Cold-Water Coral Reefs

Submitted by UNEP, Ireland, Norway, UK and WWF

Introduction

1. *Lophelia pertusa* reefs are included on the Initial OSPAR List of Threatened and/or Declining Species and Habitats (Reference Number: 2003-14).

2. The Bremen Statement adopted at the OSPAR Ministerial Meeting in 2003 states:

   "12. We are particularly concerned about the status of vulnerable cold-water coral reefs, many of which are threatened with destruction. Bearing in mind the ecological importance of these reefs and the practical irreversibility of their damage, we shall take immediate measures to protect coral reefs from further damage due to use of active fishing gear on the reefs. Furthermore, we shall ensure that steps are taken by 2005 to identify additional threats to the cold-water reefs and that measures are taken to protect the reefs against these threats."

3. In his address to the Ministerial Meeting, Klaus Toepfer, the Executive Director of UNEP, offered the support of UNEP for the emerging international actions concerning the conservation, protection and sustainable development of cold-water coral reefs.

4. Following this announcement, the UNEP Coral Reef Unit (CRU) contacted in July 2003 a number of countries and organizations interested in cold-water coral reefs. As a result, a Cold-Water Coral Reef initiative between UNEP, WWF and the governments of Ireland, Norway and the UK emerged. The initiative agreed on the need for a background report to summarize, at the global level, existing knowledge on the actual and potential distribution, state and threats to cold-water coral reefs. A team of international experts under the lead of Prof. A. Freiwald from the university of Erlangen, Germany was commissioned to prepare such a document.

5. UNEP and Norway, on behalf of the initiative, invited the International Coral Reef Initiative (ICRI) at its meeting in the Turks and Caicos Islands (17 – 19 November 2003) to include cold-water coral reefs in ICRI's programme of work. Following discussion, ICRI agreed on intersessional work to prepare for a decision about what contribution ICRI might make at the next ICRI next meeting (3 & 4 July 2004, Okinawa, Japan).

6. The background report was finalised end of May 2004 and was announced to press and media at the UNEP World Environment Day celebrations in Barcelona on 4 June. Flyers in English and French developed for this purpose, 3 copies of the report and a limited number of CD ROMs containing the report and other cold-water coral reef materials will be available at the 2004 meeting of the OSPAR Commission.

and the CD ROM will be posted to each of the OSPAR Heads of Delegation. An extract of the report with the Table of Contents, the Executive Summary and the Recommendations is attached.

7. The report contains detailed descriptions of cold-water coral reef ecosystems, including those found in the OSPAR maritime area, which has some of the best studied cold-water coral reefs. In addition to providing a comprehensive and up-to-date review of our scientific knowledge, the report also refers to national and international actions, measures and relevant political agreements, including those taken or envisaged in relation to cold-water coral reefs in the OSPAR maritime area.

**It is hoped that the report can serve as a basis for countries to take further action and to cooperate under the relevant international organizations and regional bodies such as ICRI, the EC, OSPAR and NEAFC in the development and implementation of measures towards the conservation, protection and sustainable management of these unique marine habitats.**
Cold-water coral reefs

Out of sight – no longer out of mind

André Freiwald, Jan Helge Fosså, Anthony Grehan, Tony Koslow and J. Murray Roberts
Over the last few decades the exploration of deep-water environments using new technologies has revealed insights into parts of our planet that challenge conventional wisdom. Coral reefs, once thought to be restricted to warm shallow waters in tropical and subtropical regions, have been found in dark, cold, nutrient-rich waters off the coasts of 41 countries so far. They occur in fjords, along the edge of the continental shelf and around offshore submarine banks and seamounts in almost all the world’s oceans and seas. To date, most studies have been carried out in high latitudes, where cold-water reefs occur at depths of hundreds of metres to just 40 metres. However, cold-water corals are increasingly being observed in the tropics, where they thrive at greater depths.

