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Report of the Study Group on Information Needs for Coastal Zone Management (SGINC)

19–21 April 2004
Heraklion, Crete, Greece

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Contents

1	TERMS OF REFERENCE.....	5
2	CURRENT ICZM PROGRESS	6
2.1	Canada	6
2.2	Denmark.....	6
2.3	Germany.....	7
2.4	Norway.....	8
2.5	Poland	9
2.6	Spain	10
2.7	Sweden.....	11
2.8	The Netherlands	11
2.9	The United Kingdom	13
3	LINKAGES TO ICES COMMITTEES AND GROUPS.....	15
4	LINKAGES TO OTHER RELEVANT ORGANISATIONS AND SCIENTIFIC PROGRAMMES	19
4.1	Relevant organisations	19
4.2	Scientific programmes	20
5	AVAILABLE INFORMATION AND GAPS OF KNOWLEDGE	25
6	NEW DATA PRODUCTS AND RESEARCH.....	28
7	POSSIBLE PARTNERSHIP.....	29
8	CONCLUSIONS AND FINDINGS.....	29
9	RECOMMENDATIONS	30
10	ADJOURNMENT OF THE MEETING	30
11	ANNEXES	31
	Annex 1 List of participants, Study Group on Information Needs for Coastal Zone Management (SGINC).....	31
	Annex 2 Agenda and timetable	33
	Annex 3 Summary of presentations given at the meeting	35

1 TERMS OF REFERENCE

The second and final meeting of the ICES Study Group on Information Needs for Coastal Zone Management (SGINC) was held at Institute of Marine Biology of Crete in Heraklion, Crete, Greece 19–21 April 2004 with nine participants from Denmark, Norway, Germany, Sweden, the Netherlands, and the United Kingdom.

The Chair, J. Støttrup (Denmark), reviewed the background for the establishment of this Study Group. Coastal waters cover a small percentage of the global surface but are highly productive and have a high biodiversity. Many fish species are at some stage in their life cycle dependent on coastal ecosystems, which function as areas for feeding and spawning and as nursery grounds. The production and utilisation of these marine, renewable resources cannot be sustained where the functional integrity of coastal systems is degraded. There is, however, a rapidly growing pressure on the coastal zone and evidence of increasing degradation of coastal waters around the globe due to a wide range of human activities. Examples are habitat alteration, eutrophication, toxic pollution, and overfishing. Conservation of healthy and well-functioning coastal ecosystems, to provide both goods and services to humanity in the future, calls for new sustainable management strategies. ICES addresses today many of the issues of biodiversity and marine habitat primarily within the realms of the Marine Habitat Committee, but also in other committees. Thus many of the issues are represented in Working Group activities working towards a specific goal. The challenge still remains to compile all this knowledge and develop tools in a holistic manner in order to provide a working platform for Integrated Coastal Zone Management (ICZM). In order to maintain and improve the quality of ICES advice, the specific requirements for scientific advice in support of client initiatives on ICZM need to be evaluated. These requirements will provide a framework for the ICES advice. Thus, this task should be considered of very high priority. The advice generated from this Study Group will contribute to the goal stated by the Marine Habitat Committee to “Develop procedures for integrated coastal zone management”.

The second meeting of the ICES SGINC was opened by the Chair J. Støttrup. E. Moksness (Norway) acted as Rapporteur, and the Agenda was adopted (Annex 2).

The Terms of Reference for 2004 (ICES C. Res. 2003/2E09) are to:

- a) Update and report on activities of relevant ICES working and study groups to identify information pertaining to the coastal zone; evaluate information from other ICES expert groups on potential contributions to information for ICZM;
- b) Update and report on the activities of other relevant organisations and scientific programmes which focus on coastal zone aspects with respect to information relevant for ICES;
- c) Report on the available information with respect to that required for the sustainable use and management of the coastal zone and identify gaps in knowledge;
- d) Finalise recommendations on scientific data products and new research, which ICES could use as a basis for advice on, and in support of coastal zone management;
- e) Identify possible working partnerships, which could complement ICES data products with a view to further developing and integrating knowledge for use in holistic advice for coastal zone management.

The terms of reference for 2004 (ICES C.Res. 2003/2E09) are addressed in the following sections of this report:

Term of reference	Section of this report
TOR (a)	3
TOR (b)	4
TOR (c)	5
TOR (d)	6
TOR (e)	7

2 CURRENT ICZM PROGRESS

At the 2003 meeting, national reports were provided on the status and progress of Integrated Coastal Zone Management (ICZM). This was updated at the 2004 meeting with information on national implementation of the EU Water Framework Directive and EU Habitat Directive.

2.1 Canada

Canada's Oceans Act, passed in 1997, gives the minister of the Department of Fisheries and Oceans (DFO) the responsibility to facilitate the development of integrated management plans. While the Act makes reference to coastal waters and marine waters, it does not define these two terms. In practice, the 12 nautical mile line (headland to headland) and the low water mark bound the coastal zone. However, the provisions of the Oceans Act are very broad and thereby DFO has an obligation to facilitate oceans management without regard to these borders.

Canada has the longest marine coastline in the world with almost one-quarter of its population living in coastal communities. The area of its territorial seas is two-thirds of the landmass. Given this vast area, a hierarchical or nested approach is being used to define management areas starting with the large ocean management areas or LOMAs, e.g., Beaufort Sea, Central Coast of British Columbia, Scotian Shelf and Gulf of St. Lawrence. Within each LOMA smaller management areas, either ocean, OMAs, or Coastal Management areas, CMAs, may be needed. There will be a need for smaller management areas within a CMA.

To date there has been no discussion of temporal scales although it is understood that this will need to be addressed when monitoring programmes and marine environmental quality objectives are defined.

The main goal for coastal zone management in Canada is the sustainable use of aquatic resources through integrated management and the application of the precautionary approach. DFO is being challenged to take an integrated approach in dealing with a number of current management and advisory issues. For the past ten years, sharply declining stocks of commercial groundfish have had severe impacts on the economies of coastal communities. The reasons for these declines are highly complex and poorly understood. But it has increased scrutiny on human activities including commercial fishing. The impact of mobile fishing gear such as trawls, drags, and suction dredges on commercial fish habitat and prey species is being questioned. Concern is being expressed about the potential impact of offshore oil and gas exploration, development, and production activity on fish stocks. A wide range of negative environmental impacts are being attributed to coastal sea cage culture of salmon and suspended culture of blue mussels. These impacts include the degradation of fish habitat, effects of escapees from farm and disease transmission to wild fish stocks. Residential development and recreational and tourism use of the coastal zone are often in conflict with mariculture and traditional fishing uses. Land-based sources of pollution continue to be an issue in the coastal zone, particularly near larger urban areas.

In addition, there are a number of obligations resulting from international agreements with respect to biodiversity and endangered species that are common to all ICES member countries.

2.2 Denmark

The coastal zone in Denmark is an important spawning and nursery ground for both commercial and non-commercial fish species. Spawning grounds for local herring stocks are found both in the fjords and along the open coasts together with spawning sites for a large number of non-commercial species. The Danish Wadden Sea as well as sandy coastal areas in the inner Danish waters are important nursery grounds for many flatfish species. Small cod are found on gravel bottoms interspersed with eelgrass and macroalgal meadows and the ecological quality of these areas is essential for the survival and later recruitment to the fishery.

Unlike many other countries, Denmark has defined a dividing line (the mean low-water line) between the sea and the land when dealing with management. The sea is managed by several ministries and by the counties, while coastal land areas are managed by the counties and the municipalities. Denmark has therefore not formally adopted a clear definition of the coastal zone or a defined integrated coastal zone management system (ICZM). However, the ICZM-principles have been applied through a system of laws and regulations, coordination among sectors and a high degree of public participation, which has developed over several years.

In the *Protection of Nature Act* (1992), revised in 1994, a coastal protection zone is set within 100 m from the beginning of continuous land vegetation in summer cottage areas and similarly within 300 m in rural areas. In 2002 a special commission terminated an eight-year process of defining a permanent coastal protection line according to the rules laid

down in the Act, with exceptions placing it closer to the coast. The *Planning Act* (2000) describes a coast-nearness zone—a coastal planning zone excluding urban areas—with guidelines on planning and management in the coastal zone, since 1993 defined as generally extending 3 km inland. This zone is neither a no-build nor a no-development zone, but development has to be planned carefully in harmony with nature and landscape.

The Protection of Nature Act can be applied within the entire fisheries zone and EEZ. According to the *Planning Act* from 2000, it is imposed on the county councils to elaborate and implement plans for the quality and use of coastal waters. These plans are, in part, based on the concept of “environmental quality objectives” as described in guidelines on water quality planning from the Environmental Protection Agency (1983). According to these guidelines, all bays and fjords and other coastal areas out to a depth of 6 m or at least within 1 nm from the shore are to be considered part of the counties’ responsibility regarding environmental protection and water quality.

Concerning the exploitation of natural resources and raw materials and the use of the seabed for construction of any form, these matters are regulated according to a number of different laws. Normally an Environmental Impact Assessment in accordance with the EU-directive has to be carried out by the applicant. With respect to the management of marine fisheries, a coastal zone extending 3 nm from the low-water line is defined in the *Sea Fisheries Act*. Within this zone the *Sea Fisheries Act* has laid down restrictions mostly on the use of different fishing gears. However, since Denmark is part of the European Union, the fishery is managed within the framework of the Common Fisheries Policy (CFP). The Danish *Commission of Commercial Fisheries* with members from the Ministry of Food, Agriculture and Fisheries, The Fishermen’s Organizations, the POs and the Union manages the national fishery. There is no distinction between coastal and high sea fisheries; all fisheries follow the same regulations with a few exceptions.

The EU Water Framework Directive was accepted by the Danish Parliament in December 2003 and the work with implementing the directive continues on schedule. Denmark has been divided into twelve water districts and the responsible local authorities (counties) have been nominated. This new directive is not expected to increase the number of monitoring programmes in the coastal zone since such programmes have been running for the past twenty years. At present, it is not clear to which degree the implementation of the Water Framework Directive will affect fishing and aquaculture in the coastal waters in Denmark.

The EU Habitat Directive has been in force since the beginning of the 1990s and around 100 habitats including bird protection zones have been defined. There are only a few restrictions for fishing activities within EU Habitats and several older marine fish farms established before 1992 are situated within EU Habitats. On the other hand, no new aquaculture activities will be accepted within the EU Habitats.

The Water Framework- and Habitats Directives may have some influence on the newly developing mussel farming industry in Denmark and on existing mussel dredging activities in the coastal waters.

In the management of mussel dredging and marine aquaculture, the use of GIS mapping has been taken into use and these activities are expected to be developed further in the future.

Key issues of concern in the coastal zone include:

- The severe decline in coastal fish populations of both commercial and non-commercial species;
- Marine aquaculture;
- Mussel dredging;
- Eutrophication;
- Shore nourishment;
- Extraction of raw materials.

2.3 Germany

There is no official definition of the coastal zone in Germany. For terrestrial planning purposes on the local level, responsibility generally ends at the mean high tide. The state of Schleswig-Holstein has established a 100 m inland-protected strip along the coast under its Nature Conservation Act and the state of Mecklenburg-Vorpommern has established a 200 m wide inland- and a 200 m wide offshore-protected strip under its Nature Conservation Act.

Germany has a coastline of 3379 km divided roughly into 1300 km along the North Sea and 2000 km along the Baltic Sea. Along the German Baltic Sea coast, the tide is almost absent and the water is brackish with a salinity of 8 to 20

psu. It is a shallow coast with numerous bays, lagoons, cliffs, peninsulas and islands. The North Sea coast is mainly characterized by tidal flats and islands.

In relation to coastal management, both the federal government as well as the federal states (Bundesländer) have joint responsibility for most areas of coastal planning issues. The Federal Ministry of Transport, Construction and Housing is responsible for providing national guidelines and coordinating planning policy from which the individual states derive their own planning legislation. This entails that for regional planning, water management, coastal protection, nature conservation and others, the federal states establish their own legislative structure and adhering laws, albeit having to be in accordance with the federal legal framework.

