

The Census of Marine Life pilot project
**PATTERNS AND PROCESSES OF
THE ECOSYSTEMS OF THE
NORTHERN MID-ATLANTIC
(MAR-ECO)**

THE PLANNING PHASE

**A proposal submitted for consideration by the Alfred B. Sloan
Foundation
July 2001**



Version of 5 July 2001

Summary

This proposal describes the background, aims, schedule and budget of the planning phase of the MAR-ECO project, a pilot project of the Census of Marine Life planned for 2001-2008. The planning phase is an integral part of the project as presented in full in the Science Plan appended to this proposal. MAR-ECO focusses on the exploration of distribution, identity, biology, and ecology of the pelagic and benthopelagic macrofauna of the northern Mid-Atlantic Ridge region.

The planning phase is scheduled to start in October 2001 and last for 18 months. The central objectives are to focus the entire project, formulate and submit fundable component project proposals, compile historical information, adapt technology for the 2003-2004 field campaigns, and develop a public outreach strategy. At the end of the planning phase a well-integrated portfolio of component projects has been established. Some sub-project proposals will then have received funding, others will be ready for submission to relevant funding agencies.

1. Introduction and Background

The Census of Marine Life (CoML) initiative, formalised in 1997, is an international research programme aiming at assessing and explaining the diversity, distribution and abundance of marine organisms throughout the world's oceans. It is a central objective of CoML that innovative research effort be focused on poorly known ecosystems and/or communities in which new information would be particularly important to enhance understanding. The vast oceanic areas off the continental shelves represent such poorly known areas, and the ecosystems of the mid-oceanic ridges and the mesopelagic zone are of particular interest.

Recognising this continued need for exploratory research in oceanic waters, Norway offered to take the lead in developing a regional collaborative CoML pilot project focusing on macrofauna of the northern Mid-Atlantic Ridge (MAR) from Iceland to the Azores. In a concept paper entitled "*Patterns and processes of the ecosystems of the northern mid-Atlantic*" submitted to the Scientific Steering Committee (SSC) of the CoML in February 2000, Bergstad (2000) outlined the goals and phases of such a pilot project. This idea attracted substantial international interest, and in February 2001 a CoML-sponsored workshop was convened in Bergen with the objective of defining the aims, scope and strategies of such a study. During that workshop consensus was reached among the 35 participants that the overriding aim of the project should be:

“To describe and understand the patterns of distribution, abundance and trophic relationships of the organisms inhabiting the mid-oceanic North Atlantic, and identify and model ecological processes that cause variability in these patterns.”

An international steering group was established and given the task of carrying the proposal and planning process further. The current members of the steering group are:

Dr. Odd Aksel Bergstad, IMR, Norway (chairman)
Prof. Peter Boyle, Univ. Aberdeen, UK
Dr. Olafur S. Astthorsson, MRI, Iceland
Dr. Ricardo S. Santos, Univ. Azores, Portugal
Dr. Uwe Piatkowski, Univ. Kiel, Germany
Dr. Michael Vecchione, NOAA, NMFS, USA
Dr. E.M. Bureson, Virginia Institute of Marine Science (VIMS)
(Dr Pascal Lorange of IFREMER, France was appointed in Bergen but had later to decline. French involvement in MAR-ECO has high priority, and a new French member may be appointed in the near future).

The steering group met for its first planning meeting in Arendal, Norway, 27-28 April. During this meeting an early version of the Science Plan for the project, now referred to by the acronym MAR-ECO, was revised. In addition, the tasks, financing, and organisation of the 18 month planning phase scheduled to start in October 2001 was discussed. The revised Science Plan (Appendix 1) strongly reflects the ideas discussed during the Bergen workshop, and this document represents an essential background paper for the present planning proposal. In the Science Plan, detailed descriptions of the tasks of the entire project, including the field phase scheduled for 2003-2005, is presented. The total duration of the MAR-ECO is 8 years (2001-2008), including the initial planning period.

In the following document the work content, approach, organisation, schedule, and budget of the planning phase is presented. On this basis, the Steering Group apply to the Alfred B. Sloan Foundation for a grant of \$300.000,- to partially cover the planning expenses of MAR-ECO.

2. Work Content Of The Planning Phase.

As outlined in the Science Plan, the major end result of the planning phase is a suite of component projects to be conducted during the field investigations in 2003 (and to some extent 2004 – 2005) and the subsequent analytical phase. The MAR-ECO shall function as an umbrella and co-ordinator of such component projects. In order to tackle this task, focused efforts are needed to write proposals, develop methods, test new technology, and review and assemble historical information. Also, detailed planning of the field investigation will be required to ensure that surveys and detailed process studies in such a remote area as the Mid-Atlantic Ridge become feasible and successful.

