traditional disciplines (e.g. foodweb- and ecosystem-based studies, Figure 2) and investigations assessing cumulative effects of various pressures on marine biodiversity (Figure 3) are comparatively rare.

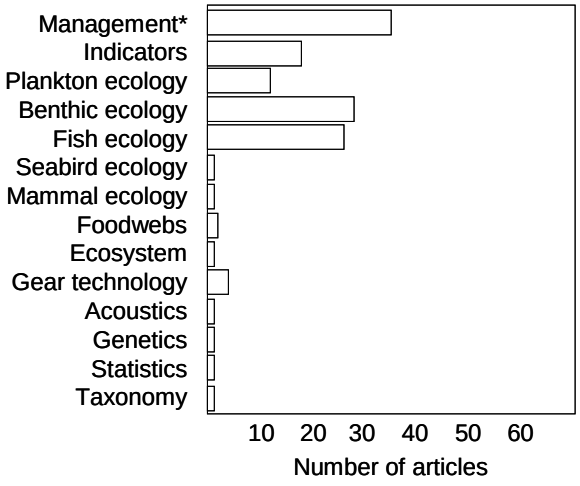

Figure 10.2.2. Topics of biodiversity-related articles published in the ICES Journal of Marine Science between 1997 and 2007 (* incl. science-policy interface, risk analysis, conservation).

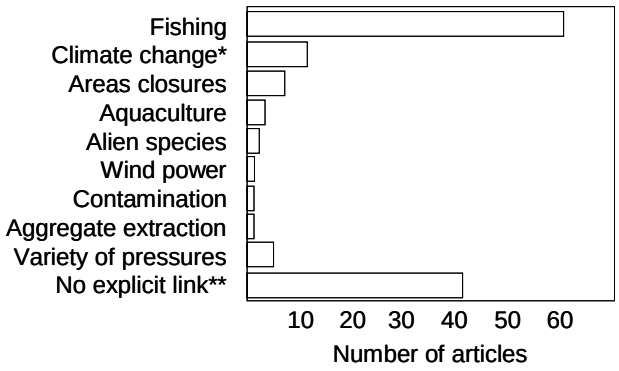

Figure 10.2.3. Pressure links of biodiversity-related articles published in the ICES Journal of Marine Science between 1997 and 2007 (* incl. regime shifts, ** incl. diversity patterns).

Research themes related primarily to structural aspects of marine biodiversity have been addressed and led effectively by existing ICES Science Committees and their expert groups (Annexes 4–7). Assessing and predicting the impacts of a multitude of natural and man-made activities on the components of marine biodiversity, however, clearly demands for a broader range and integration of disciplines. These include, for example, disciplines investigating processes, genetic diversity, meta-population structure and modelling interactions between environmental drivers and biological responses. These will require collaboration between ICES and European and international initiatives (Annex 3) as well as input from external partners (including academia, see Section 12).

10.3 Addressing ICES Biodiversity Science needs

As stated in the ICES draft Science Plan (ICES, 2008), increasing pressure on the marine environment and its living resources demand for a 'science strategy which allows not only for a responsive science agenda but also for one that is adaptive and anticipatory'. ICES has identified 17 research themes of strategic importance to its advisory needs which are indicative of its future science and advisory needs. These themes are organised in four categories:

- Understanding of ecosystem functioning;
- Understanding of human impacts on ecosystems;
- Development of options for sustainable use of ecosystems;
- Operational issues.

All elements of the advisory process including ecosystem understanding, monitoring, assessment, decision support and implementation are linked to the 17 science themes, with a major focus on ecosystem understanding (including biodiversity issues) assessment and decision support.

ICES' approach to delivering its proposed science programme is three-fold. It is proposed that:

1) Some research themes are to be addressed by existing Science Committees and their expert groups whilst others require input from academic marine experts and collaboration with national and international initiatives (see section 10.1 and 10.2);

2) Some research themes require an enhanced regional focus, potentially calling for regional committees in addition to the Baltic Committee;

3) Several issues, as yet not defined in the draft Science Strategy Plan, are sufficiently 'cross-cutting' and 'multi-disciplinary', demanding for new governance units, so-called 'Programmes'.

The major utility of our adopted framework (Zacharias and Roff, 2000), explored in section 9, is that it allowed us to judge the activities of ICES and other organisations in terms of their science and management contributions to the conservation of marine biodiversity. In contrast, we noted that the reverse exercise (i.e. trying to define how marine biodiversity fits into other frameworks, activities or mandates of organisations) rapidly became intractable. Marine biodiversity in its entirety does NOT fit into other more specific remits, mission statements, disciplines or mandates of marine science. Hence our view of the fundamental and encompassing significance of biodiversity; it is over-arching NOT a cross-cutting theme.

11 Literature

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12 Recommendations

1) Send the SGBIODIV report 2008 to Science Committees and their expert Study and Working Groups for comment: Has SGBIODIV accurately captured relevant ICES activities related to biodiversity (i.e. have ICES' contributions to Biodiversity Science been mis-interpreted and/or over- or underestimated)?

2) In view of the historical progression from single-species management, multi-species management, ecosystem-based management to conservation of biological diversity and sustainable management, SGBIODIV recommends that ICES should not view biodiversity simply as a cross-cutting theme (or a new 'Programme'), but rather it should be entrenched in the mission statement of ICES.

3) SGBIODIV recognised that ICES by itself cannot have the capacity to deliver scientific expertise in all components of marine biodiversity, which is critical for integrated advice. ICES should therefore:

- Register ICES SGBIODIV meetings as voluntary contributions to the International Mechanism for Scientific Expertise in Biodiversity (http://www. imoseb.net/voluntary_contributions) in order to inter alia attract academic marine experts to become engaged in ICES activities. This could be achieved, for example, by providing professional and financial support for academic experts to participate in ICES Study and Working Group meetings and by holding ICES meetings at universities.
- Engage with the most relevant initiative, to take full advantage of biodiversity knowledge and expertise available within Europe and internationally (Annex 3). SGBIODIV recommends that, initially, these should be:

  Clearing House: International Press Centre for Biodiversity Research (IPCB), http://www.biodiversityresearch.net/
  Policies and strategies: The European Platform for Biodiversity Research Strategy (EPBRS), http://www.epbrs.org/
  Research and Networks: Future network of virtual institutes created following the completion of various EU NoEs
  Databases and registers: Appropriate data management infratstructures, e.g. SeaDataNet (http://www.seadatanet.org/)
  OBIS (http://www.iobis.org/)
  WoRMS (http://www.marinespecies.org/) etc.

Annex 1: List of participants

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Annex 2: Agenda

Tuesday, 11 March 2008

9:00 Opening + introduction of all participants

- Adoption of agenda and appointment of rapporteurs

- Short presentation on the history of SGBIODIV (M Schratzberger)

- Review SGBIODIV 2007 recommendations

10:30 John Roff: How do we 'capture' and conserve the components of Marine Biodiversity?

11:00 Review reports from ad hoc ToR a) and b)-groups

13:00 – 14:00 Lunch

14:00 Plenary ToR a) Define and report on the term 'Biodiversity Science' as it is applied within ICES

16:00 Plenary ToR b) Review and report on the remit of the Study Group on Biodiversity Science in support of ICES science and advice

Wednesday, 12 March 2008

9:00 Review report from ad hoc ToR c)-group

10:00 Plenary ToR c) Review and synthesise the current and emerging European and international marine biodiversity initiatives

13:00 – 14:00 Lunch

14:00 Review report from ad hoc ToR d)-group

15:00 Plenary ToR d) Prepare an inventory of the contribution of existing Study and Working groups to Biodiversity Science and how this information is currently taken up by Advisory and Science Committees

Thursday, 13 March 2008

9:00 Plenary ToR e) Prepare an inventory of the current and future ICES Biodiversity Science needs, explore how these needs can be addressed by existing and new groups and propose mechanisms for communication and integration

13:00 – 14:00 Lunch

14:00 Plenary ToR e)

16:00 Discuss structure of SGBIODIV 2008 report including recommendations, actions and ToRs for 2009

Friday, 14 March 2008

9:00 Draft SGBIODIV report

13:00 – 14:00 Lunch and close

Annex 3: Current and emerging European and international marine biodiversity initiatives

Inventory of European (multi-national) initiatives

ENVironment: Marine (M), Terrestrial (T) and Freshwater (F)
TYPES of Activity: Clearing House, Policies and strategies, Research, Networks, Databases and registers
LEVELS of biodiversity components addressed: Genetic, Species and Ecosystems

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
International Press Centre for Biodiversity Research (IPCB) Web: http://www.biodiversityresearch.net/ Funding: EU Countries: Secretariat in Brussels The IPCB is an AlterNET initiative was launched in 2005 at the European Commission's event *Communicating European Research*. The aim of IPCB is to provide a common web portal for publicising biodiversity research news. Using IPCB, news providers (research organisations and others involved in biodiversity studies) can provide information direct to journalists.	MTF	Clearing House	Genetic, Species, Ecosystems	2005	----
EC Biodiversity Clearing House Mechanism (EC-CHM) Web: : http://biodiversity-chm.eea.europa.eu Funding: EU Countries: EU The EC-CHM site is managed by the European Environment Agency, which is designated as the EC Clearing House Mechanism Focal Point by the European Commission. This site has been established in order to fulfill the obligation of the European Communities being a signatory party to the Convention on Biological Diversity. The objective of the EC Biodiversity CHM is to promote technical cooperation and technology transfer within the European Union and its Member States, within the Pan European Region and the rest of the world.	MTF	Clearing House	Genetic, Species, Ecosystems	2003	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
The Biodiversity Project Cluster (BIOTA) Web: http://www.nbu.ac.uk/biota/ Funding: Projects under FP5 & FP6 Countries: Depends on project The BIOTA cluster lists EU funded projects related to biodiversity, in response to the Convention on Biological Diversity, WEHAB and the European Biodiversity Strategy, and aims to determine and promote strategic approaches to biodiversity conservation and management in Europe. Projects in the BIOTA cluster: Assess and predict the impact of major drivers of biodiversity Are developing tools, such as biodiversity indicators, to promote the conservation and sustainable use of biodiversity Seek to identify and resolve conflicts between society, economy and biodiversity Support the conservation of biodiversity by creating databases on the taxonomy, biology and ecology of Europe's plants and animals. Strengthen scientific and technological excellence on biodiversity research through the durable integration of research capacities across Europe	MTF	Clearing House	Genetic, Species, Ecosystems	?	?
International Mechanism of Scientific Expertise on Biodiversity (IMoSEB) Web: http://www.imoseb.net/fr/ Funding: Countries: International After the conference of Paris, "Biodiversity: Science and Governance" in January 2005, an international consultation was launched to assess the need, scope and possible forms of an International Mechanism of Scientific Expertise on Biodiversity (IMoSEB). **Case studies**: IMoSEB Case study - TK & scientific expertise and decision making IMoSEB Case Study - The case of Mexico IMoSEB Case study - Avian Influenza IMoSEB Case Study-Lessons from Assessments IMoSEB Case study - Lessons from Invasive Alien Species Management IMoSEB Case Study - Decision making landscape & Use of MA IMoSEB Case Study - Lessons from Fisheries	MTF	Clearing House	Species	2005	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Global Earth Observation System of Systems (GEOSS) Web: http://www.earthobservations.org/ Funding: Countries: The Group on Earth Observations (or GEO) is coordinating international efforts to build a Global Earth Observation System of Systems (GEOSS). This emerging public infrastructure is interconnecting a diverse and growing array of instruments and systems for monitoring and forecasting changes in the global environment. This "system of systems" supports policymakers, resource managers, science researchers and many other experts and decision-makers. GEOSS Themes: Disasters, Health, Energy, Climate, Water, Weather, Ecosystems, Agriculture, Biodiversity GEOSS will link together the world's many stand-alone biodiversity monitoring systems and connect them to other Earth observation networks that generate relevant data, such as climate and pollution indicators. It will also help to fill in gaps in taxonomic and biological information, generate updated assessments of global biodiversity trends, track the spread and retreat of invasive alien species, and monitor how biodiversity responds to climate change. News: Ocean monitoring system 'vital to mankind'	MTF	Databases and registers	Genetic, Species, Ecosystems	2007	----
Global Monitoring for Environment and Security (GMES) Web: http://www.gmes.info/ Funding: Countries: 31 European countries GMES will be based on observation data received from Earth Observation satellites and ground based information. These data will be coordinated, analysed and prepared for end-users. GMES will be built up gradually: it starts with a pilot phase which targets the availability of a first set of operational GMES services by 2008 followed by the development of an extended range of services which meet user requirements. Endorsed global ocean monitoring projects: MERSEA, MAMA, ESONET	MTF	Databases and registers	None	2001	----
Integrated Taxonomic Information System (ITIS) Web: : http://itis.gbif.net/ Funding:? Countries: USA, Canada, Mexico ITIS offers authoritative taxonomic information on plants, animals, fungi, and microbes of North America and the world.	MFT	Databases and registers	Species	?	