The Federal Maritime and Hydrographic Agency (BSH) has established an information system called CONTIS, which is the acronym for Continental Shelf Information System. This GIS database contains information on the different existing and planned uses such as offshore windfarms, pipelines, cables for energy transfer and telecommunication, military training areas, sediment extraction sites, dumping sites for dredged material, shipping routes, anchoring areas as well as nature conservation areas on the German shelf. Maps can be downloaded from the BSH website (see www.bsh.de/en, go to CONTIS maps).

Due to increasing activities in offshore and coastal waters, especially the planning of offshore windfarms, the federal states of Niedersachsen, Schleswig-Holstein and Mecklenburg-Vorpommern commenced the introduction of development plans for their territorial waters, which are presently at a draft stage. According to the Federal Building Act, development (spatial) planning will probably be introduced into the German Exclusive Economic Zone (EEZ) by the end of 2004 for managing the different economic and ecological interests and minimize conflict potentials.

Key issues in Germany are:

- the development of offshore windfarms in the EEZ;
- the increase in planned sediment extraction activities in offshore waters;
- the establishment of nature conservation areas in the framework of the EU Habitat and Birds Directive;
- the development of ports and harbours, especially in Hamburg, Wilhelmshaven and Bremerhaven;
- the decline of fish stocks due to overfishing;
- the preservation of tourism as a major economic factor for the coastal region;
- coastal defence strategies;
- the possible development of inshore and offshore aquaculture.

With respect to the EU Habitat and Birds Directive, the federal states of Schleswig-Holstein, Niedersachsen, and Mecklenburg-Vorpommern identified areas in the territorial waters that have been or will soon be reported to the Commission. Based on the work of the Federal Agency for Nature Conservation, the Federal Ministry of Environment is proposing seven areas under the Habitat Directive and two SPAs under the Birds Directive for the German EEZ to the federal government. The proposed areas comprise about 30% of the total EEZ area. The Federal Agency for Nature Conservation is presently updating further information and reviewing the size and shape of these areas to some extent. For information on their location, see www.bsh.de/en (go to "CONTIS maps").

On 25 June 2002 the EU Water Frame Directive was implemented into national law. By the end of 2004, the different national working groups will finish their evaluation on the ecological state of the German coastal waters.

2.4 Norway

In Norway the coastal zone (equal to the definition in the EU Water Framework Directive) covers an area of about 100,000 km² and extends about 85,000 km (including islets and islands) with complex topography. The fisheries along the coast, and in more recent years fish farming, are important to the Norwegian community, its welfare and economy in a long-term perspective. Crucial conditions for these industries are the maintenance of high, natural production and biodiversity and good water quality along the coast, which call for sustainable management of human activities and exploitation of resources. The utilisation and production of marine, renewable resources cannot be sustained where the functional integrity of coastal systems is degraded.

The coastal zone is the key area for many marine species. The areas where the large oceanic stocks spawn are important both for the stocks, the coastal ecosystem, the fishermen, and for the people living or recreating along the coast. These spawning areas should be treated as sacred and every necessary measure to secure these areas for spawning also in the

future should be taken. The threats from anthropogenic activities to the fishery resources and to the health status and the biodiversity of the coastal ecosystems in general are much the same. Negative influences may be due to inputs of nutrients, toxic substances, habitat- alteration from physical encroachment, oil exploitation and transport, and the introduction of alien species. In addition, the fishery itself may overexploit the resources and use methods such as trawling that may damage bottom ecosystems such as coral reefs and soft-bottom habitats. Non-sustainable fisheries may thereby be a threat both to optimal utilization of the resources and to conservation of nature and biodiversity. Several of the largest oceanic fish stocks in the North-East Atlantic region migrate to the Norwegian coast to spawn. These stocks thereby transform and transport the vast oceanic plankton production from the Norwegian and the Barents Seas towards the coast. Their spawning products, eggs and larvae, are prey for local fish, mammals and birds and are consequently of vital importance to the sustainability of the coastal ecosystem. The large oceanic fish stocks are the basis for important fisheries that, together with aquaculture, support people living along the Norwegian coast. Therefore, it is important to manage the fish stocks in a way that they are sustainable and support the coastal communities both now and in the future. Advanced genetic studies have recently demonstrated the existence of local stocks of the common species Atlantic cod along the Norwegian coast and such populations may have difference in age and size at maturity, survival rates, and growth rates. The size of these local stocks is crucial for recruitment and future fisheries. This new knowledge calls for careful and sustainable management, both from a resource and a biodiversity point of view. These local stocks use local spawning areas and are also dependent on nursery grounds in the neighbourhood. It is important to protect the spawning areas and nursery grounds from habitat-destruction, and to assess the size of local stocks in order to prevent over-exploitation. Because local stocks of cod are very small compared to the North-Sea and the Norwegian Arctic stocks, they are easily neglected by the management authorities. Local populations are, however, valuable resources to the local public for leisure and recreation fishery, and may also attract tourists.

Key issues are:

- Ecosystem structure and function, and effects of intervention. An important part of this is knowledge about life history in marine organisms and dispersal/spreading of marine organisms.
- The environmental carrying capacity (including the significance of varying physical framework conditions and studies of species and system vulnerability).
- Species-demand on the environment including suitability and their vulnerability with respect to toxins and eutrophication (anthropogenic).
- The effect of the size of local fish stocks, cod, herring, capelin and invertebrates such as bivalves, crustaceans and echinoderms on the environment.
- Interaction between wild and reared organisms, sustainable multi-mariculture and the interplay and interaction between wild species.
- There is little knowledge today on the effect of rearing and stock enhancement on local spawning grounds for, e.g., cod, herring, capelin, etc., and areas for eggs, larvae and juveniles (cod, herring, etc.).
- Long-term trends, both nature and community processes, and the interaction between them.
- Knowledge to avert and reverse unwanted processes, rehabilitation and environmental actions (habitat improvement in the form of, e.g., fertilizing and artificial reefs).
- Rehabilitation of strained production environments.
- Forming of cost-effective efforts/effort packs.
- Coastal management has to find the balance between exploitation and protection issues in the coastal zone.
- Risk Assessment Models should be made.

Two projects to organize our knowledge on the coastal zone and to make it available to managers and stakeholders are now being conducted in Norway. The aim of the first one is to organize all information on coastal resources and coastal use in maps. The other project aims to make information on how and where relevant knowledge on the coastal zone can be found and information on how to use it, available on the internet. Implementation of the EU Water Framework Directive is in progress and is according to the timetable agreed upon.

2.5 Poland

There is no precise legal definition of the entire coastal zone in Poland; therefore, boundaries are taken according to the purpose of different needs and different activities. For the purpose of coastal defence against erosion, the “Technical Belt” has been established legally. It is “an area designed for maintaining the coast in a state conforming to the requirements of safety and environmental protection”. It extends along the whole Polish coastline and includes the surf zone and a 200-m wide terrestrial strip. In some areas, it has been increased to as much as 1 km in width, but in urban

areas and along the shores of the lagoons it can be narrower. The relevant Maritime Office must approve all uses of the strip; however, it is primarily intended for coastal defence and environmental protection.

The total length of the open Polish coastline is 524 km and 843 km when including length of the coasts of lagoons. It includes mostly sandy shores (about 60%), cliff coast (about 20%) and delta plains (about 10%). Most of the coast is open and subjected to sea erosion. There are two open bays (Pommeranian Bay and the Gulf of Gdansk), one semi-enclosed bay (Internal Puck Bay), and two lagoons (Szczecin and Vistula Lagoon). These morphological units can be regarded as ecological sub-systems (also managerial units).

Perhaps the most important key issue is erosion of the coast. Over 100 km of the coast is now protected in some form: groyne, seawalls, bulkheads, revetments, and, increasingly, artificial beach nourishment.

The coastal zone hosts a traditional mass recreation and tourism activity which is almost exclusively concentrated on the summer season, therefore in some places exceeding environmental and infrastructure capacity. A number of popular tourist spots have experienced devastation of flora on sand dunes and cliffs and deterioration of coastal forests.

There is no national legislation and/or national policy that can be identified as ICZM plans; however, there is so-called "spatial planning", which can be regarded as a sort of substitute to ICZMs. During the past decade, there have been several local initiatives taken which can be regarded as ICZM planning. Unfortunately, most of these initiatives were confined to administrative borders and did not really cover natural borders.

2.6 Spain

The National Shores Act, "Ley de Costas", defines the coastal zone as the shore of the sea and its inlets between high and low water marks of equinoctial tides, or up to the limits reached by the waves of the major storms; along the river margins it extends as far as the effects of the tides are noticed. The coastal zone also includes all salt marshes, lagoons, and, in general, all lowlands that can be flooded by sea either through waves, tides or underground infiltration, the beaches and cliffs. The Act establishes a 100 m-wide area, "Servidumbre de protección", extending along the landward side of the coastal zone where all human activities are strictly regulated; for some of them the regulated area extends to 500 m from the landward side of the coastal zone. The Territorial Sea extends from the sea side of the coastal zone to a distance of 12 nautical miles. Both the coastal zone and the territorial sea are public domain, cannot be owned by private parties, and all activities and developments are done under temporary permits, licenses granted by the different levels of the Government. Public domain of the coastal zone also means free, open access to it.

There is no nationwide legislation specific for coastal zone management. The 1978 Constitution transferred most components of environmental and territorial planning to the regional governments, "Comunidades Autónomas". Municipalities are responsible for producing land-use plans. Jurisdiction overlaps are the rule among national, regional, and local governments. ICZM is acknowledged as a desirable goal by the different government levels but there is no standard approach and the degree of implementation varies widely between the different regions. Each region can produce its own environmental legislation. The Spanish Government is currently elaborating the Spanish Strategy for Sustainable Development (EEDS), which adopts ICZM as a key element to assure the sustainable development of the coastal zone, and requires the cooperation among all levels of Government and the private sector in the design of integrated strategies for sustainable development as a main goal.

EEDS identifies urban development and tourism, coastal erosion, pollution, and overexploitation of fisheries as the key issues affecting the Spanish coastal zone. Urban development affected 5% of the surface of a 10 km-wide area along the coastline in 1990, and 30 % of human population lived in coastal municipalities in 1995. The greater part (65%) of Spanish industrial production is located in the coastal zone, and 90% of the imports and 80% of the exports are done by maritime transport. Nearly 70% of the 48 million foreign visitors to Spain have the coastal zone as their destination. Coastal mariculture is a rapidly growing sector of the Spanish economy and contributed 24% of total national fish production in 1998. Overall, more than 10% of the gross national product is generated by economic activities performed in the coastal zone; this percentage can increase up to 65–90% in some regions (i.e., Balearic Islands).

Following the EU Directive of 1992, Spain issued the 1997/1995 Directive for the identification and management of the protected areas. All the previously protected spaces for birds (ZEPAS included in the Bird Directive 79/409) were included in the Natura 2000 network. The Spanish Government approves the LICs, which are included in the Natura 2000 network. These have a wide ecological variation from terrestrial to marine ecosystems. The Regional Governments propose the areas to be identified as LICs and manage them, implementing the regional normative and protection measures. In a recent revision of the state of the implementation of the Habitat Directive at Mediterranean level, the delay in the identification of the LICs and their protection was manifest.

Legislation establishing the basis for the Spanish National Hydrological Plan (SNHP) was passed by the Spanish Parliament in July 2001 and entered into force in August 2001. The Plan has two parts: A new water transfer of 1,050 cubic hectometres of water per year from the Ebro river to another four basins in the east of the country and, secondly, a “package” of 889 public works. The Ebro water transfer is the main bulk of the SNHP. In addition to the piping, it will require approximately 381 new water infrastructures and other works affecting all five river basins. The most environmentally damaging of these works are six new dams in the Pyrenees mountains. The impacts of this water transfer could ultimately include the total disappearance of the Ebro Delta (a proposed Special Area of Conservation under the EC Habitats Directive, a Ramsar site, and the third most important wetland in Spain). Recent political developments and the change of Government probably will determine a change in this issue.

