REGERINGSKANSLIET

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Ministry of the Environment Sweden

Division for Natural Resources

Lars Berg
Telephone +46-8-405 17 93
Fax +46-8-21 91 70
E-mail lars.berg@environment.ministry.se

Voluntary report on implementation of the Programme of work on marine and coastal biological diversity in Sweden.

This paper presents examples of activities and processes that have been carried out or are under progress in Sweden and are of relevance for the implementation of CBDs programme of work on marine and coastal biodiversity. The aim of this report is not to give a comprehensive assessment of the Swedish work on coastal and marine biological diversity, but to show case studies of importance both at the local, national and regional level.

1.1:To apply appropriate policy instruments and strategies, including building of capacity, for the effective implementation of IMCAM

Swedish authorities have recently adopted several decisions of relevance for the management of the coastal zone. One is the establishment of a marine environmental unit at the Swedish EPA. The other is the creation of a new institute for synthesis and interdisciplinary marine research. Moreover, the European Marine Strategy has been given priority by Sweden.

IMCAM in Sweden is currently in a phase of strong development. The EU Marine directive, The EU maritime policy, the HELCOM Baltic Sea Action plan and several national initiatives all drive this development. Currently, different forms of marine spatial planning in Sweden are performed the various administrative levels (national, regional level (by the County administrations), and at the municipal level).

Case study: **Data-base coordination**
In Sweden a process to build an internet-based knowledge-portal for marine environmental management has recently started. Within this process, the Swedish Government has committed the Swedish EPA to describe and analyse the current knowledge base for marine environmental management. Information is being collected from 12 central authorities. All these authorities have a role to play in ICZM. The information has been collected through interviews, a questionnaire, document- and www-site analysis,

The report under preparation provides information about:
1. Existing data:
2. Analysis of problems and needs (see conclusions below)

Preliminary conclusions are:

- Lack of coordination of data relevant to the Swedish EEZ! No authority has formal responsibility for overall-perspective (including management)!
- Shore-line problems: Much data collection stops at the shore line or shortly after creating problems of harmonisation along shoreline and sea-level (project under way, but takes time, low priority with some authorities). Important for modelling and exact maps.
- A lot of data, a lot already in digital form. Much old data need digitalisation (interesting for research & modelling, e.g. climate).
- Highly varying character of data. Varying standard of quality (especially old data or data provided by lower administrative levels or private actors).
- High costs of production. Charging of costs varies with authority (survey, geology, statistics, marine survey maps cost). Difficulties with exchange and actuality due to costs.
- Difficulties with classified information: exchange, storage, permits (different types of classification, most difficult to handle bathymetric data).
- Low focus on social scientific data relevant for marine/coastal management.
- Problems with natural scientific data: Need for a finer grid for information (especially offshore and in water). Co-ordination of data collection can improve even further (buoys, expeditions).
- Data portals: Many data portals with varying focus under construction nationally and internationally, bad coordination between authorities. Network-design with data hosts seems most appropriate: Need for standardisation. Important external factors to consider: A national Geodata-Strategy under way affecting standardisation of data-presentation and exchange (process led by Swedish National Survey Authority). Important EU regulation affecting information collection and presentation (under way): INSPIRE-directive, Marine Strategy

Contact persons for further information: Anders Foureaux, Swedish EPA (anders.foureaux@naturvardsverket.se)

Case study: BALANCE project, spatial planning on a regional sea scale

BALANCE – or in full "Baltic Sea Management – Nature Conservation and Sustainable Development of the Ecosystem through Spatial Planning" – was an EU INTERREG III B co-funded project aimed towards development of informed marine management tools for the Baltic Sea based on spatial planning and cross-sectoral and transnational co-operation. BALANCE, started in July 2005 and ended in December 2007

BALANCE aimed to:

1. develop transnational marine spatial planning tools and an agreed template for marine management planning and decision-making, be based on 4 transnational pilot areas demonstrating the economical and environmental value of habitat maps and marine spatial planning (exemplified through 2 zoning plans). The tools and zoning plans integrate biological, geological and oceanographic data with local knowledge from stakeholders;
2. develop the "blue corridor" concept and promote "blue corridors" between protected sites adding spatial development dimensions to the implementation of EU Directives;
3. assess if the Baltic marine Natura 2000 network is ecological coherent and adequately represents & protects a continuum of habitats;
4. develop a communication strategy for stakeholder involvement to ensure that objectives and decisions address local stakeholders needs and that products is used and understood by the end of project;
5. disseminate project outputs to key users and public through various media, including a project web site, enhancing awareness of the marine natural heritage and the benefits of sustainable resource use.

