A global census of marine life on seamounts (CenSeam)

PIs
Malcolm Clark
National Institute of Water and Atmospheric Research
301 Evans Bay Parade
Greta Point
Wellington
New Zealand
Phone: (+64) 4 386 0300 FAX: (+64) 4 386 0574 E-mail: m.clark@niwa.co.nz

Ashley Rowden
National Institute of Water and Atmospheric Research
301 Evans Bay Parade
Greta Point
Wellington
New Zealand
Phone: (+64) 4 386 0394 FAX: (+64) 4 386 2153 E-mail: a.rowden@niwa.co.nz

Karen Stocks
University of California San Diego, SDSC
9500 Gilman Drive # 0505
La Jolla, CA 92093-0505
USA
Phone: (+1) 858 534-5009 Fax: (+1) 858 822-3610 E-mail: kstocks@sdsc.edu

Project Manager
Mireille Consalvey
National Institute of Water and Atmospheric Research
301 Evans Bay Parade
Greta Point
Wellington
New Zealand
Phone: (+64) 4 386 0853 FAX: (+64) 4 386 0574 E-mail: m.consalvey@niwa.co.nz

Education and Outreach Network Liaison
Mireille Consalvey
National Institute of Water and Atmospheric Research
301 Evans Bay Parade
Greta Point
Wellington
New Zealand
Phone: (+64) 4 386 0853 FAX: (+64) 4 386 0574 E-mail: m.consalvey@niwa.co.nz

http://censeam.niwa.co.nz/

1. 2006 ACCOMPLISHMENTS & SCIENTIFIC HIGHLIGHTS

In February 2006 the CenSeam Data Analysis Working Group (DAWG) met in Wellington, New Zealand to synthesize the current state of knowledge on the potential vulnerability of deep-sea corals to fishing on seamounts beyond areas of national jurisdiction. The meeting brought together leading scientists in the field to discuss not only current knowledge, but future analyses. The meeting was funded by the Dutch Ministry of Agriculture, Nature and Food Quality with CenSeam supporting a second meeting in association with the 11th Deep Sea Biology Symposium (DSBS; Southampton, UK). Some of this work was presented at the 11th DSBS and a report was delivered to the Dutch Ministry on the 15th of August. Overall the results highlighted a broad band of the southern Atlantic, Pacific and Indian Oceans between about 30°S and 50°S, where there are numerous seamounts at fishable depths, and high habitat suitability for corals at depths between 250m and 750m (the preferred alfonsino fisheries depth range), and again -but somewhat narrower- between 750m and 1,200m depth (the preferred orange roughy fisheries depth range). In addition, the report identified that there are large gaps in the current knowledge of the distribution of seamounts and the biodiversity which they harbour. Furthermore to establish and implement adequate and effective management plans and protection measures for these areas beyond national jurisdiction will present major challenges for international cooperation. In the light of these findings, the report recommends a number of activities to be carried out in a collaborative approach between all stakeholders under the following headings: *a)Precautionary management of seamounts and associated ecosystems and resources and b) Further and improved seamount research.*

Seamount scientists have identified difficulties inherent in finding seamount faunal datasets that can be combined to undertake robust analyses. DAWG will work towards gathering complete data sets, and filling in data gaps. The involvement of taxonomists is central to this process and DAWG members will liaise with taxonomists to fully reconcile data from the South Pacific (an area identified by CenSeam as being under-studied). At present the data is being gathered taxon by taxon and at the next DAWG meeting (December 2006, to coincide with the Seamount Biogeosciences Network (SBN) seamount session at the Fall American Geophysical Union meeting) the possibility of combining data for the different taxa will be considered.