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Universal Biological Indexer and Organiser (uBio) Web: http://www.ubio.org/ Funding: ? Countries: USA uBio is an initiative within the science library community to join international efforts to create and utilise a comprehensive and collaborative catalog of known names of all living (and once-living) organisms. The Taxonomic Name Server (TNS) catalogs names and classifications to enable tools that can help users find information on living things using any of the names that may be related to an organism.	MTF	Databases and registers	Species	?	
Ocean Biogeographic Information System (OBIS) Web: http://www.iobis.org/ Funding: Countries: OBIS was established by the Census of Marine Life program (www.coml.org). It is an evolving strategic alliance of people and organisations sharing a vision to make marine biogeographic data, from all over the world, freely available over the World Wide Web. It is not a project or program, and is not limited to data from CoML-related projects. Any organisation, consortium, project or individual may contribute to OBIS. OBIS provides, on an 'open access' basis through the World Wide Web: taxonomically and geographically resolved data on marine life and the ocean environment; interoperability with similar databases; software tools for data exploration and analysis. OBIS was one of the earliest Associate Members of the Global Biodiversity Information Facility (www.gbif.org) which publishes data on all species. OBIS is a very active participant in GBIF activities, and one of the largest publishers of data to GBIF, reflecting its role as a specialist network for marine species. GBIF recommends that marine data are first published through OBIS, because OBIS can add special value (e.g. depth) and will manage the subsequent publication of data through GBIF. This also avoids duplication of data being separately published to GBIF and OBIS.	M	Databases and registers	Species	1997	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
The European Ocean Biogeographic Information System (EurOBIS) Web: http://www.marbef.org/data/eurobis.php Funding: see MarBEF Countries: see MarBEF The European Ocean Biogeographic Information System (EurOBIS) is a distributed system that allows you to search multiple datasets simultaneously for biogeographic information on marine organisms. EurOBIS has been developed within the MarBEF network and acts as the European node of OBIS. This distributed system to present biogeographic information will integrate individual datasets on marine organisms into one large consolidated database. Through collaboration with OBIS the scientific community will have rapid free access to data on marine species distributions, and ocean environmental data. The ultimate goal of EurOBIS is to provide the end-user with a fully searchable biogeographic database, focused on three main parameters of a distribution record: taxonomy, temporal and geographical cover. Within EurOBIS the European Register for Marine Species (ERMS) will function as the taxonomic backbone and each species list from every incoming dataset will be matched with this register.	M	Databases and registers	Species	2005	----
World Register of Marine Species (WoRMS) Web: http://www.marinespecies.org/ Funding: EU-FP6-NoE MarBEF and EU Species 2000 Countries: see MarBEF The aim of a World Register of Marine Species (WoRMS) is to provide an authoritative and comprehensive list of names of marine organisms, including information on synonymy. While highest priority goes to valid names, other names in use are included so that this register can serve as a guide to interpret taxonomic literature. The content of WoRMS is controlled by taxonomic experts, not by database managers. WoRMS has an editorial management system where each taxonomic group is represented by an expert who has the authority over the content, and is responsible to control the quality of the information. Each of these main taxonomic editors can invite several specialists of smaller groups within their area of responsibility. This register of marine species grew from the European Register of Marine Species (ERMS), and its combination with several other species registers maintained at the Flanders Marine Institute (VLIZ). Rather than building separate registers for all projects, and to make sure taxonomy used in these different projects is consistent, we developed a consolidated database called 'Aphia'. A list of marine species registers included in Aphia is available below. MarineSpecies.org is the web interface to this database. The WoRMS is an idea that is being developed, and will combine information from Aphia with other authoritative marine species lists which are maintained by others (e.g. AlgaeBase, FishBase, Hexacorallia, NeMys).	M	Databases and registers	Species	2007	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
A Pan-European Species-directories Infrastructure (PESI) Web: http://www.eu-nomen.eu/pesi/ Funding: EU-FP7-CA-PESI Countries: ---- Because the correct use of names is essential for biodiversity management, the availability of taxonomically validated standardised nomenclatures (name databases) is fundamental for data infrastructures. A range of initiatives has been taken within the European Research Area (ERA) to develop information systems assembling and integrating biological species information for various purposes. Among these is *SpeciesBase*, attempting to provide accumulated species data sets in one web interface, as the European contribution to the *Global Species Information Systems* (GSIS). The *Life Watch* initiative will monitor Europe's biodiversity by bringing together observational and collection data in a single research system. *Species2000* prepares comprehensive catalogues of species names by incorporating the results of an array of autonomous federated taxonomic databases. A prerequisite of these initiatives is the support of scientists and infrastructures that provide standardised and authoritative taxonomic information. PESI will coordinate the delivery of this information through the inter-operation of the existing data infrastructures and networks of experts.	M	Databases and registers	Species	2008	----
Marine Ecoregions of the World (MEOW) Web: http://www.worldwildlife.org/MEOW/index.cfm MEOW is a biogeographic classification of the world's coasts and shelves. It is the first ever comprehensive marine classification system with clearly defined boundaries and definitions and was developed to closely link to existing regional systems. The ecoregions nest within the broader biogeographic tiers of Realms and Provinces.	M	Databases and registers	Ecosystems	----	----
European Marine Observation and Data Network (EMODNET) Web: ---- Funding: EU Countries: EU In its Action Plan for an integrated Maritime Policy, SEC(2007)1278, adopted on 10 October 2007 the Commission announced that, with the support of a specially constituted advisory group, it would prepare by 2009 an EU action plan to make progress on a European Marine Observation and Data Network.	M	Databases and registers	Genetic, Species & Ecosystems	2009	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
The Biological Collection Access Service for Europe (BioCASE) Web: http://www.biocase.org/ Funding: EU-FPx-NoE, ENBI, EU-SYNTHESIS, GBIF Countries: 31 European Countries BioCASE is a transnational network of biological collections of all kinds. BioCASE enables widespread unified access to distributed and heterogeneous European collection and observational databases using open-source, system-independent software and open data standards and protocols. BioCASE builds on the predecessor projects CDEFD, BioCISE, and ENHSIN. These laid the groundwork for implementing a fully functional service unlocking the immense biological knowledge base formed by biological collections. Since the end of its funding period (2004) the continuous development of BioCASE, as well as user and data provider support, was or is supported by the European Union projects ENBI and SYNTHESYS, as well as by other initiatives such as the GBIF mirror and replication project..	MTF	Databases and registers	Species	2001	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
The Global Biodiversity Information Facility (GBIF) Web: http://www.gbif.org/ Funding: Organisation for Economic Co-operation and Development (OECD); 10M€ Countries: The Global Biodiversity Information Facility enables scientific research that has never before been possible, facilitates the use of scientific data in biodiversity policy- and decision-making, and makes a whole world of biodiversity information--data that are currently exceedingly difficult to access-- freely and universally available via the Internet. GBIF's activities are organised around six integrated thematic areas: **Data Access and Database Interoperability**, designed to facilitate the full use of biodiversity and other databases by facilitating "data-mining;" **Digitisation of Natural History Collections Data**, in order to expand biodiversity knowledge on the Internet; **Electronic Catalogue of the Names of Known Organisms**, to improve searching of biodiversity data and enable combining of data from different disciplines; **Outreach and Capacity Building**, to ensure that people in every country have access to and can easily and freely use the world's biodiversity information **SpeciesBank**, to provide a complete compendium of knowledge about particular species drawn from online information sources; and **Digital Biodiversity Literature Resources**, to open up Web access to digitised versions of the published literature. GBIF focuses on precise areas of emphasis: DATA ACCESS AND DATABASE INTEROPERABILITY (DADI) - Answering complex questions involving many disparate types of data from many sources depends on the development of standards for data and metadata. DIGITISATION OF NATURAL HISTORY COLLECTIONS (DIGIT) - GBIF encourages and supports the online provision of primary biodiversity data from natural history specimens and observational databases. ELECTRONIC CATALOGUE OF NAMES OF KNOWN ORGANISMS (ECAT) - Scientific names are the key to all scientific literature about species. A complete electronic listing is even more important for digital searching. OUTREACH AND CAPACITY BUILDING (OCB) - GBIF aims to provide software tools and training to bridge biodiversity information technology gaps for all countries around the world. GBIF also addresses scientific and technical collaboration in many areas, including repatriation of data and intellectual property rights.	MTF	Databases and registers	Species	2001	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
European Network for Biodiversity Information (ENBI) Web: http://www.enbi.info/forums/enbi/index.php Funding: EU-FP5-TN Countries: 26 European countries ENBI is the European contribution to the Global Biodiversity Information Facility (GBIF). It is a network pooling the technical resources and human expertise in biodiversity informatics within Europe. ENBI enhances the communication and co-operation between GBIF-nodes, biodiversity institutes and relevant initiatives in Europe.	MTF	Databases and registers	Species	2002	----
BioGeomancer Web: http://www.biogeomancer.org Funding: NSF, GBIF, Foundations Countries: USA; Mexico; Australia; Brasil The BioGeomancer Project is a worldwide collaboration of natural history and geospatial data experts. The primary goal of the project is to maximise the quality and quantity of biodiversity data that can be mapped in support of scientific research, planning, conservation, and management. The project promotes discussion, manages geospatial data and data standards, and develops software tools in support of this mission. The BioGeomancer consortium is developing online workbench, web services, and desktop applications that will provide georeferencing for collectors, curators and users of natural history specimens, including software tools to allow natural language processing of archival data records that were collected in many different formats.	MTF	Databases and registers	Species	2005	----
PLANKTON-NET Web: http://www.awi-bremerhaven.de/plankton-net/ Funding:EU-FP6-RI (0,2M€) Countries: Germany, France, Portugal, United Kingdom The aim of this project is to create a flexible and extensible communal information system which allows registered users to publish and retrieve taxonomic data online.	M	Databases and registers	Species	2006	2008

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Pan-European infrastructure for Ocean & Marine Data Management (SeaDataNet) Web: http://www.seadatanet.org/ Funding: EU-FP6-III (8,75M€) Countries: 35 European Countries: France, Ukraine, Netherlands, Morocco, Poland, Malta, Turkey, Iceland, United Kingdom, Georgia, Russia, Spain, Slovenia, Ireland, Bulgaria, Estonia, Croatia, Albania, Sweden, Portugal, Israel, Tunisia, Belgium, Lebanon, Greece, Romania, Cyprus, Norway, Algeria, Italy, Lithuania, Germany, Denmark, Latvia, Finland SeaDataNet objective is to construct a standardised system for managing the large and diverse data sets collected by the oceanographic fleets and the new automatic observation systems. The objective is to network and enhance the currently existing infrastructures, which are the national oceanographic data centres and satellite data centres of 35 countries, active in data collection. The networking of these professional data centres, in a unique virtual data management system will provide integrated integrated data sets of standardised quality on-line.	M	Databases and registers	Species, Ecosystems	2006	2011
BIODIVERSA; Core Project of the European Research Area Network (ERA-net) Web: http://www.eurobiodiversa.org/ Funding: 19 European funding Agency Countries: 15 European Countries: Biodiversa is an ERA-net (European Research Area) project and its objective for the period 2004-2008 is to achieve an efficient trans-national research co-operation in the field of biodiversity research funding. In order to achieve this, BiodivERsA will proceed through seven stages: inventory, description and classification of biodiversity research programmes and research funding programmes of ERA-Net members. information gathering and linkage of ERA-Net members funding programmes with developing countries identification of best practices to be compared, shared and implemented among the participants. identification of the existing opportunities for cooperation ; identification of administrative, legal and technical barriers to cooperation. implementation of collaborative planning, joint activities, training, career-development and assessment. initiation of mutually open research call on biodiversity issues. development of proposals for management of a sustainable pan-European biodiversity research. Current call: The European partners in the BiodivERsA network have joined efforts to organise and fund a Pan-European call for international research projects on biodiversity linking scientific advancement to policy and practice.	MTF	Funding	Genetic, Species, Ecosystems	2004	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
EU-wide monitoring methods and systems of surveillance for species and habitats of Community interest (EUMON) Web: http://eumon.ckff.si/ Funding: 2.2M€ total; EU (1.5M€) Countries: 11 European countries The EuMon objectives can be broken down into the following specific objectives. reviewing available methods and approaches to monitor abundance and trends in species and habitats of Community interest; Link DaEuMon evaluating the appropriateness of and recommending improvements for these methods and approaches for assessing the extent to which the 2010 target is achieved; Link DaEuMon designing methods that allow an evaluation and cost-effective improvement of the contribution of NATURA 2000 and other conservation activities to the achievement of the 2010 target; developing methods for prioritising among species and habitats based on rankings of national responsibilities for their conservation; (Link to national responsibilities) assessing and understanding how the work of amateur naturalists contributes to monitor the achievement of the 2010 target and developing recommendations how they could be encouraged to work most effectively within this framework; Link Volunteers integrating the most promising methods, approaches, and techniques (schemes) into a comprehensive, coherent, and consistent framework for assessing the achievements towards the 2010 target; making the framework, its recommendations, and the set of tools publicly available via an Internet portal.	MTF	Networks	Species, Ecosystems	?	?
European network of excellence for ocean ecosystems analysis (EUR-OCEANS) Web: http://www.eur-oceans.eu/ Funding: EU-FP6-NoE (10M€) Countries: 25 countries: France, United Kingdom, Norway, Poland, Sweden, Germany, Denmark, Tunisia, Finland, Estonia, Switzerland, Spain, Netherlands, Ukraine, Latvia, Chile, Belgium, Russia, South Africa, Portugal, Algeria, Turkey, Morocco, Greece, Italy The Network of Excellence for Ocean Ecosystems Analysis (EUR-OCEANS) aims at achieving lasting integration of European research organisations on global change and pelagic marine ecosystems and other relevant scientific disciplines by bringing together the three research communities of pelagic ecosystems, biogeochemistry and ecosystem approach to marine resources.	M	Networks	Ecosystems	2005	2008