The spatial planning tools developed include:

a) BS marine landscapes presented in GIS maps;
b) a holistic approach to marine habitat mapping integrating data on benthic, pelagic & fish habitats in 4 transnational pilot areas;
c) development of habitat models for areas with little biological information;
d) templates for zoning plans in 2 pilot areas, including planning guidelines and criteria to evaluate management success;
e) meta-database for BS marine data, outlining data formats, techniques and data availability for use by stakeholders in future planning;
f) development of agreed protocols for habitat mapping based on intercalibration of existing national protocols, ensuring compatible data for future transnational mapping.

More information can be found on the web site http://balance-eu.org

Case study: Integrating maritime safety over different spatial scales in the Baltic – Baltic master
Baltic Master was an international project (part-funded by the European Union) which aimed to improve maritime safety by integrating local and regional perspectives. The focus was on the Baltic Sea Region and issues concerning preparedness, prevention and marine spatial planning. The project was implemented during 2005 - 2007 and involved more than 40 partners in 7 countries across the Baltic. The partnership was cross-sectorial, including municipalities, regions, national authorities and international organizations in order to facilitate co-operation between different levels. *The work was organized in 4 different themes:
1) Preparedness and Division of Responsibilty
2) Safe Transportation at Sea
3) Sustainable Spatial and Regional Development
4) Communication and Dissemination

For more information, see the web-site www.balticmaster.org

Case study: ICZM in Northern Bohuslän – local scale
Integrated coastal zone management on the municipal scale:
On the Swedish west coast, five, municipalities – Lysekil, Munkedal, Sotenäs, Strömstad and Tanum have joined forces in order to develop strategies and methods for coastal zone management and approach for sustainable marine development. I addition, regional and national agencies are taking part in the project. The project started in 2007, and the first phase will end in December 2009.

For more information, see the web-site www.tillvaxtbohuslan.se

Case study: The Swedish co-management initiative
In June, 2004, the Swedish Board of Fisheries was commissioned by the Government to coordinate a program with the aim of developing local or regional co-management of fisheries. The main task was to draw upon the experience from pilot projects to elaborate proposals concerning platforms for collaboration and decision making processes for sustainable coastal and inland fisheries. Furthermore, also included was to answer what functions local groups could have in management and what parties ought to be included. The overarching program was coordinated by the Board and named *The Fisheries Co-management Initiative*, and included six local platforms or co-management groups in six ecosystems having different characteristics. The ecosystems represented in the program were an open marine ecosystem, an island, a river, a lake, and two archipelago systems one in each coast.
The Fisheries Co-management Initiative searched for working methods that support a development towards a sustainable fishery in coastal and inland waters by complementing the current management

form with an increased influence by the local level. The structure of the groups has varied; depending on the case they have included different categories of fishermen, water owners, municipalities, county board and scientists. Besides the process of working together in the definition of problems and solutions, the groups have delivered different outputs. Examples are: proposals for new regulations or revisions, information campaigns, marine ecology education for fishermen, local labelling of products, self control and participation in surveys. The work of the groups has been limited by the lack of funding and the lack of formal management authority. The lack of recognition by dominant actors has also been problematic. The time that the Board had for its disposal to enable an institutional environment for local co-management was short but adequate enough to illuminate the interest of stakeholders for this way of working and its future potential.
The Comanagement initiative in Northen Bohuslän has been instrumental in the Kosterhavet National Park building process. The Co-management initiative in Halland has been instrumental in the process of the establishment of a no take zone in Kattegatt.

In 2007 the Swedish Board of Fisheries has presented a report to the Swedish Government. The report suggests legal support for the institutionalisation of co management. The Swedish government has requested these aspects to be incorporated in the ongoing reform of the Fisheries Law.

1.2: To undertake direct action to protect the marine environment from negative impacts

Sweden's environmental objectives

The Swedish Parliament has decided to hand over a society free of major environmental problems to coming generations. To guide efforts towards that goal, 16 environmental quality objectives have been adopted, each supported by one or more interim targets. These objectives describe the quality and state of the Swedish environment which the Parliament judges to be sustainable in the long term. They require the involvement of everyone in our society – from central and local government and the business sector to organizations and individuals. These goals are to be achieved by 2020. The Environmental Objectives Council provides the Swedish Government with basic analysis for the process of implementing the 16 national environmental quality objectives by undertaking, every four years, an in-depth evaluation of action to achieve them. The second such evaluation was presented 2008.

Environmental objectives of major importance to the marine environment is:
Zero Eutrophication
A Non-Toxic Environment

A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos.

Reference and more information, see the web-site www.naturvardsverket.se and Sweden´s environemtal objectives - no time to lose

Actions against eutrophication

Eutrophication remains one of the most serious threats to marine biodiversity in Sweden, despite many years of actions. Virtually all municipalities and industries have extensive treatment sewage plants. For several years, there have been programmes to decrease the amount of diffuse nutrients leaking from agricultural land uses. The construction of new wetlands help both to decrease nutrient leakage and to increase the habitat for e.g. wetland birds and amphibians. Despite all these efforts, the environmental objectives council's assessment is that the environmental quality objective Zero Eutrophication will be very difficult or not possible to achieve by 2020 even if further action is taken. Although emissions of eutrophying substances into both air and water are continuing to decrease, the state of the environment shows no corresponding improvement. No clear trend in the state of the environment
can be seen.