Five inter-related actions shall be accomplished simultaneously during the planning phase:

Action 1. *Project building.* Based on current knowledge and ideas (see Action 2, below), central testable hypotheses relevant to the study of patterns and processes will be developed and refined to tackle the three core tasks defined for the field and analytical phases of MAR-ECO (see Science Plan, 2.2.2 and 2.2.3). These hypotheses will provide greater focus for the pilot project and provide guidance for investigators of the individual tasks. Investigators will have to commit themselves to specific tasks and responsibilities. The writing of component project proposals and acquisition of financial resources are essential activities of the planning phase (see Action 4, below). The stimulation of project building has already begun, and writing of proposals shall be facilitated by networking activity and focussed workshops, the first in January 2002.

Action 2: *Literature studies and data mining.* Although the mid-ocean ridge system is perhaps the least studied large ecosystem on earth, information pertinent to this project exists. Such information includes results of exploratory fishing on the mid-Atlantic ridge, open-ocean studies in the deep Atlantic Ocean, and seamount studies from around the world. Some of this information is in formats that may be difficult to obtain or to interpret. In addition to journal publications, such information includes data and project reports, databases, “grey-literature”, and publications in languages that are not widely understood. For example, extensive background information is thought to have resulted from exploratory fishing on the mid-Atlantic ridge by former Soviet block nations. In line with the priority given to such data mining activity in the Science Plan, compilation and evaluation of current and archived information will be an important part of the planning process, as well as an important task in the entire project. This research task will therefore begin during the planning phase and continue during the field phase. Early results of this action will be used to refine hypotheses to be tested during the field phase. Information accumulated will be stored in a format compatible with OBIS.

Action 3: *Technological adaptation and fitting of research vessels.* A main aim stressed in the Science Plan of MAR-ECO and CoML is to gain new knowledge through the application of new technology. A workshop will be convened to decide on technology and methods to address each task of the field phase. When appropriate, materials and methods will be coordinated with other CoML projects so that broader-scale comparisons are optimized (see Action 5, below). Prior to the main field effort, necessary new technologies should be adapted and tested in realistic environments. Preliminary cruises by the Norwegian Institute of Marine Research and the US National Marine Fisheries Service are being planned and could serve as platforms for such testing. Purchase of additional equipment and outfitting and scheduling of research vessels for the field phase will be a responsibility of individual investigators and their funding agencies but will have to be begun during the planning phase as sub-projects addressing the field tasks are funded.

Action 4: *Promotion of the pilot project and the field activities.* Assembling the proposed research and building support for it will require establishment of an international communications network. It is important to focus this effort on three subtasks: (a) recruiting potential investigators, (b) informing funding agencies, and (c) educating other interested parties, including the general public.

- (a) In order to accomplish the research outlined in this Science Plan, investigators interested in particular aspects of the plan will have to apply to appropriate funding agencies to support their specific activities. A team of qualified researchers will be assembled to ensure that the tasks of the field study and the analysis, assimilation and modeling phases of the project are accomplished. As soon as the Science Plan is approved, the Steering Committee will disseminate it to major research institutes on both sides of the Atlantic and through resources such as the BIONET.BIOLOGY.DEEPSEA and the Deep-sea Newsletter (see <http://www.le.ac.uk/biology/gat/deepsea/deepsea.html>). Interested persons will be able to obtain additional information from the MAR-ECO web site which has already been established (<http://www.efan.no/midatlencensus/>). A general-interest article explaining this project will be written and translated to several languages. Submission to a broadly circulated science publication (e.g., *Science* or *Nature*) is also planned.
- (b) To assist potential investigators in securing support for the research encompassed by this Science Plan, the steering group, in coordination with CoML staff, will inform major national and international funding agencies of the importance of this research and how it fits into the broader goals of the Census of Marine Life. The Steering Committee will offer to evaluate all proposals submitted under the auspices of this project for relevance and to eliminate duplication of effort.
- (c) A central goal of CoML and its pilot projects is that the activities and results become common knowledge. It is therefore essential that a strategy for information exchange and public relations be developed at an early stage. The MAR-ECO website will be a central focal point for education and outreach. Investigators will also be encouraged to coordinate with education agencies and non-governmental organizations to establish outreach activities such as real-time on-line coverage of field work. Dissemination of results in popular press and mass communications media, in addition to peer-reviewed scientific publications, will also be encouraged and facilitated.