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Synthesis of systematic recources (SYNTHESYS) Web: http://www.synthesys.info/ Funding: EU-FP6-III Countries: SYNTHESYS is setting standards for collection management and databases, and aims to raise scientists' awareness of best practice by offering improved training and workshop opportunities, and guidelines for the care, storage and conservation of collections. The Project will also provide new policies on emerging technologies for storing collections, such as DNA samples or tissue banks.	MTF	Networks	Genetic, Species	2004	2008
LIFE WATCH Web: http://www.lifewatch.eu/ Funding: EU-FP7 (TBA) Countries: TBD In preparation for the Seventh Framework programme (FP7), the European Commission asked the European Strategic Forum on Research Infrastructures (ESFRI) to establish a priority list for Research Infrastructures of pan-European interest. One of these is LIFE WATCH, a European infrastructure for research in and protection of biodiversity. It is a European plan to link ecological monitoring data collected from marine and terrestrial environments with the vast amount of data in physical collections. The new infrastructure will open up new areas of research and new services by providing access to the large data sets from different (genetic, population, species and ecosystem) levels of biodiversity together with analytical and modelling tools. Following a positive evaluation of this plan, the European Commission decided in July 2007 to start negotiations for funding of a preparatory phase leading to final decisions about the establishment of the research infrastructure. LIFE WATCH plans to construct and bring into operation the facilities, hardware and software and governance structures to create a biodiversity research infrastructure with: • infrastructure networks for data generation and processing. • facilities for data integration and interoperability. • virtual laboratories with analytical and modelling tools. • Service Centre for users and to promote research opportunities.	MTF	Networks	Genetic, Species, Ecosystems	2008	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
MARINE GENOMICS EUROPE Web: http://www.marine-genomics-europe.org/ Funding: EU-FP6-NoE (10M€) Countries: 16 Countries: France, Belgium, Denmark, Germany, Chile, Greece, Israel, Italy, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom, Norway, Iceland The EU Network of Excellence Marine Genomics was established for the implementation of high-throughput genomic approaches to investigate the functioning of marine ecosystems and the biology of marine organisms. Experts in genomics, proteomics and bioinformatics from several Centres of Excellence in genomics in Europe will be grouped and networked with marine biologists who can make use of high-throughput genomics data.	M	Networks	Genetic, Species, Ecosystems	2004	2008
European Distributed Institute of Taxonomy (EDIT) Web: http://www.e-taxonomy.eu/ Funding: FP6-NoE (11,9M€) Countries: FRANCE; Belgium; Denmark; Germany; Ireland; Netherlands; Poland; Russia; Spain; United Kingdom; Hungary; Slovakia; United States of America The objectives of EDIT are to help to reduce the fragmentation in European taxonomic research and expertise, and to co-ordinate the European contribution to the global taxonomic effort, in particular the Global Taxonomy Initiative, through an integrated initiative aimed at improving society's capacity for biodiversity conservation.	MTF	Networks	Species	2006	2011
Marine biodiversity and ecosystem functioning (MarBEF) Web: http://www.marbef.org/ Funding: EU-FP6-NoE (8,7M€) Countries: Netherlands, Belgium, Denmark, Germany, Finland, France, Greece, Ireland, Italy, Lithuania, Poland, Portugal, Spain, Sweden, United Kingdom, Norway, Slovenia MarBEF integrates and disseminates knowledge and expertise on marine biodiversity, with links to researchers, industry, stakeholders and the general public.	M	Networks	Species, Ecosystems	2004	2009

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
European Seas Observatory Network (ESONET) Web: http://www.ifremer.fr/esonet/ Funding: EU-FP6-IP (2003-2004) EU-FP6-NoE (7M€) Countries: United Kingdom, Belgium, Germany, Bulgaria, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Norway, Turkey The ESONET NoE is a stepping stone on the way to creating an underwater ocean observatory network that will remain in place for decades. ESONET addresses: Global Change and Physical Oceanography; Earth sciences, geohazards and seafloor interface; The Marine Ecosystem; and Non-Living resources ESONET observatories are powerful instruments to approach some critical points: Biogeography of European seas; The temporal ecology of photosynthetically and chemosynthetically driven benthic ecosystems; The dynamics of deep seafloor hydrothermal vents ecosystems; Pelagic (upper ocean) ecosystems; and Coral reefs and Carbonate Mounds.	M	Networks	Species, Ecosystems	2007	2011
Developing the EU Biodiversity Research Strategy (BIOSTRAT) Web: http://www.biostrat.org/ Funding:EU-FP6-SSA () Countries:32 countries The main objective of BIOSTRAT is to support the further development of a European Biodiversity Research Strategy. Such Research Strategy brings together ideas on research priorities in fundamental and applied sciences to addresses critical gaps in knowledge on the conservation and sustainable use of biodiversity. It is intended to support the decision-making process in orienting biodiversity-related research at both the European scale and in individual EU Member States. It consists of two parts: • a mechanism for communication and information between European researchers and policy makers. EPBRS and its meetings will be the core for this mechanism, BIOSTRAT with its outreach to national platforms and connection to other European and international activities in the field will provide the further integration • a document or set of documents regularly discussed and updated through the mechanism.	MTF	Policies and strategies	?	2006	2009

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
The European Marine Research Stations Network (MARS) Web: http://www.marsnetwork.org/ Funding: Countries: 21 European countries An essential part of the MARS network are regular Conferences of Directors of the 54 member institutes in order to present and discuss current trends in Marine Research and to interface with EU authorities helping to structure European research.ocean, including the Commission of the European Community in Brussels and the Marine Board of the European Science Foundation in Strasbourg. The culmination of those endeavours is the current EU-FP6-NoE MarBEF. Accordingly, MARS has become consolidated and is active. Currently, the new EU-Framework Programme is being developed which may carry science beyond 2010. Among its envisaged research themes climate impacts on biodiversity and ecosystems persist and particularly, assessments of trends in marine biodiversity. MARS will help to define new and fitting research topics in these directions.	M	Policies and strategies	Genetic, Species, Ecosystems	1996	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Convention on Biological Diversity (CBD) Web: http://69.90.183.227/ Countries: United Nations At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a comprehensive strategy for "sustainable development" -- meeting our needs while ensuring that we leave a healthy and viable world for future generations. One of the key agreements adopted at Rio was the Convention on Biological Diversity. This pact among the vast majority of the world's governments sets out commitments for maintaining the world's ecological underpinnings as we go about the business of economic development. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. *Thematic Programme – Marine and Coastal Biodiversity* The road ahead for coastal areas lies in better and more effective implementation of integrated marine and coastal area management in the context of the Convention's ecosystem approach. This includes putting in place marine and coastal protected areas to assist the recovery of biodiversity and fisheries resources and controlling land-based sources of pollution. For open ocean and deep sea areas, sustainability can only be achieved through increased international cooperation to protect vulnerable habitats and species. *Cross-Cutting Issues* These cross-cutting issues correspond to the issues addressed in the Convention's substantive provisions in Articles 6-20, and provide bridges and links between the thematic programmes. Some cross cutting initiatives directly support work under thematic programmes, for example, the work on indicators provides information on the status and trends of biodiversity for all biomes. Others develop discrete products quite separate from the thematic programmes. The work done for these cross-cutting issues has led to a number of principles, guidelines, and other tools to facilitate the implementation of the Convention and the achievement of the 2010 biodiversity target. 2010 Biodiversity Target Access to Genetic Resources and Benefit-sharing Climate Change and Biodiversity Communication, Education and Public Awareness Economics, Trade and Incentive Measures Ecosystem Approach Global Strategy for Plant Conservation Global Taxonomy Initiative	MTF	Policies and strategies	Genetic, Species, Ecosystems	1992	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Impact Assessment Identification, Monitoring, Indicators and Assessments Invasive Alien Species Liability and Redress - Art. 14(2) Protected Areas Sustainable Use of Biodiversity Tourism and Biodiversity Traditional Knowledge, Innovations and Practices - Art. 8(j) Technology Transfer and Cooperation					
European Biodiversity Strategy (EBS) Web: http://ec.europa.eu/environment/docum/9842sm.htm Countries: On 4th February 1998, the European Commission adopted a Communication on a European Biodiversity Strategy. This strategy aims to anticipate, prevent and attack the causes of significant reduction or loss of biodiversity at the source. This will help both to reverse present trends in biodiversity reduction or losses and to place species and ecosystems, including agro-ecosystems, at a satisfactory conservation status, both within and beyond the territory of the European Union (EU). The Communication was presented by Environment Commissioner Ritt BJERREGAARD, who characterised this initiative as "a model case for integration of environmental policies into key policy areas". During the last decades reduction and losses on biodiversity at a global scale has accelerated dramatically. Existing measures have proved to be insufficient to reverse present trends. The best way forward is for actors in the relevant policy areas to assume the responsibility for the impacts of their policies on biodiversity. With this strategy, the EU reinforces its leading role world-wide in the efforts to find solutions for biodiversity within the framework of the United Nations´ Convention on Biological Diversity (CBD).	MTF	Policies and strategies	Genetic, Species, Ecosystems	1998	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
The European Platform for Biodiversity Research Strategy (EPBRS) Web: http://www.epbrs.org/ Funding: ----- Countries: Open to all states that participate in the 6thFramework Programme and to the EU institutions. The participating states each nominate one scientist and one policymaker to attend the meetings. The EPBRS "is a forum for scientists and policy-makers to ensure that research contributes to halting the loss of biodiversity by 2010." Its participants, from across Europe, meet to identify and promote strategically important biodiversity research that will contribute to policies and management to reduce biodiversity loss, and help to conserve, protect, restore and make the use of the components of biodiversity sustainable. The main tangible deliverable of each EPBRS meetings is the short written agreement of the group on issues that are of high scientific and policy importance. The scientists are mostly biologists, so the Commission invites some socio-economic experts to participate *ad personam*. Other stakeholders are invited to participate as appropriate. The EPBRS process consists of meetings, activities between meetings, and activities ofnational platforms. The EPBRS also makes extensive use of an active internet discussion list – 'EU BiodiversityScience' – whose membership is open to anyone interested in biodiversity science. During the Portuguese EPBRS meeting, held in Porto from 7th to 9th November 2007 the following recommendations and statement were adopted by the participants. Life on the Blue Planet: Biodiversity Research and the New European Marine Policies (pdf, 150kb) Statement on "Marine Biodiversity Research in support of the EU Integrated Maritime Policy" (pdf, 150kb) You can consult those recommendations and statement by using the links above. For more information: http://www.cimar.org/epbrs/	MTF	Policies and strategies	Genetic, Species, Ecosystems	1999	----
Southern European Seas: Assessing and Modelling Ecosystem Changes (SESAME) Web: http://www.sesame-ip.eu/ Funding: EU-FP6-IP (9,9M€) Countries: 17 European countries: Greece, Turkey, Tunisia, Malta, Slovenia, Lebanon, Georgia, Spain, Belgium, Israel, Croatia, Romania, Italy, Bulgaria, Ukraine, France, Cyprus, Germany, Egypt, Russia SESAME aims to assess and predict changes in the Southern European Seas (Mediterranean and Black Sea) ecosystems and in their ability to provide key goods and services with high societal importance, such as tourism, fisheries, ecosystem biodiversity and mitigation of climate change through carbon sequestration in water and sediments. The Mediterranean and Black Sea, are unique and evolve rapidly with large interannual to decadal variability and abrupt fluctuations. For this reason, SESAME will merge economic and natural science in order to study the changes in the Western and Eastern Mediterranean and Black Sea. To this end, it will bridge the gap between natural and socio-economic sciences in order to assess the ability of the ecosystems to sustain these essential functions.	M	Research	Ecosystems	2006	2010