Case study: HELCOM Baltic Sea Action Plan – eutropication segment

The major actions taken to mitigate eutropication in the Baltic is the Baltic Sea Action Plan adopted by all HELCOM countries and the European Community on 15 November 2007. The plan's objectives for eutrophication include: concentrations of nutrients close to natural levels, clear water, natural levels of algal blooms, natural oxygen levels, and natural distributions and abundance of plants and animals. The action plan duly proposes provisional country-wise annual nutrient input reduction targets for both nitrogen and phosphorus. To reach these reduction targets, the Baltic Sea countries will:

- develop national programmes, by 2010, designed to achieve the required reductions. Each country will be given enough flexibility to choose the most cost-effective measures, which can also be incorporated into River Basin Management Plans.
- implement specific measures to improve the treatment of wastewater, including increasing phosphorous removal from 80% to 90%, and substituting phosphorous in detergents. These measures alone will reduce phosphorus inputs into the Baltic by more than 7,000 tonnes, almost half of the total required reduction.
- implement measures to drastically reduce agricultural inputs, including changes in manure handling and fertilisation practices.

The main sources of funding for these actions include national budgets and EU structural funds, including the Cohesion Fund which aims to help new member countries implement EU Directives.
The implementation of the action plan will also include the identification of individual pollution Hot Spots such as major animal farms, where actions should be prioritised.
The action plan also encourages the elaboration of bilateral and multilateral projects and programmes to reduce nutrient inputs using the most cost-efficient measures, particularly for addressing transboundary nutrient inputs from non-HELCOM countries. The plan recognises non-profit foundations and private companies as important contributors to the establishment of projects to reduce pollution to the Baltic Sea.

Reference and more information, see the web-site www.helcom.fi and HELCOM Baltic Sea Action Plan, Hesinki Commision 2007.

Marine protected areas
The establishment of marine and coastal protected areas are one interim target of the environmental quality objective "A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos".

Interim target for coastal and marine protected areas
By 2010 long-term protection will be provided for at least 50% of marine environments of high conservation value and at least 70% of coastal and archipelago areas with significant natural and cultural assets. By 2005 another five marine areas, plus a further 14 by 2010, will be protected as nature reserves. Together, these will form a representative network of marine natural habitats.

The Environmental Objectives Council judges that the goal of long-term protection for 70% of identified coastal and archipelago areas can be met within the time frame laid down, provided that additional action is taken to protect cultural heritage.
The target of another 14 marine nature reserves by 2010 is also likely to be achieved. These reserves will probably be spread across all counties and marine geographical regions within Swedish territorial waters. In some respects, though, the geographical distribution of protection is very uneven, and the current distribution of protected areas and that projected for 2010 fall short of the goal of a representative network of different marine habitats. By the end of 2008 there are 21 marine reserves established. In addition to the marine reserves there are more than 250 Natura 2000 sites with marine habitats designated. This sites cover in total more than 6 percent of the marine territorial water and approximately 3,5 percent of Sweden's Exlucive Economic Zone.

Case study: Kosterhavets National Park - Marine protection and local development hand in hand.

On the west coast of Sweden, on the border to Norway, Sweden's first marine national park is underway. The marine environment here is influenced by the Atlantic and it includes habitats and species found nowhere else in Swedish waters.

This area, Kosterhavet, is also a valuable recreational resource - it is one of Sweden's most visited tourist destinations attracting over 90 000 tourist each year. The area is important for inshore fishery, mostly for prawns and Norwegian lobsters. Kosterhavet is both home and workplace to many people. Nearly 24 000 people live in this, and neighbouring districts. About 1 000 people live in, or immediately adjacent to the proposed national park.

Protecting and maintaining the natural and economic wealth of Kosterhavet is one of the great challenges in planning this new national park. Comparing to other Swedish national parks the Kosterhavet will be a co-managed park that will promote conservation through sustainable use.
The Kosterhavet Marine National Park will be inaugurated in September 2009.

More information is available at www.kosterhavet.se

No-take zones for fishery
The establishment of marine and coastal protected areas are one interim target of the environmental quality objective "A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos".

Interim target for NTZ
An area in which fishing is permanently banned will be established by 2006 for evaluation by 2010. A further three coastal and open sea areas with permanent bans will be established in the Baltic Sea and the North Sea respectively by 2010 for evaluation by 2015.

The goal of establishing a no-fishing zone by 2006 was met when the Swedish Board of Fisheries banned all fishing from an area within four nautical miles of Gotska Sandön, within a marine nature reserve earlier established. Preparations are in hand for the designation of another six no-fishing areas by 2010, where the first of the six areas was established in Kattegat between Sweden and Denmark the 1 of January 2009.