Action 5: Coordination. MAR-ECO shall be multidisciplinary and international (see Science Plan), and all phases of the project will require both internal and external coordination. As noted above, the Steering Committee will coordinate sub-projects addressing tasks by working with investigators during proposal development and with funding agencies during the proposal review process. This is to ensure that all tasks are addressed but without unnecessary duplication. Members of the Steering Committee will also be designated for liaison with other CoML projects. If relevant similarity among separate CoML projects can be maximised, then broad-scale comparisons (e.g., between the MAR and the slope and seamounts off the Gulf of Maine or the slope of the Bay of Biscay) will be facilitated. Of particular importance will be coordination with OBIS to ensure that data from this project can be incorporated directly into that information system. Although coordination is obviously integral to all activities, the Steering Committee feels that the importance of coordination for a project this complex is so great that designation of coordination as a separate action is warranted.

3. Approach and Organisation

Organisation and responsibility

The already established MAR-ECO International Steering Group will be responsible for the planning process. Norway has offered to take on secretarial duties for the project, and the responsible institutions will be the Institute of Marine Research (IMR) in collaboration with the University of Bergen (UoB). The forum for the planning process will be a project formally embedded in the current activity plan of IMR but open to multi-institutional and international participation. A Norwegian planning group will be running the secretariat and report to the International Steering Group. The task of this national group is to organise meetings and carry out day-to-day tasks during the planning period.

The grant will be administered by the Office of Sponsored Research at the Virginia Institute of Marine Science, the School of Marine Science for College of William and Mary. The co-PIs for proposal is Dr. M. Vecchione, Dr. E.M. Burreson, VIMS Director of Research and Advisory Service, and Dr. O. A. Bergstad.

Networks

An informal network of experts has already been established and will be extended. The Steering Group is aware of the considerable interest in developing component projects under the MAR-ECO, and this interest will be nourished further in the immediate future using the web-site, direct contacts with experts and their institutions, promotion at meetings, in journals, and via web-based channels. Maintaining links to other CoML pilot projects and other relevant research programmes is also important.

Start-up workshop

A first essential aim for the Steering Group is to stimulate prospective PIs or groups of dedicated experts to take on the tasks of proposing core component projects for the field and analysis phases. This work has effectively already started, and the Steering Group will from now on concentrate on organising this work so that ideas can be turned into concrete proposals that can be submitted to funding agencies.

A workshop will be held in January 2002 in order to bring together PIs and project groups to develop project workplans and write proposals. At the same workshop, there will be sessions (perhaps onboard a research vessel) dedicated to methodology and technology, and also multidisciplinary sessions in which biologists shall define what methodological challenges have to be tackled to carry out specific investigations. The feasibility of the proposals in terms of technical capability should then become more clearly defined. Some central decisions will have to be made at this stage, e.g. regarding survey design and selection of sub-areas for detailed studies.

Planning cruises

The Steering Group has already explored the possibilities for carrying out deep-water cruises in 2002 as elements of the planning process. These cruises should be used for testing sampling methods, instrumentation, and procedures. Such testing will

stimulate new planning activities and reveal problems that need to be tackled prior to the main surveys in 2003.

Norway will dedicate about two weeks ship-time on one of her larger research vessels to such tasks, and Iceland may also have the opportunity to incorporate such activity on already planned cruises. The Norwegian vessel will probably operate in the Norwegian Sea and/or the deep fjords. Part of the time of a NOAA NMFS cruise to the New England seamounts in June 2002 will also be made available for relevant planning activities. The ship-time will in all cases be funded by national funding sources, but planning activities related to MAR-ECO will be supported by other funds.

Methodological projects during the planning phase

Some specific methodological sub-projects will be incorporated in the planning process. One is the further development of DNA-based population genetics for deep-sea fish species. Such a project focusing specifically on the macrourid fish *Coryphaenoides rupestris*, which is a wide-ranging inhabitant of the MAR, is already being proposed and partially funded through a collaboration between the University of Oslo (Prof. Nils Christian Stenseth) and the University of Southampton (Dr. Alex Rogers). A proposal will be submitted in June 2001 to NERC UK, and the Univ. of Oslo has already dedicated 6 months post-doc time to this project.

Another sub-project shall explore the possibilities for placing self-recording instrument packages on merchant ships crossing the relevant sea area. This implies both designing these packages and organising the technical and formal arrangements with shipowners and crew. A preliminary contact has already been made with Andreas K. L. Ugland A/S who has offered to assist the project with contacts in the shipping industry both in Norway and through the International Chamber of Shipping.

Other similar projects of technical nature will be supported by planning funds, e.g. the development of sampling methods for fish taking account of their tendency to regurgitate, adaptation of current ROV and AUV technology, and exploration of the applicability of various other innovative techniques and instruments as indicated in the Science Plan.

