

Deep-Sea Life

Issue 1, March 2013

Welcome from the Editor

Welcome to the first edition of Deep-Sea Life: a new informal publication for the deep-sea biology community. This newsletter aims to deliver current news regarding projects, new papers, meetings and workshops, cruises, student progress, jobs and training opportunities, opinion pieces and other useful information for the science community and all interested parties.

Deep-Sea Life was inspired by the original Deep-Sea Newsletter that many of us will remember fondly, which started in October 1978 and was tirelessly edited by Dr Torben Wolff (University of Copenhagen). The newsletter was intended to open regular communication between the European and, latterly, the international deep-sea community and was closely associated with the Deep-Sea Biology Symposia, which started in 1981. This publication was very well-received and much appreciated by the community. The entire back catalogue of the Deep-Sea Newsletter (1978-2005) is now available in scanned form via the INDEEP website (thanks to Gary Poore, Museum Victoria, Australia): www.indeep-project.org/news/deepsea-newsletter-archive-now-online.

It is my sincere hope that Deep-Sea Life (currently hosted by INDEEP and published digitally twice per year) will be a useful read and will enhance our communication on an international level. I would very much appreciate any feedback regarding any aspect of the publication, so that it may be improved as we go forward. Please circulate to your colleagues and students who I have not reached as yet, and have them contact me if they wish to be placed on the mailing list for this publication.

I would like to thank the 61 contributors from 20 different countries that have led to this bumper first edition. Long may such enthusiasm to share your news and views continue! I would finally like to sincerely thank Dr Abigail Pattenden (University of Limerick, Ireland) and Dr Eva Ramirez-Llodra (ICM-CSIC, Spain) for their invaluable help with production.

Dr Maria Baker (Editor)

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This beautiful polynoid was captured by Deep-Sea Photographer, David Shale (now available for all your sea-going photography requirements. Contact: davidmshale@mac.com)

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The International Deep-Sea Biology Symposium Goes South

Author and Symposium Organiser: Ashley Rowden, NIWA, NZ

The 13th International Deep-Sea Biology Symposium was held for the first time in the Southern Hemisphere when it washed up on the shores of Wellington, New Zealand in December 2012. Despite the geographical isolation of New Zealand, and the current economic climate, the symposium was well attended. There were over 220 participants from over 20 countries, representing universities, private and government institutes, NGOs, industry, and the media. Talks and posters covered a very wide range of topics, although interest in biodiversity and matters benthic still apparently dominates deep-sea research 30 years after the first deep-sea biology symposium took place. Nonetheless the conference programme gave encouraging signs of a growing focus on the understudied pelagic realm, as new techniques to sample this environment become more widely available. There were also indications that more sophisticated research approaches are being used to provide scientific guidance for the conservation and management of the oceans. The symposium provided an impromptu forum for discussion around setting up this newsletter and a Deep-Sea Society, and no doubt many other conversations that will spark new initiatives among members of the deep-sea community.

The symposium was held at the Museum of New Zealand/Te Papa Tongarewa, hosted by the National Institute of Water & Atmospheric Research. During the week of the symposium the city of Wellington provided an example of its reputation as a place of changeable weather, and typically saved its best conditions for the excursion afternoon and the evening of the conference dinner. Not that the weather influenced the high spirits of the latter event. As is traditional, the symposium closed with presentations from those offering to host the next meeting - followed by a plebiscite. The vote was very close, and could have been swayed by the economic analysis made by the winning proposer. After its brief sojourn down south, the International Deep-Sea Biology Symposium will migrate back to the northern hemisphere and take place in Aveiro, Portugal.



Clockwise from top left: An excellent rendition of Maori culture was enjoyed by the DSBS audience during the opening ceremony; Ashley Rowden, NIWA and the supergiant amphipod from the Kermadec Trench (Credit: CHRIS SKELTON/FAIRFAX NZ); James Cameron, right, delivered a talk about his deep-sea exploration at the International Deep-Sea Biology Symposium at Te Papa. With him are NIWA's Ashley Rowden, left, and Woods Hole Oceanographic Institute's Tim Shank (Credit: ROSS GIBLIN/Fairfax NZ); delegates enjoying the social side of the conference (courtesy of Ann Vanreusel)

Hot off the Press

A recent study on azooxanthellate Scleractinia identification key

Dr Stephen D. Cairns and Dr Marcelo V. Kitahara (2012)

ZooKeys 227: 1–47

Azooxanthellate scleractinian corals are reported from off continental Antarctica (Cairns, 1982) to the Arctic Circle (Roberts et al., 2009) and although most species commonly occur between 200 and 1000 m (Cairns, 2007), some are able to inhabit waters as deep as 6300 m (Keller, 1976), with temperatures as low as -1°C (Vaughan & Wells, 1943). The ready identification of azooxanthellate Scleractinia to the genus and species level has been hampered by the lack of a comprehensive key to the genera as well as a lack of species level keys. For instance, the last comprehensive set of keys to the genera was published by Vaughan and Wells (1943) almost 70 years ago. Since then the number of recent azooxanthellate genera and species has almost doubled, and new observations on apozooxanthellate species (species that have facultative symbiosis with zooxanthellae) are also available. Thus, Cairns and Kitahara (2012) provide a single, comprehensive, illustrated key to the presently recognized 120 azooxanthellate scleractinian genera and 7 additional subgenera. The key was constructed using gross morphological characteristics of the corallum, which, when used in conjunction with the glossary and illustrations, should provide a guide to the proper genus identification.

Link to the paper:

<http://www.pensoft.net/journals/zookeys/article/3612/an-illustrated-key-to-the-genera-and-subgenera-of-the-recent-azooxanthellate-scleractinia-cnidaria-anthozoa-with-an-atta>

Patterns and controlling factors of species diversity in the Arctic Ocean

Yasuhara, M., Hunt, G., van Dijken, G., Arrigo, K. R., Cronin, T. M., Wollenburg, J. E. (2012)

Journal of Biogeography, 39: 2081–2088.

The Arctic Ocean is one of the last near-pristine regions on Earth and, although human activities are expected to impact on Arctic ecosystems, we know very little about baseline patterns of Arctic Ocean biodiversity. This paper aims to describe Arctic Ocean-wide patterns of benthic biodiversity and to explore factors related to the large-scale species diversity patterns. We used large ostracode and foraminiferal datasets to describe the biodiversity patterns and applied comprehensive ecological modelling to test the degree to which these patterns are potentially governed by environmental factors, such as temperature, productivity, seasonality, ice cover and others. To test environmental control of the observed diversity patterns, subsets of samples for which all environmental parameters were available were analysed with multiple regression and model averaging. Well-known negative latitudinal species diversity gradients (LSDGs) were found in metazoan Ostracoda, but the LSDGs were unimodal with an intermediate maximum with respect to latitude in protozoan foraminifera. Depth species diversity gradients were unimodal, with peaks in diversity shallower than those in other oceans. Our modelling results showed that several factors are significant predictors of diversity, but the significant predictors were different among shallow marine ostracodes, deep-sea ostracodes and deep-sea foraminifera. On the basis of these Arctic Ocean-wide comprehensive datasets, we document large-scale diversity patterns with respect to latitude and depth. Our modelling results suggest that the underlying mechanisms causing these species diversity patterns are unexpectedly complex. The environmental parameters of temperature, surface productivity, seasonality of productivity, salinity and ice cover can all play a role in shaping large-scale diversity patterns, but their relative importance may depend on the ecological preferences of taxa and the oceanographic context of regions. These results suggest that a multiplicity of variables appear to be related to community structure in this system.

