

---

## **Establishing two-way communication between schools and the MAR-ECO project**

---



The deep-waters of the oceans are one of the last remaining unexplored areas of the world. The MAR-ECO project will investigate waters of the Mid-Atlantic Ridge from Iceland to the Azores to understand the patterns and processes within these deep-sea ecosystems. This project provides an opportunity for students and the general public to partake in the investigation and exploration of these marine habitats in the MAR-ECO survey that will take place in the course of the summer 2004.

---

Institute of Marine Research (IMR) in collaboration with the University of Bergen (UiB) have been given the role of coordinating the MAR-ECO project. IMR and UiB will also be responsible for developing the public outreach platform that is outlined in this application.

### **Aims**

The main objective of the MAR-ECO project is to describe and understand the patterns of distribution, abundance and trophic relationships of the organisms inhabiting the mid-oceanic North Atlantic, and to identify and model ecological processes that cause variability in these patterns.

This communication / networking public outreach project aims to work as a communication tool between the scientific part of the MAR-ECO project and the public by providing a network solution that enables efficient exchange of information and ideas between researchers, students, and the general public. This exchange will occur by:

- Providing an opportunity for people to take part in an interactive online exploration-adventure of the deep sea through web-based reports, projects and exchange of questions and answers.
- Presenting exciting new discoveries in marine deep sea biology.
- Offering the participants updated information on scientific activities in the MAR-ECO project.
- Inviting participants to contribute with projects on issues relevant to the MAR-ECO project.

- Providing a communication channel where schools may communicate directly with scientists.
- Giving people an opportunity to see how scientists work to uncover new scientific discoveries, and demonstrate the process of adding new knowledge to known facts.
- In addition to being a valuable asset for the MAR-ECO project, establishment of the kind of a network outlined here could be a valuable model for a public outreach dimension in other projects, both within and outside of Census of Marine Life.

## **Target groups**

### Schools

- students from the age of 12
- teachers

### General public with an interest in

- marine environment
- exploration of the seas

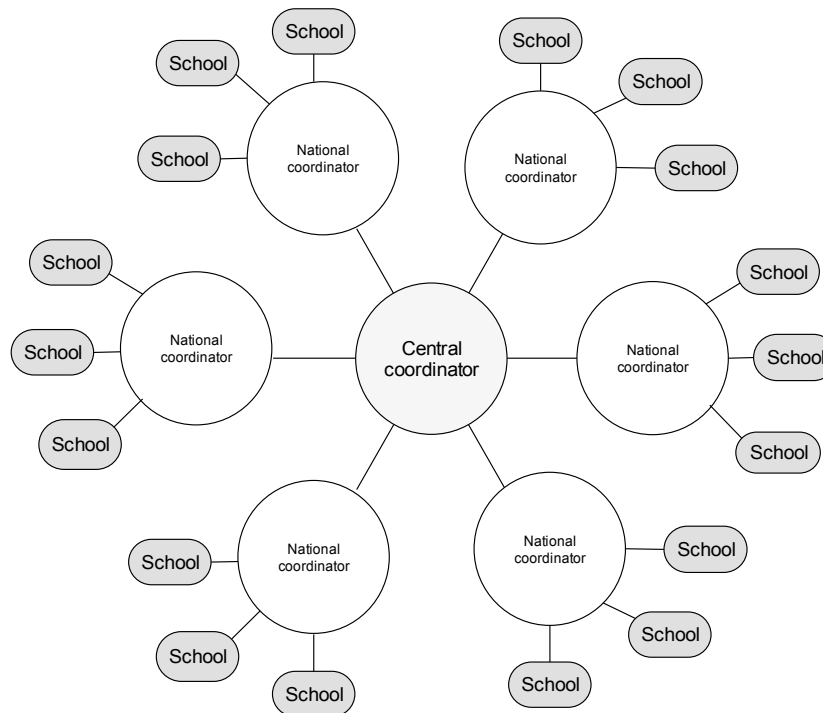
## **Means**

- Construct an interactive website/database that may form the basis for efficient two-way communication between the MAR-ECO project and participating schools.
- Establish an international network of collaborators.