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Towards DNA chip technology as a standard analytical tool for the identification of marine organisms in biodiversity and ecosystem science (FISH & CHIPS) Web: http://www.fish-and-chips.uni-bremen.de/PostNuke/html/ Funding: EU-FP6-STRP (1,6M€) Countries: Germany, Denmark, France, Greece, Italy, Spain, Iceland, Turkey The aim of the project is the development of DNA chips for the identification of marine organisms in European Seas as a cost effective, reliable and efficient technology in biodiversity and ecosystem science.	M	Research	Genetic	2004	----
European platform to develop probiodiversity business (PROBIOPRISE) Web: http://www.efmd.org/html/Projects/cont_detail.asp?id=051202bysd&aid=051202ljdn&tid=1&ref=ind Funding: EU-FP6-SSA (0,65M€) Countries: United Kingdom and Belgium Focussing on the use of biodiversity by Small and Medium Enterprises (SMEs), the project has developed several case studies regarding fish farming. PROBIOPRISE aims to: identify the specific business opportunities and constraints for sustainable use of terrestrial, freshwater and marine biodiversity by SMEs especially in ecologically sensitive areas; and propose a research programme on opportunities and constraints for sustainable use of biodiversity by SMEs through a platform of practitioners and researchers.	MTF	Research	Genetic, Species, Ecosystems	2005	2007
Hotspot ecosystem research on the margins of European seas (HERMES) Web: http://www.eu-hermes.net/ Funding: EU-FP6-IP (15M€) Countries: 15 European countries: United Kingdom, Belgium, Germany, France, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Norway, Morocco, Romania, Turkey HERMES brings together expertise in biodiversity, geology, sedimentology, physical oceanography, microbiology and biogeochemistry so that the relationships between biodiversity and ecosystem functioning can be better understood. HERMES study sites extend from the Arctic to the Black Sea and include biodiversity hotspots such as cold seeps, cold-water coral mounds and reefs, canyons and anoxic environments, and communities found on open slopes. These important systems require urgent study because of their possible biological fragility, unique genetic resources, global relevance to carbon cycling and susceptibility to global change and human impact.	M	Research	Genetic, Species, Ecosystems	2005	2009
Fast advanced cellular and ecosystems information technologies (FACEIT) Web: http://www.unil.ch/face-it Funding: EU-FP6-STRP (3,7M€) Countries: Switzerland, Germany, France, Lithuania, Netherlands, Spain, United Kingdom The FACEIT project proposes to develop rapid, cost-effective and reliable innovative measurement technologies to analyse and predict in situ population effects and ecosystems community diversity and functioning, in marine and freshwater ecosystems.	MF	Research	Genetic, Species, Ecosystems	2005	2009

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Hotspot Ecosystems Research on the Margins of European Seas (HERMES) – Extension Web: see HERMES Funding: EU-FP6-IP (0,56M€) Countries: United Kingdom, Russia, Ukraine, Kenya	M	Research	Genetic, Species, Ecosystems	2009	2011
Delivering alien invasive species inventories for Europe (DAISIE) Web: http://www.daisie.se/ Funding: EU-FP6-STRP (2,4M€) Countries: United Kingdom, Germany, Austria, Czech Republic, France, Greece, Ireland, Israel, Italy, Lithuania, Russia, Spain, Switzerland, Slovenia DAISIE addresses the need for a regional network of invasive alien species information. With direct access to national knowledge bases throughout Europe, those addressing the invasive alien species challenge will easily obtain data through DAISIE on which species are invasive or potentially invasive in particular habitats, and use this information in their planning efforts. General Objectives of DAISIE: To create an **inventory** of invasive species threatening European terrestrial, fresh-water and marine environments. To structure the inventory to provide the basis for **prevention and control** of biological invasions through the understanding of the environmental, social, economic and other factors involved. To assess and summarise the **ecological, economic and health risks and impacts** of the most widespread and/or noxious invasive species in Europe. To use distribution data and the experiences of the individual Member States as a framework for considering **indicators for early warning.**	MTF	Research	Species	2004	----
Models for assessing and forecasting the impact of environmental key pollutants on marine and freshwater ecosystems and biodiversity (MODELKEY) Web: http://www.modelkey.org/ Funding: EU-FP6-IP (8,4M€) Countries: Germany, Belgium, Austria, Czech Republic, Finland, France, Italy, Netherlands, Russia, Spain, Switzerland, United Kingdom, Norway, Slovakia MODELKEY comprises a multidisciplinary approach aiming at developing interlinked and verified predictive modelling tools as well as state-of-the-art effect-assessment and analytical methods generally applicable to European freshwater and marine ecosystems.	MF	Research	Species, Ecosystems	2004	2010

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Biodiversity impact assessment using species sensitivity scores (BioScore) Web: http://www.ecnc.nl/StateOfEuropeanNatur/Bioscore_529.html Funding: EU Countries: EU The BioScore will develop a tool for linking pressures from policy sectors to the (change in the) state of biodiversity as measured by the presence and abundance of individual species. The tool will be a database containing information on the ecological preferences of individual species in relation to individual sectoral pressures and relating to selected Community policies as well as the EU headline biodiversity indicators. This tool will be applied for assessing impacts and the effectiveness of biodiversity conservation policies based on historic data as well as for forecasting future impacts based on existing scenario studies. The results of these assessments will be presented in European maps. The BioScore tool will be integrated into existing biodiversity monitoring frameworks and incentives for uptake will be formulated. Furthermore, the tool will be made freely accessible on the Internet.	TF	Databases and registers	Species	2006	2009
The EU Network of Excellence on Terrestrial Biodiversity (AlterNET) Web: http://www.alter-net.info/ Funding: EU-FP6-NoE (10M€) Countries: 17 European Countries AlterNET aims at integrating capacity across Europe to assess and forecast changes in biodiversity, structure, functions and dynamics of ecosystems and their services. A main focus of efforts is to create a network of sites for European long-term terrestrial and freshwater biodiversity and ecosystem research, also with attention for socio-economic implications.	TF	Networks (and Infrastructures)	Species, Ecosystems	2004	2009

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Integrating biodiversity science for human well-being (DIVERSITAS) Web: http://www.diversitas-international.org/ Funding: International 15 countries Countries: International 15 countries DIVERSITAS is a partnership of inter-governmental and non-governmental organisations formed to promote, facilitate and catalyse scientific research on biodiversity – its origin, composition, ecosystem function, maintenance and conservation. The goal of DIVERSITAS is to provide accurate scientific information and predictive models of the status of biodiversity, to find ways to support a more sustainable use of the Earth's biotic resources, and to build a world-wide capacity for biodiversity science. In so doing, DIVERSITAS brings added value to national and regional biodiversity research projects. In establishing international, multidisciplinary networks of scientists, DIVERSITAS endeavours to address the scientific priorities presented in its **Science Plan**. In addition to the four Core Projects (bioGENESIS, **bioDISCOVERY**, **ecoSERVICES** and **bioSUSTAINABILITY**), DIVERSITAS creates **Cross-cutting Networks** to investigate specific topics of global importance. Recognising that biodiversity is one element of the processes that support the complex Earth system, DIVERSITAS is also a founding member of the **Earth System Science Partnership**. With its interdisciplinary focus, ranging from the natural to the human dimensions of biodiversity, DIVERSITAS provides key insights into a broad range of important socio-economic policy questions and fosters innovations and partnerships between research institutions and universities of developed and developing countries. The expertise supplied by DIVERSITAS is relevant to the aims of **Agenda 21** and of the Convention on Biological Diversity.	TF	Networks	Genetic, Species, Ecosystems	1991	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
EcoSERVICES ; Core Project of DIVERSITAS Implementation of the ecoSERVICES Science Plan, published in 2005, involves collaboration between ecologists, sociologists, economists, stakeholders and political institutions establishing an international network. The objective of the collaboration is to establish effective governance and protection for the long term of biodiversity as a provider of irreplaceable services, thereby benefiting human societies. Innovative methods for data collection, handling and analysis are required, as are protocols for integrating formal and informal knowledge. Workshops, publications, and projects by international networks of scientists will result in various scientific products that will generate useful knowledge for stakeholder groups. EcoSERVICES organises events to bring the scientific community together (e.g., DIVERSITAS and ESSP Open Science Conferences, workshops). The network develops concrete links with policy fora (CBD, the Global Land project (GLP)), promotes and organises activities related to capacity building for practitioners and policy makers in collaboration with the NSF. Recognising the need for new empirical and experimental studies on biodiversity and ecosystem functioning, the Scientific Committee has identified Focus I 'Linking biodiversity to ecosystem functioning (BEF)' as a top research priority of which Task 6 'Second generation of biodiversity functioning research' was seen as the prominent subject to investigate at once. *Phase I (2003-2005)* launched a range of short-, medium- and long-term initiatives on BEF: Compare the BEF patterns from macro-ecology literature with small scale experiments Compare existing time-series and experimental datasets of diversity-stability relationships Develop multi-trophic theory of BEF, from data on Biodiversity change in complex ecosystems Start a set of workshops and analysing biodiversity and carbon cycles (BIOMERGE workshops) *Phase II (2006-2008)* started the implementation of focus 3 'Human responses to changes in ecosystem services'. *Phase III (2009-2014)* will focus on data analysis to develop models and draw conclusions to provide syntheses and recommendations for the UN Convention on Biological Diversity.	TF	Networks	Genetic, Species, Ecosystems	2003	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
BioSUSTAINABILITY; Core Project of DIVERSITAS As its primary objective, bioSUSTAINABILITY will investigate the successes and shortcomings of current conservation policies. The bioSUSTAINABILITY Core Project will generate knowledge and develop tools to help policy makers and resource managers make informed decisions and adopt best practice to slow biodiversity loss on local, regional and international scales. *Focus 1.* ***Evaluating the effectiveness of current measures for conservation and use of biodiversity*** – By identifying factors that lead to the success or failure of existing conservation efforts, bioSUSTAINABILITY will create a solid foundation for developing measures of biodiversity and of the effectiveness of programmes and policies. Tasks are: measuring biological diversity criteria for measuring the effectiveness of actions, strategies and policies for the conservation of biodiversity defining the roles of formal and informal institutions and their interactions in the conservation and sustainable use of biodiversity addressing mismatches between biological, economic and political boundaries ***Focus 2. Social, political and economic drivers of biodiversity loss*** – As a prerequisite to developing successful conservation policies, it is important to assess whether the net effects of changing variables within ecosystems are positive or negative — and to understand the mechanisms and conditions associated with various outcomes. Tasks are: statistical analyses of social, political and economic characteristics related to biodiversity loss detailed analyses of why particular countries are relatively successful or unsuccessful at conservation ***Focus 3. Social choice and decision making about conservation and sustainable use of biodiversity*** – To promote fuller appreciation of the value of biodiversity, it is necessary to develop methods to fully account for the immediate and long-term impacts of human activities. Steps must then be made to: a) incorporate this information into decision-making processes; b) improve understanding of cause and effect mechanisms; and c) develop adequate incentives to minimise impacts. Tasks are : full-cost accounting: Incorporating the value of biodiversity and ecosystem services decision making with multiple stakeholder groups conservation and sustainable use of biodiversity in the face of uncertainty	TF	Networks	Genetic, Species, Ecosystems	2003	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
BioGENESIS; Core Project of DIVERSITAS The bioGENESIS Science Plan wishes to encourage scientific research that will facilitate the development of new strategies and tools for discovering, documenting and navigating various aspects of biodiversity, as well as to understand why and how the diversity of life evolved in time and space. Scientists associated with bioGENESIS published a paper in Nature (Forest *et al.*. 2007) that demonstrates that biodiversity assessments based on phylogenetic diversity (PD) provide insights not available from standard species-level assessments. Related work on PD illustrates its utility in assessments for climate change impacts, invasive species, and conservation priority setting. The details can be found here. ***Focus 1. New strategies and tools for documenting biodiversity*** – To greatly accelerate the pace of documenting biodiversity, we aim to identify and facilitate the implementation of new strategies and tools, thereby providing a far more efficient pipeline from field exploration, through laboratory and museum studies, to the accessibility of these data to the relevant user communities (see also bioDISCOVERY Core Project). Tasks are: Discovering the unknown Capturing biodiversity information Developing phyloinformatics ***Focus 2. The dynamics of diversification*** – The change of biological diversity through time provides both a historical perspective within which to interpret modern patterns and a framework for generating predictions about future changes. bioGENESIS aims to understand how various drivers (climate change, invasive species, etc.) have influenced biodiversity in the past in order to facilitate better predictions of future changes by using a combination of paleontological and phylogenetic approaches. This research will inform related research communities that study ecosystem functions (see ecoSERVICES Core Project), or design predictive models (see bioDISCOVERY Core Project). Tasks are : Identifying the drivers of evolutionary change in diversity Inferring the evolutionary history of biotic assembly Assessing the role of evolutionary factors in shaping spatial patterns of biodiversity Analysing the evolution of ecological/metabolic traits in relation to ecosystem function ***Focus 3. The evolutionary biology of human-induced environmental change*** – For organisms with short life spans and large effective population sizes, human impacts such as pollution, habitat fragmentation, and invasive species, may be among the most important drivers of modern evolutionary change. Therefore, any prediction of species' responses to environmental change must now at least accommodate the possibility that evolution is a factor, even in the short term, and analyses of the impacts of such evolutionary responses become critical to the development of a truly predictive biodiversity science.	TF	Networks	Genetic, Species, Ecosystems	2005	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
bioGENESIS will promote this integration, especially by providing a focal point for identifying and tackling the evolutionary questions most immediately relevant to understanding and managing biodiversity as environmental circumstances (biotic and abiotic) change rapidly owing to human activities. Tasks are: Understanding evolutionary responses to anthropogenic impacts Applying evolutionary biology to sustain biodiversity and promote human well-being					
BioDISCOVERY; Core Project of DIVERSITAS The first aim of bioDISCOVERY is to advance efforts to assess biodiversity at the level of genes, species and ecosystems. This is a fundamental step in the broader goals of improving our capacity to monitor changes and losses, and to find out why they are occurring. This basic knowledge will better equip scientists to probe the relationship between biodiversity and ecosystem functioning (ecoSERVICES) and to develop appropriate social mechanisms to support more sustainable use of Earth's natural resources (bioSUSTAINABILITY). *Focus 1.* ***Assessing current biodiversity*** – In order to advance the current state of knowledge of biodiversity, it is important to develop, validate and integrate new approaches. This focus will try to link taxonomic information to data on functional ecology and other relevant attributes while also synthesising collection-based information technology with spatial sampling design and geographic mapping efforts. Tasks are: strengthen taxonomic expertise in understudied taxa and regions increase cutting-edge methods and techniques fill in the gaps, making maximal use of museum collections while optimising new data collecting efforts facilitate access to biological specimens and data by integrating existing and emerging programs and institutions standardise and integrate data production, storage, access, and analyses use these data to explore biogeographical patterns of species distributions explore the correlation between this spatial dimension of biodiversity and environmental parameters use the spatial dimension to improve conservation measures, e.g. the prioritisation and zoning of conservation areas and a global gap analysis	TF	Networks	Genetic, Species, Ecosystems	2005	----