Link to the paper: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2699.2012.02758.x/abstract>

Climatic forcing of Quaternary deep-sea benthic communities in the North Pacific Ocean

Yasuhara, M., Hunt, G., Cronin, T. M., Hakanishi, N., Kawahata, H., Tsujimoto, A., Ishitake, M. (2012)
Paleobiology, 38: 162–179

There is growing evidence that changes in deep-sea benthic ecosystems are modulated by climate changes, but most evidence to date comes from the North Atlantic Ocean. Here, we analyze new ostracod and published foraminiferal records for the last 250,000 years on Shatsky Rise in the North Pacific Ocean. Using linear models, we evaluate statistically the ability of environmental drivers (temperature, productivity, and seasonality of productivity) to predict changes in faunal diversity, abundance, and composition. These microfossil data show glacial-interglacial shifts in overall abundances and species diversities that are low during glacial intervals and high during interglacials. These patterns replicate those previously documented in the North Atlantic Ocean, suggesting that the climatic forcing of the deep-sea ecosystem is widespread, and possibly global in nature. However, these results also reveal differences with prior studies that probably reflect the isolated nature of Shatsky Rise as a remote oceanic plateau. Ostracod assemblages on Shatsky Rise are highly endemic but of low diversity, consistent with the limited dispersal potential of these animals. Benthic foraminifera, by contrast, have much greater dispersal ability and their assemblages at Shatsky Rise show diversities typical for deep-sea faunas in other regions. Statistical analyses also reveal ostracod-foraminiferal differences in relationships between environmental drivers and biotic change. Rarefied diversity is best explained as a hump-shaped function of surface productivity in ostracods, but as having a weak and positive relationship with temperature in foraminifera. Abundance shows a positive relationship with both productivity and seasonality of productivity in foraminifera, and a hump-shaped relationship with productivity in ostracods. Finally, species composition in ostracods is influenced by both temperature and productivity, but only a temperature effect is evident in foraminifera. Though complex in detail, the global-scale link between deep-sea ecosystems and Quaternary climate changes underscores the importance of the interaction between the physical and biological components of paleoceanographical research for better understanding the history of the biosphere.

Link to paper: <http://www.bioone.org/doi/abs/10.1666/10068.1>

Human-induced marine ecological degradation: micropaleontological perspectives

Yasuhara, M., Hunt, G., Breitburg, D., Tsujimoto, A., Katsuki, K. (2012)
Ecology and Evolution, 2: 3242–3268

We analyzed published downcore microfossil records from 150 studies and reinterpreted them from an ecological degradation perspective to address the following critical but still imperfectly answered questions: (1) How is the timing of human-induced degradation of marine ecosystems different among regions? (2) What are the dominant causes of human-induced marine ecological degradation? (3) How can we better document natural variability and thereby avoid the problem of shifting baselines of comparison as degradation progresses over time? The results indicated that: (1) ecological degradation in marine systems began significantly earlier in Europe and North America (~1800s) compared with Asia (post-1900) due to earlier industrialization in European and North American countries, (2) ecological degradation accelerated globally in the late 20th century due to post-World War II economic growth, (3) recovery from the degraded state in late 20th century following various restoration efforts and environmental regulations occurred only in limited localities. Although complex in detail, typical signs of ecological degradation were diversity decline, dramatic changes in total abundance, decrease in benthic and/or sensitive species, and increase in planktonic, resistant, toxic, and/or introduced species. The predominant cause of degradation detected in these microfossil records was nutrient enrichment and the resulting symptoms of eutrophication, including hypoxia. Other causes also played considerable roles in some areas, including severe metal pollution around mining sites, water acidification by acidic wastewater, and salinity changes from construction of causeways, dikes, and channels, deforestation, and land clearance. Microfossils enable reconstruction of the ecological history of the past 102–103 years or even more, and, in conjunction with statistical modelling approaches using independent proxy records of climate and human-induced environmental changes, future research will enable workers to better address Shifting Baseline Syndrome and separate anthropogenic impacts from background natural variability.

Link to paper: <http://onlinelibrary.wiley.com/doi/10.1002/ece3.425/pdf>

Diversity of Zoanthids (Anthozoa: Hexacorallia) on Hawaiian Seamounts: Description of the Hawaiian Gold Coral and Additional Zoanthids

Sinniger F., Ocaña O.V. and Baco A.R. (2013)

PLoS ONE 8(1): e52607

The Hawaiian gold coral has a history of exploitation from the deep slopes and seamounts of the Hawaiian Islands as one of the precious corals commercialised in the jewellery industry. Due to its peculiar characteristic of building a scleroproteic skeleton, this zoanthid has been referred as *Gerardia* sp. (a junior synonym of *Savalia* Nardo, 1844) but never formally described or examined by taxonomists despite its commercial interest. While collection of Hawaiian gold coral is now regulated, globally seamounts habitats are increasingly threatened by a variety of anthropogenic impacts. However, impact assessment studies and conservation measures cannot be taken without consistent knowledge of the biodiversity of such environments.

Recently, multiple samples of octocoral-associated zoanthids were collected from the deep slopes of the islands and seamounts of the Hawaiian Archipelago. The molecular and morphological examination of these zoanthids revealed the presence of at least five different genera and species including the gold coral. Among these, only the gold coral appeared to create its own skeleton. Two other species are simply using the octocoral as substrate, and the situation is not clear for the final two species. Phylogenetically, all these species appear related to zoanthids of the genus *Savalia* as well as to the octocoral-associated zoanthid *Corallizoanthus tsukaharai*, suggesting a common ancestor to all octocoral-associated zoanthids.

The diversity of zoanthids described or observed during this study is comparable to levels of diversity found in shallow water tropical coral reefs. Such unexpected species diversity is symptomatic of the lack of biological exploration and taxonomic studies of the diversity of seamount hexacorals.



Deep-sea fan: A. Baco/NOAA

Link to paper:

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0052607>

The secret to successful deep-sea invasion: Does low temperature hold the key?

Smith, K.E. and S. Thatje (2012)

PLoS ONE, 7 (12): e51219

Today's deep-sea biodiversity has largely resulted from recurrent invasions and speciations occurring through homogenous waters during periods of the Phanerozoic eon. Migrations likely continue today, primarily via isothermal water columns, but the necessary ecological and physiological adaptations behind them are poorly understood. We examined pressure tolerance during development in the shallow-water neogastropod *Buccinum undatum*, using thermally acclimated egg masses from temperate and sub-polar regions. Fossil records indicate neogastropods to have a deep-water origin, suggesting shallow-water species may be likely candidates for re-emergence into the deep sea. Results show population level differences in physiological thresholds, which indicate low temperature acclimation to increase pressure tolerance. These findings imply that this species is capable of deep-sea penetration through isothermal water columns prevailing at high latitudes. This gives new insight into the fundamentals behind past and future colonisation events and such knowledge may help to understand better how changes in climate envelopes affect the distribution and radiation of species, both along latitudinal as well as bathymetric temperature gradients.