2.7 Sweden

There is no formal definition of the coastal zone, but the jurisdiction of the smallest administrative unit, the municipality, comprises land and coastal waters to the 12 nautical mile line. Each municipality is obliged to have an overall plan for land and water use within their jurisdiction. On regional and national scales, the definition of the coastal zone varies depending on activities and resources being managed, e.g., coastal fisheries are sometimes defined by distance to the baseline (1–4 nautical miles) and sometimes by vessel size rather than by geographical boundaries.

Sweden's coastline is about 7,600 km long, including mainland bays and the coasts of the larger islands. The salinity of the water decreases from about 30 parts per thousand in the Skagerrak to about 1 part per thousand in the northern Bothnian Bay. The marine ecosystems off the Swedish west coast are rich in species, whereas the estuarine ecosystems in the Baltic are characterised by few species occurring in large numbers, and the co-occurrence of marine and freshwater species.

To obtain a long-term sustainable development, the Swedish parliament has approved fifteen national environmental quality objectives. One of them—“A Balanced Marine Environment, Sustainable Coastal Areas and Archipelagos”—specifically applies to the marine and coastal areas. To achieve this objective, eight interim targets were decided in 2001 (<http://miljomal.nu/english/english.php>). The interim targets include actions such as long-term protection of the marine environment, action programmes for endangered species and fish stocks, control of catches to enable fish stocks to recover and to reduce by-catch of mammals, as well as birds and undersized fish, to levels that do not have an adverse effect on the populations.

In accordance with the EU Water Framework Directive, Sweden is being divided into 119 catchment areas, which are subsequently divided into five water districts, based on the location of the catchment areas and the morphology of the coast. To begin with, each district is to be governed by a local water authority that will be connected to a County. This authority is to ensure that the water quality objectives that are decided on are reached within the given time frame.

In the inshore areas of Sweden, several problems threaten a sustainable use of the coastal resources, e.g., local over-fishing, rapidly developing recreational fishing and fishing tourism, conflicts between stakeholders with differing interests, poor economy in the commercial fisheries, and increased use of ecosystem goods and services in coastal areas. Several studies are being conducted to address these issues. Thus, areas of current and future research relevant to coastal zone management in Sweden are as follows:

- Integrating fishery with environmental management and social sciences;
- Harmonizing management units with spatial distribution of local resources (e.g., genetic characterization of sub-populations) and identifying important local spawning sites and nursery areas;
- Assessing effects of eutrophication, physical disturbances (such as increased boat traffic, dredging, constructions as, e.g., harbours, obstacles in migration routes, etc.), and biological interactions (predation by seals and cormorants) on fisheries dependent on local resources;
- To develop fishery-independent monitoring systems of coastal stocks and schemes to obtain statistics concerning recreational fishing, as well as improving the quality of statistics obtained from commercial catches.

2.8 The Netherlands

The coastal zone is the relatively small and dynamic zone between land and sea. It is defined as a strip of land and sea of varying width depending on the nature of the environment and management needs. It seldom corresponds to existing administrative or planning units. The natural coastal systems and the areas in which human activities involve the use of coastal resources may therefore extend well beyond the limit of territorial waters and many kilometres inland. The

coastal zone system is an integrated complex of marine coast and land subsystems. The coast-subsystem includes the foreshore, the beach area, and natural coastal protection systems such as dunes.

Natural ecological processes on the one hand, and socio-economic and political processes on the other hand, act on different temporal and spatial scales. Human activities such as dredging, sand-nourishment, and recreation have their implications on a short-term scale of days to several years or even decades, while for instance habitat alteration and climate change have effects on larger time scales of decades to centuries. Local authorities are responsible for coastal defence and recreation, while fishing management is carried out within a European framework, and global warming should be addressed on a global scale. An important question now arises on what temporal and spatial scales information is needed on ecological processes, entities to play a role in integrated coastal zone management.

The Dutch government developed by the end of 2002 the contours for integrated coastal zone policy. In accordance with the European recommendation, a national strategy must be ready by 2004/2005. This policy document, "Towards an Integrated Coastal Zone Policy—policy agenda for the coast", examines subjects of imminent importance, giving priority to safety policy. A number of safety and risk problems in the near future must be faced. Topping the policy agenda are the weak links in the coastal defences, which must be mitigated in time to continue to guarantee the safety of the hinterland. In addition to the weak links, risk management and quality boosts present a challenge for coastal towns. The coastal foundation zone concept illustrates the philosophy that sand is the basis of Dutch coastal defences and other functions in the coastal zone. Another duty of the national government is to ensure effective coastal zone policy and administration. With regard to communication and education, the policy agenda takes consideration of the storm surge awareness. Finally, the policy agenda places great importance on shaping integrated coastal zone policy. It stimulates the development of the national government's vision of the coastal zone, which is based on the basic qualities of the coast: resilience, cohesion, and horizon.

In October 2001, the European Environment Council made recommendations for integrated coastal zone management, stressing the strategic importance of coastal areas as residential areas and links in the trade and transport chain. Attention was drawn to the fact that these areas contain ecologically valuable habitats and are favourite holiday spots. However, a number of serious problems can be identified. Habitats are threatened and the coast is eroding.

On the basis of the three basic qualities of the Dutch coast, resilience, cohesion and horizon, the Dutch vision of the coastal zone includes the following with respect to ecosystems:

- To protect existing ecosystems, there should be sufficient space for natural processes (resilience) in the coastal area. The aim with respect to estuaries is to restore the natural freshwater/saltwater interfaces (cohesion). Human activities, such as fishing, should be carried out in a sustainable manner. Given the connection between the coast and the sea, the (ecological) quality must be ensured. An example is the development of a marine reserve to compensate for the loss of nature resulting from the development of an offshore industrial site in the North Sea.
- Space for the development of human activities is limited in the coastal areas. This requires special attention to spatial planning. Therefore, a growing search for space is thought to be found in the marine part of the coastal zone, for instance, the planning of an artificial island to be used as a new airport and locations for wind turbine parks. A major concern is the minimal amount of ecological knowledge of the nearshore coastal areas, i.e., the sandy shores and surf-zone area, as well as the lack of instruments to integrate this ecological knowledge into integrated coastal zone management. The different temporal and spatial scales acting in both the natural environment and in the political and socio-economical planning need special attention.

The protection of species according to the EU Birds and Habitats Directives has been fully implemented in the Netherlands since 2002 (*Flora en Fauna Wet*). Special protected zones have already been put forward to the EC, according to *Natura 2000*. These areas are, however, not yet fully implemented. The *Voordelta* and the *Wadden Sea* including the part of the *North Sea* coastal zone will be implemented according to the *B&H Directive* as an adjustment of the *Natuurbeschermingwet* (1998). There is only very limited protection of specific species and habitats in the sandy shores in the coastal zone in the Netherlands, other than some birds and sea mammals. This has partly to do with the lack of knowledge on the ecology of sandy shores in the Netherlands. Therefore, it is also unknown how vulnerable and valuable the species and habitats of the coastal zone are. The *Water Framework Directive* aims at the protection of all water bodies (including coastal waters) in Europe and must have achieved a "good ecological status" in 2015. Coastal areas will be part of river basin plans (*Rijn, Schelde, Maas and Eems*). The ecological status will be judged using chemical and biological quality elements (phytoplankton, macrofauna, macrophytes, and fish). The *Ems-Dollard* estuary, as transitional waters, will be judged on all four biological elements. The *Wadden Sea* and other coastal areas, being coastal waters, do not have to be judged on the presence of fish.

2.9 The United Kingdom

The boundaries involved with the UK coastal zone management are not clearly defined; however, the Crown Estate manages the marine areas below Mean Low Water Springs (MLWS) out to 12 nm. For planning purposes, the Local Authority boundaries seaward limit is generally the MLWS mark. There is no statutory planning offshore, however, the recent Water Environment and Water Services Act extended marine fish farming to local authority control in terms of planning permission. There is no official development setback line policy or protected zone for the coast. Recently, however, there have been several instances where an informal 5-metre contour line has been recognised, specifically in relation to dealing with coastal erosion and flood defence. The coastline around Scotland is highly indented with rocky cliffs, firths and beaches, creating a large inshore area (within 12 miles of the coast). The diverse habitats in the inshore zone are vital to Scotland's fisheries as they provide important spawning and nursery grounds for white fish and flatfish as well as rich feeding areas to several bird colonies. The UK's long complicated coastline is summarised in the following table:

Geographical area	Length km	% GB coast
Great Britain total	18838	
England	5496	29%
Scotland (mainland)	6482	35%
Scotland (islands)	5295	28%
Wales	1562	8%

Key issues:

- The development of urban infrastructure, ports and harbours and the substantial areas of tidal land that has been converted to agriculture through enclosure. This has been particularly intense around the major estuaries.
- A significant percentage (31%) of the coastline is already developed in industrial, commercial, residential, and recreational terms. Economic pressure for further expansion of these facilities is likely to increase in the future.
- Approximately 40% of UK manufacturing industry is situated on or near the coast. Much of this industry, along with major cities, is located around large estuaries.
- Most of the Scottish population lives within a few miles of the coast and on its many islands.
- Spatial issues regarding the distribution of resource exploitation in the coastal zone by inshore fisheries, shellfish gathering, aquaculture, game fishing, offshore oil and gas, shipping, recreation, tourism, and small-scale agriculture.
- Flooding and erosion threat resulting from climate change, sea level rise and isostatic sinking are an issue around the south and east of England, requiring coastal defence.
- Decline in inshore fish stocks due to over-fishing and habitat damage.
- Decline in runs of wild salmon and sea trout in many rivers.
- Fish farming (spatial reclamation, benthic impact, disease, escapes, algae blooms).
- Coastal water pollution threatening the collection and farming of shellfish and the local wildlife.
- Offshore wind farm development.

ICZM Stocktake

The aim of this was to produce a stocktaking report to analyse the current framework for management of the coastal zone in the UK (i.e., the different legislation, institutions and stakeholders involved and how they interact) and identify the issues of common concern in terms of the scale of integration within this framework. It started in March 2003 and finished in March 2004. This will set the path for strategies for ICZM for each of the devolved administrations, but not to develop the actual strategies and Action Plans. The final report has been completed and discussion has started on the implementation of findings in the report. The report was not yet available due to technical problems. The following key findings were available:

- 1) There is no overarching framework for integrating CZM activities for planning across the land-sea boundary and communication between government departments is weak.
- 2) The principles of ICZM are not implemented nationally although there are very good local schemes.

- 3) The Marine Stewardship visions are not communicated down to the local level and stakeholders.
- 4) There should be a lead body for the National Strategy with coordination at the Regional level.
- 5) To use existing models to achieve greater integration, e.g., Marine SACs (Special Areas of Conservation), SMPs (Single Management Plan), etc.
- 6) A statutory level for ICZM is not required, but a mechanism to drive the coordination of governing bodies is required.
- 7) Current legislation should be streamlined.
- 8) Local implementation is the best option when specific local conflicts need to be resolved.
- 9) Clarify the best approach to integrated management out to 1 nm.
- 10) Strengthen regional bodies and enforcement, e.g., Sea Fisheries Committees.

SACs in terrestrial areas and marine areas out to 12 nautical miles are designated under the Conservation (Natural Habitats, etc.) Regulations 1994 (as amended). Regulations to implement both the Habitats and Birds Directives in the UK offshore area (12 n.m. out to 200 n.m. and the UK Continental Shelf) are due in 2004. The list of candidate SACs is updated whenever the UK submits new data to the EC. These were last updated 9 February 2004 following the submission of Tranche 31 on 29 January 2004, comprising of four new sites in England. At present, there are 605 cSACs and 35 pSACs and 240 cSPAs and 10 pSPAs in UK (not all marine).