Case study: No take areas for fisheries
The Swedish Board of Fisheries (SBF) is responsible for establishing the closed areas (no-take zones, NTZ) in consultation with the Swedish Environmental Protection Agency (SEPA) and the County Administrations (CA). A project has been put in place and this is the first report of the planning phase, in which six areas and/or fish stocks which could gain from area closure have been identified.

Stakeholder involvement at different levels is a central part of the work. National non-governmental organisations representing conservation and fishery interests are represented in a consultative group in which also the SEPA, the CA:s, the Swedish Coast Guard and the Water District Authorities are represented. A series of five regional meetings around the Swedish coast have been held to inform about the goals and objectives of the project. During the meetings the participants were asked to identify target species that could benefit from NTZ and propose areas that could be discussed further in local stakeholder meetings. The proposals from these meetings have been evaluated by SBF and those considered of interest have, following further analysis and input from the consultative group been put forward as proposals in this report.

Guiding principles for the proposals are that the focus populations require management measures, and that there is a good potential that they will benefit from NTZ. These principles are based on the objectives set by the Swedish Parliament, according to which the NTZ should:

* Contribute to minimizing the risk for collapse of fish stocks
* Rebuild fish stocks to states with diversified size structure and natural genetic variability

The areas and stocks proposed as NTZ in the open sea are:

* The South-eastern Kattegatt to protect cod
* The Southern Baltic Sea to protect juvenile cod
* The Bothnian Sea to protect coastal spawning herring

The areas proposed as NTZ in coastal waters are:

* The Havstensfjord on the Skagerrak coast to protect cod, plaice and turbot
* The Buskär-Tanneskär area on the Skagerrak coast to protect lobster and demersal fish
* The archipelago of Stockholm in the Baltic to protect pike, perch and pikeperch.

In this phase of the project, with the exception of the Kattegatt, no proposals for borders of the NTZ are presented. The proposals identify target stocks rather than precise areas and only parts of the areas within each proposal may be subject to closures. Size and delimitations will be discussed in stakeholder meetings both internationally and locally.

The first area of the six was established in Kattegatt the 1 of January 2009. Se next case study.

Reference and more information is available at www.fiskeriverket.se and the summary in “Sköld. M, Bergström.U, Andreasson.J, Westerberg. H, Bergström. B, Högberg.B, Rydgren.M, Svedäng.H,

Piriz.L. Möjligheter till och konsekvenser av fiskerfria områden, Finfo 2008:1"

Case study: The Kattegatt NTZ

The recovery plan for the Kattegat cod has been proven unsuccessful. Spawning stock biomass is historically low and the fishing mortality remains high. Even though TAC has decreased tenfold since 2001, there is no sign of reduced fishing mortality. Hence, the present management has not been successful and complementary measures are needed in order to achieve cod recovery.

Stock identity and management units may not always be the same. The present knowledge about the biological Kattegat stock can be summarised as follows:

*The biological Kattegat cod have limited migration (see Svedäng et al. 2007)

*There is a small but significant genetic differentiation between spawning aggregations of cod in the Kattegat versus the North Sea /Skagerrak area (see Carl André et al. in prep.), i.e. the biological Kattegat stock is unlikely to be replenished from elsewhere in mid-term perspective.

*The historical spawning grounds in Kattegat are well documented (see Pihl & Ulmestrand 1988; Hagström et al. 1990; Svedäng & Bardon 2003)

* Spawning still occurs in particular localised grounds

*The distribution of codeggs is concentrated to the putative spawning grounds, confirming local spawning and indicating retention of eggs and larvae (unpublished, IMR).

These characteristics indicate the suitability of spatial management instruments like closed areas. In 2007 the responsible management authorities and Ministers of Sweden and Denmark initiated discussions about the need for taking new measures to improve the situation in the Kattegatt. Consultations with the affected fishermen were also carried on.

The process culminated with a compromised decision which consists of a closed zone and two adjacent zones where fisheries have been restricted.

There are lessons to be learned from this case in relation to the consultation process, the international negotiation process and the harmonisation of definitions across boarders and the trade off analysis leading to the compromise.

Regional actions to towards favourable conservations status of Baltic Sea biodiversity

Case study: HELCOM Baltic Sea Action Plan – biodiversity segment

Major actions towards favourable conservations status of Baltic Sea biodiversity was agreed upon in the Baltic Sea Action Plan adopted by all HELCOM countries and the European Community on 15 November 2007.

Many human activities have impacts on biodiversity, and the biodiversity segment of the HELCOM Baltic Sea Action Plan aims to serve as an all encompassing element reflecting the performance of the whole plan. The goal of achieving a favourable conservation status for the biodiversity of the Baltic Sea cannot be reached without comprehensively considering human activities and carrying out decisive action in other segments of the plan.

