

MAR-ECO, a field project of the Census of Marine Life

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 for 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 represented by the Institute of Marine Research and the University of Bergen 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.

The project was given the acronym **MAR-ECO**, and has the following overriding aims:

"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 the ecological processes that cause variability in these patterns."

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MAR-ECO focuses on biodiversity of the macro- and megafauna associated with the Mid-Atlantic Ridge, e.g. crustaceans, gelatinous plankton, fishes and cephalopods. (*Meganycitiphanes norvegica* Krill).

MAR-ECO heading in the right direction

Following a period of intensive planning, the MAR-ECO project enters its challenging field phase. Two research vessels have already set to sea, and close to ninety international researchers are thrilled with excitement. Several of the ocean's well-kept secrets are about to be revealed.

SILJE GRIPSRUD

The Russian research vessel "Akademik Mstislav Keldysh" left Copenhagen on 3 June, headed for the Charlie-Gibbs Fracture Zone, a 4000m deep rift in the Mid-Atlantic Ridge where the deepwater flows between the ocean basins on either side of the ridge. Using two manned submersibles, the US and Russian crew as the first humans ever, dove to 3600 m below the surface to study and film animal life. Concurrently, the Icelandic vessel "Arni Fridrikson" sailed to the Irminger Sea and the northern part of the Mid-Atlantic Ridge known as the Reykjanes Ridge. The Icelandic, Faroese and American MAR-ECO scientists onboard will be studying zooplankton, redfish and other midwater animals, and also count whales.

- The project is running according to schedule, and the enthusiasm amongst those involved is high. The funding agency that supported the planning phase, the Alfred P. Sloan Foundation based in New York City, recently awarded us a field phase grant for the next two years, and several scientific sub-groups have worked out good project plans. It is a great pleasure to be part of all this, says the project leader for MAR-ECO Odd Aksel Bergstad, with a smile.

Basic research and management

MAR-ECO has ten interrelated scientific component projects, all with a broad international participation. The aim of these projects is not only to investigate the animal life along the Mid-Atlantic Ridge and provide new data to basic science, but also to contribute new knowledge to the advisory processes, hopefully facilitating a more sustainable management of natural resources and marine biodiversity.

- MAR-ECO aims to optimise the collaboration between basic science and the more management-orientated research, says Bergstad and explains that for all the animal groups under study, three aspects will be focused:
 - Firstly, the species identity, composition and distribution patterns will be mapped and analysed, and this also includes studies of population structure using molecular genetics.
 - Secondly, we will study trophic patterns, i.e. the food-webs of the communities, essentially "who eats who, and how". Most animals living in the deep sea are totally dependant on energy channelled to them from the productive surface layers above. The third aspect we focus on is the life history strategies of deep-sea animals. Questions may be: When do they become sexually mature? How often do they reproduce, and how many eggs do they lay? Why does the life spans differ so radically from species to species.
 - Take the deep water fish Orange Roughly for example; it can probably live to an age of 150 years, while some cephalopods (squids, octopuses) die after only 12 months. We want to investigate why this is the case, says Bergstad.

A joint effort between the public and the private sector

The largest international MAR-ECO expedition will take place in the summer of 2004. The Norwegian research vessel G.O. Sars will -from early June to early August- work along the Mid-Atlantic Ridge all the way from Iceland to the Azores.

- G.O. Sars is a fabulous ship providing exceptionally good working conditions. She is equipped with advanced instruments facilitating direct visual or indirect acoustical observation of the animals in their own environment. Furthermore, analyses of the data and biological samples, collected using a number of samplers and instruments, can begin right away in the laboratories onboard, a factor of great importance to the final results. We are also hoping to charter a commercial fishing vessel that can operate alongside G.O. Sars for a month next year, in order to expand sampling capability and capacity even further. Organisations in the Norwegian fishing industry assist us in our effort to finance such an operation which would give the scientists outstanding working conditions, says Bergstad.

He emphasises that MAR-ECO has attracted considerable interest and enthusiasm also beyond scientific circles. And the project is intended to succeed as a result of a collaboration between private and governmental funding agencies splitting the costs, something which is relatively rare in Norway. Until now the Sloan Foundation and national governments (through institutes and Universities) have provided the primary funding base for the project.

- We have approached several Norwegian international companies to explore the interest in the private sector. Thus far, Kongsberg SIMRAD is our only major industry sponsor

contributing instrumentation worth 1.4 million NOK. Of top priority now is to secure funding for the AUV "Hugin" (an autonomous vehicle that can operate independently to 3000 m depth), a deep-sea ROV (a tethered vehicle for observing and filming deep-sea life), and labour costs for the subsequent analysis phase. We also need funding for involving e.g. Russian experts in the project. I am still opt-



Odd Aksel Bergstad

imistic though; we are currently investigating several funding options both nationally and internationally, says Bergstad.