Reef-building and habitat-forming corals in cold waters are derived from several systematic groups. The most important of these are the colonial stony corals (Scleractinia), true soft corals (Octocorallia), black corals (Antipatharia) and calcifying lace corals (Hydrozoa). Several species of these groups create reefs and three-dimensional, forest-like structures on the sea floor, comparable to their warm-water cousins in size and complexity. These cold-water reefs and structures act like islands in the normally flat, featureless and muddy surroundings and harbour a distinct and rich ecosystem, providing niches and nursery grounds for a variety of species, including commercial fish species.

Cold-water coral ecosystems are long lived, slow growing and fragile, which makes them especially vulnerable to physical damage. Regardless of the depth at which these reefs occur, the impact of human activities is evident in almost every survey undertaken. Bottom fisheries, especially using trawls and heavy gear, have already destroyed or scarred several reefs, and represent one of the major threats to cold-water corals. Other documented and potential sources of impact are hydrocarbon and mineral exploration and production, cable and pipeline placement, repair and dumping.

We are still only beginning to understand the principal ecological aspects of cold-water corals, including the environmental factors (temperature, salinity, nutrition) and biological processes (reproductive biology, molecular genetics, predation, parasitism and bioerosion) which regulate their life and distribution. It is
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9. Recommendations for the sustainable management of cold-water coral ecosystems

The previous chapters have demonstrated that cold-water coral ecosystems are biodiversity hotspots and resources which may be as important as their counterparts in tropical, warm waters. However, our understanding of cold-water coral ecosystems is still fragmented and incomplete. We do know that these corals are widely – probably globally – distributed, slow growing and long lived, and that they form fragile reefs*. We also know that they are under serious threat from increasing resource exploitation in the deeper areas of the oceans, particularly by commercial deep-water fisheries.

In order that cold-water coral ecosystems do not disappear before we even begin to appreciate their role, function and value, urgent actions and measures are needed. Both cold- and warm-water corals form unique marine ecosystems. Their conservation, protection and sustainable management requires a concerted, dedicated approach and an increase in national and international efforts and commitments.

The following recommendations are intended to provide all cold-water coral reef stakeholders – ranging from academia, non-governmental and intergovernmental organizations, national and international policy/decision makers from developed and developing countries to business and industry – with a choice or ‘toolbox’ of options for actions and measures to be considered for the effective conservation, protection and management of cold-water coral ecosystems. They are not intended to divert attention or resources from actions to reverse the degradation of other marine environments, such as warm-water coral reefs. The recommendations have been numbered for ease of reference – numbers do not reflect priority.

Recommendations have been grouped under the following headings:
- Information management and research
- Monitoring and assessment
- Regulations and measures
- International coordination and awareness.

Although some of these recommendations are interrelated and linked, together they constitute a flexible framework which can be adapted to existing knowledge and particular circumstances, enabling every stakeholder to consider and choose the most appropriate recommendation(s).

**INFORMATION MANAGEMENT AND RESEARCH**

The distribution of cold-water corals and reefs (especially in the tropical and subtropical deep-water areas of developing countries and small island developing states) is still poorly known. Most location records are held by individual experts and scientific institutions, or by companies exploring the deep waters for commercial purposes. There is a need to combine, maintain and present this information from the various sources in a way that allows all stakeholders easy access.

**Recommendation 1**

Encourage the mapping, establishment and maintenance of a global internet-based database of locations where cold-water coral reefs occur, or are absent.

**Recommendation 2**

Develop a dialogue with industries operating in areas of the oceans where cold-water corals may occur, so that cold-water coral reef data and information, especially those originating from fishing activities and oil and gas exploration and production, are made available to the scientific community, managers and decision makers.

Investigations using the latest deep-sea technology and instruments are time consuming and costly, so their deployment has to be as effective as possible. Modelling the potential distribution of cold-water coral reefs will focus further research and habitat mapping, especially in the tropical and subtropical areas where *in-situ* observations are so far limited. The results of modelling

*For the purpose of this report ‘reefs’ are defined as submarine, biogenic concretions which arise from the sea floor and which support a community of animals (Box 2).*
activities should be verified with existing records/observations (where possible) and should be made widely available.