Link to paper: <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0051219>

Note: Kathryn (Katie) Smith is about to finish her PhD at University Southampton. She is going to join Richard Aronson's lab at FIT (Florida) to work on a collaborative NSF grant on the study of processes governing the emergence of deep-sea predatory crabs onto the Antarctic continental shelf.

Aragonite saturation states at cold-water coral reefs structured by *Lophelia pertusa* in the Northern Gulf of Mexico

Jay J. Lunden, Samuel E. Georgian and Erik E. Cordes (2013)

Limnology & Oceanography 58(1): 354-362

Ocean acidification, the reduction in pH and calcium carbonate saturation states of seawater, is likely to exhibit its most immediate effects on cold-water corals in deep waters with the shoaling of the aragonite saturation horizon. However, empirical data describing the carbonate chemistry at cold-water coral reefs is very rare. Regions of the upper slope of the Northern Gulf of Mexico harbor several deep-water reefs structured by the scleractinian *Lophelia pertusa*. We collected discrete water samples at a range of depths in the Gulf of Mexico, including eight *Lophelia* reefs, and measured total alkalinity and pH to calculate the aragonite saturation state (Ω_{arag}). The deep waters of the Gulf of Mexico (> 300 m depth) were at aragonite saturation states between 0.98 and 1.69. *Lophelia pertusa* was present at sites with Ω_{arag} between 1.25 and 1.69, and carbonate ion concentrations between 92 and 123 $\mu\text{mol kg}^{-1}$. These data provide a critical baseline for detecting future changes in carbonate chemistry in the water column (i.e., aragonite saturation horizon shoaling), as well as at the sites of well-developed cold-water coral structures threatened by ongoing ocean acidification.

Link to paper: http://www.aslo.org/lo/toc/vol_58/issue_1/0354.html

Just because we cannot see it, it does not mean it is not there: Litter in the deep Mediterranean Sea

Eva Ramirez-Llodra, Ben De Mol, Joan B. Company, Marta Coll and Francesc Sardà

Institut de Ciències del Mar, CSIC. Spain

Because of their remoteness, deep marine habitats have long been out of sight – and therefore out of mind – for policymakers and society in general. This ignorance has facilitated waste and litter discard into the sea in the absence of regulations. In the framework of the Barcelona Convention (1976), the Mediterranean countries adopted, in 1980, a protocol for the protection of the Mediterranean Sea against pollution from land-based sources (UNEP, 2009). In the revised version of this protocol (1996), marine litter was defined as “any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment”.

The accumulation of marine litter is an increasing issue in all oceans. In the Mediterranean Sea, this is particularly important because the Mediterranean is a closed sea with highly populated shorelines. The distribution, type and quantity



Figure 1: Examples of marine litter collected from the bathyal seafloor in the Mediterranean Sea. A, litter collected in the Western Mediterranean at 2000 m depth; B, litter collected in the Blanes canyon at 1500 m depth; C, an oil drum, tyre and longline collected in the Central Mediterranean at 1200 m depth; D, lost or discarded fishing net with dead/moribund Geryon crabs collected in the Western Mediterranean at 1200 m depth. Photos: Eva Ramirez-Llodra, BIOFUN/ICM-CSIC.

of marine litter accumulated on the bathyal and abyssal Mediterranean seafloor has been studied in the framework of the Spanish national projects PROMETEO and DOS MARES and of the ESF-EuroDEEP project BIOFUN (Ramirez-Llodra et al., accepted). Litter was collected with an otter trawl and Agassiz trawl while sampling for megafauna in the Blanes canyon and on the adjacent margin (Catalan margin, NW Mediterranean) between 900 and 2700 m depth, and in the western, central and eastern Mediterranean basins at 1200, 2000 and 3000 m depth. Litter was sorted into 8 categories (hard plastic, soft plastic, glass, metal, clinker, fabric, longlines and fishing nets) and weighed. The most abundant litter types were plastic, glass, metal and clinker. Lost or discarded fishing gear was also commonly found (figure 1).

On the Blanes margin, litter weight was highly variable amongst samples and, although data indicated an accumulation at the deeper stations sampled (1500 and 1750 m), mean weight was not significantly different between depths or between the margin and the canyon. Litter weight was also highly variable amongst samples on

the trans-Mediterranean transect and, although a higher amount of litter seemed to be collected on the Western Mediterranean, differences of mean weight were not significant between the 3 geographic areas and the 3 depths. When comparing the canyon and slope at 900 and 1500 m, light litter (plastics) was significantly higher in the canyon at 1500 m, while heavy litter (glass, metal, clinker) was significantly higher on the slope at 1500 m. Litter weight was also compared to biomass of megafauna. On the Catalan margin, biomass was significantly higher than litter weight at the mid-slope depths, but there were no significant differences in the samples from the deeper stations (2000-2700 m).

Across the Mediterranean, no significant differences between biomass and litter weight were found, except in the Central Mediterranean at 1200 m where biomass was higher than litter, and in the Eastern Mediterranean, where litter was higher than biomass. These results provide evidence that marine litter is a major issue in the deep Mediterranean Sea, needing urgent attention by policy makers, managers and society.

The European Council and Parliament issued, in June 2008, the Marine Strategy Framework Directive (MSFD) for the establishment of a framework for community action in the field of marine environmental policy. Eleven qualitative descriptors for determining Good Environmental Status have been defined, including marine litter (Galgani et al., 2010). Our data provide essential information towards the assessment of the deep Mediterranean Sea.

For a reference list, please contact Eva at ezr@icm.csic.es



Figure 2. Eva Ramirez-Llodra during a cruise in the NW Mediterranean holding a specimen of the echinoid *Brissopsis lyrifera*.

A hybrid zone between *Bathymodiolus* mussel lineages from eastern Pacific hydrothermal vents.

Shannon B. Johnson, Yong-Jin Won, Julio B.J. Harvey and Robert C. Vrijenhoek (2013)

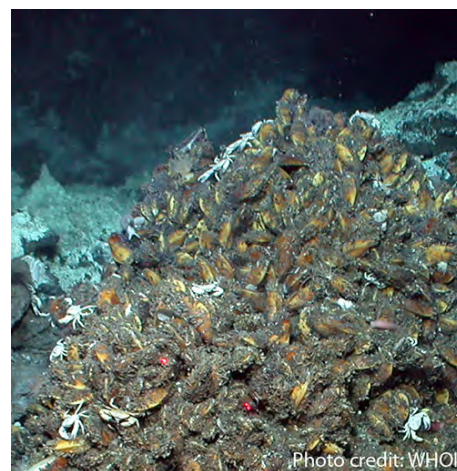
BMC Evolutionary Biology, 13:21

Background: The inhabitants of deep-sea hydrothermal vents occupy ephemeral island-like habitats distributed sporadically along tectonic spreading-centers, back-arc basins, and volcanically active seamounts. The majority of vent taxa undergo a pelagic larval phase, and thus varying degrees of geographical subdivision, ranging from no impediment of dispersal to complete isolation, often exist among taxa that span common geomorphological boundaries. Two lineages of *Bathymodiolus* mussels segregate on either side of the Easter Microplate, a boundary that separates the East Pacific Rise from spreading centers connected to the Pacific-Antarctic Ridge.