The first CenSeam linked voyage sailed in May 2006 to New Zealand's Graveyard seamount complex (funded by New Zealand Ministry and Fisheries and the Foundation for Research, Science and Technology). The aims of the trip were to re-visit some seamounts that have previously been sampled in order to monitor changes in the fauna against a variety of levels of fishing activity, as well as sampling closed seamounts. A daily log was sent from ship to shore describing the scientific activities as well as life on the ship (http://censeam.niwa.co.nz/outreach/censeam_graveyard). Visitors to the site were able to view deep-sea photographs taken that day, as well as pictures of the organisms that were collected. Furthermore, through contact with taxonomists on shore we were able to identify a potential new species of carnivorous sponge.

This was not the first new species, in April 2006 CenSeam linked scientist Bertrand Richer de Forges described a new species of the genus *Neoglyphea*. The Glypheides were well known from the Jurassic and Cretaceous periods and were supposed to be extinct at the Eocene (about 50 million years ago).

In 2006 CenSeam awarded a total of US$ 55645 in mini-grants. Work has now commenced on all projects which range from recovering data from former Soviet Union expeditions to examining the genetic diversity of corals between seamounts to aiding the completion of a deep-sea protocols

document. The first recipients to spend their funding were Verena Tunnicliffe and John Dower from the University of Victoria, Canada. A mini-grant funded their participation in the recent NOAA Ring of Fire '06 expedition exploring the submarine volcanoes lying along the Mariana Arc aboard the R/V Melville. On this trip the scientists aimed to collect samples of a new flatfish species discovered on the 2004 SROF cruise, and which seems to make a living by digesting bacteria from the sediments.

In 2006 the CenSeam SC held a meeting in association with the 11th DSBS. The meeting provided an ideal platform to network with seamount researchers from around the world and further expand the CenSeam network of taxonomists/researchers. Many members of the SC presented work at the symposium.

Overall, in 2006 CenSeam scientists have increased our knowledge of the species that inhabit seamount ecosystems and the environmental variables that underpin species distribution. We have identified significant gaps in our knowledge but through a concerted effort have brought new data to the fore and gained new insight into the threats to seamount ecosystems.

2. SOCIETAL BENEFITS, IMPACT & APPLICATIONS

In March 2006 the International Seabed Authority held a workshop entitled “Cobalt-Rich Crusts and the Diversity and Distribution Patterns of Seamount Fauna”. The aim of the workshop was to determine the impact that exploration and mining activities related to cobalt-rich crusts will have on seamounts and their associated biodiversity. The core aims were to: (1) Assess patterns of diversity and endemism of seamount fauna including the factors that drive these patterns; (2) Examine gaps in current knowledge of these patterns with a view to encouraging collaborative research to address them, and (3) Provide the Legal and Technical Commission with recommendations to assist it in developing environmental guidelines for future contractors. This workshop was attended by members of the CenSeam SC and Data Analysis Working Group, as well as members of CenSeam’s taxonomy network. Overall it was anticipated that the expert knowledge gained from the workshop would allow for a better determination of the data and information that will be required from contractors when establishing environmental baselines and associated monitoring programmes.

The United Nations General Assembly has called, inter alia, "for urgent consideration of ways to integrate and improve, on a scientific basis, the management of risks to the marine biodiversity of seamounts, cold water coral reefs and certain other underwater features." In October this issue will be discussed in New York. The report prepared by the Data Analysis Working Group on the “Vulnerability of deep-sea corals to fishing on seamounts beyond areas of national jurisdiction” provides new information and scientific opinion on the issue of bottom-trawling in areas outside of national jurisdiction and has been made available to inform discussions.

The CenSeam linked voyage in New Zealand’s Graveyard seamount complex targeted seamounts that have been closed to fishing, as well as those that remain open – all with different fishing histories – which may feed into national decisions regards strategies for managing seamount fisheries of New Zealand.