The biodiversity segment of the action plan aims to restore and maintain natural marine landscapes, thriving and balanced communities of animals and plants, as well as viable populations of species. Actions are focused on three cross-cutting issues to be addressed together with the relevant international authorities: marine spatial planning, long-term management plans for threatened species and habitats; and the promotion of research needed to fill in the information gaps that currently hamper the planning of further actions.

In order to secure the sustainable use of marine resources by reducing conflicts and the adverse impacts of human activities, HELCOM will devise a set of principles for cross-sectoral marine spatial planning as well as test and apply tools to be further developed jointly with other international organisations. These principles and tools should be ready by 2012. One particularly important issue is the further development of an ecologically coherent network of marine protected areas around the Baltic Sea, including fisheries management measures to be applied in marine protected areas by 2010.

In order to enhance the balance between the sustainable use of marine natural resources and their protection, HELCOM will develop a model of good management of human activities for the Baltic Sea area. This will involve:

*developing, by 2012, long-term plans for protecting and sustainably managing the most threatened and declining species and habitats defined by HELCOM;
*further developing and implementing long-term management plans for commercially exploited fish stocks so that they remain within safe biological limits; preventing catches of non-target species and under-sized fish; and devising long-term plans for the monitoring, protection and sustainable management of coastal fish species. These actions will be carried out by the competent fisheries authorities in co-operation

with the Baltic Sea Regional Advisory Council (RAC) and HELCOM, mainly by 2012.

HELCOM will promote further research planned to support the conservation of marine landscapes, habitats, communities and species. This work will involve:
*developing detailed landscape and habitat maps, especially for habitat-forming species
*updating HELCOM Red Lists of Baltic habitats/biotopes and biotope complexes, and producing a comprehensive HELCOM Red list of Baltic Sea species
*developing additional methods for the assessment of, and reporting on, the impacts of fisheries on biodiversity, including effective monitoring and reporting systems for by-catches of seabirds and marine mammals.

Reference and more information, see the web-site www.helcom.fi and HELCOM Baltic Sea Action Plan, Hesinki Commision 2007.

1.3: To develop guidelines for ecosystem evaluation and assessment, paying attention to the need to identify and select indicators, including social and abiotic indicators that distinguish between natural and human-induced effects.
To assess progress towards the national environmental quality objectives as described in 1.2, and the associated interim targets, use is made of indicators. These are based on regular gathering of quantitative and qualitative data from sampling programmes, questionnaire surveys, interviews, voluntary reporting and studies of other kinds.

Sweden has implemented The EU Water Framework Directive (Directive 2000/60/EC). Water agencies in Sweden are to ensure that a monitoring programme is established.
More information is available at
http://ec.europa.eu/environment/water/water-framework/index_en.html

The EU habitat directive (Directive 92/43/EEC) also play an important role in assessing and monitoring the status and trends on a regional scale.

The need for information about depth, the state of the seabed, and the prevalence and extent of marine habitats and species is enormous. Founding is allocated both to the local and national level to build up the knowledge base. As an example has approximately 4.5 Mill Euro been used directly to marine surveys performed by the County Board Administrations to gather information prior to the establishment of marine protected Areas. Detailed information is particularly required

to implement to establish marine reserves and develop the marine management.

Case Study: offshore bank survey
The survey of 18 offshore banks in 2004-2005 is one of the first systematic surveys of marine habitats in Sweden, together with the basic marine survey for Natura 2000 and the Species Databank survey of marine species along the west coast of Sweden.

The value offshore banks in terms of nature conservation is that they often serve as refuges for organisms that were once more common in shallow coastal areas but have disappeared or declined because of habitat disturbance and pollution.
Offshore banks have been characterised by classification of their ecotypes under Natura 2000 and EUNIS (European Nature Information System). Mapped species lists have been produced showing observations of bottomdwelling species on the banks There is also a list of the red-listed species observed on each bank.

Most of the offshore banks surveyed are of great ecological value. Several of them are worthy of protection, and some have been notified for inclusion in the international network of protected marine areas.

More information is available at www.naturvardsverket.se

Case study: The research programme MARBIPP
MARBIPP (MARine BIodiversity, Patterns and Processes) was a 5-year research project funded by the Swedish environmental protection agency SEPA) running 2001-2005. The purpose was to increase the scientific knowledge of marine biodiversity of 5 common biotopes along the Swedish coast, and to use this to develop an web-based information tool for managers and the public.
More information about the scientific part of the programme is available at www.marbipp.tmbl.gu.se
While the information tool is available at www.marbipp.se/

Case study: Stockholm Resilience Centre
The Stockholm Resilience Centre is a new international centre that advances transdisciplinary research for governance of social-ecological systems with a special emphasis on resilience - the ability to deal with change and continue to develop. The Stockholm Resilience Centre was established on 1 January 2007. It is a joint initiative between Stockholm University, the Stockholm Environment Institute and the Beijer International Institute of Ecological Economics at The Royal Swedish Academy of Sciences. The centre is funded by the Foundation for Strategic Environmental Research, Mistra.