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Focus 2. Monitoring biodiversity change – There is an urgent need to build a scientifically integrated Global Biodiversity Monitoring System to monitor biodiversity changes and to quantify the impacts of drivers acting on biodiversity. This network will enable researchers to identify and quantify the drivers of such change and to better understand both the causative processes and mechanisms and the ultimate consequences for ecosystem function and human well-being. Tasks are: assess the adequacy of ongoing and proposed monitoring methods and programmes review research on biodiversity monitoring to identify gaps and suggest further studies and data needs create a global network of biodiversity observatories standardise monitoring methods with an emphasis on combining data collection for monitoring and indicator purposes with the collection of information on the underlying processes and mechanisms that drive biodiversity changedevelop guidelines, standards and data requirements for the Global Biodiversity Monitoring System coordinate adequate data flows and timely analyses by implementing international working agreements and treaties develop scientific products such as biodiversity indicators establish adequate infrastructures and institutions on a long-term basis based on widespread international acceptance and finance inform stakeholders and decision-makers about the effects of proximate and ultimate drivers of biodiversity change, and further identify their data and product needs ***Focus 3. Understanding and predicting biodiversity change*** – As a means of examining the anthropogenic drivers of biodiversity change, Focus 3 will seek to develop theoretical, experimental and empirical knowledge of ecological and evolutionary processes related to biodiversity. In this context, it will investigate how changes in the pattern and intensity of resource use affect ecological structures and processes, such as metapopulation dynamics, habitat fragmentation, etc. The ultimate goal is not just to understand, but to predict biodiversity change, developing biodiversity scenarios that predict biodiversity change at the landscape, regional and global scales in response to various scenarios of how anthropogenic drivers will change in the future. Tasks are : develop model-based scenarios of biodiversity change, using several approaches such as dynamic global vegetation models or niche-based models use various scenarios of anthropogenic drivers of biodiversity change to make predictions of possible future biodiversity change encourage model/data and model/model comparisons as means of improving the confidence in both the interpretation of data and the robustness of model predictions					

INITIATIVE DESCRIPTION	ENV	TYPES	LEVELS	START	END
Assessing LArge scale Risks for biodiversity with tested Methods (ALARM) Web: http://www.alarmproject.net/alarm/ Funding: FP6-IP Countries: , Argentina, Austria, Belarus, Belgium, Bolivia, Bulgaria, Chile, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Guatemala, Hungary, Ireland, Israel, Italy, Lithuania, Mexico, Netherlands, Philippines, Poland, Portugal, Romania, Russia, Serbia, Slovenia, South Africa, Spain, Sweden, Switzerland, Ukraine Based on a better understanding of terrestrial and freshwater biodiversity and ecosystem functioning ALARM will develop and test methods and protocols for the assessment of large-scale environmental risks in order to minimise negative direct and indirect human impacts.	TF	Research	Species, Ecosystems	2003	----
Rationalising Biodiversity Conservation in Dynamic Ecosystems (RUBICODE) Web:www.rubicode.net Funding: EU-FP6-CA (2M€) Countries: 19 European countries RUBICODE will concentrate on assessing the ecological resilience of those components of biological diversity essential for maintaining ecosystem services. Specific project objectives: To develop and apply concepts of dynamic ecosystems and the services they provide, covering both terrestrial and freshwater ecosystems in a comprehensive framework. To explore relationships between service-providing populations, ecosystem resilience, function and health, and socio-economic and environmental drivers of biodiversity change. To improve and test indicators that provide rapid assessment methods for monitoring ecosystem and habitat ecological quality. To characterise biological traits that lead to a population becoming threatened, rare or invasive. To develop habitat management strategies that take account of drivers of biodiversity change in order to maintain threatened populations or assist populations to adapt. To suggest priorities for habitat, ecosystem and landscape biodiversity conservation policy on the basis of dynamic ecosystems and the services they provide, including the perfection and maintenance of endangered habitat lists. To identify gaps in knowledge and propose a plan for future research that is required to develop innovative pan-European conservation strategies for terrestrial and freshwater ecosystems.	TF	Research	Species, Ecosystems	2006	2009

Inventory of Canadian initiatives

ENVironment: Marine (M), Terrestrial (T) and Freshwater (F)
TYPES of Activity: Clearing House, Policies and strategies, Research, Networks, Databases and registers
LEVELS of biodiversity components addressed: Genetic, Species and Ecosystems