Results: A recent sample from the northwest flank of the Easter Microplate contained an admixture of northern and southern mitochondrial haplotypes and corresponding alleles at five nuclear gene loci. Genotypic frequencies in this sample did not fit random mating expectation. Significant heterozygote deficiencies at nuclear loci and gametic disequilibria between loci suggested that this transitional region might be a 'Tension Zone' maintained by immigration of parental types and possibly hybrid unfitness. An analysis of recombination history in the nuclear genes suggests a prolonged history of parapatric contact between the two mussel lineages. We hereby elevate the southern lineage to species status as *Bathymodiolus antarcticus* n. sp. and restrict the use of *Bathymodiolus thermophilus* to the northern lineage.

Conclusions: Because *B. thermophilus* s.s. exhibits no evidence for subdivision or isolation-by-distance across its 4000 km range along the EPR axis and Galápagos Rift, partial isolation of *B. antarcticus* n. sp. requires explanation. The time needed to produce the observed degree of mitochondrial differentiation is consistent with the age of the Easter Microplate (2.5 to 5.3 million years). The complex geomorphology of the Easter Microplate region forces strong cross-axis currents that might disrupt self-recruitment of mussels by removing planktotrophic larvae from the ridge axis. Furthermore, frequent local extinction events in this tectonically dynamic region might produce a demographic sink rather than a source for dispersing mussel larvae. Historical changes in tectonic rates and current patterns appear to permit intermittent contact and introgression between the two species.

Link to paper: <http://www.biomedcentral.com/1471-2148/13/21>



Above: *Bathymodiolid* mussels from the EPR (WHOI)

Cruise News

Early career scientists conduct deep-sea explorations-based cruise off the San Diego coast

Christina Frieder, Scripps Institution of Oceanography, USA

During 2012 a two-part research cruise aboard R/V Melville off the coast of San Diego was led by Scripps Institution of Oceanography graduate students. The major research tasks involved assessing the sensitivity of San Diego's seafloor margin communities to strong environmental gradients in oxygen, carbonate chemistry and sediment properties, and exploring methane seeps.



Opportunities for graduate students to sample deep-sea habitats can be rare and often lab-specific. By creating a cruise opportunity that was both local and student-led, as many as 26 graduate students were involved in field-based deep-sea research. Funding for ship time was provided by UC Ship Funds, an award that pays for sea time aboard Scripps research vessels to provide hands-on training. The cruise was designed to capture the seasonal low and high oxygen and carbonate chemistry conditions across the San Diego shelf. Where oxygen minimum zones (OMZs) intercept margins in other parts of the world, the benthic fauna are known to exhibit altered microbial and faunal communities. The seafloor was sampled during both cruises through the OMZ using a multicore to characterize the geochemistry, microbiology and different size classes of multicellular animals. Preliminary findings indicated a considerable presence of fauna, particularly at the core of the OMZ, which harbored chemosynthetic symbionts. This finding will have implications for the role of low oxygen environments in carbon cycling when non-photosynthetically derived carbon pathways are being utilized to support the fauna. Additionally, megafaunal trends at the upper OMZ boundary and through the oxygen limiting zone (OLZ) were observed with the use of an ROV and otter trawl, to look for patterns in community structure in relation to oxygen.

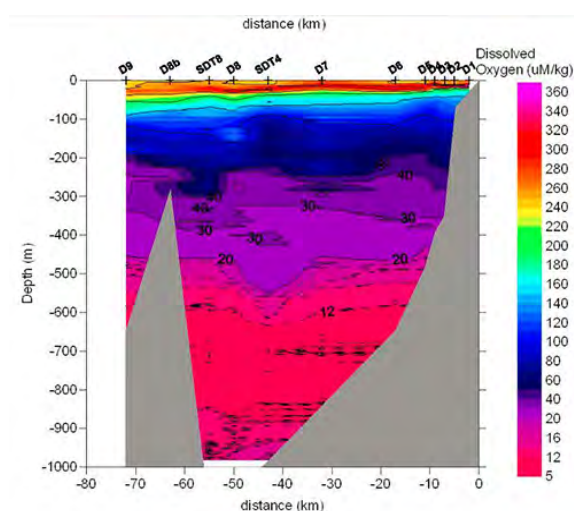


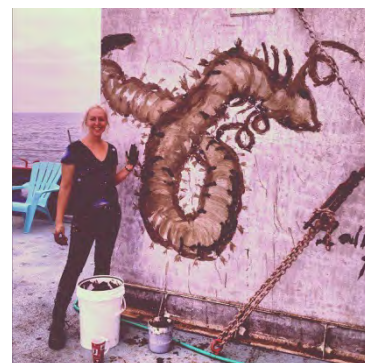
Figure 1. Spatial distribution of oxygen along the San Diego margin (coastline = 0 km) during July 2012.

The second major task of the cruise was to search for a methane seep. Methane seeps are known from the Southern California Bight, and there were several lines of evidence suggesting that there are methane seeps on the continental margin near San Diego. Areas of interest were selected based on this prior evidence of seeps, and geophysical surveys were conducted. From this data, the presence of gas wipeout regions were targeted for further exploration. Multicoring these sites recovered mud with sulfide, carbonate nodules, and seep-endemic taxa (Figure 2); indicating an active seep off San Diego (see LINK). Following the discovery of the seep, Scripps' new ROV was used to visualize the seep. Multiple dives were successful and associated students are working to further characterize the habitat from data collected on the cruise.

The students' experiences and initial findings were shared via social media to friends, family, colleagues and the general public. By the end

of the first cruise the 'Viral Reach' of the Facebook page was over 15,000 people. The success of this cruise highlights the importance of providing early career scientists with at-sea, hands-on opportunities in order to ensure the future of well-trained scientists who will continue deep-sea science and exploration.

Figure 2 (right): A common Paraonidae found in sediment samples collected along the San Diego margin. Figure 3 (far right): Artist Lily Simonson poses next to her deep-sea mud mural of the day. (Photo credit: Lisa Levin).