## **Organization of the project**

Researchers from many countries participate in the investigations made within the MAR-ECO project. We envisage a structure that reflects this international representation. When establishing such a network, it is important to avoid an excess of one-way information flow from MAR-ECO to interested parties. People have a tendency to lose interest after a while if they do not feel that they have a sense of ownership of the network, or if they do not have an opportunity to take an active contributing role in the network. We therefore think that it is vital for the success of the project that participants at all levels have a role in shaping the network.

## The organization structure



The network will consist of one central coordinator and several national coordinators. The actual number of participating countries will depend on how many countries we succeed in recruiting. Our initial aim is to reach somewhere between 5 and 10 cooperating countries. Countries on both sides of the Atlantic Ocean will be targeted. The number of schools recruited will probably vary between countries, but as the figure above indicates, even the conservative projection of three schools in each country would constitute a reasonably large number of participants.

The Institute of Marine Research (IMR) in Bergen, Norway in collaboration with the University of Bergen (UiB) will be the central coordinator with responsibility for the technical development and maintenance of the server, database, and website. There will be at least one national coordinator in each participating country. Schools in countries without a national coordinator could also participate via the central coordinator.

There will be an editorial group responsible for the website content and information updates. This group will consist of representatives from IMR (project administration personnel) representatives from the participant countries, and scientists. Each national coordinator node will thus have at least one representative in the editorial group.

## **Recruitment of national coordinators**

Development of a school network is demanding in terms of time and effort. For this reason it will be a great advantage to use already existing network channels between schools and projects with a similar structure as the one we propose. Therefore, personnel already working as coordinators of similar projects will be approached and offered roles as national coordinators. Representatives from collaborating nations will, in addition to editorial tasks, also work as liaisons between MAR-ECO and local participating schools. Hence, information to participants will be channeled through the national representatives as well as directly via the website.

The editorial group should convene in at least two workshops. The first workshop will be held to coordinate and plan the different activities that are going to be presented on the website, and the second to evaluate the progress of the project and, if necessary, make adjustments of the pedagogic profile.

## **Recruitment of participant schools**

A presentation of the MAR-ECO project, in the form of an information leaflet aimed at schools, will be made for use in the initial phase of the recruitment of participant schools. In order to attain a satisfactory high number of participants, we think it necessary that teachers are stimulated to (/and given the opportunity to) take an active part in the project. Therefore national coordinators should arrange workshops for their local teachers. Inviting teachers to such a forum will serve several purposes:

- Teachers will be made aware of the project.
- Teachers receive information on the different school activities and on what kind of information the MAR-ECO project offers, which they then may integrate in their own teaching schedule.
- Teachers have an opportunity to comment on the project, these comments can be relayed by the national coordinators to the editorial group.

Apart from these workshops and ensuing dialogues between schools and their national coordinators, contributions from participant schools will be via the website. The website will provide discussion boards where schools may communicate with each other and exchange results and experiences.

## **Collaboration with researchers**

Researchers that take part in the project will be given a short presentation on the website. They will also be asked to provide summaries of their findings from the MAR-ECO cruises. These will be posted on the website. We also aim to establish web forums where the public can ask researchers questions that they may have.

## **Information flow in the network**

The information on the website will be published in English. The project might reach a broader number of countries if the website were also to present information in other languages. However, the added amount of resources required to translate the information to several languages and maintain and update several parallel versions of the website, would, in our view, outweigh the benefits of reaching a few more countries.

The national coordinators of non-English speaking countries could alleviate some of the potential language-barrier problems by providing their schools with information in their native language. Schools in non-English speaking countries might also find this project useful to integrate as a tool in their teaching of the English language.

As stated previously, this project seeks to create a network that allows for the rapid interchange of information and ideas between its members. We think this best can be attained by structuring the information flow as shown below:

## **Information flow in the network**



comments and further discussions will take the form of discussion threads rooted in the original article, report, or student project.

The website interface will provide the following services and communication channels:

- **Editorial news section**
- **Researcher presentation**
- **Articles, reports and updates from researchers**
- **Project page** presenting activities and projects aimed at students and teachers.
- **Image gallery pages** presenting images and footage from the survey and images provided by users of the website in general. Visualization is a powerful means of communication, and it is a requisite to create in participants a sense of taking part in the exploration. A lot of research methods and results will be documented in images and footage, and the processing and web publication of these will be prioritized relatively highly. Since production and processing of images/footage will require a significant amount of resources, the extent of this kind of documentation on the website will be determined by the amount of available resources within the budget.
- **Uploading channels for student projects**
- **Ask a scientist** column for questions and answers.
- **Discussion threads** may also be initiated by users on relevant topics of their choice

All the published material will be stored in a database, from where it can be retrieved via the website.