Stockholm Resilience Centre will advance the understanding of complex social-ecological systems, and generate new and elaborated

insights and means for the development of management and governance practices,
- through internationally recognized inter- and transdisciplinary research that integrates social science, the humanities and natural sciences
- by fostering an international arena for science, practice and policy dialogues,
- through capacity-building by providing academic programmes and inputs to academic curricula and training,
- and through strategic communication for improved policy and decision support
with the aim of securing ecosystem services for human wellbeing and building resilience for long-term sustainability.
More information is available at www.stockholmresilience.su.se

Case study: The research programme Aqualiens
AquAliens was a research programme aimed at increasing our knowledge on how to assess the risks posed by introduced aquatic species and their impact on ecosystems and economy in Sweden. The programme was financed by the Swedish environmental protection agency. The programme period was 2002-2007.

Introductions of alien species have been listed as one of the major global human influences on bio-diversity and have in several cases had huge economic impact. The aquatic ecosystems imply better chances of survival and dispersal of introduced species and are more difficult to monitor than terres-trial ecosystems thus high-lightening them from a risk perspective.
The programme focused on:
i) Evaluating the risks on the ecosystem level for organisms having specific functions or attributes;
ii) Identifying the types of aquatic ecosystems that are most vulnerable to introductions and which kind of organism will pose the largest threat in different environments;
iii) Tools for risk analyses and assessments;
iv) Economic analyses of efficient risk management.

The emphasis of the entire programme was on risks at the ecosystem level to elucidate general patterns of success or failure in marine, brackish and freshwater ecosystems. Four different types of organisms was be studied: Macroalgae, vascular plants, invertebrates and fish. These were studied for patterns of species characteristics such as those facilitating dispersal, settling, establishment and reproduction. Patterns of site characteristics included heterogeneity in space and time, biodiversity of recipients in comparison to non-invaded areas as well as vector influences.

Dissemination of the results emphasized the spread of information to different target groups and on different levels as an important component needed to decrease the dispersal of introduced species.

More information is available at www.aqualiens.tmbl.gu.se

2.1: To promote ecosystem approaches to the conservation and sustainable use of marine and coastal living resources, including the identification of key variables or interactions, for the purpose of assessing and monitoring, first, components of biological diversity; second, the sustainable use of such components; and, third, ecosystem effects.

The ecosystem approach is a corner stone in Swedish environmental policy, as expressed *e.g.* in the 2002 government communication to Parliament: "A Comprehensive Policy for Nature Conservation", it is highlighted in the Strategy for management of land, water and built environment, adopted by Parliament, and the definition of the environmental quality objective *A Rich Diversity of Plant and Animal Life* is clearly based on the ecosystem approach.

More information of the implementation of the ecosystem approach in Sweden will be found in Sweden's Fourth national report to the Convention on Biological Diversity

Case study: Ecosystem approaches in the works of the National Board of Fisheries:

Fish and crustaceans have always been an important resource for human beings. In 2002, Swedes consumed more than 150,000 tonnes of fish. Today, there are over 2,000 professional fishermen in Sweden, who each year catch some 330,000 tonnes of fish and crustaceans with a market value of around one billion kronor. Also, recreational fishing is widespread. More than two million Swedes enjoy angling in their spare time.

We want to be able to go on exploiting this renewable but not inexhaustible resource, and we want it to be available to future generations as well. This calls for a responsible management approach in which environmental social and financial considerations are kept carefully balanced.

According to Government instructions The Swedish Board of Fisheries should:

* ensure richly varied fishstocks
* ensure ecologically sustainable management of fish resources
* promote the attainment of environmental quality objectives
* ensure ecologically sustainable and environmentally compatible fishing and aquaculture practices
* contribute to give consumers access to fish of good quality
* participate in international fisheries programmes and negotiations
* promote strive increasing angling opportunities for members of the general public.

The Swedish Board of Fisheries is commissioned by the Government to take charge of three of the 16 objectives. One of these are “A balanced marine environment, flourishing coastal areas and archipelagos. The work is focused primarily on maintaining and promoting the diversity of species in our waters and setting up conditions for sustainable stocks of fish. The following are a few examples of what this may entail in practice.

The EU's overall fishing fleet, like Sweden's, has a larger capacity than necessary in comparison with available fish resources. Several of the stocks important to Swedish fishermen are deemed to be below a biologically safe level. By introducing regulations on catch restrictions, off-limit areas and effort limitation, the Board aims to keep fishing at an ecologically sustainable level.