**Recommendation 3**
Support the modelling of the potential distribution of cold-water coral reefs globally and regionally on the basis of their environmental preferences and the requirements of reef-building species.

Knowledge of cold-water coral biology and the genetic relationship between populations is poor. Much of the structure and function of cold-water coral ecosystems in relation to biodiversity in the marine environment remains to be studied. There is also little understanding of the effects of different human activities, such as physical damage and pollution, on these reefs and their capability to regenerate. Furthermore, cold-water coral field research (including bioprospecting) is expensive, and potentially an impacting activity in itself. Good international coordination of marine research programmes can help to focus research efforts with a view to achieving cost efficiency and minimizing damage to the coral habitats.

**Recommendation 4**
Strengthen cold-water coral research through increased activity and coordination at the global, regional and national levels, with a view inter alia to countries with expertise and modern deep-sea research, exploration and habitat mapping facilities (vessels with multibeam equipment, remote operated vehicles, submersibles) assisting or co-operating with countries that lack such expertise and tools.

**Recommendation 5**
Develop and implement a code of practice for in-situ research (and bioprospecting) on cold-water coral reefs.

**MONITORING AND ASSESSMENT**

Most regulations and measures to protect cold-water coral reefs have been established only recently, and little information exists concerning their efficacy in achieving conservation objectives (Reed et al., in press). With more regulations and measures to be established, it will become increasingly important to compile and share information about the range of management strategies adopted by various countries and organizations, and to develop monitoring and assessment tools to evaluate and redefine, as necessary, the approaches taken to protect the reefs. This will help to guide countries in their efforts to manage cold-water coral reefs, especially those countries with fewer resources for basic research.

**Recommendation 6**
Collate the range of existing and new regulations and measures to conserve, protect and manage cold-water coral reefs, and assess their performance and effectiveness with a view to establishing and disseminating ‘lessons learned’ and ‘better practices’.

Appropriate monitoring is vital for the conservation, protection and sustainable management of ecosystems. The monitoring of remote and deep-water habitats is still challenging and requires the development of methods and equipment which are robust, practicable, flexible and cost efficient, so that they can be customized to local conditions and applied in waters of both developed and developing countries. Monitoring efforts should be able to describe the status of undisturbed reefs, and the state and recovery of damaged reefs, as well as the environmental and socio-economic effects of conservation and management regulations and measures.

**Recommendation 7**
Initiate the development of practical strategies and guidelines for in-situ monitoring of cold-water coral reef habitats.

**Recommendation 8**
Initiate the development of practical strategies and guidelines to assess the socio-economic costs and benefits of cold-water coral reef management actions.

In the light of the increasing amount of data and information becoming available from various sources, there is a need to consider establishing and maintaining database facilities and regular publications on the health and status of cold-water coral reefs, similar to those in place for warm-water tropical reefs, which are able to assist resource managers in coral reef conservation.

**Recommendation 9**
Establish and maintain a global cold-water coral database for storing and providing access to information and monitoring data on the health, management and conservation efforts of cold-water coral reefs, inter alia, as a basis for the production of periodic regional status reports and the compilation of regular global conservation status reports.
REGULATIONS AND MEASURES
Cold-water coral reefs are of ecological and socio-economic importance. Without urgent measures for their conservation, protection and sustainable management, the goods and services these reefs supply might be lost forever. Any regulations and measures should be precautionary and designed to prevent deliberate or accidental damage to cold-water coral reefs, as the restoration of adversely affected reefs, if possible at all, will take generations and require considerably more costs, resources and efforts than precautionary, preventative measures.

Recommendation 10
Develop and adopt precautionary regulations and measures to protect, conserve and sustainably manage cold-water coral ecosystems and reefs to prevent deliberate or accidental damage caused by human activities. This should include consideration of interim prohibitions to reduce or eliminate human activities which adversely impact upon cold-water coral ecosystems within and beyond the limits of national jurisdiction.