To address the growing concern over unsustainable rates of exploitation, in many areas, of deepwater fisheries the FAO will hold an Expert Consultation on Deep-sea Fisheries in the High Seas from 21-23 of November 2006 in Bangkok, Thailand. The Consultation will focus on the management and

conservation of deep-sea fisheries including discussion and analysis of: (1) Options for management; (2) Creation of protected areas; (3) Regulation and compliance; and (4) Guidance for compatible management options within EEZs. This meeting will represent a first step in the deep-sea fisheries component of an ongoing project, with the end goal being the development of technical guidelines for the conservation and management of deep-sea fisheries and ecosystems. Several members of the CenSeam SC will be attending this meeting, joining a wide variety of experts (e.g. technical, legal, political).

In 2006 work has continued on the CenSeam protocols manual, in consultation with researchers around the world. The manual is still under preparation but will be disseminated early 2007 and will be considered as a work in progress, being revised in light of experiences in local application.

3. WORK PLANNED FOR 2007

The CenSeam resubmission bid will be submitted on 15 January 2007. In the event of being successful CenSeam Phase II will commence on 1 April.

In between now and March 31 CenSeam has atleast one further voyage to the seamount Rumble III (NE of New Zealand). The aim of this voyage is to determine the influence of Rumble III on the water column, through measuring: (1) Hydrographic circulation; (2) Environmental conditions; (3) Plankton distribution and abundance and, if possible, to additionally examine trophic linkages between plankton, benthic invertebrates and demersal fish on the seamount. A voyage log will be maintained and analysis will be ongoing into 2007.

The Data Analysis Working Group has one further meeting planned at the end of 2006 and work will be on-going into 2007. The group will identify, in collaboration with taxonomists, suitable seamount faunal datasets from the South Pacific to enable robust analyses. It is anticipated that this work will lead to several publications and enhance our knowledge and understanding of seamount fauna biodiversity, as well as address hot topics such as endemism.

CenSeam researchers will further make data available to SeamountsOnline.

The Standardisation Working Group will make available a revised set of seamount protocols. This will be disseminated on the internet and through our newsgroup. The protocols will be available to all future CenSeam voyages and will aid cross comparisons between different programmes.

Additionally numerous proposals have been submitted by CenSeam linked scientists and a selection are detailed below:

- A proposal has been submitted to the National Institute of Oceanography in India to support a CenSeam voyage to the Indian Ocean in 2007. This voyage would bring together scientists from a range of disciplines and institutions to examine seamounts in the Indian Ocean (an area identified by CenSeam as being under-studied) (Baban Ingole, India)
- A consortium bid was submitted to the Natural Environment Research Council (UK) to examine “What determines the species diversity of seamount communities in the Northeast Atlantic and how are they maintained?” (Alex Rogers, UK)

- A proposal has been submitted to the NOAA OE to examine the "Biogeography of Deep-Sea Corals from North Pacific Seamounts and Discovery of New Species Using Molecular Methods" (Amy Baco-Taylor, USA)
- A proposal has been submitted to the NOAA OE to examine "Top Down Pressure Shaping Subphotic Ecosystems: The Deep Foraging of Monk Seals" (Frank Parrish, USA)
- A proposal has been submitted to the NOAA OE called "Resting on Old Pillows: Deep-Water Faunal Development" (Craig Young, USA)
- A proposal has been submitted to examine "Mid-depth benthic communities of conservation importance in the Azores: cold-water coral ecosystems" (Gui Menezes, Portugal)
- A proposal has been submitted to examine "Cetacean habitat associations in oceanic ecosystems: an integrated approach" (Gui Menezes, Portugal)
- A proposal has been submitted to the FRST on establishing a biogeography of seamounts in the South Pacific, with particular emphasis on the New Zealand region (Paul Brewin, USA/New Zealand)
- A proposal has been submitted to examine seamounts in the Cape Verde regions (Bernd Christiansen, Germany)

In between now and the completion of CenSeam Phase I the mini-grants will be completed and numerous publications and outreach deliverables are anticipated to be associated with these.

Finally, in recognition of the CoML All-Program meeting coming to New Zealand in 2007 CenSeam is linking with Mark Costello (OBIS) to host the meeting and ensure good media coverage of the event.