Sandbanks that are slightly covered by sea water all of the time	23
Estuaries	15
Mudflats and sandflats not covered by seawater at low tide	27
Coastal lagoons	19
Large shallow inlets and bays	14
Reefs	33
Other vegetated habitats	104
Coastal sand dunes and continental dunes	147

The UK Marine SACs Project was set up to establish management schemes on selected marine SACs. Its activities have focused on a selection of twelve Marine SACs around the UK and on developing specific areas of knowledge needed for the management and monitoring of European marine sites.

The implementation of the Water Framework Directive was reached on 11 December 2003, and came into force on 2 January 2004, as The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. There are to be nine river basin districts in England and Wales covered by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, which have been made jointly with the National Assembly for Wales. For the cross-border river basin districts of Northumbria and Solway Tweed, separate regulations have been introduced. At the end of November 2003 it was decided to have a single river basin district for Scotland, with separate arrangements for the cross-border area with England. These new arrangements were introduced by means of a Designation Order under the Water Environment and Water Services (Scotland) Act 2003. A water classification scheme is aimed to be in place by 2006. This will also need an assessment of habitat sensitivity with regard to fishing pressure and aquaculture developments. Once classification is completed, a monitoring programme will be developed. An EU Pilot River Basin network, comprising fifteen river basin projects, to test the implementation process has been set up. The UK participates in this network through the Ribble Pilot River Basin project, located in the North West River Basin District. The UK Technical Advisory Group (TAG) was set up by the UK Administrations to provide technical advice to assist the process of implementing the WFD in the UK. It consists of the UK Environment and Countryside Agencies together with a representative from the Republic of Ireland (Department of Environment and Local Government). In the UK, a group of Task Teams are working towards selecting the tools for ecological assessment, and intercalibration and risk assessments in each of the river basin districts have been carried out.

The Water Framework Directive promotes the concept of water as an economic commodity. Although this is mainly confined to determining the most cost-effective way of meeting water quality targets, the "value" of the benefits of clean water is to be weighed against the cost of achieving this. Therefore, economists involved with the Water Framework Directive have estimated the value of the environment, in terms of providing a service like waste assimilation to fish farming, for example.

The environment has apparently been valued at £3Tr! (J. Morris Institute of Water and Environment, Cranfield University).

The Scottish Executive is committed to adopting an ICZM strategy by spring 2006. The Scottish Coastal Forum is working to prepare a draft strategy for Ministers to consider. This is at an early stage.

The Royal Society for the Protection of Birds (RSPB) and Scottish Natural Heritage jointly commissioned Hull University to assess how well the current system for managing Scotland's inshore fisheries is protecting the environment on which the fisheries depend. Among the study's key recommendations are:

- Establishing an "Inshore Waters Act" to promote protection of the marine ecosystem.
- Setting up "Inshore Fisheries Management Committees" to enable fishermen and other stakeholders to become directly involved in managing their fisheries.
- Providing financial incentives to promote environmentally friendly fisheries.
- Specific reforms to key fisheries legislation.

The RSPB is now working with the government and the fishing industry to investigate how these recommendations can be taken forward. The Scottish Executive has also begun a strategic review of inshore fisheries with a consultation sent out in June 2003. The aims of the review are to develop a strategy for the future development of inshore fisheries management, and to assess how effective inshore fisheries management has been to date and how it can be improved.

3 LINKAGES TO ICES COMMITTEES AND GROUPS

TOR (a)

This section contains the results from the questionnaire sent to the Working Group (WG), Study Group (SG), Planning Group (PG) and Workshop (WS) chairs between meetings and reported to SGINC during the 2004 meeting. This section also contains relevant information on some of the working groups identified during the first meeting as being highly relevant to SGINC.

SGINC questionnaire response

A questionnaire was sent to the chairs of all Working Groups (WG), Study Groups (SG), Planning Groups (PG), and Workshops (WS) to provide information on the extent of ICES involvement in the coastal zone. They were provided with a copy of the 2003 SGINC report with particular reference to two tables now found in this report (Tables 5.1 and 5.2) listing main human activities, key issues, and gaps of knowledge identified. Responses were obtained from six of the ICES committees ranging from 6% to 33% of the different groups within each committee.

Table 3.1. Response from the ICES Committees.

Committee name	Number and nature of group	Response group	% response per committee
Mariculture Committee (MCC)	5 WG	WGPDMO	20
Marine Habitat Committee (MHC)	7 WG, 2 SG	WGMHM WGMS MCWG	33
Ressource Management Committee (RMC)	4 SG, 3 WG, 1 WS, 1 PG	WPGNAPES	11
Oceanography Committee (OCC)	9 WG, 3 SG, 1 PG, 3 WS	WGSE	6
Fisheries Technology Committee (FTC)	2 WG, 5 SG, 1 PG, 1 WS	WGFTFB SGSTG SGAFV	33
Living Resources Committee (LRC)	8 WG, 3 SG, 3 PG, 1 WS	WGBIFS WGFE SGSBSA PGEGBS	27

Table 3.2. List of issues addressed which directly deal with coastal zone. The middle column provides the answers to the request: *List the issues your WG/SG addresses, which directly deal with the coastal zone.* The right column: *List additional with relevance to the coastal zone that might be addressed by your group, but which are not included presently.*

Expert group	Issues addressed	Additional
WGPDMO	Disease/parasite trends in wild and farmed fish and shellfish (molluscs and crustaceans); Disease/parasite interactions between wild and farmed fish and shellfish; Disease/parasite interactions between indigenous and non-indigenous species; Effects of contaminants on estuarine fish and shellfish health; Development of strategies and design of environmental monitoring programmes on fish and shellfish health; Development of the ICES fish disease databank and data analysis/assessment in terms of spatial and temporal trends and cause-effect relationships with environmental factors.	Diseases of marine mammals and seabirds
WGMHM	Intertidal and seabed habitats and associated issues centred around their mapping	Use of mapping information in management issues (e.g., coastal zone dynamics, spatial planning, habitat loss assessment)
WGMS	Chemical contamination of sediments, Methodologies for the measurement and monitoring, Interpretation of data, spatial and trends, Exchange of contaminants with the water phase, Exchange of information with other groups to integrate work.	
MCWG	Coastal/estuarine pollution, contaminant transport	
WPGNAPES	Do not address coastal zone issues	
WGSE	Seabird ecology, especially seabird fishery interactions and effects of habitat change on seabird ecology and populations	
WGFTFB	Reducing negative impacts of commercial harvesting techniques, e.g., discards and by-catch, Advice on survey gears for stock assessment, Methods of monitoring and mitigating benthic impact from commercial fishing gears	Definition of fisheries metiers/fleets, fishermen's reaction to legislation
SGSTG	Do not address coastal zone issues	
SGAFV	Do not address coastal zone issues	
WGBIFS	> 15 m; Do not address Coastal zone issues	
WGFE	Threatened fish, which will include diadromous and coastal fishes (e.g., sturgeon, shad)	Habitat use by fish in coastal waters
SGSBSA	Sardine and anchovy spawning areas in the Iberian peninsula and the Bay of Biscay	
PGEGGS	Mainly offshore spawning of cod and plaice, but inshore areas are nursery grounds	

Four of these ICES WGs identified further issues, which their group could address relevant for the coastal zone. All these issues were pertinent information and one also suggested working with the implementation of information for management purposes and these are included in the revised Tables 5.1 and 5.2 of this report (see Section 5).

Table 3.3. List of other key issues and gaps in knowledge not yet identified by SGINC (2003 report, Table 3; middle column) and answers to the questions: *Would your SG/WG with its present composition (expertise) be able to address the identified coastal zone issues?* (right column).

Expert group	Gaps in knowledge/issues/contribution	Expertise available
WGPDMO	See above table.	Yes
WGMHM	<p>Mapping of fish spawning, nursery habitats – some may be available, others may be difficult to provide and obtain GIS maps for, but this is not really focus for this group. Possibly by fish stock groups?</p> <p>Downscaling to coastal zone management needs – needs to be clarified.</p> <p>Major information gap: Access to comprehensive maps of coastal zone habitats according to common habitat classification schemes.</p> <p>Issues relating to management of the coastal zone and broader perspectives on regional/national management issues are difficult because of lack of coastal habitat data.</p> <p>May lead to inappropriate use of the coastal resource or potential damage to scarce or sensitive habitats.</p> <p>InterReg MESH project.</p>	Yes – may need more inshore expertise
WGMS	Study of processes, fluxes and effects.	Yes
MCWG	Coastal/estuarine pollution, contaminant transport.	
WGSE		Yes
WGFTFB	<p>Provision of methodologies for determining benthic impacts of commercial fishing operations and the provision of potential mitigation measures.</p> <p>Already contributed to reduction of by-catch and discard from estuarine shrimp and prawn fisheries – now EU legislation.</p> <p>Also to habitat mitigation measures using alternative stimuli for fish capture.</p>	Yes
WGFE	Address fishes (habitat, threatened species, assemblages and their ecosystem function).	Some
SGSBSA	<p>Sardine and anchovy spawning areas in coastal waters.</p> <p>Possibly very limited interaction between the two groups.</p>	
PGEGGS	No – Possibility to share data with WGMHM, WGEKO	

The Marine Habitat Committee

The Marine Habitat Committee, to which this Study Group reports, oversees the work of the following Expert Groups, further to those that responded to the questionnaire. All of these groups undertake work that is of direct relevance to coastal zone management. Most of these groups have access to relevant data but those data would have to be placed in the appropriate context and analysed in order to provide information of direct use to ICZM. Examples of available data include:

Expert Group	Nature of activities	Relevant data
WG on Biological Effects of Contaminants (WGBEC)	Methods for biological effects measurements and ecological relevance of effects.	Potential indicators of ecosystem quality
WG on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT)	Collate and analyse country reports, evaluate impacts of aggregate extraction on fisheries, develop guidelines, etc.	Sediment extraction activities and their biological effects
Benthos Ecology WG (BEWG)	Scientific research on benthic ecology, methods, taxonomy, development of EcoQOs.	Inventories of benthos
WG on Statistical Aspects of Environmental Monitoring (WGSAEM)	Statistical methods for the design and interpretation of monitoring programmes.	Could offer important guidance on the proper design of baseline and monitoring projects.

It should be noted that most databases are not comprehensive in spatial coverage. There is a need for more detailed smaller-scale information for coastal zone management purposes. The eulittoral, beach and swash zones, for example, are poorly covered. However, these expert groups can provide a means of defining useful data and appropriate protocols for collection, quality assurance, storage, and processing.

Other groups very relevant to SGINC reported on at the 2003 meeting also undertake work of direct relevance to integrated coastal zone management.

Expert Group	Nature of activities	Relevant data
Working Group on Ecosystem Effects of Fishing Activities (WGECO)	Identification, justification and use of EcoQs, EcoQEs and EcoQOs. Study of ecosystem response to fishing activity and other human activities. Matrix of classification of sensitive habitats against fishing impacts. Assess data on which the justification of the habitats in the OSPAR Priority List of Threatened and Endangered Species and Habitats will be based.	Potential indicators of ecosystem quality. Develop evaluation process for other human impacts on sensitive habitats.
Working Group on Environmental Interactions of Mariculture (WGEIM)	Develop procedures for integrated coastal zone management, including protocols for environmentally sound mariculture practices.	Mariculture impact on coastal ecosystems

An obvious observation is the fragmentary nature of ICZM-relevant information within the diverse groups of the different committees. The lack of response to the questionnaire from some of the relevant groups (including those mentioned above) further highlights the necessity to be proactive in obtaining the information relevant to CZM rather than relying on voluntary information being provided. There is a need to compile, assess, process, and integrate the available information and continue to identify gaps in knowledge and develop methodology.

4 LINKAGES TO OTHER RELEVANT ORGANISATIONS AND SCIENTIFIC PROGRAMMES

TOR (b)

The SGINC have reviewed activities of other relevant organisation and scientific programmes which focus on coastal zone aspects with respect to information relevant for ICES. The result is listed below.