## **Technical requirements/solutions**

Information and reports from the research vessel will be sent to IMR, where it will be processed for publication on the website. The editorial group will regularly keep in touch with each other and may distribute the publishing tasks among themselves in the manner they find most practical and expedient.

Preparation and posting of graphics, movie clips and other material received from the research vessel will require both hardware and software suited for these purposes. Personnel with experience with this kind of work will also be needed.

The database server will be based at IMR in Bergen. Technical solutions for the website should be selected on basis on existing competence, development time and cost. There are various ways of developing such a database. One possible platform choice might be:

- Apache web server
- use of the PHP scripting language

- using a FreeBSD or GNU/Linux operating system
- with a PostgreSQL database backend.

This software is freely available and stable, runs on inexpensive hardware, and needs very little maintenance once installed. There are also a lot of free third party modules available. These will reduce development time greatly.

## **Personnel requirements**

In order for the project to run satisfactorily, some tasks require the attention of qualified personnel on a daily basis:

- to develop web-solutions and carry out daily technical management
- to process and publish received information on the website
- to handle editorial tasks
- to administrate the project

## **Expected contribution from students and other interested parties**

As the MAR-ECO project and its network develop, suitable problems and student projects will be agreed upon and formulated by the different parts of the network. At this stage we consider that the public will contribute with the following kind of input:

- thoughts and ideas regarding what the MAR-ECO cruises will discover
- comments to articles and findings that are presented on the website
- various kinds of student project reports
- questions regarding various aspects of the survey
- any kind of relevant curiosity-driven input

## **Examples of student projects that can be presented**

We think that in order to optimize participation, interaction and visits on the website, it is important to take advantage of the curiosity and enthusiasm that may be stimulated in people when given the opportunity to closely follow and take part in an online expedition. People are curious and interested in explorations and new discoveries, and there are not many parts of the world that remains to be explored. We think that this might be kept in mind and profited on when recruiting contributing participants and collaborators, as well as when formulating student projects that are to be presented on the website.

The amount of interesting student projects that might be spawned by such a diverse project as MAR-ECO is considerable. Below we give but a few examples of the kind of

student projects that we think might be suitable to present in the network. Students will have the opportunity (and be encouraged) to comment on project reports published by other schools.

Projects on issues related to deep sea biology:

- *Construct your own deep-sea organism!*  
The marine environment affects and shapes various aspects of appearance and biology of its inhabitants. The deep sea habitat induces strange adaptations in body shape and morphology, techniques for acquiring food, vision and other sensory functions, bioluminescence, movement, encountering and choosing mate, spawning strategies, and much more. By providing an example collection of typical adaptations in deep sea marine organisms and how they work to improve survival, students may be challenged/encouraged to construct their own deep-sea organism. Drawings of the hypothetical creature might be accompanied by explanations of the different adaptations that it has; e.g. “it has big eyes because it lives in a dark environment” and/or “when they meet the male attach themselves to the female and stay attached the rest of their life, because they so rarely meet that otherwise they would have a low number of offspring”. Similar reflections may be made of what it eats, how it moves, how it mates, how old it gets, natural enemies, color, special abilities, and so on. This hypothetical species might also be assigned a scientific name and a placed in an existing taxonomic group, duly accompanied by a reasonable explanation for why it should be placed here.
  
- *Help us name new species!*  
The survey will probably discover new species spread over several marine groups. The website might publish descriptions of the new species and explain how they differ from previously known species. Students may then be challenged/encouraged to offer suggestions for new species names along with their explanation for their choice of names. There may even be a prize for the best suggestion.
  
- *Get acquainted with deep-sea organisms!*  
Choose an organism group (e.g. jellyfish, octopus, whale, fish, or plankton). Focus on an assortment of species within this group. Search for information on these species, make illustrations and write a report on their life in the deep-sea environment. Focus on environmental constraints like sea-water pressure, lack of light, diet and availability of food, predatory regime, buoyancy, temperature, lack of plants, etc. How do such factors tend to affect the way of life of the creatures in question? Upload written reports and drawings to the MAR-ECO website.