One of fishing's most serious environmental problems is undesirable by-catches. Fish that are too small, along with illegal catches and catches of little commercial value, are routinely discarded into the sea and do not survive. To address this problem, new types of fishing gear are being developed specifically to reduce by-catches, including eel traps and trawl gear for Norway lobster, vendace and cod. The Board also runs projects using alternative fishing techniques in an effort to reduce by-catches of seals, porpoises and birds, such as cormorants.

Power stations, culverts and other constructions in streams and waterways may make it impossible for migrating fish such as salmon, trout, eel and lamprey to reach their spawning-grounds. The Board is involved in efforts to restore the migratory paths and spawning-grounds of freshwater fish. We also investigate the ecological impact of the release of fish into lakes and waterways.

Reference and more information: www.fiskeriverket.se

Case study: Forum Skagerrak – ecosystem approach on a regional scale

The regions in Sweden, Norway and Denmark bordering the Skagerrak Sea collaborated on the EU project Forum Skagerrak. The programme was financed by the contributing countries and the EU Interreg IIB programme, and ran for two phases from 1999-2007. The aim was to widen the knowledge of and deliver concrete actions for a cleaner and more attractive sea and coasts. The project work involved governmental and regional organisations as well as other interested parties, such as research institutions.

The project included work in seven areas:
1) Eutrophication
2) Hazardous materials, pollution and oil spills
3) Fish and shellfish issues

4) Integrated coastal zone management and planning
5) Coordinated environmental monitoring
6) Mapping for increased knowledge on sensitive deep sea beds
7) Dissemination of information.
More information is available at the web site
www.forumskagerrak.com

2.3: To gather and assimilate information on, build capacity to mitigate the effects of, and to promote policy development, implementation strategies and actions to address: (i) the biological and socio-economic consequences of physical degradation and destruction of key marine and coastal habitats including mangrove ecosystems, tropical and cold-water coral-reef ecosystems, seamount ecosystems and seagrass ecosystems

Sweden puts effort in the protection and mitigation of key marine habitats both on national and regional level.
Regarding the protection of cold water coral reefs within Sweden's territorial waters, mapping has been undertaken and fishing regulations against trawling has been established.

Case study: Seabed mapping and biological groundtruthing of Coral habitats in the EEZ on the Swedish west coast- Forum Skagerrak

The aim of the project was to carry out a survey of a selected offshore area and to develop maps of benthic habitats. develop a dialog with stakeholders i.e. commercial and recreational fishermen, and governmental authorities to use the achieved knowledge. One difficulty in managing the offshore marine environment is lack of inventories of habitats and species of large areas. Using advanced techniques such as multibeam swath bathymetry and side scan sonar, it is now possible to efficiently and in detail survey the seabed topography and structure. With biological groundtruthing and geological and biological interpretation of datasets, habitat maps can be developed. As a test case, an area situated in the Swedish economic zone was been chosen due to indications of high biological values (valuable fishing ground for both commercial and recreational fisheries and reports that deep-water coral habitats are present in the area). The fishery in the area is under EU regulation and thus provides an interesting case since interregional interests operate and there are few examples of marine protected areas outside territorial waters. The ultimate aim of the project was to deliver results that can be used to set up a management plan for best fishing practises. This was a part of the Forum Skagerrak programme.

The project surveyed the area using multibeam echo sounders to assess bathmetry and geology. The surveys were carried out with the research vessels Alkor and Triad in collaboration with Kiel University and Marin Mätteknik AB. Flat areas, slopes, trenches and sills have been identified from the bathymetry data. In selected areas sidescan sonar and sub-bottom profiler data have been collected for increased

resolution of benthic structures and assessment of historical trawl marks. Stratified biological groundtruthing was be used to describe different benthic habitats and dominating organisms in the area using remotely operating vehicles (ROV) with cameras, dredging and grab sampling. Commercial fishery intensity in the area was assessed using databases of set positions and satellite positioning (VMS) of boats operating in the area. Meetings were arranged with stakeholders to present the habitat maps and discuss potential conflicts between the use of the area and possible conservation aspects. A report gave recommendations on how the achieved results can be included in a management plan for the area.

More information is available at the web site
www.forumskagerrak.com

3.1: To establish and strengthen national and regional systems of marine and coastal protected areas integrated into a global network and as a contribution to globally agreed goals.
Sweden works with national and regional systems of MPA trough EUs Natura 2000 network and trough the contribution MPAs the regional conventions HELCOM and OSPAR. Sweden also have marine areas protected trough the RAMSAR convention.

In marine and costal areas more than 250 sites are reported to the Natura 2000 network covering in total more than 6 percent of the marine territorial water and approximately 3,5 percent of Sweden's Exclusive Economic Zone. 6 areas are reported to the OSPAR MPA network and 21 sites to HELCOM BSPA (Baltic Sea Protected areas) network.
The work with a national system of protected areas are described under 1.2

Analyses of the representativeness of the MPA networks are performed within EU regarding the Natura 2000 network and within the regional conventions. The BALANCE project did extensive analysis on the gaps and need for establishing representative and ecologically coherent MPA network in the Baltic. (for more information see Case study: BALANCE project, spatial planning on a regional sea scale under 1.2).