4.1 Relevant organisations

EU Commission

The Commission of the European Communities presented A Strategy for Europe on integrated coastal zone management. The strategy recognises that coastal zones are of strategic importance to all Europeans, that they are home to a large percentage of the population, a major source of food, a vital link for transport, the location of some of our most valuable habitats, and the favoured destination for leisure time; ICZM is necessary for sustainable use of coastal zone resources. To achieve a European integrated coastal zone management, an integrated, participative territorial approach is therefore required to ensure that the use of Europe's coastal zones is environmentally sustainable, as well as socially equitable and cohesive. The Strategy aims to promote a collaborative approach to planning and management of the coastal zone, within a philosophy of governance by partnership with civil society. The Strategy is expected to lead to improved management of coastal zones. It is furthermore expected to improve the implementation of a wide range of EU legislation and policies in coastal zones. The Commission's Demonstration Programme on Integrated Coastal Zone Management (ICZM) has looked at the many inter-related biological, physical and human problems presently facing these zones. The basic biophysical problem in the coastal zones is that the development is not kept within the limits of the local environmental carrying capacity. Some of the most common manifestations of this problem are: widespread coastal erosion, habitat destruction, loss of biodiversity, decline of coastal and offshore fish stocks by damage to coastal spawning grounds, contamination of soil and water resources, and problems of water quality and quantity.

HELCOM

Since 1992, when "New" Helsinki Convention was signed, coastal areas of the Baltic Sea are covered by HELCOM regulations. Six important HELCOM Recommendations have been issued regarding protection of the coastal environment:

- i) Recommendation on protection of the coastal strip (Rec. 15/1).
- ii) Recommendation on establishing marine protected areas (Rec. 15/5), resulted in establishing 62 coastal Baltic Sea Protected Areas—HELCOM BSPA.
- iii) Recommendation concerning preservation of natural coastal dynamics (Rec. 16/3), which is applicable to protection of sediment transport along the coast (to preserve accumulation/erosion natural processes) and protection of coastal wetlands (e.g., against the drainage activities).
- iv) Recommendation on marine sediment extraction in the Baltic Sea (Rec. 19/1).
- v) Recommendation on sustainable and environmentally friendly tourism in the coastal zone of the Baltic Sea (Rec. 21/3), which should preserve areas subjected to strong tourism pressure, particularly those with limited carrying capacity.
- vi) Recommendation concerning protection of heavily endangered or immediately threatened marine and coastal biotopes of the Baltic Sea (Rec. 21/4).

From 1992 until 1998, the coastal environment of the Baltic Sea was under the consideration of the HELCOM Environment Committee, Working Group NATURE. In 1999 a new group was established: Nature Conservation and Coastal Zone Management, which also works on ICZMs.

OSPAR

The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) was opened for signature at the Ministerial Meeting of the Oslo and Paris Commissions in Paris on 22 September 1992. The Convention has been signed and ratified by all of the Contracting Parties to the Oslo or Paris Conventions (Belgium, Denmark, the Commission of the European Communities, Finland, France, Germany, Iceland, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom of Great Britain and Northern Ireland) and by Luxembourg

and Switzerland. The OSPAR Convention entered into force on 25 March 1998. It replaces the Oslo and Paris Conventions, but Decisions, Recommendations and all other agreements adopted under those Conventions will continue to be applicable, unaltered in their legal nature, unless they are terminated by new measures adopted under the 1992 OSPAR Convention.

MON (OSPAR/ASMO/SIMA)

MON is an *Ad hoc* WG on monitoring temporal trends of contaminants/hazardous substances in biota and sediments. The WG started in 1995 and became an *Ad hoc* group in 2001. Since then it changed to a permanent group. A new analysis of temporal trends and biological effects monitoring will be finished in 2004. The WG works in close cooperation with ICES.

4.2 Scientific programmes

LOICZ – Land-Ocean Interactions in the Coastal Zone

LOICZ focuses on:

- Effects of changes in external forcing or boundary conditions on coastal fluxes;
- Coastal biomorphology and global change;
- Carbon flux and trace gas emissions;
- Economic and social impacts of global change in coastal systems.

Although the objective of LOICZ is not to undertake coastal zone management, a clear goal is to provide a sound scientific basis for future integrated management of coastal areas (<http://www.nioz.nl/loicz>). The foci of LOICZ are relevant for several of the issues listed by SGINC, namely eutrophication, chemical contamination, and habitat destruction in the coastal zone. For example, the extensive database of regional carbon/nitrogen/phosphorus data and budget models compiled in the LOICZ core project “Biogeochemical Budgets and Modelling” can fill an important function for coastal management in several regions.

ELOISE – European Land-Ocean Interaction Studies

ELOISE is a European Commission programme which consists of more than 60 projects from EU’s Framework Programmes FP4, FP5 and FP6. The common base is the land-ocean interaction aspect. The objectives are:

- Determine the role of coastal seas in land-ocean interactions in the perspective of global change;
- Consequences of human impact through pollution, eutrophication, and physical disturbance on land-ocean interactions;
- Formulate a strategic approach to the management of sustainable coastal zone resource use;
- Promote the development of a European scientific infrastructure for coastal zone research.

The European Union for Coastal Conservation (EUCC)

The EUCC (www.coastalguide.org) first proposed a European Code of Conduct for Coastal Zones in 1993, “as a means to provide practical guidance to public agencies, local authorities, coastal users, and others with regard to ecologically sustainable development in the coastal zone”. The European Code of Conduct for Coastal Zones was officially adopted by the Council of Europe Ministers in 1999. The Code of Conduct provides practical guidelines for the conservation of nature and biodiversity in coastal areas covering a range of key socio-economic sectors. It includes recommendations on how to deal with direct and indirect impacts.

The Water Framework Directive (WFD)

(<http://www.europa.eu.int/comm/environment/water>) The European Commission signed in December 2000 and agreed in May 2001 the Directive with the following objectives: To prevent deterioration of status of all surface water bodies;

- To achieve good surface water status (during 15 years);
- To achieve good status also for artificial and heavily modified waters (15 years);
- To reduce pollution from priority substances and cease or phase out emissions, discharges, and losses of priority hazardous substances.

Key elements of the legislation are:

- Protection of all waters;
- Ambitious objectives to ensure waters meet “good status” by 2015;
- Requirement for cooperation between countries;
- Participation of all stakeholders, NGOs and local communities in water management activities.

Basic in the WFD is the theory that physical and chemical (salinity) factors set the limits for biological production in a water body.

Similar physio-chemical conditions within a biogeographical region will, in principle, contain the same species and similar communities if no disturbing, pollution factors affect the environment. The normative classification/characterisation in WFD can be summarized as: high \approx no or only minor deviations;

- good \approx low levels of disturbance, but deviate only slightly;
- moderate \approx moderate deviations and significant effects;
- poor \approx major biological alterations and substantial deviation;
- bad \approx severe biological alterations and large deviation,

WFD contains both Ecological status and Chemical status. The Ecological status includes five classes (including quality elements):

- Phytoplankton;
- Phytobenthos;
- Zoobenthos;
- Fish fauna (transitional waters);
- Supporting Chemical and physical elements (including nutrients and oxygen).

The Chemical status contains two classes: Good and Failing to Achieve Good status. Quality elements: Hazardous Substances (HS) according to list of priority substances (to be agreed). Monitoring and intercalibrating between the countries are required by the WFD. The surface water monitoring network should provide a coherent and comprehensive overview of ecological and chemical status, and ecological potential within each river basin and allow classification of water bodies to be shown on maps in River Basin Management Plan (including Coastal water). The Plan should have an acceptable level of precision and confidence and be operational within six years.

Quality elements for the classification of ecological status are performed for Rivers, Lakes, Transitional waters, Coastal waters, artificial and heavily modified surface water bodies. Normative definitions for high, good and moderate ecological status classifications in all water types and definitions for maximum, good and moderate ecological potential for heavily modified or artificial water bodies are made.

Current national monitoring and assessment systems do not allow the formulation of indicators of Ecological and Chemical Status in terms of the Directive. These will be developed over time with the progressive implementation of the Directive. Intercalibration will be required between national systems and indicators will accordingly be developed and refined over time. Deadlines of the Directive: 2003: National and regional laws to be adapted to the WFD
2004: Analysis of pressure and impacts on our waters to be completed
2006: Monitoring programmes to be operational
2008: River Basin Management plans presented to the public
2009: Publishing first River Basin Management Plans (including Transitional and Coastal Waters)
2015: Waters to meet “good status”

EUROCOAST

European Coastal Association for Science and Technology (EUROCOAST) was established in 1989 and has its secretariat in Cardiff, UK. It is an association of scientists and decision makers within the European community. There are eight members and national associations (Croatia, France, Italy, Poland, Portugal, Spain, Ukraine, UK) included. The objectives are:

- To create a European network for scientific and technical exchange, both within and outside Europe, on subjects relating to the protection, development and management of the coastal zone.
- To identify and promote multidisciplinary research and the synthesis of common themes between experts in different fields.
- To establish a database and reference library on all aspects of the coastal zone.
- To promote the wider dissemination of information on the above themes.
- To generally take all initiatives and actions that will advance the realisation of these objectives.

The main activities are the Biennial Littoral Conferences. The aims are to bring together experts from a wide range of backgrounds, natural and social scientists, engineers and other technical experts. Other activities include a recent international exchange between CoastNET (UK) and Eurocoast Ukraine, and the CORINE (coastal erosion project) supported by DGXI and generating a database for the coastline of the eleven member nations of the EC and CEO (Centre for Earth Observation) project, undertaken for DGXII of the EC. The next conference in 2004 will be in Aberdeen, Scotland. It will be the second joint conference between EUROCOAST and the EUCC – The Coastal Union. Papers presented at the biennial conferences indicate that ICES could be addressed on issues relating to integrated coastal zone management.

ECSA (Estuarine and coastal sciences association)

ECSA is an academic organisation with a worldwide membership, which promotes research and study of all aspects of estuarine and coastal regions. The Association was founded in 1971, as the Estuarine and Brackish-Water Biological Association, to promote production and dissemination of scientific knowledge and understanding of estuaries and coastal waters, in order to encourage resource management for the public benefit.

GESAMP

GESAMP is a multidisciplinary body of independent experts nominated by the sponsoring organisations. These include The United Nations (UN), the UN Environment Programme (UNEP), the Food and Agriculture Organization (FAO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the World Meteorological Organization (WMO), the World Health Organization (WHO), the International Maritime Organization (IMO), and the International Atomic Energy Agency (IAEA). Its mission is to provide advice to the sponsoring organizations, at their request, on pollution and other problems that face marine and coastal environments. Each sponsoring organisation nominates one to four experts according to its interests in the substantive work for the session. Experts appointed to the Group should act in their individual capacities. The multidisciplinary composition of the Joint Group is agreed among the sponsoring organisations. Some experts are nominated to serve for a period of up to four years to provide a continuing nucleus, while others can be appointed as occasion demands, having in mind the particular subjects to be considered at each session of the Joint Group. In 1993 its role was extended to cover all scientific aspects on the prevention, reduction and control of the degradation of the marine environment to sustain life support systems, resources and amenities.

GESAMP has prepared several reports relevant to the coastal zone, including:

- “A Sea of Troubles”. This considers the degradation of coastal ecosystems and habitats, over-fishing, threats from alien species, aquaculture as a source of environmental problems, pressure from tourism and a reduction of marine biodiversity.
- “Protecting the Oceans from Land-based Activities”. This is a report on land-based sources and activities affecting the quality and use of marine, coastal and related freshwater environments. The report reviews, among others, available information on the input of nutrients, heavy metals and persistent organic pollutants (POPs) to the seas through the atmosphere.
- “Planning and Management for Sustainable Coastal Aquaculture Development”
- “The Contributions of Science to Integrated Coastal Management”

United Nations Environment Programme-Mediterranean Action Plan (UNEP-MAP) and the Programme for the Assessment and Control of Pollution in the Mediterranean Region (MED POL)

Mediterranean Action Plan (MAP) is an effort of 20 countries bordering the Mediterranean Sea and the European Union to meet the challenges of environmental degradation and to link sustainable resource management with development in the sea, coastal areas and land. The legal framework for this effort is the Barcelona “Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean” which in 1995 revised the “Convention for the Protection of the Mediterranean Sea against Pollution” of 1977. Six binding legal instruments (protocols) addressing specific aspects of environmental protection have been produced. The Barcelona Convention is still under ratification by the contracting parties.