Types of regulations and measures
Various countries and regional bodies have adopted, or are in the process of establishing, regulations and measures for the protection and management of vulnerable marine habitats, including cold-water coral reefs. Depending on the specific threat, state and location of the cold-water coral reefs, these regulations and measures vary considerably, ranging from a requirement for an environmental impact assessment, the prohibition of an expansion of operations and bottom trawling on cold-water coral reef areas, to specific management plans and regulations, such as a ban on all or certain types of fishing gear (especially those which are dragged over or can come into contact with the sea floor) on known cold-water coral reefs.

Recommendation 11
Consider the establishment of requirements and procedures for environmental impact assessments to be carried out prior to licensing of activities which affect the sea floor in potential cold-water coral reef areas. This would benefit from a cumulative assessment of all on-going and projected activities in a spatially framed assessment process, with a view to avoiding any damage to coral sites.

A number of known cold-water coral reef locations have been designated by national or international agreements as ‘habitats of particular concern’, ‘special areas of conservation’ or ‘marine protected areas’. Marine protected areas (MPAs) have long been used by countries in their territorial and EEZ waters as a tool to protect sensitive or valuable marine species and habitats against harmful human activities. MPAs can vary in size and the level/duration of protection, from reserves totally closed to all activities to multiple-use areas that allow human uses compatible with the specific MPA conservation objective[s]. In 2002, the international community at the World Summit

Bycatch of a live Madrepora oculata colony from Santa Maria di Leuca, off Apulia, Ionian Sea

Huge stem and holdfast of the bubblegum coral Paragorgia
on Sustainable Development (WSSD) agreed on the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks, by 2012. The specific goals and targets to ensure practical and timely implementation of this commitment (including the need to designate cold-water coral reef locations as MPAs) are being discussed in various global and regional fora (Chapter 8).

**Recommendation 12**
Include an adequate representation of cold-water coral ecosystems in national and regional networks of marine protected areas.

Cold-water coral reefs also occur in the international waters of the high seas which are beyond national jurisdiction. The protection of these reefs forms part of international efforts to protect vulnerable high-seas habitats and to create a legal basis for this protection consistent with existing law. This is currently being discussed at the international level, including meetings of the UN General Assembly (including the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea), the UN Convention on the Law of the Sea, the UN Fish Stocks Agreement, the Code of Conduct for Responsible Fisheries of the Food and Agriculture Organization of the United Nations and the Convention on Biological Diversity.

**Recommendation 13**
Support at the global and regional levels the establishment of urgent and precautionary international measures designed to conserve, protect and manage sustainably vulnerable marine habitats such as cold-water coral ecosystems in the high seas.

**Recommendation 14**
Support the establishment of legal regime(s) and framework(s) to conserve, protect and manage sustainably cold-water coral reefs in the high seas under and/or consistent with UNCLOS and existing international agreements and conventions.

**Stakeholder involvement**
In order to be effective and achieve their goals, regulations and measures will need to be balanced, taking into account the concerns and interests of all relevant stakeholders, including those from industry and business.

**Recommendation 15**
Inform the relevant industry associations and sectors of the distribution, importance and vulnerability of cold-water coral reefs and encourage their active involvement and support in the process of developing and implementing management regulations and measures.

Fisheries, especially those carried out with bottom gear, the exploration and production of oil and gas, and the placement of pipelines and cables pose the greatest threats to cold-water coral reefs. Actions to reduce these threats will have to be considered both at international and national levels.

**Recommendation 16**
Engage global and regional organizations (both regulatory and non-regulatory), especially global and regional fishery bodies, international oil and gas industry associations, as well as pipeline and cable-placement companies, in the development of international and national work plans on cold-water coral reefs.

**Recommendation 17**
Encourage the fishing industry and fishing fleets to comply with the Code of Conduct for Responsible Fisheries of the Food and Agriculture Organization (FAO) of the United Nations* and to avoid the use of destructive fishing methods and gear in known or potential cold-water coral reef areas.