QUELLE (Quest for Limit of Life) 2013 cruise

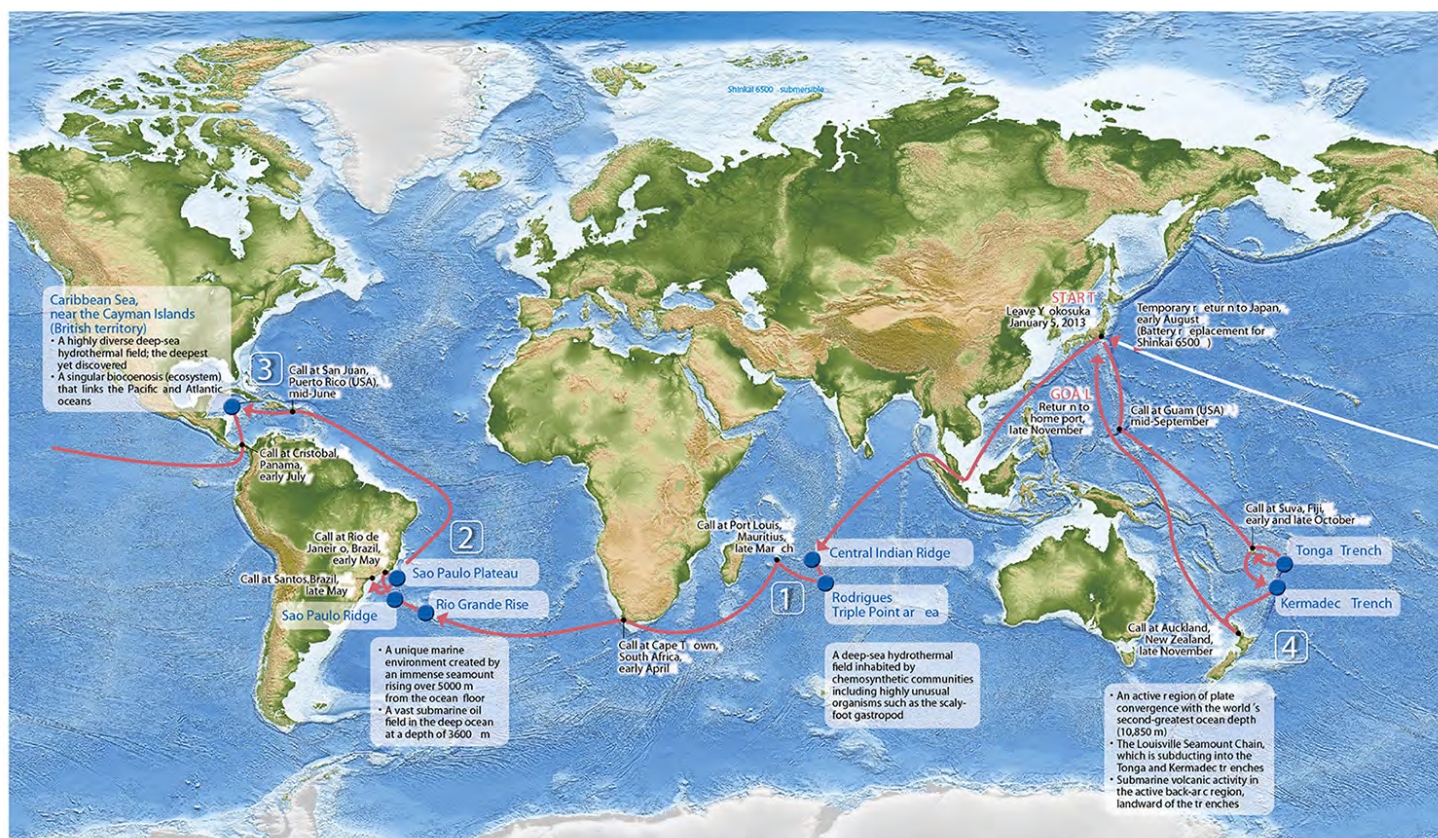
HOV Shinkai 6500 diving expedition

Yoshihiro Fujiwara, JAMSTEC, Japan

The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) is conducting an "around-the-world" diving expedition named "QUELLE 2013" using the manned submarine Shinkai 6500 and the research vessel Yokosuka. This expedition is an international collaborative project and more than 10 countries are involved. "QUELLE" is an abbreviation of "Quest for Limit of Life" and means "origin" in German. The main aims of this expedition are to elucidate the limits of life in various deep-sea marine environments and to understand the evolutionary processes of organisms living on the edges of the biosphere. The research areas and targets are as follows:

- Hydrothermal vents on the Central Indian Ridge and the Rodrigues Triple Junction in the Indian Ocean
- Rio Grande Rise, São Paulo Ridge and São Paulo Plateau off Brazil in the South Atlantic
- Hydrothermal vents on the Cayman Rise in the Caribbean Sea
- Louisville seamount chain and hydrothermal vents on the Kermadec Arc volcanoes in the Southwest Pacific Ocean
- Tonga Trench in the Southwest Pacific Ocean, the 2nd deepest point of the world

The R/V Yokosuka left Japan on January 5th, 2013 for the first survey location in the Indian Ocean and will end in late November 2013.



News from the ReDEco cruises in the eastern Mediterranean

Nikolaos Lampadariou (HCMR, Greece) and the REDECO team

Last summer (June 2012), a short oceanographic cruise was conducted in the Ierapetra deep, located in the eastern Mediterranean at 4300 m, with the greek R/V AEGAEON within the framework of the ReDEco project (Regional Drivers of Ecosystem Change and its Influence on Deep-Sea Populations in the Mediterranean). Onboard the ship, researchers from five different institutions recovered and redeployed a deep sediment trap and collected benthic samples from several locations around the basin. Throughout the duration of the project, which ends in April 2013, the area has been visited several times aiming, among other things, to continue a benthic sampling series which started back in the 90's with the R/V METEOR (Meteor cruise No 5/1, 1987) and has been continuing ever since on a regular basis. The successful cruise was a real joy, not only because it was a 100% success, but also because of the fabulous weather (Figure 1), which lasted during the whole cruise and made us think we were actually working on a calm lake! The retrieval of the sediment trap was met by a surprise. All equipment was completely covered with biofouling material (Figure 2), something that has not been observed on our previous cruises. This observation was accompanied by an increased mass flux event observed in April 2012 and therefore considered a strong indication of an episodic event, which may have triggered the cascading of dense shelf water in the eastern Mediterranean. Our next cruise in the same area is scheduled for July 2013 and it remains to be seen whether this was a true dense shelf water cascading event and if so, if it had any impact on the benthic communities, similar to the effects observed after the dramatic Eastern Mediterranean Transient (EMT) which occurred back in 1992.

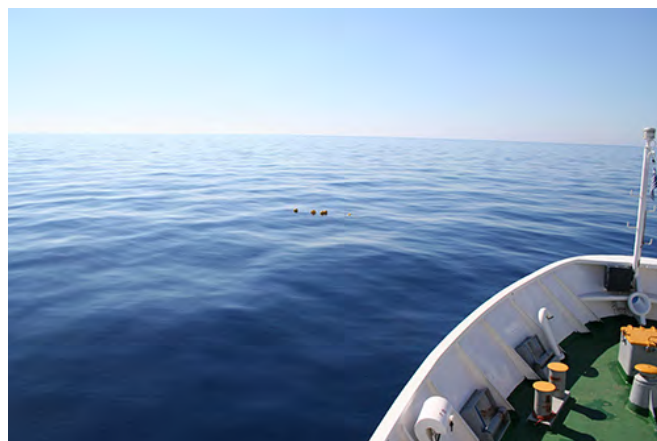
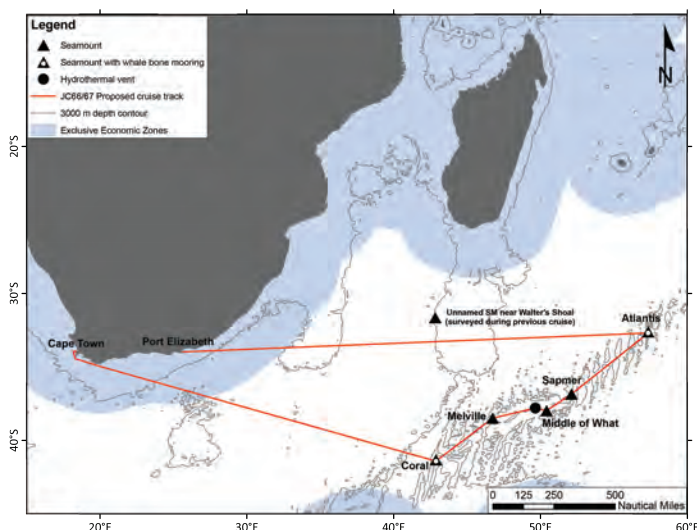


Figure 1 (top): The Mediterranean pool!