Other projects may revolve around the role that research and science has in our society

- How do we obtain new knowledge? Which methods are used in science? What is a typical day in the life of a scientist like? Draw, or make a cartoon strip of a scientist that is occupied with his favorite activity.
- The scientific procedure: formulating of hypotheses based on current theory, investigations, production of results, interpretation of findings, and communication of new discoveries.
- Do we really need to do as much research as possible? Would it be better if we left the deep sea alone? What value should we put on new scientific findings and discoveries? How can they be used? How does scientific research work as a foundation for political decisions e.g. regarding management of natural resources? Can research be the first step on a path leading to future exploitation of currently unknown marine resources? May there be a potential conflict between nations over management of natural resources in international waters? Do we know enough of the life in the deep sea to make sound decisions regarding management of the deep sea marine resources?
- Should scientific results be free for all to use? If not, who should own the scientific results, and who should decide what their use should be? Can you think of conflicts of interests in relation to exploitation of resources and scientific findings between nations, between large corporations and people in general, or between people today and people in the future? Who should fund scientific research? What are the ups and downs of private vs. public funding, civil vs. military research, national vs. international funding? Who should decide the direction of the research, i.e. what research areas should be prioritized? Is it more important to do research on projects that we know beforehand will have a high likelihood of economical pay-off, or are benefits of gathering knowledge in its own enough to justify expensive research projects?

Interactive projects

- We also think it is an excellent idea to present interactive projects. Based on researchers' models that simulate the deep sea environment, students could be given the opportunity to manipulate variables like temperature, velocity and direction of ocean streams, predator pressure, reproduction rate, migration patterns, pollution rate, food availability, volcanic activity, and so on. This could produce various scenarios

with different implications for various organisms. It would also in an excellent manner demonstrate for students how abiotic and biotic parameters interact to pose ecological constraints, and how these might affect the life of members of an ecosystem.

Upon uploading of project reports, the reports will remain accessible at the website. They may then be the source of comments by other schools, researchers or other interested parties.

### **Further educational scopes for the network**

The development of this network solution may also provide opportunities for further educational projects relevant for other levels and in other fields of science than specified here. In addition to be a source of undergraduate or graduate projects in biology, it might also be useful in other disciplines like pedagogy, web-based teaching, and information science, for instance related to the curriculum of people studying to be teachers.

## Projected budget for the project

Estimated costs of the project are summarized in the table below.

<b>Budget</b>	<b>Costs in EURO</b>
<b>Activities</b>	
Two international editorial workshops	60.000
Seven national workshops (one in each participating country)	100.000
<b>Personnel</b>	
Website/database development and technical maintenance (1 position, 100%, 18 months)	90.000
Processing and publishing of website material/graphic design (1 position, 100%, 18 months)	90.000
Seven national coordinators (20%, 18 months)	126.000
<b>Equipment</b>	
Server	6.500
Workstation for editorial work and preparation of web-content	3.000
Software	2.000
Equipment for processing web-content (images and video clips)	2.500
<b>Other expenses</b>	
Production and printing of information material	2.000
Administrative costs	[utgifter til dekningsbidrag /admin.]
<b>Investment from IMR</b>	
[Føre opp eventuell egeninnsats (stillinger, utstyr, o.l.)]	
<b>Total costs of project</b>	
<b>Application sum</b>	[totalsum minus egenbidrag]

## **Timeframe**

Autumn 2002

- production of information leaflets
- recruitment of collaborators

Spring 2003

- recruitment of collaborators
- first editorial workshop
- announcement of positions/hiring of personnel

Autumn 2003

- construction of website and database solution
- workshops for national coordinators and schools

Spring 2004

- presentation of researchers and cruise preparation
- planning and formulation of school projects
- dialogue with schools/student project reports

Summer 2004

- MAR-ECO cruises
- publication of activities, results, and updates from the research vessel
- dialogue with schools/student project reports

Autumn 2004

- reports from researchers
- second editorial workshop
- dialogue with schools/student project reports

Spring 2005

- dialogue with schools/student project reports
- assessment of project results and project evaluation