**Recommendation 18**
Encourage the oil and gas industries and the pipeline/cable-laying placement industries to avoid and mitigate damage to cold-water corals due to their activities and avoid operations and the placement of pipelines or cables in known or potential cold-water coral reef areas.

**Enforcement and compliance**
Effective control and policing, together with stakeholder acceptance and cooperation, will be crucial for the successful implementation of regulations and measures to protect the marine environment.

**Recommendation 19**
Enhance enforcement of existing legislation and establish punitive penalties to prevent destruction of cold-water coral reefs.

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*Adopted by the 28th Session of the FAO Conference on 31 October 1995.*
Monitoring and enforcing compliance with such regulations and measures in areas far off the coast or in international waters require considerable logistical and financial resources.

**Recommendation 20**
Assess the feasibility of extending the use of satellite vessel monitoring systems (VMS) to provide the responsible authorities with data related to compliance with regulations to protect cold-water coral reefs in national and/or international waters.

**INTERNATIONAL COORDINATION AND AWARENESS**
At present, most of the initiatives to improve international coordination and raise awareness of cold-water coral reefs are being carried out by individuals or small groups at a national or regional level. International events, such as the International Deep Sea Coral Symposium series (begun in 2000 in Halifax, Canada, and continued in 2003 in Erlangen, Germany) bring the scientific cold-water coral community together. However, they do not deliver the means of involving all stakeholders, coordinating sectoral activities and providing a policy delivery mechanism that could be achieved by a dedicated international forum/host organization which brings all stakeholders together, coordinates activities and establishes cooperative programmes of work.

Such a forum/host organization would also be able to raise the global awareness of cold-water coral reefs and reach out to countries, regions and other organizations which have not (yet) considered cold-water coral reefs. Where possible, existing international expertise and frameworks dealing with issues closely related to those relevant for cold-water coral reefs should be used, especially organizations addressing the conservation, protection and sustainable management of tropical warm-water coral reefs, e.g. the International Coral Reef Initiative (ICRI) and ICRI’s operational networks, the International Coral Reef Action Network and the Global Coral Reef Monitoring Network.

The 58th session of the UN General Assembly noted that ICRI and other relevant bodies are considering incorporating cold-water coral ecosystems into their programmes of activities (Resolution 58/240). However, in order to do this, relevant organizations will have to be strengthened with additional resources to ensure that attention and resources are not diverted from their original objectives and mandates, e.g. in the case of ICRI to reverse the degradation of tropical warm-water reefs.

**Recommendation 21**
Support the incorporation of cold-water coral ecosystems into the programmes of activities of the International Coral Reef Initiative (ICRI) and other relevant bodies, and provide additional resources to strengthen these bodies.

**Recommendation 22**
Encourage the development and strengthening of global, regional and multinational cold-water coral reef partnerships and networks.

**Recommendation 23**
Support the inclusion of cold-water coral reefs as a key/representative ecosystem for deeper marine waters in existing or planned international monitoring and assessment programmes, such as the Global Ocean Observing System (GOOS), the Global Marine Assessment (GMA) and relevant programmes under Regional Seas Conventions and Action Plans.

The results of recent scientific studies and observations have contributed to raising the awareness of cold-water coral reefs at the national, regional and global levels, and the need for action has featured on the agendas of several international meetings associated with the protection of the marine environment. However, there is still a need to further disseminate information about the existence, worldwide distribution, threats and importance of cold-water corals. Some governments may still be unaware of the presence of cold-water corals or reefs in their waters.

One reason for timely conservation, protection and sustainable management of cold-water corals is to ensure that our children will have the opportunity to wonder at, study and benefit from these unique habitats. This will only be achieved with the full knowledge, understanding and support of the general public as to why efforts to prevent further damage and degradation of cold-water coral reefs are being made.

**Recommendation 24**
Further promote the awareness of cold-water coral reefs and the urgent need to conserve, protect and manage these ecosystems sustainably within relevant national governments, Regional Seas Conventions/Action Plans, intergovernmental organizations and the public.