Figure 2 (bottom): Bio-fouling on the housing of deep-sea glass spheres retrieved from 4300 m

From exploring the bottom of the sea to better conserving biodiversity and addressing fisheries management in the high seas

Aurélie Spadone, IUCN Global Marine and Polar Programme, Switzerland



IUCN's Global Marine and Polar Programme is coordinating a project on biodiversity conservation in the southern Indian Ocean focusing on seamount ecosystems.

For the last 30-40 years, expanding fisheries have become a major threat to many seamount ecosystems throughout the oceans. One of the main barriers to sustainable fisheries management and marine conservation in the high seas is the lack of scientific knowledge about these deep-sea ecosystems. In response, two scientific research expeditions were conducted by Prof. Alex Rogers' research team on five seamounts of the South West Indian Ridge (SWIR) under the IUCN Seamounts project. The first one in

Left: Map of the 2011 cruise on board the RRS James Cook. Copyright: Oxford University



Above: RRS James Cook (NERC/NOC Southampton) in Cape Town's harbour, South Africa. Copyright: IUCN/Aur lie Spadone



2009 on board the R/V Dr. Fridtjof Nansen focused on the pelagic fauna associated with seamounts, whereas the second one in November-December 2011 on board the RRS James Cook, U.K. Natural Environment Research Council's vessel, studied the benthic realm.

ROVs were used during the 2011 cruise to explore the seabed, collect samples and get high resolution images of these deep-sea habitats, gathering scientific information on the fauna but also evidence of human impact.

By conducting some of the first assessments of these seamount ecosystems, the project created a vital environmental status baseline from which to monitor future trends and impacts of these seamounts of the SWIR. The other two main outcomes of the project are: enhanced governance frameworks for high seas resource conservation and management and identifying options for conservation and management measures applicable to high-seas areas in the Southern Indian Ocean.

The project aims to raise awareness among policy makers around the world about deep-sea biodiversity and the need to better manage and protect the high-seas resources.

Left: Unknown octocoral with Brittle star. Copyright: NERC

Links to the 5 entries of the cruise diary on BBC Nature website:

<http://www.bbc.co.uk/nature/15772693>

<http://www.bbc.co.uk/nature/15872414>

<http://www.bbc.co.uk/nature/15991999>

<http://www.bbc.co.uk/nature/16076387>

<http://www.bbc.co.uk/nature/16197761>

Blake Plateau Okeanos Explorer/Sentry AUV 2012 Telepresence Cruise

Jamie Wagner, Marine Laboratory, Nicholas School of the Environment, Duke University, USA

Few things are as exciting to a deep-sea researcher as being onboard an oceanographic vessel, experiencing new discoveries in real time. This experience is limited by the number of berths on a ship, but now telepresence expands cruise involvement. Remote access cruises use ROVs with live feeds from the seabed shared with shore-based participants.

What would an AUV "virtual" cruise be like, without a live view of the seafloor to capture shoreside attention? In a word...awesome. I joined the onshore science party for the first-ever Sentry AUV telepresence cruise, led by my advisor Cindy Lee Van Dover and her colleagues from the Woods Hole Oceanographic Institution (Chris German, Carl Kaiser, Dana Yoerger), the US Geological Survey (Laura Brothers), and in collaboration with NOAA's Office of Ocean Exploration and Research. With most of the science team based on land at the Inner Space Center (University of Rhode Island), our mission was to seek out and map new seeps on the Blake Plateau off the East Coast of the US. As data fresh off AUV Sentry streamed to us daily, the onshore team developed methods and pipelines to analyze terabytes of data – multibeam bathymetry, sidescan sonar, digital photos, and chemical sensor data. We engaged the ship through video telepresence, screen sharing, phone calls, intercom, and live chats. Though most students entered the cruise with little understanding of how an AUV was used for research, the immersive experience was transformative, providing insight into deep-sea research tools and seabed science. By the end of our 10-day mission, we were feeding the lead scientists data synthesis and leading mission planning.

While nothing can replace the thrill of being at sea, I and the other students on shore felt like we were an integral part of the cruise. Leaving the screens of the Inner Space Center late each evening was almost akin to "abandoning ship" for us. Because we spent all of our waking time together, we experienced the same research intensity, camaraderie, and energy of prolonged collaboration that occurs shipboard. So, on a "virtual" cruise, while you don't have the wind in your hair, salt spray on your face, or the swell of waves rocking you up and down, and up and...well, let's just say you don't get seasick either.

The Blake cruise was funded by the National Science Foundation (BIO-OCE 1031050 to CL Van Dover) and NOAA's Office of Ocean Exploration and Research.

New Chilean research ship available to the scientific community

Eulogio Soto, Universidad de Valparaíso, Chile

Dear researchers in deep-sea oceanography and biology:

From 1st July 2013, a new Chilean ship for oceanographic studies will be available for the scientific community. The ship named "Cabo de Hornos" will have all the necessary in terms of facilities and capacities to undertake both oceanic and deep-sea investigations with a focus on the South Pacific Ocean.

The port of the ship will be Valparaíso and it will be managed by the Chilean Navy. The operational daily cost of the ship is calculated to be US\$ 26,843.

Therefore I invite you all to make and present projects together, knowing that part of the funding will come from the Chilean State by means of National Commission of Science and Technology.

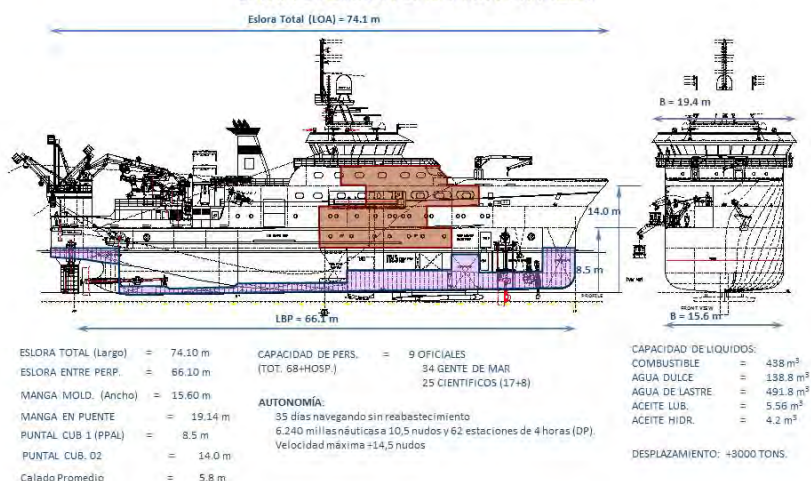
Please see the two images showing details of the ship.