MAP focuses on four key fields of activity: curbing pollution, safeguarding natural and cultural resources, managing coastal areas, and integrating environment and development. MAP set up in 1996 the Mediterranean Commission for Sustainable Development (MCSDD) as an advisory body on policies to promote the sustainable development in the Mediterranean Basin.

The Programme for the Assessment and control of Pollution in the Mediterranean region (MED POL) represents a key tool for the reduction of land-based pollution. MED POL was created in 1975 and has gone through two phases. The main goal of the first phase (1975–1980) was to enable all laboratories in the region to participate in MED POL activities and the main actions included training, the purchase and maintenance of analytical instruments, and intercalibration exercises to ensure the quality of the data gathered. The second phase (1981–1995) aimed at the establishment of national monitoring programmes with full data quality assurance; during this phase the countries collected a large number of marine pollution data. MED POL III, adopted in 1996, continues the efforts on pollution assessment (trends in the levels of pollutants, biological effects of contaminants, inventory of pollution sources and loads) and monitors on a continuous basis the effectiveness of the action plans, programmes and measures for pollution control implemented by the Governments of the Mediterranean countries. In 1980 the Mediterranean states signed the Protocol related to the control of pollution from land-based sources (LBS Protocol), which was amended in 1996 to cover all the polluting human activities and obliges the countries to formulate and implement regional and national action plans to reduce and eliminate pollution at source. In 1997 the Strategic Action Programme to address pollution from land-based activities was adopted. SAP identifies, describes and analyses the main pollution land-based sources and activities, proposes remedial actions, costs them, and formulates target dates for their implementation. The MED POL programme is also in charge of the follow up of the Protocol regulating all dumping operations at sea (Dumping Protocol) and the Protocol related to the protection from pollution by trans-boundary movement from toxic wastes (Hazardous Wastes Protocol). For additional information check <http://www.unepmap.org>

Marine Nature Conservation (RMNC) and the Irish Sea Project (ISP)

A RMNC Working Group was established in 1999 led by the former DETR (now Defra), to examine how effectively the UK system for protecting nature conservation in the marine environment is working and make proposals for improvements. This was made up of a wide range of stakeholder organisations including other Government Departments, the countryside agencies, NGOs, fishing and shipping industries. The aims were to evaluate the success of previous statutory and voluntary marine nature conservation measures, to identify examples of both current best practice and existing barriers to the successful delivery of marine conservation objectives and to put forward practical and proportionate proposals for the improvement of marine nature conservation.

The Working Group produced an Interim Report in March 2001 which recommended the promotion of a pilot scheme at a Regional Sea scale (The Irish Sea Pilot) to determine the limits of the existing system and test concepts developed by the Working Group. The Regional Seas Pilot Scheme in the Irish Sea was launched on 1 May the aims of which were to examine the potential for regional sea management over the whole Irish Sea and to test some of the ideas developed during the course of the RMNC. The final report to the RMNC will be reporting in March 2004; however, the full report was not available at the time this document was produced. The main findings and recommendations of the ISP were outlined at the Coastal Futures Conference in January 2004. The pilot has tested and refined a proposed new framework for nature conservation and constructed a process for setting conservation objectives. The pilot has demonstrated that marine data and survey technology is available to classify the sea at a landscape scale and to compile an inventory of important marine habitats and species. Various approaches to the identification of important areas for marine nature conservation were tested including the use of the analytical software tool ‘MARXAN’ (software that delivers decision support for reserve system design). Aspects of the current UK system of legislation, governance and enforcement for marine nature conservation were reviewed. The MARXAN software identified 26 nationally important habitats and 176 species in need of protection by producing 5 km grid squares of irreplaceability using criteria such as biodiversity, candidate Special Areas of Conservation (cSACs) and Special Protection Areas (SPAs). Other proposals relevant to the coastal zone outlined included:

- 1) Promote European and National commitment for a regional seas approach to marine nature conservation, strategic and spatial planning.

- 2) Improve the management of European marine data with common standards and better access.
- 3) Extend the Marine Landscapes classification to UK and European Seas and further investigate their use for marine spatial planning, marine conservation policy and the regulation of human activities for environmental protection.
- 4) Compile and maintain a list of nationally important habitats and species, selected according to agreed criteria that are likely to require conservation measures.
- 5) Define an ecologically coherent network of marine protected areas.
- 6) Increase the resources for enforcement of marine nature conservation and review government and agency structures and responsibilities, including a National recording scheme for offences, incidents and procedures.

Governance Proposals included forming a New Cabinet Committee with overall responsibility for Marine Strategic Planning with Defra as the lead body.

SUCOZOMA

Sweden is running Europe's largest research programme on ICZM of marine resources, the Research Programme on Sustainable Coastal Zone Management of Marine Resources, SUCOZOMA (<http://www.sucozoma.tmbi.gu.se/>). It was started in 1997 and will provide a final report in 2004. Among the programme deliverables are, for example, guidelines for integrated coastal management, principles and methods for management of coastal fisheries, and an analysis of how the EU Water Framework Directive can be integrated with the national coastal water quality management system.

Shortlist of other relevant projects

- UE-V PM "Assessment of Biomass Export from Marine Protected Areas and its Impacts on Fisheries in The Western Mediterranean Sea - BIOMEX".
- UE-VI FP Network of Excellence MARBEF, Marine Biodiversity and Ecosystem Function started on 1/2/2004 (<http://www.marbef.org>).
- The objective of *SuPortNet* (1999–2000) was the sustainable development with a network of ports for boat tourism in the Baltic Sea Region.
- *High Quality Tourism* (1998–2001) aimed at integrating tourism and sustainable development in regions with high percentage of protected areas.
- The goal of the project *Cultural Assets for the Sustainable Development of Tourism in the Region of HOLM and its European Partner Regions* (1999–2001) was the creation of a pearl-string of cultural events and destinations to establish high quality management.
- BEIDS (1999–2001) aimed at setting up a Baltic Environmental Information Dissemination System by improving cross-sectoral communication in relation to spatial planning, focusing on transport and energy issues in particular.
- The objective of *PROCOAST* (1999–2001) within the EU Interreg IIb programme was to bring together experts on coastal zone management issues from different regions in the Baltic in order to exchange experiences on how to incorporate environmental concerns into practical management solutions for the coastal zones in the Baltic Sea Region.
- The aim of the *Baltic Eutrophication Regional Network (BERNET, 1998–2001)* was to improve the management of the eutrophication problems in the Baltic Sea area.
- The *Integrated Coastal Management Project K.E.R.N. Region* is cooperating with the Danish county Fyn and aims at identifying the possibilities for an integrated development of the coast incorporating ecological and economic issues.
- The *BEST* project is focused on the sustainable tourism development from seven larger islands: Bornholm (Denmark), Gotland (Sweden), Hiiumaa (Estonia), Saaremaa (Estonia), Rügen (Germany), Åland (Finland), and Öland (Sweden).
- The focus of SUSWAT is on the water supply in relation to environmental protection and sustainability.
- The BALTCOAST project (2002–2005) funded within the EU Interreg IIIb programme is focusing in the working package "Offshore" on information exchange and strategies for developing offshore waters.
- "Coastal Futures" (2004–2007) deals with offshore wind-farms from an ecological as well as socio-economic perspective, ICZM for the Wadden Sea and the Wadden Sea islands, communication flows and networking between stakeholders and methodological aspects of an Integrated Assessment including indicators for ecological, social (institutional) and economic integrity. The project will link several tools like scenario techniques, modelling, Multi-Criteria Analysis, Social Network Analysis and dialogue techniques. This project is based on

methodologies which have been assessed and partly developed in the EU funded EUROCAT project having dealt with impacts of (nutrient) fluxes from river catchments to coastal waters. This project has just been finished and analysed catchment-coast interactions in eight different case study areas throughout Europe.

- “ICZM Odra Region“ (2004–2007) focuses at German-Polish coast and deals with trans-boundary ICZM in the light of local Agenda 21 in the Odra mouth. Another project deals with criteria and indicators for ICZM based on analysis of past large-scale planning procedures, mainly in Lower Saxony.
- The Ministry for Transport, Construction and Housing currently funds a project that deals with the development of proposals for a national ICZM strategy in Germany. The first step had been a comprehensive stocktaking assessment of ongoing uses, trends of economic activities in the coastal area and the institutional structures.
- The submitted project NORATLAS (InterReg IIIB) intends to establish a platform for information exchange and strategies related to development planning in the North Sea.

5 AVAILABLE INFORMATION AND GAPS OF KNOWLEDGE

TOR (c)

Significant time was dedicated to discussing available information with respect to that required for the sustainable use and management of the coastal zone and to identify gaps in knowledge.

Integrated Coastal Zone Management requires the integration of information from a number of disciplines:

- Social;
- Political;
- Cultural;
- Economic;
- Environmental.

The role of ICES may most conservatively be perceived as providing the data and information concerning the marine environment. This could be provision of data, time series data, standard monitoring programmes and techniques, analysis of changes and development within ecosystems, human impact effects, etc. It may be argued that providing advice that balances resource uses with nature conservation without considering, for example, economic and social risks and consequences may fall short of the targeted holistic approach. The problem may be to identify at which level the merging of information is required to ensure integration and ecosystem management.

The SGINC identified key environmental issues related to the coastal zone and these are:

- Dynamics of abiotic parameters (eutrophication, chemical contamination, oxygen depletion);
- Habitat destruction/restoration;
- Natural coastal dynamics;
- Biodiversity/endangered species;
- Change in trophic structure;
- Introduced species;
- Climate change.

Relationships were also identified between the key issues and natural processes and human activities (Table 5.1). Gaps in knowledge related to each key issue were identified and ICES WG/SGs with relevant expertise were noted (Table 5.2).

SGINC recognised that WGEXT activity is very relevant to interests and activities of SGINC. WGEXT is providing comprehensive advice on effects of extraction activities (as it is reflected in WGEXT Reports and ICES Guidelines for the Management of Marine Sediment Extraction). The activities of WGEXT cover the broad range of potential impacts resulting from aggregate extraction including eutrophication, contamination, habitat destruction, biodiversity change, and impact on fish and fishery. SGINC also welcomes the WGEXT overview on habitat mapping techniques, which is being published in the ICES Journal of Marine Science. In relation to WGEXT work on the effects of extraction activities, SGINC discussed whether it would be possible to study secondary effects of beach nourishment, e.g., effects

of transport of nourishment material along the coast (as an effect of coastal dynamics) which may impact, for example, spawning grounds, nursery areas, and migration routes.

The extraction of marine sediments for beach nourishment should be considered as a whole intervention, i.e., the evaluation of the effects of sediment redistribution. The extraction of sediment for beach nourishment in the Mediterranean is frequently done in the vicinity of seagrass meadows which may cause either direct, immediate seagrass loss or delayed loss due to increased sediment shortage and impaired rooting capacity of the plants. Sediment dumping can have either negative effects on seagrasses due to plant burial and/or increased water turbidity or positive effects on those seagrass meadows located in eroding coastlines (the extra supply of sediment will increase the capacity of seagrasses to root and stand wave/current action). Seagrass loss is a major agent driving biodiversity loss in the Mediterranean.