4. EDUCATION & OUTREACH

The Education and Outreach effort has included the public as well as scientists and managers.

In terms of public outreach the CenSeam web page continues to be up-dated and expanded. Most recently voyage logs from the recent voyage to New Zealand's Graveyard complex were sent from ship to shore enabling visitors to keep up to date with the trip in almost real time. The logs contained information on the science behind the trip, as well as details of life on board. The web pages were viewed by members of the public as well as by managers and scientists, including taxonomists who were able to potentially identify a new species of sponge. The web page has been successful and the voyage logs increased the number of hits.

At a local level several presentations have been given in New Zealand to school-children and other members of the public detailing seamount ecosystems and the CenSeam project.

2 newsletters have been released this year detailing on-going seamount research activities and the people behind them. The newsletters have also been used to advertise upcoming meetings/conferences as well as for attendees to report on meetings/conferences. At this stage the newsletters target scientists but in CenSeam Phase II newsletters that target the general public will be introduced. There has been a positive response to the newsletters demonstrated by requests to advertise events etc.

The outreach effort has continued through building up a network of taxonomists who have worked on seamounts and a general seamounts expert list is currently being compiled. These will be made

available through the website and newsletters to facilitate greater levels of communication at a global scale.

A CenSeam sponsored book “Seamounts: ecology, fisheries and conservation” (eds. T. Pitcher, P.J.B. Hart, T. Morato, M. Clark and R.S. Santos) is to be published by the Blackwell Science Fish and Aquatic Resources Series later this year. This book brings together many of the key names in seamount research, not only reviewing our state of knowledge but synthesizing new data. The target audience of this book includes students, scientists as well as managers and policy makers. It is anticipated that this will be a significant CenSeam output.

The Dutch Ministry Department of Agriculture, Nature and Food Quality sponsored a report prepared by the Data Analysis Working Group on the “Vulnerability of deep-sea corals to fishing on seamounts beyond areas of national jurisdiction”. The report combines new information and scientific opinion on the potential impacts of bottom-trawling in areas outside of national jurisdiction and could have considerable impact on policy decisions. The report is of interest to managers/politicians and follow on publications in the primary literature will be of direct interest to scientists.

Links have also been established with the European project DESEO (Deep Seas Education and Outreach) and it is anticipated that CenSeam will feed into future activities.

5. GEOGRAPHIC EXPANSION

In the past year members of CenSeam’s Data Analysis Working Group (DAWG), in conjunction with authors of the Blackwell Scientific Seamounts book, compiled a database of cold-water corals. The database further demonstrated that sampling of seamounts has not taken place evenly across the world’s oceans and that there are significant geographic gaps in the distribution of studied seamounts e.g. for some regions, such as the Indian Ocean, very few seamount samples are available. From the data it was possible to model the global extent of habitat suitability for stony corals for the first time. This information was then used to assess the potential impact of seamount stony corals to fisheries e.g. Alfonsino and Orange Roughy.

CenSeam’s DAWG is now starting to liaise with taxonomists to fully reconcile data from the South Pacific (an area identified by CenSeam as being under-studied). The DAWG will meet in December to assess the current state of knowledge, and then work together to progress a comprehensive and standardized analytical approach.

Both activities of the DAWG will significantly expand the geographic scope of CenSeam. At the same time as ensuring a comprehensive global analysis of existing data it is essential to move forwards with field activities. Whilst seamounts in general are under-studied CenSeam has identified the Southern Pacific and Southern Indian Oceans as being “target areas for research”. However, this should not be at the expense of other regions.

Numerous proposals have been submitted and most oceans of the world have been targeted by seamount scientists including the Indian Ocean, Northeast Atlantic, Southern Atlantic, North Pacific, South Pacific and Southern Oceans.

Part of the geographic expansion of CenSeam will involve liaisons with other Census of Marine Life Field programmes including MAR-ECO (expanding into the South Atlantic) and CAML (expanding into the Southern Ocean for International Polar Year).