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
Communication Partnership for Science and the Sea (COMPASS) http://www.compassonline.org/ COMPASS is a collaborative initiative primarily within the United States. It was established in order to advance marine conservation science and communicate scientific knowledge to policymakers, the public, and the media. Its mission is to accelerate the pace of solving important marine environmental problems. DFO is working with COMPASS with respect to its roles within the Gulf of Maine. There is current work ongoing to establish pilot sites within the Bay of Fundy to build integrated models for material flows and energy systems (MIMES). Much of this work involves the studying ecosystem services and the role biodiversity plays in those as defined by the United Nations Environment Program (UNEP) Millenium Ecosystem Assessment.	M	Clearing House	Genetic Species Ecosystem		
Ecosystem Overview Reporting (EOR) Canada's Oceans Act and the associated implementation strategies place an ecosystem approach central in the integrated management of human activities on the sea. In planning many of the activities necessary for integrated management, such as setting ecosystem objectives, identifying areas requiring enhanced protection, and developing regulatory approaches to various activities, it is necessary to have a reasonable understanding of the ecosystem in which the management is occurring. This understanding must include insights into the features of the ecosystem which are important structurally and functionally, the nature and intensity of the human activities, and how the ecosystem features and human activities interact.	M	Clearing House	Species Ecosystem		
Ecosystem Status and Trends Reporting http://www.ec.gc.ca/soer-ree/English/EST/default.cfm A joint Canada's federal, provincial, and territorial governments are cooperating to develop an Ecosystem Status and Trends Assessment. DFO is charged with providing information on marine species and environments. It will provide an integrated assessment of current status, emerging trends and significant stressors of Canada's ecosystems. It will propose a new and ongoing system for ecosystem monitoring and status and trends reporting, to provide policy-makers with the detailed assessments required for policy development and to alert the public to ecosystem changes of concern. And it will also enable Canada to fulfill its reporting obligations related to the achievement of this 2010 Biodiversity Target.	MTF	Clearing House	Species Ecosystem		
Coastal and Ocean Information Network for Atlantic Canada – (GeoConnections/COINAtlantic) http://aczisc.dal.ca/ COINAtlantic is an initiative of the Atlantic Coastal Zone Information Steering Committee (ACZISC) to develop, implement and sustain a network of data providers and users that will support secure access to data, information and applications, for decision-making by coastal and ocean managers and users of coastal and ocean space and	M	Databases and registers	Species Ecosystem		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
resources.					
General Status of Species in Canada http://www.wildspecies.ca/ Wild Species reports are released every five years and Wild Species 2005 is now available. This is the commitment of all of Canada's Ministers responsible for wildlife under the Accord for the Protection of Species At Risk. DFO in collaboration with other provincial natural resource departments coordinates and provides updated taxonomic lists and ranks for fishes (freshwater and marine).	MTS	Databases and registers	Species		
Gulf of Maine and Northwest Atlantic Species Registers http://research.usm.maine.edu/gulfofmaine-census/biodiversity/biology/taxonomy/gulf-of-maine-register-of-marine-species/ The Gulf of Maine Register of Marine Species was developed by The Gulf of Maine Program of the Census of Marine Life, with the Huntsman Marine Science Center of St. Andrews, New Brunswick. This register is a list of species inhabiting Gulf of Maine waters, including those over Georges Bank and the adjacent continental slope. The species span diatoms to marine mammals, with scientific and common names, synonyms, and generally follow the standardised classification and provide the Taxonomic Serial Number of the Integrated Taxonomic Information System. The intention is to link this in with NARMS.	M	Databases and registers	Species		
Integrated Taxonomic Information System (ITIS) – Canada http://www.cbif.gc.ca/pls/itisca/taxaget?p_ifx=cbif The Government of Canada through the Canadian Biodiversity Information Facility (CBIF) is a contributor to ITIS and is a provider of up-to-date taxonomic information related to Canadian species. DFO leads the marine species component.	MTF	Databases and registers	Species		
Maritime Science Virtual Data Centre http://marvdc.bio.dfo.ca/pls/vdc/mwmfdweb.splash A restricted access data centre hosted by DFO Maritimes region. It provides controlled access to survey data gathered within the Atlantic zone. Examples of data available are the Scotian Shelf Ecosystem Trawl Survey and the Marine Mammal Survey.	M	Databases and registers	Species		
Ocean Biogeographic Information System – Canada http://www.iobis.org/ Through the Centre for Marine Biodiversity, DFO and university collaborators are contribute Canada regional node to OBIS International. Initial work has been on species identification and distribution information but there are plans to incorporate marine habitat diversity information into the OBIS network.	M	Databases and registers	Species Ecosystem		
SciDat and SciDir projects An internal to DFO data rescue projects funded through DFO's National Science Data Management Committee. These projects are currently identifying all DFO data holdings and there status with respect to purpose, time series and storage. To date there are over 900 holdings identifies. They contain a wealth of historical species distribution	MF	Databases and registers	Species Ecosystem		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
data. The Ecosystem Indicators Working Group plans to systematically evaluate these holdings.					
Atlantic Reference Centre (ARC) http://www.huntsmanmarine.ca/arc.shtml The Atlantic Reference Centre, a joint institute between the Huntsman Marine Science Centre and Fisheries & Oceans Canada is well known throughout the Maritimes for its extensive collections of marine life. It contributes to a number biodiversity related scientific services for DFO and in collaboration with other regional organisations. This includes: • North Atlantic Register of Marine Species (in progress) • The NaGISA Atlantic Ocean regional centre is coordinated by Dr. Gehard Pohle and Lou Van Guelpen at the Atlantic Reference Centre. • Development of a biogeographic information system: pilot application in the Gulf of Maine: (http://netviewer.usc.edu/web/index2.html) • Contributions to the GMBIS project for the integration, visualisation, analysis, and dissemination of diverse types of biogeographical and oceanographic information. Specifically on-line mapping of ARC museum specimens http://gmbis.marinebiodiversity.ca/aconw95/aconscripts/groundfishsurveymap.html • On-line querying of ARC fish specimens http://www.cbif.gc.ca/portal/digir-class.php?p_classid=3&p_lang=en • Fishes of Atlantic Canada: A Photographic Compendium (http://collections.ic.gc.ca/compendium). This web site is dedicated to providing photographs and basic biological and ecological information on all fishes living in Canadian Atlantic waters. • An Atlas of Distributions of Canadian Atlantic Fishes http://collections.ic.gc.ca/FishAtlas. This web site provides a distribution map for each species of fish in the ARC museum. • Development of a species information system for the Bay of Fundy. • Providing information on the distribution of rare, endangered and keystone marine vertebrate species in Bay of Fundy seascapes. In collaboration with the Atlantic Canada Conservation Data Centre (http://www.accdc.com) • Evaluating biodiversity for marine environmental assessments (e.g. ICES Journal of Marine Science 58: 417-426. 2001) • Studies evaluating the impact of salmon aquaculture on benthic community biodiversity. • an examination of the range of options for measuring and assessing the state of marine biodiversity as a tool in environmental impact assessments • BIOMARE - a networking project that is developing a framework of marine biodiversity reference sites in Europe, and identifying appropriate indicators and measures of marine biodiversity. (http://www.biomareweb.org/) • Contributions to the Ocean Biogeographical Information System (OBIS) International Committee (http://www.iobis.org/) • Active participant in the Centre for Marine Biodiversity (http://www.marinebiodiversity.ca)	M	Networks	Genetic Species		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
Canadian Biodiversity Information Network http://www.cbin.ec.gc.ca/ This network is coordinated by Canada's Biodiversity Convention Office within the federal Department of Environment (Environment Canada). Coordinates Canada's progress on the Canadian Biodiversity Strategy. DFO collaborates with the Biodiversity Convention Office within Environment Canada to provide information on status and trends for marine species and habitats and our progress toward achieving the 2010 Biodiversity target.	MTF	Networks	Species		
Canadian Biotechnology Strategy (CBS) http://www.marinebiodiversity.ca/cmb/research/research/general-east-coast-marine-biodiversity-initiatives#cbs > The mandate of the CBS DFO/Dalhousie University Partnership is to utilise and develop leading edge biotechnology relevant to Atlantic Fisheries and Aquaculture, to expand knowledge and understanding of genetic diversity of commercially important species, and apply this knowledge to the management of fisheries resources.	M	Networks	Genetic		
Centre for Marine Biodiversity (CMB) http://www.marinebiodiversity.ca The CMB is a non-profit society established in the Fall of 2000 in order to enhance our scientific capacity in support of the protection of marine biodiversity, with a focus on the Northwest Atlantic. It is composed of a collaborative network of researchers and institutions that includes universities, DFO, and the Census of Marine Life. The CMB serves as a largely virtual institute to provide a focus for the broad array of marine biodiversity research being conducted in Atlantic Canada. The mandate of the CMB is to provide a focus for structuring independent research efforts toward an overall synthesis of information on marine biodiversity.	M	Networks	Genetic Species Ecosystem		
Committee on the Status of Endangered Wildlife in Canada (COSEWIC) http://www.cosewic.gc.ca/eng/sct5/index_e.cfm COSEWIC was established as an independent body of experts responsible for identifying and assessing species considered to be at risk. This is the first step towards protecting species at risk under Canada's Species at Risk Act (SARA). Subsequent steps include COSEWIC reporting its results to the Canadian government and the public, and the Minister of the Environment's official response to the assessment results. Species that have been designated by COSEWIC may then qualify for legal protection and recovery under Canada's Species at Risk Act. The committee consists of several species specialist subcommittees including one for marine fishes. These subcommittee are charged with establishing candidate list for species to be assessed, contracting and reviewing species assessment and conservation status reports. DFO plays a major role as a data provider toward these assessments.	MTF	Networks	Species		
Ecosystem Indicators Working Group (chair Jake Rice) Relevant to ecosystem-based management approaches within DFO Biodiversity is one of three ecosystem components (productivity, biodiversity, and habitat) that are to be evaluated with respect to objectives and indicators. This working group has three primary objectives: • provide a forum for client sectors to identify their needs for science-based ecosystem indicators; • discuss indicator selection criteria and performance standards, and develop guidelines as appropriate;	M	Networks	Ecosystem		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
• ensure that monitoring programs are closely linked to ecosystem indicators and that appropriate quality assurance is in place when indicators are being used.					
Fish Barcode of Life (FishBoL) http://www.fishbol.org/ The Fish Barcode of Life Initiative (FISH-BOL), is a global effort to coordinate an assembly of a standardised reference sequence library for all fish species, one that is derived from voucher specimens with authoritative taxonomic identifications. The benefits of barcoding fishes include facilitating species identification for all potential users, including taxonomists; highlighting specimens that represent a range expansion of known species; flagging previously unrecognised species; and perhaps most importantly, enabling identifications where traditional methods are not applicable.	MF	Networks	Genetic Species		
Taxonomy Working Group (chair Andrew Cooper) Recognising that without a good taxonomic foundation at several levels it will be difficult if not impossible for DFO to develop advice and policy on the management of Canada's fisheries in an ecosystem context. It has been proposed that a national working group (internal to DFO) review how the Department might achieve capacity with respect to: • Expertise – for original identification, data maintenance, products to improve efficiency and self reliance. • Expert-based products such as species identification sheets, species registries, current status lists which are comprehensive listing of all aquatic species in Canada. These need to be kept up to date based on new discoveries and taxonomic revisions. The availability of a common and reliable species lists are essential to consistent assessment and advice. Genetic barcodes may be another product. • Collections – For vouchers, comparative (reference) material, and teaching materials. • Training – Technicians, observers, industry, new recruitment will be expected to deliver on a broader biodiversity product. • Taxonomic network(s) – As a way to reduce duplication, improve, and maintain collaboration with institutions.	M	Networks	Genetic Species		
Aquatic Invasive Species (AIS) http://www.dfo-mpo.gc.ca/science/environmental-environnement/action_plan/action_plan_e.htm#executive_summary World leaders officially recognised the threat posed by invasive species in 1992, with the adoption of the UN Convention on Biodiversity. Aquatic invasive species (AIS) are one of the leading threats to aquatic biodiversity and ecosystem health. They have the potential to displace domestic species that support traditional fisheries and have significant negative impact on aquaculture. Canada responded in 1995 with the Canadian Biodiversity Strategy. In September 2001, federal, provincial and territorial ministers of forests, fisheries and aquaculture, endangered species and wildlife agreed to develop a Canadian plan to deal with the threat of invasive alien species. In 2002, they approved a blueprint for the plan. Also in 2002, the Canadian Council of Fisheries and Aquaculture Ministers created the Aquatic Invasive Species Task Group to develop an action plan to address the threat of aquatic invasive	MF	Policies and strategies	Species Ecosystem		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
species. The most effective approach to dealing with the hundreds of species that are (or could become) established in Canada involves managing the pathways through which invasive species enter and spread through Canadian waters. For aquatic species, these pathways are shipping, recreational and commercial boating, the use of live bait, the aquarium/ water garden trade, live food fish, unauthorised introductions and transfers, and canals and water diversions. This plan does not address authorised introductions such as aquaculture or fish stocking, as they are covered by the National Code on Introductions and Transfers of Aquatic Organisms. The Code can be accessed at: http://www.dfo-mpo.gc.ca/science/aquaculture/code/prelim_e.htm Priority Areas for AIS research to support the development of a regulatory framework and guide the development and implementation of management measures, including prevention, rapid response, mitigation, and control activities are: Strategic • developing ballast water treatment technologies • refining predictive modeling of future invaders • determining the best methods for early detection of new invaders and monitoring the spread existing ones • developing rapid response and ongoing mitigation and control methods • refining risk assessment methods to determine the risk of AIS to Canada's aquatic ecosystems • understanding aquaculture interactions with invasive species such as tunicates					
Canadian Biodiversity Strategy http://www.cbin.ec.gc.ca/strategy/default.cfm?lang=e Policy formulated by the Government of Canada that describes Canada's strategy to address its commitment to the United Nations Convention on Biological Diversity (CBD). It describes the roles of federal and provincial governments and outlines guiding principles and goals that address: • Conservation and Sustainable Use • Ecological Management • Education and Awareness • Incentives and Legislation • International Cooperation	MTF	Policies and strategies	Species Ecosystem		
Oceans Act http://laws.justice.gc.ca/en/O-2.4/ Canadian federal legislation that charges the Minister (of Fisheries and Oceans), in collaboration with other ministers, boards and agencies of the Government of Canada, with provincial and territorial governments and with affected aboriginal organisations, coastal communities and other persons and bodies, including those bodies established under land claims agreements, shall lead and facilitate the development and implementation of a national strategy for the management of estuarine, coastal and marine ecosystems in waters that form part of Canada or in which Canada has sovereign rights under international law. The national strategy will be based on the principles of	M	Policies and strategies	Ecosystem		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
(*a*) sustainable development, that is, development that meets the needs of the present without compromising the ability of future generations to meet their own needs; (*b*) the integrated management of activities in estuaries, coastal waters and marine waters that form part of Canada or in which Canada has sovereign rights under international law; and (*c*) the precautionary approach, that is, erring on the side of caution. This has led to the development of an Oceans Action Plan within which there is a component for reporting on the Health of the Oceans http://www.dfo-mpo.gc.ca/oceans-habitat/oceans/oap-pao/page04_e.asp. Under this plan aspects of biodiversity science are required in order to monitor, understand, and manage: • major declines in some fish stocks and greater stock fluctuations; • fundamental changes in the structure of marine-ecosystems, especially in the upper layers of the food web; • shifts in major oceanographic drivers due to climate change; • persistent introduction of pollutants and invasive species; • increasing numbers of marine species-at-risk; • measurable habitat alteration and degradation; • contamination of traditionally harvested resources; and, • declining biodiversity and productivity.					
Species at Risk Act (SARA) http://www.sararegistry.gc.ca/ This Act provides federal legislation to prevent wildlife species from becoming extinct and to provide for their recovery. The purposes of the Act are to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and encourage the management of other species to prevent them from becoming at risk. This legislation protects biodiversity one species at a time and for DFO the biodiversity science information, assessment, and advice implications have been profound.	MTF	Policies and strategies	Species		
Three Oceans of Biodiversity – A Canadian National Plan 2004 – 2009 http://www.marinebiodiversity.ca/cmb/research/reports/ Policy developed by the Department of Fisheries and Oceans in collaboration with the Census of Marine Life (CoML). Describes our research, development, and technology plan to protect marine biodiversity within Canada's three oceans (Pacific, Atlantic, and Arctic). Five major goals of the plan are: • Complete and maintain a national Marine Biodiversity Registry with metadata compiled by region and taxon and following international standards. • Document the marine species of Canada including their distribution with an emphasis on Arctic marine species, species living below 300 m depth, and microfauna. • Apply existing and developing technologies and sampling designs to identify, collect, measure and enumerate marine biodiversity. • Characterise factors influencing biological diversity.	M	Policies and strategies	Species Ecosystem		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
• Understand the role biodiversity plays in the functioning of marine ecosystems.					
DFO Oceans Branch Centre of Expertise for Corals and Sponges (proposed) Location and terms of reference to be determined.	M	Networks	Genetic Species Ecosystem		
DFO Science Branch Center of Expertise for Habitat (proposed) Proposed location at DFO-Northwest Atlantic Fisheries Centre (Saint Johns, NL). Chair: Dr.R Gregory	M	Networks	Species Ecosystem		
Ecosystem Science framework Ecosystem-based science frameworks recognise productivity, biodiversity, and habitat as three components within an ecosystem upon which to identify objectives, indicators, and impacts. Priority Areas for Research • developing different approaches (e.g. qualitative or quantitative) to evaluating the performance of management strategies for the ecosystem approach • evaluating the performance of alternative management tools, including spatial management measures such as Marine Protected Areas and catch and effort limitations in harvest management, in protecting and ensuring sustainable use of both the targeted resources and other parts of ecosystems • undertaking ecosystem modeling to consolidate knowledge of the ecosystem to support evaluation of management strategies • developing and evaluating risk assessment methodologies to allow prioritisation of human impacts on ecosystem components • evaluating the performance of indicators in relation to conservation objectives of integrated management, including cumulative impacts • developing ecosystem status reports to meet the needs of diverse clients of integrated management as well as the general public • working with academia to develop research approaches that ensure consideration of the ecological, social, and economic dimensions of management are fully integrated in the evaluation of management strategies. From this broad framework practical ecosystem-based management frameworks have been refined for specific areas such as the Canadian Fisheries on Georges Bank (ICES CM 2005/BB:05).	MTF	Policies and strategies	Species Ecosystem		
Gulf of Maine Biodiversity Discovery Corridor http://www.marinebiodiversity.ca/cmb/research/discovery-corridor Coordinated through the Centre for Marine Biodiversity, the discovery corridor is a collaborative initiative with objectives to: • Establish an inventory of species and seascapes within the corridor, and methodology development. • Act as a catalyst for training in systematics. • Promote biodiversity research and conservation. • Establish monitoring program to look at long-term change. • Outreach (data sharing, education, and general public).	M	Networks	Genetic Species Ecosystem		