Iceland will undertake a deep-water cruise in June 2001 to test techniques for in situ tagging of deepwater fish. This method may become very useful for the distribution and behaviour studies planned for MAR-ECO and the already nationally funded testing in 2001 may be viewed as an element of the planning phase. Tagging of redfish may take place in 2002.

Another example of an already funded relevant activity is the recently approved Portuguese MAROV project: Coastal marine habitats, thematic mapping of the seabed, GIS, AUV (Autonomous Underwater Vehicles) & ASV (Autonomous Surface Vehicles) will be involving the use automatic plankton samplers in AUV around the Azores during the next three years. The AUV will be used for higher resolution acoustic mapping, ocean data acquisition, and video and photo image taking closer to the seabed. The technologies tested may be of future use for deeper seamount research. One of the activities in this project is placing an automatic plankton sampler

on an AUV. The total budget of that three-year project is 715,000 Euros. The technology developed during this project will in particular be ideal for the seamount ecology component of MAR-ECO (studies of habitat and animal distributions).

Data mining activity

Although the research activity on the MAR has been relatively small, sources of information exist that have not been fully explored or accessible. Sub-groups proposing component projects will be stimulated to compile this information and actively pursue all sources.

A very important and specific task is the compilation of charts and other bathymetrical data from the MAR. This is a prerequisite for other planning activities and a dedicated team will be established to be responsible for this activity.

A proposal concerning retrospective analyses for deep-water fish has already been outlined by Prof. Richard R. Haedrich (Memorial University, St. John's, Canada). Starting already in the end of 2001, a species list will be prepared with relative abundance indicated and distribution maps of important deep ocean fish species across the northern mid-Atlantic Ridge environment and the associated continental slopes. If the data permit, preliminary suggestions as to the main fish assemblages present will be made, and their overlap and continuity through the region determined. The species list and distribution maps will constitute essential background information for the field phase of MAR-ECO.

The data will be compiled from published Russian sources and fishery survey information. The most important and accessible data for these purposes are probably to be found in Canada, Greenland (some of these data are also kept in Germany), Iceland, Norway, and Ireland. Using the network of contacts within the project, these countries will be visited to explain the mid-Atlantic Ridge project, seek collaborators, and obtain geo-referenced time series data on the entire demersal fish community.

The data and the distribution maps of dominant species generated will be archived in a uniform electronic format at the Institute of Marine Research in Bergen, and will be available to all partners in the MAR-ECO project. This retrospective monitoring project will be cost-shared 50:50 with research support available from NSERC (Canada) and NSF (USA). This funding is already available.

Already initiated component project proposals

The genetics project already mentioned may develop and eventually become a component project of MAR-ECO extending beyond the planning phase.

However, there are also other proposals already underway. A German initiative concerning seamount ecology (SEACOS) has been submitted to the German Ministry of Science and Technology by Drs Uwe Piatkowski, Klaus von Bröckel, and Aike Beckmann of Kiel and Bremerhaven. The future of this proposal is still unclear, but if funded it could form the core of seamount investigations within MAR-ECO, especially if collaboration with other expert groups of e.g. the Azores and US partners be developed.

4. Schedule And Deliverables

The official starting month of the MAR-ECO planning phase will be October 2001, and this phase is scheduled to last for 18 months and then immediately be followed by the field phase outlined in the Science Plan. The following is a schedule for the planning period, including also deliverables (in italics). Towards the end of the planning phase a workshop will be convened to finalise plans for the field investigations that are scheduled to start in the summer of 2003. Component project proposals will be submitted to national funding agencies and the EU throughout the planning phase, and at the end a well-coordinated portfolio of component projects will form a solid basis for the subsequent field and analytical phases.

The schedule of the planning phase is as follows:

pre- October 2001.	Establish network and IMR project, alert prospective PIs, stimulate initiation of project building, inform funding agencies and directors of relevant marine institutes. Update website and maintain links. Promotion in journals and at meetings. <i>Deliverables:</i> <ul style="list-style-type: none">- <i>Active web-based network of experts.</i>- <i>Sub-groups of expert working on specific proposals</i>- <i>Genetics project proposal submitted to NERC UK</i>- <i>Raised awareness of MAR-ECO among institutes and funding agencies</i>- <i>Generalised MAR-ECO paper written and translated, ready for submission to e.g. Nature.</i>- <i>Promotion at e.g. ICES ASC, NAFO Deep-water Fish Symposium in Cuba.</i>
October 2001.	Start-up. International Steering Group Meeting. Presentation of MAR-ECO at 2001 An Ocean Odyssey in Argentina. <i>Deliverables:</i> <ul style="list-style-type: none">- <i>Forum for the planning process and a Norwegian steering group established at IMR in co-operation with UoB.</i>- <i>Final plan and invitation to the MAR-ECO workshop in January 2002 issued.</i>- <i>Report on activities to CoML.</i>- <i>Int. Steering Group member responsibilities allocated (promotion, liason with funding agencies, other programmes etc.)</i>- <i>Progress report on genetics project.</i>- <i>Raised awareness of MAR-ECO in IAPSO/IABO</i>
November 2001.	Start-up of data mining project and project to design instrument packages for merchant ships.
January 2002.	First MAR-ECO planning workshop. Part of workshop may be held onboard Norwegian vessel. <i>Deliverables:</i> <ul style="list-style-type: none">- <i>Drafts of a series of component project proposals</i>- <i>Progress report from data mining project</i>- <i>Plans for work programme on 2002 cruises</i>- <i>List of methodology/technology tasks to be tackled</i>
June 2002.	RV Delaware cruise (New England seamounts)

	<i>Deliverables:</i>
	- <i>Reports on tests of techniques, instruments, and methods.</i>
Summer-Autumn 2002.	Submission of component project proposals to funding agencies. Norwegian vessel cruise (exact time not scheduled)
	<i>Deliverables:</i>
	- <i>Proposals covering all central tasks of field phase submitted.</i>
	- <i>Results of data mining made generally available.</i>
August 2002.	Int. Steering Group meeting.
	<i>Deliverables:</i>
	- <i>Progress report on component project proposals.</i>
	- <i>Identification of tasks not covered by proposals.</i>
	- <i>Plan for the field phase.</i>
	- <i>Plan for the second MAR-ECO planning workshop.</i>
January 2003.	Second MAR-ECO planning workshop.
	<i>Deliverables:</i>
	- <i>Status report on component proposals, and co-ordination.</i>
	- <i>Allocation of ship-time and responsibilities</i>
	- <i>First draft of scientific crew list.</i>
	- <i>Identification of remaining planning tasks.</i>
April 2003.	End of planning phase.
	<i>Deliverables:</i>
	- <i>Status and progress report to CoML</i>
	- <i>Component project portfolio for field and analysis phase ready, and the majority financed. Final set of proposals ready for submission to funding agencies.</i>
	- <i>Plan for field phase ready.</i>

5. MAR-ECO Planning Phase Budget

The budget (Table 1) assumes starting date October 15, 2001, and duration 18 months. All amounts are given in \$US.

Running costs of the Steering Groups and secretariat also include some travel funds to promote the project and extend network. Included is the salary of a junior scientist/consultant for 12 months.

The budget includes the costs of two workshops, each with about 40 participants, and four international Steering Group meetings. One of the Steering Group meetings is the one held in Arendal, Norway 27-28 April 2001.

The Steering Group will provide funding to PIs and sub-groups of experts who develop component project proposals, and also to minor projects aimed at adapting technology and methodology for the field phase activity.

The already secured matching funds are the salaries and running costs provided from home institutes to the International Steering Group members (approx. 1,5 months each for ordinary members, and 12 months for chairman and support staff at IMR),

and the two-week Norwegian cruise in 2002 (running costs of ship and crew). Matching funds for data mining and genetics depend partially on the positive responses to proposals now being prepared, but as indicated in the previous chapter some funds have already been secured from national sources.

Norway, in collaboration with international partners, is involved in several marine technology projects that are highly relevant to the MAR-ECO observational strategy as described in the Science Plan. In collaboration with the industry and partially funded by the EU, development of vehicles and instrument packages for ROVs and AUVs is actively pursued in order to enhance observation and recording capability at the relevant time and space scales. One of the great challenges of MAR-ECO is to observe macrofauna near the sea-bed in rough terrain and at great depths. Collaboration with many of these projects will be established and will help MAR-ECO meet this challenge. Spin-off from these already funded activities, although difficult to quantify in monetary terms, is therefore included as matching activity in the budget.

It is planned to seek additional planning funding from the European Commission, either in the form of a “Concerted Action proposal” or component project proposals. Such processes will be initiated in the early autumn 2001.

Table 1. Budget for the MAR-ECO planning phase.

Removed

6. References

Bergstad, O.A. 2000. Patterns and processes of the ecosystems of the northern mid-Atlantic. A proposed Census of Marine Life initiative. Concept paper submitted to the Steering Committee of CoML, February 2001. Available on <http://www.efan.no/midatlencensus/>

Appendices

Appendix 1: MAR-ECO Science Plan.

Appendix 2: CVs of members of the MAR-ECO International Steering Group.