Based partly on the BEWG report the SGINC concluded that sampling and monitoring methods for benthic invertebrates, benthos, epibenthos and fish in the tidal and the coastal zone are both numerous and varied. In relation to impact studies and to studies in relation to Ecological Quality Studies standard methods are of greatest importance. No standard methods exist for the collection of data on *fish populations* in the coastal zone. Different gears have been used including trawls, push nets, traps and set nets (e.g., fyke nets). In the open sea standard trawling methods are used (i.e., the ICES International Bottom Trawl Surveys). One of the difficulties in the coastal zone is the large number of bottom sediment types, some of which make trawling impossible. Other methods than trawling have been used, among these are the use of a special set of nets with different mesh sizes (Denmark, Sweden). There is a need to establish standard fishing methods for collecting quantitative data on fish populations/distribution in the coastal and intertidal zone in order to ensure reliable and comparable data.

Table 5.1. Relation between the key issues and nature and human activities.

Natural Influences	Key Issues
Climate change	Habitat change
	Changed freshwater runoff
	Changed water temperature
Human Activities	Key Issues
1. Mariculture	Eutrophication
	Habitat deterioration/restoration
	Genetic pollution
	Biodiversity/endangered species
	Changes in trophic structure
	Impact on local biomass
2. Fisheries	Habitat deterioration/restoration
	Biodiversity/endangered species
	Changes in genetic structure
	Changes in trophic structure
	Impact on local biomass
3. Oil and gas	Chemical contamination
	Habitat deterioration/restoration
	Biodiversity/endangered species
4. Mineral extraction	Chemical contamination
	Habitat destruction/restoration
	Impact on spawning/nursery habitat (critical/ essential habitat)
5. Tourism, recreation	Eutrophication
	Chemical contamination
	Habitat destruction/restoration
	Introduced species
	Impact on local biomass
	Impact on spawning/nursery habitat (critical/ essential habitat)
6. Transport / Port	Chemical contamination
	Introduced species
	Navigational dredging
7. Residential/ Urban development	Eutrophication
	Chemical contamination
	Habitat destruction/restoration
	Impact on spawning/nursery habitat (critical/ essential habitat)
8. Physical structures (e.g., windfarms and wave energy)	Habitat destruction/restoration
	Impact on spawning/nursery habitat (critical/ essential habitat)
9. Land use practices/ Dams	Eutrophication
	Chemical contamination
	Habitat destruction/restoration
	Impact on local biomass
	Impact on spawning/nursery habitat (critical/ essential habitat)
	Impact of physical barriers on migratory species

Table 5.2. Relationship between each key issue and gaps of knowledge and identification of relevant ICES WG/SG, which could address these issues.

Key Issues	Gaps in knowledge	Relevant WG /SG
Eutrophication	Method and techniques to be adjusted for coastal zone conditions	MCWG, SGQAC, SGQAB
Chemical contamination	Study of processes, fluxes and effects	MCWG, SGQAC, MON, WGMS, WGBEC
Habitat change, destruction, and restoration	Mapping of fish spawning, nursery habitats	WGMHM, WGECO
	Downscaling to coastal zone management needs	WGMHM, WGECO
	Restoration: How, what, compensation	WGECO, BEWG
	Impact of nourishment	WGEXT, WGECO, BEWG
	Impact on spawning/nursery habitat (critical/essential habitat)	WGECO
	Impacts of temperature changes	
	Impacts of increased freshwater runoff	
Biodiversity/endangered species	Impacts, taxonomy	WGEIM, WGECO, BEWG, WGITMO
Changes in trophic structure	Ecosystem function	WGECO, BEWG
Alien/introduced species	Impacts, taxonomy, interaction with native species	WGEIM, WGECO, BEWG, WGITMO
Local living resources	Impact on local biomass	WGECO, BEWG, WGSE, WGBEC
	Develop standards methods for sampling benthos, epibenthos and fish in the tidal and coastal zone	MON, BEWG, SGQAB, WGECO, WGEXT, WGEIM
Spatial planning	Habitat protection, including MPAs	WGMHM
	Understanding coastal processes	WGMHM

6 NEW DATA PRODUCTS AND RESEARCH

TOR (d)

Common to both ICES WGs and SGs is the cross-border nature of the issues they deal with. Coastal issues are generally cross-border, and therefore common to several countries. Developing common cross-border objectives, criteria, and protocols would thus improve the sustainable management of these regions. Examples of local issues common to several countries and regions are tourism-driven pressures and coastal protection, whereas eutrophication and chemical pollution can be cross-border hence impacting areas further from their source.

Should ICES deal with the socio-economic aspects or specialise in the biological/ecological information, processing it towards advice on coastal issues, feeding into regional/local bodies dealing with the management to include the socio-economic aspects? Because of the high and increasing number of stakeholders, the study group recognises the need to include socio-economic expertise to help:

- integrate the biological, ecological, and environmental information emerging from the different ICES groups;
- identify the role of the stakeholders;
- process data to meet the needs of managers.

The ecosystem-based approach to the management of human activities, as the leading principle for integrated coastal zone management, implies that knowledge on the critical ecosystem processes and properties in the coastal zone will be the core business of the information ICES will be able to add into the process of ICZM. The 'value' of ecological niches, particular habitats, etc., needs to be addressed as part of the input. The identification of Essential and Critical Species Habitats are important components together with valuable management tools such as GIS and Coastal Protected

Areas. An important feature of the ecosystem approach is that it calls for strong stakeholder participation, which places a spotlight on human behaviour as the central management dimension. Also of some significance is that the ecosystem approach recognises that in order to develop a coherent policy for addressing the impacts of multiple human uses of marine ecosystems, it is necessary to consider how impacts occur in space and over time, as well as how different factors interrelate (complexity). A list of new data products and research is given below.

- a) Expertise in taxonomy is required for the assessment of biodiversity and ecosystem dynamics in the coastal zone.
- b) Decision Support Systems, as applied in decision making for the establishment of aquaculture farms, should be applied more generally for the coastal zone. This kind of tool helps in deciding what kind of data or information is required.
- c) The SG identified the need for information on macrophyte systems focused on macroalgae as a resource and as habitat for other species, such as fish, and recommended the need for a future ICES expert group to provide advice on macrophytes.
- d) There is a need for information on fish spawning, nursery and feeding areas and fish migratory corridors in the coastal zone. The WGMHM suggested that this work be carried out by the fish assessment groups as WGMHM does not have the required expertise.
- e) There is a need for information on coastal zone habitat requirements of different life stages of (epi-)benthic organisms, birds and mammals.
- f) The SG identified the need to map the different habitats in marine shallow waters.
- g) The SG identified the need for distinction between coastal and offshore commercial fisheries.
- h) The SG identified the need to provide a systematic methodology for the design and selection of MPAs, especially coastal protected areas including both terrestrial and marine systems.
- i) There is a need to develop a suite of monitoring, assessment, and management tools for MPAs.
- j) There is a need to develop a suite of modelling tools for evaluating the expected performance of MPAs. The latter is considered essential for the future of MPAs.
- k) There is a need for harmonising coastal ecosystem EcoQs with those of the Bird and Habitat Directives, the Water Framework Directive and the EcoQs presently developed by several ICES Working Groups for OSPAR.
- l) There is a need for data and information on the recreational fishery.
- m) Further guidelines for monitoring and assessment programmes for impacts of human activities related to coastal zone management should be developed where necessary.
- n) There is a need for the standardisation of monitoring methods and tools for environmental assessment, which need to be acceptable to all other users of the coastal area.
- o) The SG identified the following research areas as being valuable for integrated coastal zone management:
 - critical ecological processes; the ecosystem interactions between the chemical, physical and biological environment in the coastal zone;
 - appropriate time and space scales in coastal ecosystems; relationship between marine and terrestrial coastal ecosystems; impact of both off-shore and terrestrial human uses on the coastal ecosystem; EcoQ-elements and EcoQ-objectives that best represent the coastal ecosystem;
 - Develop quantitative methods for monitoring the recreational fishery.

7 POSSIBLE PARTNERSHIP

The SGINC identified the following possible working partnerships, which could complement ICES data products with a view to further developing and integrating knowledge for use in holistic advice for coastal zone management: EUCC, GESAMP, MAP, EPA (Environmental Protection Agency, USA), CSIRO (Australia), and ICLARM. The participants agreed that OSPAR, HELCOM, EU Commission are already clients and should not be listed.

8 CONCLUSIONS AND FINDINGS

The following is a summary of the major conclusions and findings, as agreed upon by the meeting participants based upon reports presented and reviewed at the meeting, as well as upon substantive and extended discussion arising from the presentations.

There is no clear common definition of the coastal zone, and the SG has not attempted to come up with such a definition.

This land-ocean interface represents key areas for many marine living resources and experiences significant compound impacts from human activities. Increasing international awareness of coastal zone issues will generate a higher demand for integrated advice.

Some coastal zone aspects are addressed by individual groups within ICES, resulting in fragmented information. Furthermore, as pointed out by several of the groups, the coastal zone issues are not given priority by ICES. Several groups indicated that they have the necessary expertise to address some coastal zone issues relevant for their WG, whereas others would require additional specific expertise. In response to demands for ecosystem-based advice, ICES has adopted an ecosystem-based approach. Including the coastal zone would allow ICES to provide better holistic advice.

There is a need to compile and integrate this information to ensure consistent and integrated advice. The SG agrees with the statement made by ACE that “if ICES is to provide scientific advisory support for integrated management, more fundamental change in approach would be needed at the level of the working and study groups” (ICES, 2003). The SG finds that this task would be best achieved by establishing a WG dedicated to assimilating and integrating the diverse information. Part of the remit of this WG could be to identify gaps in knowledge and feed back through the advisory committee on any information and research needs. The list of new data products and research (Section 6) identified by this group could constitute the WG TOR.

9 RECOMMENDATIONS

The SGINC recommend that:

- ICES should feel responsible for the ecological processes in the *coastal waters* with the same concern as in the ocean.
- ICES should only deal with *natural science* of the coastal zone as part of the process of ICZM.
- ICES should define what the *ecosystem approach* means for the information and assessment needs for coastal zone management.
- ICES should establish an *ICES working group* for natural science information needed for ICZM. The WG should have a broad representation of scientific fields and should report to all three Advisory committees.

10 ADJOURNMENT OF THE MEETING

The final report including the recommendations were discussed and approved by the SGINC participants.

On behalf of the SGINC, Josianne Støttrup rendered thanks to Nadia Papadopoulou and Institute of Marine Biology of Crete for the provision of excellent meeting facilities.

Annex 1 List of participants, Study Group on Information Needs for Coastal Zone Management (SGINC)

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Annex 2 Agenda and timetable

1. Opening.
2. Practical details. Introduction of delegates.
3. Appointment of Rapporteur.
4. Adoption of Agenda and Timetable.
5. Review/status on country ICZM progress. This should be a short summary (for European countries for example based on ICZM progress report for the different countries located at www.coastalguide.org) lasting max. 10 min. followed by update since last status on ongoing projects/completed projects or other new initiatives.
6. Review of Terms of Reference:
 - 6.1. ToR (a). update and report on activities of relevant ICES working and study groups to identify information pertaining to the coastal zone; evaluate information from other ICES expert groups on potential contributions to information for ICZM (results of recommendation i).
 - 6.2. ToR (b). update and report on the activities of other relevant organisations and scientific programmes which focus on coastal zone aspects with respect to information relevant for ICES;
 - 6.3. ToR (c). report on the available information with respect to that required for the sustainable use and management of the coastal zone and to identify gaps in knowledge;
 - 6.4. ToR (d). finalise recommendations on scientific data products and new research, which ICES could use as a basis for advice on, and in support of coastal zone management.
 - 6.5. ToR (e). identify possible working partnerships, which could complement ICES data products with a view to further developing and integrating knowledge for use in holistic advice for coastal zone management.
7. List what still needs to be included/checked within the report, deadlines and responsible.
8. Discuss whether the report should be recommended published as an ICES Co-operative Research Report and if so what changes would be required.
9. Adjournment.