Public involvement through web-based and traditional channels

Sharing the research results with the general public is an important goal of the MAR-ECO project and the parent programme Census of Marine Life. It is

important that the new knowledge and exciting discoveries are quickly conveyed beyond the science community, and especially to young people, claims Bergstad.

- Our desire is to stimulate people's curiosity, and we are continuously exploring ways of presenting the research in an appealing fashion. In addition to an exhibition displaying material curated by the Bergen Museum and data from the cruises, plans include a book project and a television documentary. However, priority number one at present is establishing and maintaining a dynamic and informative web site, according to Bergstad.

- Our intention is to provide the means whereby students can follow the cruises via the internet, and even enter into dialogue with the researchers on board, says Bergstad. An international school network project is being developed. In addition to bringing the basic research forward and improving international nature management advice, Bergstad maintains that the MAR-ECO project will contribute significantly to scientific research in the open ocean through networking of scientists and recruitment of students to the field.

- The project has attracted several first-class scientists from many countries, and to Norwegian scientists and students, participating in MAR-ECO constitutes a major opportunity for international collaboration and training.



Kongsberg SIMRAD
MAR-ECO Industrial Partner.

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Mesmerizing encounter with the Mid-Atlantic

Ørnulf Opdahl has all his life been drawn to the sea. He has painted steep mountains plunging into the sea. The artist is now about to break the surface himself and explore the underwater world.

SILJE GRIPSRUD

- I remember the first time I realised that the sea has more than one face; I had signed on a fishing boat for a few months, and we were fishing for cod. It was a surprise to me that the fishermen were so well acquainted with all the variations under water; they read the landscape below the surface, just as well as the one above, or maybe even better. All of a sudden it became clear to me that there were vast areas yet to explore, a landscape concealed in the dark deep. The thought was at the same time comforting and scary, says Ørnulf Opdahl pointing as he speaks to a steep rock wall seen from his kitchen window.

- It is virtually impossible to grasp that this majestic mountain is nothing compared to the Mid-Atlantic Ridge.

Opdahl is taking us to the island Godøy outside Ålesund; this wind-ridden spot on earth, where the painter and the textile artist Sidsel Colbiørnsen settled in the early seventies. He wants to show us the landscape where all his motifs stem from; the view from the blue-painted living room, the spectacular panorama seen from his studio. This April afternoon offers a rapid change of weather; hail hammers the house at first, the soothing sun takes over next. The weather reveals all the abstracted expressions in Opdahl's art; the colours range from dark grey tones, to the powerful ochre.

It is 2003, a year before Opdahl goes on board the research vessel G. O. Sars, in order to find motifs from the Mid-Atlantic Ridge and the varied, mystical animal life under water. The artist is thoroughly excited by the thought of this trip, and his mind has already stepped on board.

Drifted away.

An old painting of a ship is the focal point of the blue timbered wall. Opdahl explains that the ship went down in 1909; his grandfather, who was the captain, went down with it and nine children became orphans. Opdahl has sailors and sea captains on both sides of the family. At thirteen Opdahl confidently informed his parents about his future plans: Sailor or artist. His parents did not let him sign on as a sailor, hence Opdahl painted his way into the National Academy of Art and Design as a sixteen year old, and into the National Academy of Fine Art the year after. He settled down in Oslo when he had completed his education, yet he carried this perpetual longing for the Western coast, the mountains and the ocean. Although the homesickness was present within him, it was the green, ecological sentiments of the seventies that finally brought them to the small, deserted farm at Godøy; a life by the



sea that included sheep, hens and the raising of children. And art. His pictures have, throughout the years, been subjected to various different influences, but the closeness to the sea has always been evident in his work.

- I am addicted to the sea, I cannot picture myself living anywhere else, says Opdahl.

You can see it through the window; the farmland which turns into sea shore. The blue-grey sea merging with the black mountains and the soft horizon. Everyone who comes to visit is mesmerized and taken by this view; faced with a landscape like this, it is difficult not to utter anything but clichés. The impressions are best captured in pictures. In Opdahl's plain form.

- It is hard to avoid flamboyancies when one is trying to capture these surroundings in a painting. You cannot dwell on the details. I stare and stare and absorb the feeling of it all, and then it has to mature within myself before I can give form to it. Almost all my paintings have emerged from striking experiences I have had in nature. These are the moments I search for, these are the ones that create good art. Thus I always have to be in some sort of constant emotional movement.