Best wishes

Dr. Eulogio Soto
Universidad de Valparaíso

Capacidades

CARACTERÍSTICAS PRINCIPALES



Capacidades

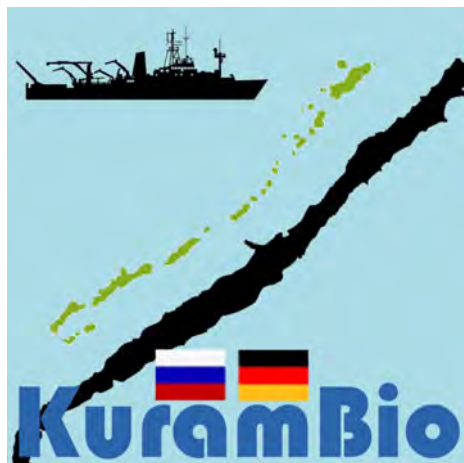
Ubicación de Equipos de Investigación



The German-Russian deep-sea expedition KuramBio (Kurile Kamchatka Biodiversity Study)

Angelika Brandt & Marina Malyutina

University of Hamburg, Germany & A.V. Zhirmunsky's Institute of Marine Biology, Russia



The joint German-Russian expedition KuramBio (Kurile Kamchatka Biodiversity Study) onboard the R/V Sonne (SO 223) to the Kurile Kamchatka Trench and adjacent abyssal plain started in Busan, South Korea on July 21th and terminated in Busan on September 7th, 2012.

The project KuramBio is implemented within the frameworks of the Special Russian Federal Program "World Ocean", the programs of the Presidium of the Far-Eastern Branch of the Russian Academy of Sciences (FEB RAS) "Biodiversity changes in some areas of the World Ocean with space and time", "Marine biota response to the changes of environment and climate", "Technologies of Investigation and Monitoring of Biodiversity of the Deep-Sea Regions of the Far Eastern Seas" and international projects and programs: "Census of the Diversity of Abyssal Marine Life" (CeDAMar) and "Circulation Research in East Asian Marginal Seas" (CREAMS) within the North Pacific Marine Science Organization (PICES). A Memorandum of Understanding (MoU) was signed in Vladivostok in

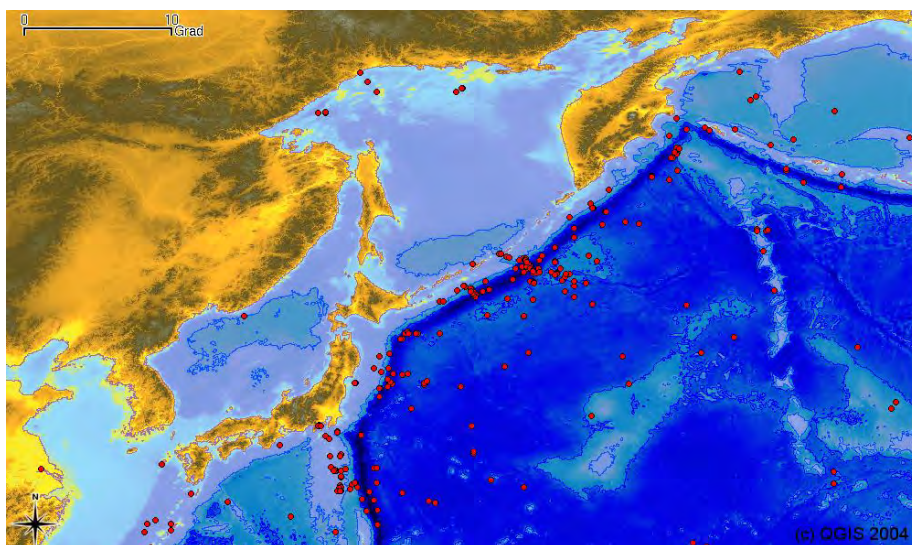
September 2007 by representatives of the A.V. Zhirmunsky Institute of Marine Biology (IMB), Zoological Institute and Museum (ZIM) of the University of Hamburg, and the Senckenberg am Meer, German Centre for Biodiversity Research (SAM), Wilhelmshaven. The MoU included exchange of material and scientists as well as the establishment of joint expeditions and projects.

The KuramBio project is a follow-up project of the joint Russian/German project SoJaBio (Sea of Japan Biodiversity Study). First data of this 2010 expedition are published in a special volume in *Deep-Sea Research II* (Guest editors: M.V. Malyutina & A. Brandt).

Aims of the RV Sonne expedition to the Kurile-Kamchatka region are to investigate the biodiversity and community patterns of the meio-, macro- and megafauna. Our project partner, Prof. Dr. Pedro Martinez, director of the German Centre for Marine Biodiversity Research and his working group are responsible for the meiofauna of this expedition. Using methods of community analyses and coefficients, the selected meio-, macro-, and megabenthic communities shall be characterised and compared with regard to their composition and diversity. New species shall be described and made available for future investigations. The new data on taxonomic species composition and zoogeographic distribution of the fauna of the geologically old open abyssal plain of the Kurile-Kamchatka region will be compared with the faunistic data from the semi-enclosed and younger Sea of Japan, with the existing global deep-sea data from the Atlantic and Pacific Oceans which were obtained during the CeDAMar project using a standardised sampling protocol as well as the data from the adjacent shelf and bathyal zones.

We aim to test the following hypotheses:

1. Communities of the Kurile Kamchatka stations (and transects) differ in terms of species composition and richness.
2. The non-isolated abyssal plain of Kurile-Kamchatka area causes an increase of the abyssal biodiversity in comparison to the geographically "relatively" isolated Sea of Japan.
3. In the Kurile-Kamchatka Trench and abyssal plain we will sample around 50% of new species in the different taxa.
4. The standardised sampling techniques will increase the faunistic knowledge about that region.
5. Enhanced productivity leads to an increase in biodiversity (species richness).



Above: Abyssal stations sampled in the area of the Kurile Kamchatka Trench and abyss (changed after Stuart et al., 2008).

Mid-Cayman Spreading Centre Vent Exploration

Jon Copley

University of Southampton, UK

During February 6th-25th, Research Cruise 82 of the RRS James Cook (JC82) visited two hydrothermal vent fields on the Mid-Cayman Spreading Centre (MCSC) in the Caribbean Sea with the UK's Isis ROV.

Water column signals indicative of underlying hydrothermal activity were first detected above the MCSC by a US cruise in November 2009 (German et al., 2010), and two hydrothermal vent fields were first observed on the seafloor of the MCSC by a UK cruise in April 2010 (Connelly et al., 2012). The Jason-2 ROV visited the two vent fields in January 2012, and now it has been the turn of the Isis ROV, recently rebuilt following an accident in January 2011.

JC82 visited the Von Damm Vent Field, located on the upper slopes of an off-axis Oceanic Core Complex at a depth of ~2300 m, and the Beebe Vent Field, located in a neovolcanic zone at a depth of ~5000 m. One species of alvinocaridid shrimp, *Rimicaris hybisae*, is abundant at both vent fields (Nye et al., 2012a), and other species described so far from MCSC vents include a hippolytid shrimp and a turbinid gastropod from the Von Damm Vent Field (Nye et al., 2012b,c).

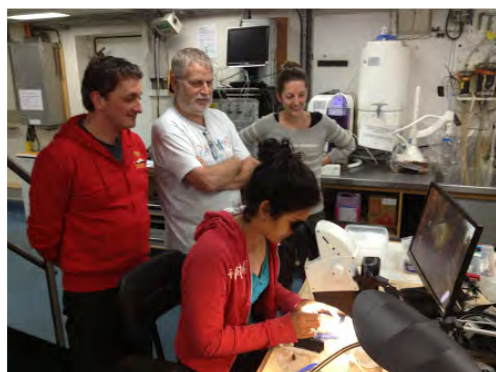
During JC82, the Isis ROV completed more than 196 hours of bottom time during 11 dives at the two vent fields; average bottom time per dive was 17 hours, with a maximum of 35 hours for a swath mapping dive. The dive programme collected a suite of samples and data to investigate the wider geological context of the vent fields, the geochemistry of their dispersing plumes, and the ecology of their fauna.