Furthermore in recognition of gaps in knowledge 2 new members have been invited to the CenSeam SC: (1) Tina N. Molodtsova (Russia) in recognition of her general knowledge of the South Pacific (e.g. the Nazca and Sala Y Gomez seamount chain) as well as invertebrate fauna (in particular the ceriantharians and antipatharians) and (2) Shinji Tsuchida (Japan) in recognition of his knowledge of previous, as well as ongoing Japanese deep-sea and seamount research.

6. PARTNERSHIPS & COLLABORATION

a. Partnerships

Organization Name	Point-of-Contact (Name)	Nature of Relationship
OASIS 2	Bernd Christiansen	Some of the OASIS 2 research themes cross over with CenSeam core themes
HERMES	Martin White	Some of the HERMES research themes cross over with CenSeam core themes
Shirshov Institute (Russia)	Tina Molodtsova Andre Gebruk	Planned Russian Submersible voyages throughout the globe in 2007. Whilst the trips will not be focusing on seamounts they will sample some, and there could be some berths available. Potential link with MAR-ECO
National Institute of Water and Atmospheric Research (New Zealand)	Don Roberston	Host of the CenSeam secretariat and ongoing seamounts research programme which feeds into CenSeam
Seamount Biogeosciences Network	Karen Stocks	Establishing linkages between the projects and opportunities for collaboration
National Institute of Oceanography	Baban Ingole	Trying to pursue funding to expand the geographic scope of CenSeam into the Indian Ocean
CSIRO	Alan Williams	In the process of establishing linkages including standardising protocols, cross-referencing between taxonomists as well as monitoring and performance assessment in deep water MPAs

b. Links to Other CoML Ocean Realm Projects

Project Name	Cross-Over Person(s)	Nature of Relationship
MAR-ECO	Gui Menezes Franz Uiblein	Establishing linkages and common ground between projects e.g. including expansion into the Southern Atlantic
COMARGE	Thomas Schlacher	Establishing linkages and common ground between projects
ChEss	Ashley Rowden	Establishing linkages and common ground between projects e.g. venting seamounts
CAML	Michael Stoddart Victoria Wadley	Establishing linkages and common ground between projects, with particular emphasis on collaboration for International Polar Year

c. Links to CoML National and Regional Implementation Committees (NRICs)

NRIC	Liaison or Cross-over personnel	Nature of Relationship
Australia		
Canada		
Caribbean		
China		
Europe	Bhavani Narayanaswamy	Establishing linkages and common ground between projects e.g. links with recent bids for seamount research in Europe
Indian Ocean		
Japan		
South America		
Sub-Saharan Africa		
USA		

d. Liaisons to CoML Cross-Cutting Groups

Project Name	Liaison Name & Institution	Nature of the Relationship
OBIS	Karen Stocks	Maintaining close contact for support and advice relating to data provision/support e.g. for CenSeam's Data Analysis Working Group
HMAP		

FMAP	Ram Myers/Derek Tittensor	Maintaining close contact for support and advice relating to CenSeam's Data Analysis Working Group
SCOR Tech Panel	Alex Rogers	Liaising to enable CenSeam to capitalize on SCOR advice and recommendations
E&O	Mireille Consalvey	Have had contact with Darlene Trew Crist regards many aspects of Education and Outreach, particularly advice at the start of CenSeam
Barcoding	Tim Shank Malcolm Clark	Liaising to enable CenSeam to capitalize on recommendations and so that CenSeam can develop DNA protocols

e. Effectiveness of the Partnerships and collaborations

Since the start of CenSeam in 2005 we have had positive interactions with the cross-cutting groups detailed above, Euro-CoML and other Ocean Realm projects. Everyone has been very helpful in our planning and expansion phase providing useful advice on many aspects of our work.

In response to section (c) above: whilst CenSeam has coverage in many of the regions listed, the potential for formal collaborations should be identified and pursued in the coming months.