Case study: Baltic Sea protected Areas
HELCOM started as early as 1994 to establish a system of marine and coastal Baltic Sea Protected Areas (HELCOM Recommendation 15/5). The aim of a Baltic Sea network of coastal and marine protected areas is to contribute to the protection of the entire ecosystem with all its components and functions and not just specific species or habitats. Baltic Sea Protected Areas (BSPAs) should therefore be adequately distributed across the Baltic Sea and its different sub-regions to include all species, habitats and ecosystems, ensuring genetic diversity in the network.

According to the HELCOM Baltic Sea Action Plan (BSAP) the improvement of the protection efficiency of the network of marine BSPAs is a central action in order to reach all HELCOM ecological objectives (HELCOM BSAP 2007).
Sweden did a review of the Swedish BSPA sites 2007 increasing the total number of sites from 15 to 21. the sites covering more than 6700 km^2.
More information is available at www.HELCOM.fi

3.3: To achieve effective management of existing marine and coastal protected areas
The Swedish Environmental Protection Agency published 2007 guidelines for the establishment and management of marine protected areas. The national guidelines are based on recommended guidelines from the regional conventions HELCOM and OSPAR and are therefore even designed to meet the recommendations of management of protected areas reported to the conventions.
Sweden has approximately 400 nature reserves in coastal areas but where only a very few are designed to protect the marine waters. The County Board Administrations responsible for the nature reserves are working on adjustments of the regulations and updating management plans for the sites where has the most valuable marine areas.
The major obstacles is the lack of marine knowledge to design proper regulations and monitoring in many of the former protected areas. It is both time consuming and expensive to gather this information and update the management plans.

3.4: To provide support for and facilitate monitoring of national and regional systems of marine and coastal protected areas
Sweden has no national program specially deigned for monitoring marine protected areas. For some of the marine nature reserves specific monitoring has established. A monitoring program for all protected areas in Sweden (both Natura 2000 and national protected areas) are under development, but the marine parts are not jet designed.

Monitoring is an important tool within the Water Framework Directive to classify the status of each water body. This monitoring programme will be of great importance to follow up the status and trends within marine and coastal protected areas.

Case study: National monitoring programme for Sea and Coastal Areas
The Swedish national monitoring programme for Sea and Coastal Areas, run by the Swedish Environmental Protection Agency emphasizes eutrophication, hazardous substances and biodiversity. The programme is not designed to specific monitor protected areas, but can be used to analyse trend in marine basins of value for the management of protected areas. The information collected will also

support the assessment of effects of other pressures, such as climate change and introduced species. Results from monitoring at the county level also are needed, adding to the national picture. The programme does not follow up on anthropogenic environmental threats such as overfishing, oil spills at sea and radioactivity, since the responsibilities for these issues fall on other authorities.

For the open sea monitoring, the aim is to have time trend stations in each of the six main basins (Bothnian Bay, Bothnian Sea, Northern Baltic Proper, Southern Baltic Proper including Öresund, Kattegat and Skagerrak). In the coastal areas, the aim to have at least one station per Water Framework Directive type could not be fulfilled, due to the high cost. In order to get a better geographical coverage, especially in the coastal areas, a new time feature has been introduced: recurrent investigations. There still remains however, a need to increase activities in coastal areas, in order to be able to get a more detailed picture of trends in these areas

Monitoring of coastal fish may be extended, and aerial surveillance of grey seals will eventually be included.
The setting up of all new coastal stations is coordinated with the county administrations and water districts. The result are presented in a national annual report.

More information is available at www.naturvardsverket.se

3.5: To facilitate research and monitoring activities that reflect identified global knowledge gaps and priority information needs of management of marine and coastal protected areas.

Case study: Larval dispersal and the design of marine reserve networks in Sweden
This research programme will develop tools for the analysis of connectivity among marine areas, using a combination of hydrographic models and mathematical network analysis, The aim is to produce generic methods that can be applied in any network, and specifically to eveluate existing MPA networks in Sweden. The project will run between 2009 and 2011, and is a cooperation between universities, SEPA and the national board of fisheries.

5: Invasive alien species
The Swedish Environmental Protection Agency presented a proposal for a comprehensive national strategy and action plan for national and international work with alien species and genotypes to the government in December 2008.
The objective of the strategy and action plan is that human spread of organisms that naturally do not belong in Swedish ecosystems should

not be allowed to harm biological diversity, ecosystem function, socioeconomic and cultural values or human or animal health.

More information is available at www.naturvardsverket.se and in the summary of the national strategy