- I cannot camp on the sofa, waiting for the lightening to strike, he adds with a smile.

Opdahl thinks that the MAR-ECO project and the cruise with G. O. Sars will offer numerous experiences of this kind. He has flicked through books with pictures of species living 2-3000 metres below sea level; creatures that are beyond imagination. He has met with the international



Ørnulf Opdahl

scientists he will be spending six weeks at sea with. They hope to discover 150 new species, and have given Opdahl a hint of what to expect. He can hardly wait.

- Just imagine: Down there in the infinite darkness, the sperm whale hunts down octopuses and squids. It is an enigma how they do it. One of the

researchers told me that the reason why the sperm whale succeeds, might be that it has extremely strong sonars which helps it navigate in the dark, and they are maybe even used to anaesthetize the octopus. Furthermore I was told that several of the creatures produce light themselves, so called bioluminescence. One of the goals on this research trip is to investigate and find out more about how these things work. These accounts about the life under water certainly fuel my imagination!

It is easy to be taken by Ørnulf Opdahl's way of telling stories; the one about the otter he saw by the water yesterday, the fat plaice he caught, how he loves his trade or the account of his urge to explore.

- I feel some kind of fellowship with the scientist. We both base our work on knowledge and imagination. One has to be creative and innovative in order to reach the next step, to understand and explore new things and areas, says Opdahl before he pauses and adds:

- Research and art can benefit mutually from being together. My contribution will naturally be in the presentation of the scientific results and material. The enthusiasm which marks this whole MAR-ECO project, the thrill one experiences faced with new discoveries, can best be captured by art, not in a scientific report. Scientific articles may lack something when it comes to this...

Painters used to participate on scientific research trips in the earlier days. Before the invention of the digital camera and other electronic equipment, the discoveries were documented with pen on paper. However, some researchers did this job themselves. Both the marine biologist G.O. Sars and Fridtjof Nansen made some fine illustrations, which have impressed Opdahl with their artistic quality.

- I will bring with me my laptop and digital photo equipment, in addition to pastels and water colours. I might suit the label old fashioned in some areas, however technical equipment is a useful tool in my work; I can preserve the impressions on disc as well as in my head, and process them when I return home, says Opdahl before he gets up and finds the key to the studio next door.

The smell of wood and tempera enchants the big, spacious studio rooms. This is where Opdahl spends most of his day. Leisure time is a foreign word to him, especially after the children moved out. His images might come to him while he is asleep, thus he has to reach them by moving slowly, removing one layer after the other, using colours mixed with

sand from the garden, using oil and egg as binders.

Canvases hung close together in one end of the building; the floor covered with specks of paint and metal containers. A sofa in the other end of the room, one can sit back and take in the almost ready paintings, framed, just waiting for a name. The titles are born in the process of painting. They are written directly on the wall: "The day dies", "Light born in darkness", "The meteorology of melancholy".

- Come here, I will show you something! I might want to continue doing this when I have returned from the trip with G.O. Sars, says Opdahl and pulls out a series of prints made with the shoemaker's roller he bought as a penniless student.

Opdahl has used old sea maps as a background. Compass cards and contour lines shine through grey and



white brush strokes; makes one think of cold mountains and a frozen heart. It is a map over the north-western bit of the Barents sea. However, sea maps is not the only background he has used. He has sailed seven times with his own ship. He has taken the hundred years old lady "Elizabeth" several places; the Faroe Islands, the Orkneys, Shetland. He is already planning a new trip, but a little bird has told him that his wife has bought tickets for a boat expedition along the coast of South America as his birthday present. He turns 60 in 2004; a good age for plunging into new adventures and to explore the Mid-Atlantic ridge, according to himself.

- The most fascinating and exciting thing is that I do not know which expression I will end up with. I have been through various phases in my artistic development, and now I feel I am on the track of something new. Maybe my participation in the MAR-ECO project will alter my artistic expression totally. I am up for it.

Facts/ Ørnulf Opdahl

Born 1944, Ålesund
 Education: National Academy of Art and Design, Oslo National Academy of Fine Art, Oslo
 Professor at the National Academy of Fine Art
 Represented in several collections, amongst them: National Museum, Oslo
 Museum of Contemporary Art, Oslo
 Astrup Fernley Museum of Modern Art, Oslo
 Bergen Billedgalleri, Bergen
 Rolf Stenersen Collection
 Stavanger, Trondheim
 Ålesund's permanent collections
 Several separate shows in the Nordic countries, as well as Great Britain.