INITIATIVE DESCRIPTION	ENV	CATEGORIES	BD LEVELS	START	END
The Canadian Healthy Oceans Network (CHONe) CHONe is a proposed strategic network between university researchers and government (predominantely DFO). CHONe will address a need for scientific criteria for conservation and sustainable use of marine biodiversity resources. Three main research themes and theme objectives have been proposed: • Biodiversity Characterisation at Multiple Scales – addressing the objective to maintain biodiversity. • Population Connectivity – addressing the objective to maintain sustainable use. • Ecosystem Function – addressing the objective to maintain function.	M	Research	Genetic Species Ecosystem		
Trans-Atlantic Coral Ecosystem Study (TRACES) http://www.lophelia.org/traces/ TRACES is a scientific program to investigate cold-water coral communities found along the continental shelf break and slope, and in association with canyons and seamounts in the North Atlantic Ocean. TRACES will develop the first coherent plan to study cold-water coral ecosystems across an ocean basin and lay the foundations for an international research programme beginning in 2010. One of the intended benefits of this program is a better understanding genetic and 'biodiversity' links among Atlantic coral ecosystems used to develop sound long-term conservation management policies.	M	Research	Genetic Species Ecosystem		

Annex 4: Contribution of existing ICES Study and Working Groups to Biodiversity Science

COMMITTEE/GROUP NAME	RELEVANT WORK
Advisory Committee (ACOM)	Provides advice on fish and shellfish stocks, the marine environment (including contaminants) and the status and outlook for marine ecosystems, (including the effects of human exploitation).
Working Group on Introductions and Transfers of Marine Organisms (WGITMO)	The ICES Code of Practice on the Introduction and Transfer of Marine Organisms is one of the most comprehensive instruments to assist in the responsible use of introduced organisms, it is however only voluntary. The code adopts the FAO 1995 principles especially the precautionary approach. It includes updated definitions, an implementation strategy based on increasing awareness, and a risk evaluation approach. Three main challenges derive related to alien species, (a) increased chance of disease transfer from the movement of aquatic species (b) impacts of alien species on native aquatic biodiversity and (c) impacts that genetically altered stocks may have on related natural populations. In 2007, WGITMO reported on changes in the distribution, population abundance and condition of introduced marine species in the OSPAR maritime area in relation to changes in hydrodynamics and sea temperature.
Working Group on Deep Water Ecology (WGDEC)	Deep-water species are particularly vulnerable to overexploitation due to their low productivity. The fish reproduce slowly and take a long time to grow to maturity. Many deep sea ecosystems and species that stand proud of the seafloor are similarly vulnerable to the impacts of bottom fishing. Remaining gaps in information on the biology of deep sea fish species, the diversity, ecology and location of deep sea ecosystems as well as on fishing effort make responsible management extremely difficult. In previous years, WGDEC advised that closures of some deep water fisheries are necessary to protect corals. Noting the virtually non-existent information for habitats other than corals, WGDEC emphasised the need for a concerted effort to map the distribution of seabed habitats.
Working Group on Ecosystem Effects of Fishing Activities (WGECO)	In 2007, WGECO continued to work across a broad spectrum of ecosystem issues, dealing with advisory requests and developing its own areas of work. For example, the group continued to develop the proposed OSPAR ecological quality objective for fish communities, discussed changes that have occurred in the abundance and distribution of marine species (including biodiversity) as a result of climate change as part of OSPAR Quality Status Report 2010, reported on an integrated framework for the provision of ecosystem advice in European Seas and examined the impact of North Sea shrimp beam trawl fisheries on a comprehensive list of ecosystem components.
Working Group on Marine Mammal Ecology (WGMME)	In several large marine ecosystems, processes are initiated to establish Ecosystem Management Plans with associated ecological quality objectives (EcoQOs). Attempts are made to select relevant indicators or parameters to monitor and assess the ecosystem health but selecting the appropriate monitoring parameters essential for assessing ecosystem health is challenging. Since marine mammals are generally at high trophic levels exposed to biological effects of biomagnified and accumulated pollutants, these organisms are often selected as potential indicators. Reliably relating marine mammals to environmental quality requires better understanding of the mechanisms and processes involved. WGMME therefore proposed a workshop to address the unsolved questions linking ecosystem/environmental health to different harmful effects on the health status of marine mammals. The workshop aims to address the biological effects at the level of the individual, explores the subsequent impacts at the population and community levels and elaborates on the relevance for integrated chemical-biological assessment of ecosystem health and implications for management.
Working Group on Regional Ecosystem Description (WGRED)	Developing a complete picture of marine ecosystems requires the combined knowledge of a variety of experts in marine related areas of research. Integrated scientific and political communities aid efforts to understand and manage the effects of human activities in marine ecosystems. There are a few examples of some progress in science-policy integration, including WGRED composed of experts in a variety of

COMMITTEE/GROUP NAME	RELEVANT WORK
	disciplines.
Science Committees	
Fisheries Technology Committee (FTC)	Provides a technical bridge that spans the issues of fishing practices, environmental impact, biodiversity studies and fisheries resource evaluation and management.
Working Group on Fisheries Technology and Fish Behaviour (WGFTFB) and Working Group on Ecosystem Effects of Fishing Activities (WGECO)	Based on their common focus on the North Sea Crangon Beam Trawl Fishery, the WGFTFB forged links with the Working Group on Ecosystem Effects of Fishing Activities (WGECO) and produced a joint report on the ecosystem impacts of this fishery. Further collaboration is planned in 2008.
Oceanography Committee (OCC)	Addresses issues linked to physical, chemical, and pelagic biological oceanography, especially in relation to the processes relevant to living marine resources and environmental quality.
Working Group on Zooplankton Ecology (WGZE)	In the North Atlantic, significant changes have occurred in the abundance, distribution, community structure and population dynamics of zooplankton and phytoplankton, mainly reflecting changes in regional climate, caused predominately by the warming of air and sea surface temperatures. Poor recruitment of several commercial fish species and low seabird breeding productivity recorded in recent years in some regions are associated with changes in plankton biomass and in the seasonal timing of plankton production. In 2007, WGZE discussed progress in the assessment of zooplankton species biodiversity in the context of the European Census of Marine Life (EuroCoML) project.
Resource Management Committee (RMC)	In collaboration with the Marine Habitat and Oceanography Committees the RMC takes into account natural environmental effects and anthropogenic effects, including fishing (main focus), in resource management decisions.
International Bottom Trawl Survey Working Group (IBTSWG)	The traditional objective of IBTSWG has been to coordinate the collection of standardised data from international demersal trawl surveys operating over wide spatial areas of the ICES area. These surveys aim to provide information to the assessment Working Groups on the distribution and relative abundance of commercial fish stocks and biological information on these species. Recently there has also been an increased emphasis on the surveys also providing information on the wider ecosystem.
Study Group on Fisheries Induced Adaptive Change (SGFIAC)	There is a growing body of scientific evidence indicating that fisheries can cause evolutionary responses over time periods as short as 10 – 20 years, in particular in traits such as the onset of maturation. As these changes will most likely have consequences for conservation of biodiversity and sustainable exploitation of marine species, management objectives and (precautionary) reference points for sustainable exploitation need to be re-defined, and new objectives and reference points for managing fisheries-induced evolution need to be developed (e.g. reducing harvest rates, raising a stock's minimum size). In 2007, SGFIAC presented an overview of the available empirical evidence for fisheries-induced evolution, showed that fisheries-induced evolution has consequences that require attention of fisheries scientists and managers, elaborated on how management objectives more specific to fisheries-induced evolution might be defined and introduced Evolutionary Impact Assessments as a tool for tackling this challenge.
Marine Habitat Committee (MHC)	Concerned with the quantity, quality and functional value of the living resources of the marine habitat. This includes studying marine biodiversity and investigating the effects of human activities/impacts on the marine habitat.
Benthos Ecology Working Group (BEWG)	In 2007, BEWG reviewed and considered recent developments in ongoing benthos research in Europe. Furthermore, the group assessed and reported on changes in the distribution, population abundance and condition of benthic invertebrates in the OSPAR maritime area in relation to changes in hydrodynamics and sea temperature. A sub-group of the BEWG (Study group on the North Sea Benthos Project,

COMMITTEE/GROUP NAME	RELEVANT WORK
	SGNSBP) conducted a re-appraisal of the status of the North Sea benthic communities following the earlier (1986) ICES North Sea Benthos Survey. They found no evidence of a consistent directional trend over time in the densities or diversity of the benthic macrofauna.
Working Group on Integrated Coastal Zone Management (WGICZM)	The objective of ICZM is to establish sustainable levels of economic and social activity in coastal areas while protecting the coastal environment. The most significant environmental and social pressures facing coastal areas include habitat destruction, loss of fish stocks and biodiversity, pollution, economic decline and social deprivation. Similar to the SGBIODIV ToR d), in 2007 WGICZM reported on activities of relevant ICES Study and Working Groups to identify information relative to ICZM needs. WGICZM found that the focus within ICES WGs is primarily on the effects of fisheries and mariculture whereas the impacts of several human activities (e.g. tourism, coastal erosion prevention, transport, urban development) are largely unexamined. Whilst there is some progress on the development of indicators, regional Working Groups are struggling with the enormous task of integrating data towards integrated ecosystem-based (fisheries) management.
Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT)	In 2007, WGEXT reviewed scientific programmes and research projects relevant to the assessment of environmental effects of the extraction of marine sediments. These included studies on marine habitat mapping, benthic impact and seabed recovery, modelling and risk assessment, biodiversity and nature conservation of sand and gravel habitats and the characterisation of shipwrecks etc. in areas of resource interest.
Working Group on Marine Habitat Mapping (WGMHM)	Species inventories form the basis for much conservation work, but these inventories are only reasonably complete for a small number of taxa such as birds and large mammals. An approach based on habitat types can potentially help to protect both these well-known taxa and lesser-known organisms. For this reason, policy makers, conservation organisations and scientists all require a sound and practical characterisation, inventory, classification and cartography of marine habitats. Several major programmes have made substantial progress in mapping and modelling the distribution of seabed and water column habitats, for example BALANCE for the Baltic Sea, MESH for north-west Europe and OSPAR for selected habitats across the north-east Atlantic. WGMHM regularly reviews national and international programmes, providing a forum for the exchange of information, techniques and strategies. Recognising the importance of habitat mapping to a wide range of marine management and policy contexts WGMHM started to outline a paper on the role of habitat mapping in an ecosystem-based context. This will recognise the many areas of ICES activity for which marine habitat mapping has relevance, including ecosystem functioning, coastal zone management, fisheries, protected areas and spatial planning.
Mariculture Committee (MCC)	Areas of responsibility are biological, ecological and engineering aspects of mariculture systems. The committee covers scientific aspects of stock enhancement, the transport and introduction of non-indigenous species and stocks and evaluates the ecosystem effects of fishing and of mariculture.
Working Group on The Application of Genetics in Fisheries and Mariculture (WGAGFM)	Advances in molecular biology over the last decade provide fisheries geneticists with cost-effective tools for resolving unprecedented levels of genetic diversity within the genomes of marine fish and shellfish species. Analysis of the amount and distribution of this diversity can be highly informative, not only as regards the structuring of a species into breeding populations but also, potentially, about the reproductive status of the populations themselves. This approach has the potential to be a valuable management tool. WGAGFM will meet in Scotland in 2008 to review prospects for genetic monitoring for evaluating the conservation status, intraspecific biodiversity and population health in fishes.
Living Resources Committee (LRC)	Groups within the LRC address the biology and ecology of living marine resources. Topics covered include taxonomy, genetics, behaviour and migration, trophic relationships, distribution, abundance, and population dynamics. The committee also co-ordinates international, monitoring and data management programmes which underpin ongoing ICES core science.
Working Group on Fish Ecology (WGFE)	The rationale behind the formation of WGFE in 2003 was to support ICES on issues of fish community metrics and to provide advice on threatened marine fishes. Until 2002, fish community issues were considered by WGECO, but as the demands on WGECO increased the