Meeting Time Table (SGINC). 19–21 April 2004

	Monday April 19	Tuesday April 20	Wednesday April 21
9.00	1. Opening 2. Practical details Introductory round 3. Rapporteur 4. Adoption of Agenda and Time Table 5. Update on country ICM progress	Continue on 6.3. ICES role in ICZM. Erlend Moksness Ecosystem-based approach to management of human activities Gerard Janssen	Decision support and other expert systems (ICES WGEIM). How do we integrate this information?
9.30			
10.00			
10.30			6.4. Brainstorm on other data products that may be relevant and new research for ICES
11.00	6.1. Results of the questionnaire and discussion. Josianne Støttrup	Writing groups	Writing groups
11.30			
12.00		Writing groups	
12.30			
13.00 – 14.30	L U N C H		
14.30	6.2. Input from different members.	Tour of the facility.	Conclusions and recommendations
15.00	6.3. Coastal Habitats as Essential Fish Habitats. Josianne Støttrup and discussion		
15.30			
16.00	Implementation of Coastal MPA's. Erik Hoffmann and discussion	Questionnaire results relevant for Table 1	7. What is still needed to complete the report?
16.30			8. ICES co-operative research report?
17.00		Questionnaire results relevant for Table 2	9. Adjournment
17.30			
18.00			

Coffee breaks in the morning and afternoon.

Annex 3 Summary of presentations given at the meeting

Coastal Habitats as Essential Fish Habitats by Josianne Støttrup

Implementation of Coastal MPA's by Erik Hoffmann

ICES role in ICZM by Erlend Moksness

Ecosystem-based approach to management of human activities by Gerard Janssen

Coastal Habitats as Essential Fish Habitats by Josianne Støttrup

Coastal aquatic ecosystems are under pressure from diverse human activities such as the need for coastal protection, tourism, commercial and recreational fishery, some of which are directly dependent of the maintenance of these resources for their sustained activity. Several examples have been reported of human activities negatively impacting marine areas which support habitats for particular life stages for certain fish species, such as physical obstructions disrupting migratory routes for anadromous species, and eutrophication causing changes in eelgrass distribution or the increased occurrence of filamentous macroalgae effecting juvenile stages of fishes that have inshore nursery grounds utilising eelgrass beds or dependent on macroalgae free sandy bottoms.

Essential fish habitats (EFH) are gaining recognition among fisheries scientists as being important components for the conservation and management of fishery resources. A definition of EFH is provided by NMFS in 1996 as being "those waters and substrate necessary for fish to spawn, breed, feed and grow to maturity". A review of Essential Fish Habitat is provided by WGFE in the 2003 report (Section 4 of the report, ICES CM 2003/G: 04). This reviews the concept of EFH and describes different EFH with examples. EFH are categorised into breeding, spawning and parturition grounds, nursery grounds, shelter and natural and artificial refuges, feeding grounds and migratory corridors. In this review a list of data requirements for identifying EFH is also provided, including identification of knowledge gaps such as knowledge on the role of offshore reefs and hard bottom substrate as fish habitats.

Within fishery management focus is sustained on the size of the spawning stock and numbers of recruits. This is often translated into the need to preserve breeding grounds, including inshore breeding grounds for example for herring and sardine. Very little attention within ICES is diverted to inshore nursery grounds, but it is unclear whether this is a traditional trend or due to a lower priority need for conserving nursery grounds, based on relative values of habitat needs and requirements. The species which utilise coastal areas as nursery grounds often have a limited depth-wise distribution in these areas. Gibson (1994) found a significant positive correlation between the habitat requirements of juveniles in terms of depth range and their abundance. The relatively narrow depth range of juvenile turbot *Scophthalmus maximus* and brill *Scophthalmus rhombus* was suggested as the underlying reason for why these species are relatively rare in the North Sea (van der Veer *et al.*, 2000). Thus coastal areas may constitute larger or smaller nursery grounds depending on the species habitat requirements. There is a need to document the importance of these areas in terms of spatial distribution and quality indices for the sustenance of the fish stock for the different species.

References

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Implementation of Coastal MPA's by Erik Hoffmann

Marine Protected Areas (MPAs) have been used as a tool in marine and coastal management for decades. To day it has turned out to be a very popular subject but unfortunately MPAs are also used as a political solution for all problems in the sea and coastal zone. In theory, but also demonstrated in several cases, the MPAs can restore natural population structures of exploited species and protect biodiversity at all levels. Furthermore MPAs can increase biomass and provide undisturbed spawning conditions, habitats and settling sites. The problem is however, that too many MPAs, both in relation to management of ecological habitats but specially when it is used as a tool in fisheries management, are established without a clear definition of the objectives and without an evaluation of the possibilities to reach the goals. The situation is too often that no scientific data exist to evaluate the effect of the MPA and also the consequences if the MPA is reopened. Such situations could have been avoided if a scientific research program specifically designed to study the effects of the MPA had been set up from the beginning.

For future work with MPA it is recommended:

- To clearly define the objective for MPA
- To list the criteria for the potential for MPAs
- To provide a systematic methodology for the design and selection of MPAs
- To develop a suite of monitoring, assessment and management tools for MPAs
- To develop a suite of modelling tools for evaluating the expected performance of MPAs. The latter is considered essential for the future of MPAs

If these conditions are met, MPAs are considered relevant and potentially useful tools for the management and protection of coastal zone resources.

ICES role in ICZM by Erlend Moksness

The coastal zone is the key area for 75% of the marine species. The areas where the large oceanic stocks spawn are important both for the stocks, the coastal ecosystem, the fishermen, and for the people living or recreating along the coast. These spawning areas should be treated as sacred and every necessary measure to secure these areas for spawning also in the future should be taken. The threats from anthropogenic activities to the fishery resources and to the health status and the biodiversity of the coastal ecosystems in general are much the same. Negative influence may be due to inputs of nutrients, toxic substances, habitat- alteration from physical encroachment, oil exploitation and transport and introduction of alien species. In addition the fishery itself may overexploit the resources and use methods as trawling which may damage bottom-ecosystems as coral reefs and soft bottom. Non-sustainable fisheries may thereby be a threat both to optimal utilization of the resources and to conservation of the nature and biodiversity.

The goals of ecosystem based fisheries management (EBFM) is: Healthy, productive fish stocks

- Balanced harvest at different trophic levels from plankton feeders to top predators
- Healthy fishing industry and coastal communities
- Healthy seafood

The ICES vision (2002) is: An international scientific community that is relevant, responsive, sound and credible, concerning marine ecosystems and their relation to humanity. In the ICES ARTICLE 1 it says:

It shall be the duty of the International Council for the Exploration of the Sea, hereinafter referred to as the "Council",

- (a) to promote and encourage research and investigations for the study of the sea particularly those related to the living resources thereof;
- (b) to draw up programmes required for this purpose and to organise, in agreement with the Contracting Parties, such research and investigations as may appear necessary;
- (c) to publish or otherwise disseminate the results of research and investigations carried out under its auspices or to encourage the publication thereof.

Further in

ARTICLE 2 it is stated:

ICES will give ecosystem based advices The Council shall be concerned with the Atlantic Ocean and its adjacent seas and primarily concerned with the North Atlantic. Today's situation within ICES:

- Limited focus on Coastal Zone, except for aquaculture and as nursery area for living resources
- No focus on ICZM

Does ICES have a responsibility?

- ICES will give ecosystem based advices;
- The coastal zone is the key area for most living resources as spawning and nursery area;
- Any human activity in the coastal zone can affect the different coastal habitats and ecosystems, and thereby affect spawning and nursery area for the larger open sea fish stocks, and other living resources.

Recommendation

Establish an ICES WG to collate and assess biological and ecological information required for integrated coastal zone management (ICZM)

Ecosystem-based approach to management of human activities by Gerard Janssen

In the ACE-report 2003 on the subject of the framework for the provision of integrated advice (chapter 15) the concept of an integrated ecosystem approach, as adopted at the EU-stakeholders conference on ICZM (Køge, 2002), is mentioned to be an important issue for ecological advice for coastal zone management. The ecosystem approach was codified in the overarching international legal instrument at the 1992 Convention on Biological Diversity (CBD), and was strengthened by the global political commitment to sustainable development and re-emphasised in the agreed outcome of the World Summit on Sustainable Development in Johannesburg, September 2002. At regional seas and sub-regional level, the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention), particularly Annex V on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area, has a major role in supporting the implementation of the "ecosystem approach" as required within the CBD. According to the European Commission the "ecosystem approach" can be defined as the comprehensive integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity. This definition was adopted by European stakeholders at the Conference on the Development of a European Strategy for the Protection and Conservation of the Marine Environment, Køge, Denmark, 4–6 December 2002. The European Commission agreed as well to come towards a strategy to protect and conserve the marine environment in 2010.

Marine Strategy is meant to be the comprehensive integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and the maintenance of ecosystem integrity. According to the definition of OSPAR the ecosystem approach is considered to be fundamental to achieving sustainable use and protection of the marine environment. The general intention is that management decisions should consider all consequences of human activities for the marine environment in an integrated way (OSPAR, 2002). Also ICES has put forward a working definition of Ecosystem Approach: Integrated management of human activities based on knowledge of ecosystem dynamics to achieve sustainable use of ecosystem goods and services, and maintenance of ecosystem integrity.

The development and application of the ecosystem approach focuses on the critical ecological processes, the ecosystem interactions and the chemical, physical and biological environment. Ecological quality is an integral expression of the desired state of an ecosystem, reflecting basic ecosystem properties and human use. Ecological quality objectives (EcoQOs) are specific expressions of the desired level of ecological quality, determined by science and/or society. An important feature of the ecosystem approach is that it calls for strong stakeholder participation, which places a spotlight on human behaviour as the central management dimension. Also of some significance is that the ecosystem approach

recognises that in order to develop a coherent policy for addressing the impacts of multiple human uses of marine ecosystems it is necessary to consider how impacts occur in space and over time, as well as how different factors interrelate (complexity). Stakeholder participation and local knowledge should be incorporated into the scientific methods to study the marine ecology.

An ecosystem-based approach protects ecosystem functioning at all spatial scales through time as the first priority, and seeks to sustain, within ecological limits, a diversity of human uses across the landscape. In other words, an ecosystem-based approach focuses first on what to leave and then on what can be taken without damage to the ecosystem functioning. It first protects the ecosystem functioning and then design ecologically responsible uses (Fraser Headwaters Alliance, 2002). Applying the ecosystem based approach to the coastal zone also implies the recognition of the following important principles of the ecosystem approach:

- Conservation of the structure and functioning of the ecosystem. In the longer term conservation of processes is more important than species.
- The approach should be applied on the appropriate time and space scales.
- The approach should consider all relevant information, including scientific, local knowledge, innovations and experiences.
- Due to the complexity of the problems of managing human activities in ecosystems, all relevant scientific and social disciplines should be considered.

What does the ecosystem approach mean for the information needs for coastal zone management?

For an ecosystem based approach in the coastal zone it is necessary to consider what are the critical ecological processes and the ecosystem interactions of the chemical, physical and biological environment. Moreover, it is necessary to consider how impacts of multiple human uses of marine coastal ecosystems occur in space and over time, as well as how different factors interrelate. There are some basic questions on which research should be focused:

- What are the critical ecological processes, the ecosystem interactions between the chemical, physical and biological environment in the coastal zone?
- What are the appropriate time and space scales in coastal ecosystems?
- What is the relation between marine and terrestrial coastal ecosystems?
- What is the impact of both off-shore and terrestrial human uses on the coastal ecosystem?
- What are the EcoQ-elements and EcoQ-objectives that best represent the coastal ecosystem?
- What does that mean for research and monitoring programmes?
- What is the relation of the coastal ecosystem EcoQ's with those of the Bird and Habitat Directives, the Water Framework Directives and the EcoQ's presently developed by several ICES Working Groups for OSPAR?

The ecosystem based approach to the management of human activities as the leading principle for integrated coastal zone management implies that knowledge on the critical ecosystem processes and properties in the coastal zone will be the core business of the information ICES will be able to add into the process of ICZM.

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