COMMITTEE/GROUP NAME	RELEVANT WORK
	establishment of WGFE enabled a more focussed consideration of fish community issues. WGFE has addressed issues on non-commercial fish species, including species of conservation importance, fish communities and assemblages, and other aspects of fish ecology (e.g. feeding habits and prey rations, habitat requirements), so that ICES can provide advice in these areas in relation to ecosystem, biodiversity and nature conservation issues.
Working Group on Seabird Ecology (WGSE)	As a new topic for WGSE, ecological issues related to the threats of pathogens and parasites to seabird populations and biodiversity were reviewed in 2007. The group presented a general outline of the subject and some details on specific issues.
Baltic Committee (BCC)	Scientific areas of responsibility are the effects of human activities on the Baltic ecosystem, the links between environmental quality and living resources, the integration of environmental and fisheries issue and coastal zone management and development. This committee is the only 'regional' science committee.
Study Group on Baltic Ecosystem Health Issues in support of the BSRP (SGEH)	SGEH continues to develop the Baltic ecosystem health concept in relation to the main ecological concerns including eutrophication, hazardous substances, overfishing, marine transport and biodiversity. The 2007 SGEH report includes a revised table of indicators on habitat destruction and loss of biodiversity.

Annex 5: Components of marine biodiversity from genetic to ecosystem levels, listed by structure and process (modified from Zacharias and Roff 2000)

GENETIC		SPECIES/ POPULATION		COMMUNITY		ECOSYSTEM	
Structures	*Processes*	*Structures*	*Processes*	*Structures*	*Processes*	*Structures*	*Processes*
Genetic structure	Mutation	Population structure	Migrations	Community structure	Succession	Water masses	Ocean currents
Genotypes	Genotype differentiation	Population abundance	Dispersion	Species diversity	Predation	Temperature	Tidal currents
Fitness	Genetic drift	Distribution	Retention	Species richness	Competition	Salinity	Physical disturbances
Genetic diversity	Gene flow	Focal species	Migration/ counter drift	Species evenness	Parasitism	Water properties	Gyres
Stock discrimination	Natural selection	Keystone species	Growth/ Production	Species abundance	Mutualism	Boundaries	Retention mechanisms
	Inbreeding	Indicator species – condition	Reproduction	Representative communities	Disease	Depth/ pressure	Pelagic-benthic coupling
	Non-random mating/ sexual selection	Indicator species - composition	Recruitment	Distinctive communities	Production	Light intensity	Entrainment
	Directional selection	Umbrella species		Biome types	Decomposition	Stratification	Biogeochemical cycles (incl. nutrient dynamics/ energy flow)
	Stabilising selection	Charismatic species		Biocoenoses		Bottom topography	Seasonal cycles (physical and biological)
	Disruptive selection	Vulnerable species		Species-area relationships		Substrate type	Productivity
	Micro-evolution	Economic species		Transition areas		Geophysical anomalies (inc. frontal systems)	Hydrosphere - atmosphere equilibria
	Genetic erosion	Phenotypes		Functional groups		Representative habitats	Hydrosphere-lithosphere equilibria

	Speciation	Population fragmentation	Heterogeneity	Distinctive habitats	Eddy diffusion/ turbulence/ internal waves
	Macro-evolution	Meta-populations	Endemism	Wave exposure	Mixing/ stabilisation
			Alternate stable states	Patchiness	Upwelling/ convergences
			Mutualisms	Nutrients	Divergences
			Biomass	Dissolved gasses	Ecological integrity
				Anoxic regions	Erosion/ sedimentation
					Desiccation

This list should not be considered as either inclusive or exclusive in its contents, and should be used for guidance of components only.

Annex 6: Table showing how the various ICES Study and Working Groups contribute to research activities or information on the components of marine biodiversity

	GENETIC		SPECIES/ POPULATION		COMMUNITY		ECOSYSTEM	
	Structure	*Process*	*Structure*	*Process*	*Structure*	*Process*	*Structure*	*Process*
WGITMO (mainly review existing info)	Alien species, undefined	Genetically altered stocks of alien species (incl. fitness)	Distribution and abundance of alien species, disease patterns	Impacts of alien species on native species (incl. inter-breeding, intra-specific competition)	Impacts of alien species on native (fish) communities	Inter-specific competition	Effects of hydrodynamics and sea temp. on alien species distributions	
WGDEC (mainly review existing info)			Distribution of corals and structural sponges	Growth, reproduction and recruitment in deep water fishes	Provision of biogenic habitat (e.g. corals)			
WGECO (review and evaluate existing info)			Distribution and abundance of marine species		Distribution of fish species in response to climate change			
WGMME (review and evaluate existing info)			Distribution and abundance of marine mammals	Vulnerability of marine mammals	Effects of hydrodynamics and sea temp. on marine mammal distributions			

	Genetic		Species/ Population		Community		Ecosystem	
	Structure	*Process*	*Structure*	*Process*	*Structure*	*Process*	*Structure*	*Process*
WGRED (collate existing info)								
WGFTFB (mainly review existing info)								
WGZE (mainly review existing info)			Distribution and abundance of plankton populations	Population dynamics of plankton, recruitment of fish species and seabird breeding	Distribution, abundance and diversity of plankton communities	Effects of hydrodynamics and sea temp. on plankton distributions	Seasonality of plankton production	
IBTSWG (collect information, coordinate and improve surveys)			Distributions of target and non-target species					
SGFIAC (review scientific evidence)		Onset of maturation, artificial selection, evolution*						

	GENETIC		SPECIES/ POPULATION		COMMUNITY		ECOSYSTEM	
	Structure	*Process*	*Structure*	*Process*	*Structure*	*Process*	*Structure*	*Process*
BEWG + SGNSBP (compilation, analysis and interpretation of data)		Distribution, abundance and condition of benthic invertebrates	Community structure and diversity (incl. function) of benthos	Effects of hydrodynamics and sea temp. on benthos distributions				
WGICZM (mainly review existing info)								
WGEXT (mainly review existing info)							Habitats and substrates	Disturbance and recovery
WGMHM (mainly review existing projects)			Distribution of species			Distribution of habitat types		
WGAGFM (mainly review existing info)	Genetic diversity of marine fish and shellfish							
WGFE (review and translate scientific info)			Distribution of commercial and non-commercial fish species (incl. threatened and rare species)	Feeding habits, prey rations, habitat requirements	Fish community metrics	Function and productivity of fish communities		
WGSE (mainly review existing info)						Threats of pathogens and parasites to seabird communities		
SGEH (mainly review existing info)			Invasive species			Habitats, eutrophication		

Scientific evidence suggests that fisheries-induced adaptive change operates on the genetic level but responses of exploited populations are expressed on the species/population level.

Annex 7: Table showing how the various ICES Study and Working Groups contribute to the management of the components of marine biodiversity

	GENETIC		SPECIES/ POPULATION		COMMUNITY		ECOSYSTEM	
	Structure	*Process*	*Structure*	*Process*	*Structure*	*Process*	*Structure*	*Process*
WGITMO								
WGDEC (recommend research activities)							Identified habitat mapping requirements	
WGECO (develop integrated frameworks)					Develop EcoQOs for fish communities	Impacts of beam trawl fisheries on ecosystem components		
WGMME (develop indicators of ecosystem health and EcoQOs)			Workshop 2008: Impacts of pollutants on marine mammals	Workshop 2008: Impacts of pollutants on top predators				
WGRED							Prepare regional ecosystem overviews	
WGFTFB							Impacts of beam trawl fisheries on ecosystem components	
WGZE					Workshop 2008: Coordinating existing and new research effort			
IBTSWG								
SGFIAC (develop management tools)			Managing fisheries-induced evolution					
BEWG + SGNSBP				Workshop 2008: Workshop of benthos-related environmental metrics				

	GENETIC		SPECIES/ POPULATION		COMMUNITY		ECOSYSTEM	
	Structure	*Process*	*Structure*	*Process*	*Structure*	*Process*	*Structure*	*Process*
WGICZM							Review of ecosystem goods	Review of ecosystem services
WGEXT							Habitat mapping, modelling, risk assessments	
WGMHM							Draft position paper in 2008 on habitat mapping in ecosystem-based context	
WGAGFM	Review molecular techniques							
WGFE			Underpins advice on threatened species		Underpins advice on fish communities			
WGSE								
SGEH						Potential drivers of changes in species composition		Indicators of habitat destruction

Annex 8: SGBIODIV Terms of Reference for the next meeting

2008/2/MHC00 The **Study Group on Biodiversity Science** [SGBIODIV] (Chair: Michaela Schratzberger, UK) will meet in 2009 (date and venue to be confirmed) to:

a) review the assessment, advisory and governance structure within ICES in order to determine the most appropriate levels at which Biodiversity Science should be coordinated.
b) explore options for the integration of Biodiversity Science into the ICES science and advisory community.
c) develop a working plan to integrate and communicate ICES Biodiversity Science.

SGBIODIV will report by [TBA] 2009 for the attention of the Marine Habitat and Living Resources Committees, BEWG, and ACOM.

Supporting Information

PRIORITY:	High. The work of the Group is essential if ICES is to progress with making biodiversity an integral part of ICES work..
SCIENTIFIC JUSTIFICATION AND RELATION TO ACTION PLAN:	a) In light of recent changes in the advisory structure and the necessity that Biodiversity Science becomes an over-arching theme within ICES, SG BioDiv will examine the interactions between assessment, advice, and governance within ICES. This would be to ensure that the integrative nature of Biodiversity Science is effectively served within an advisory climate that may not specifically request information and advice in this holistic context. b) Understanding that integrating a new paradigm for marine science within a complex and already fully engaged organisation will be challenging and best served if the ICES advisory and governance structure was able to assess various approaches to this direction with associated tasks, timelines and risks. c) Provide schedule of activities for the integration of capacities within ICES to improve knowledge of ecosystem processes as well as to engage capacities external to ICES that improve our knowledge of structure and processes for those required components of biodiversity in which ICES has not traditionally invested. Offer a plan to communicate the ICES approach to Biodiversity Science and its vision within the ICES science community, to help redefine customer needs (such as EC, NEAFC, OSPAR, NASCO, HELCOM) and to bring common understanding for restructured advice that serves specific management questions but in a more global biodiversity context.
RESOURCE REQUIREMENTS:	No specific resource requirements beyond the need for members to prepare for and participate in the meeting.
PARTICIPANTS:	Expertise from all areas of the marine benthic and pelagic food web components.. Participation is sought from ICES countries and by scientists both from disciplines and scientific circles not normally represented at ICES.
SECRETARIAT FACILITIES:	Not exceeding the usual requirement
FINANCIAL:	None specific.
LINKAGES TO ADVISORY COMMITTEES:	ACOM.
LINKAGES TO OTHER COMMITTEES OR GROUPS:	Ecology and survey groups, WGDEC, BEWG
LINKAGES TO OTHER ORGANIZATIONS:	CBD, IMoSEB, OSPAR, HELCOM