Upgraded Isis facilities from its rebuild include a Reson high-resolution multibeam sonar, new LED lighting, and a 12 megapixel Scorpio digital stills camera that also provides a third HD video feed, in addition to the vehicle's two other HD cameras. For JC82, all video was recorded directly to hard drives, and totalled more than 30 terabytes.

Full details of JC82 activities and participants are available via cruise blogs at <http://intothecaymanabyss.blogspot.co.uk> and <http://www.thesearethevoyages.net/jc82/index.html>

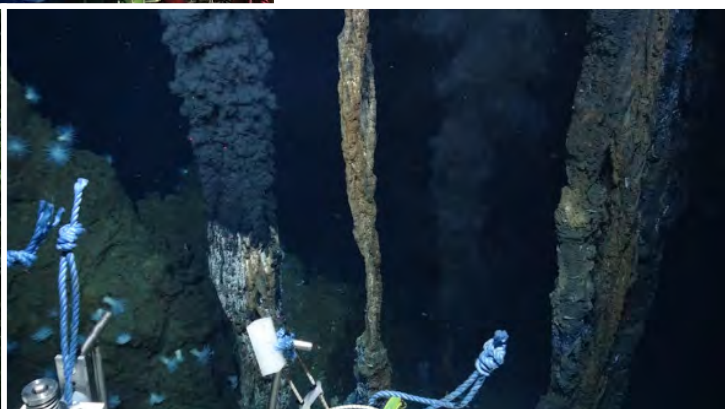
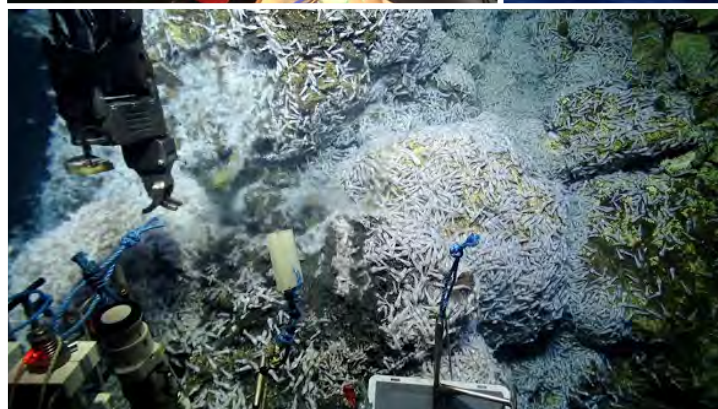
A BBC News team also briefly joined the ship, broadcasting live during a dive:
<http://www.bbc.co.uk/news/science-environment-21559029>

In July this year the vent fields of the MCSC will be visited by the Shinkai 6500 submersible, and the Nereus HROV aboard Schmidt Ocean's RV Falkor. The NOAA Ocean Exploration program will also return to the Von Damm Vent Field in August.



For a full reference list, please contact Jon at jon.copley@soton.ac.uk

Clockwise from top left: The excitement of science at sea; ROV ISIS recovery; Sampling vent fluid on Von Damm vent field; Chimneys at Beebe Vent at 5000m. All images credited to NERC, UK



Project Focus

Condor seamount nematodes: unexpected richness at the summit brings nematologists together

Ann Vanreusel

University of Gent, Belgium

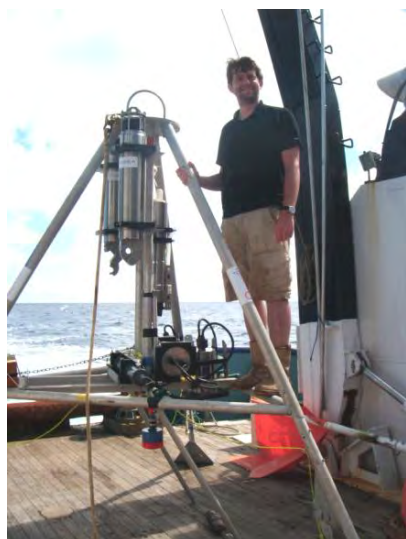
In January 2013, Daniela Zeppilli, currently working at IMAR (University of Azores) in the framework of a research project BIOMOUNT (funded by FCT/Portugal) on the biodiversity of the Condor Seamount (Promoter Lucia Bongioni and Ricardo Santos), visited Ann vanreusel at Ghent University to check the high biodiversity of epsilonematid and draconematid nematodes observed at the summit of the seamount. Draconematid and epsilonematid nematodes are characterized by their spectacular morphology in terms of body shape, the presence of large spines or adhesion tubes, which makes some of them looking like micro-sized dragons. Wilfrieda De Craemer, from the Natural History Museum Brussels, author of several taxonomic papers on this group, assisted them and confirmed the presence of numerous (possibly more than 10) new species and possibly 1 or 2 new genera too. The first analysis seems to confirm that the seamount summit is a biodiversity hot spot for this group. More samples may reveal the true extent of the biodiversity of this group since up to now only four samples of 10 cm² were analysed. It would also be very interesting to further explore if the same species are found at adjacent seamounts.



HADEEP: exploration of the hadal trenches

Alan Jamieson

University of Aberdeen, UK



Alan Jamieson on the Hadal-Lander ready to deploy to 9500 m in the Kermadec Trench in 2012

HADEEP is a project coordinated by the University of Aberdeen, whereby they have been using baited cameras and traps to investigate the hadal fauna of the ultra-deep subduction trenches of the Pacific Ocean. The project began in 2006 and has since evolved into a series of concurrent projects funded by various international agents. To date the project has completed ten trench cruises and achieved nearly 50 deployments to depths exceeding 6000 metres, and 20 on the surrounding plains of 5 of the Pacific Trenches (Japan, Izu-Bonin, Peru-Chile, Tonga and Kermadec). The project highlights so far have been filming the deepest fish ever seen alive, finding decapods in the hadal zone, discovery of the supergiant amphipod in the southern hemisphere and at hadal depths, catching snailfish from the Kermadec Trench for the first time in 59 years, as well as amassing the largest collection of hadal amphipods in history, of which there are many new species.

With funding from the Marine Alliance for Science and Technology Scotland (MASTS), the HADEEP project recently embarked on their tenth trench cruise in January 2013, on the NIWA owned RV Kaharoa. This was the fifth time they have visited the Kermadec Trench off New Zealand, and in contrast to the last two visits, the focus was on the shallower end of the trench; 1000 to 6500 metres. The cruise deployed two imaging landers and two baited traps, this completing a 55 deployment transect from 1000 to 9900m. In October

2013, the team will be heading on a much longer Kaharoa cruise whereby they will be deploying all their gear across the South Fiji Basin (North of New Zealand) and then down the slopes of the New Hebrides Trench east of New Caledonia from 4000 to 7800 metres.

Below, from left: Scavenging macrourids (*grandeirs*) and very large Ophidiids (cusk eels) aggregate at the lander at 4000m on the dge of the Kermadec Trench; A group of snailfish (*Notoliparis kermadecensis*; Liparidae) arrive at bait placed at 7561m in the Kermadec Trench; these are deepest fish in the Southern Hemisphere; Head shot of the amphipod *Eurythenes gryllus* from the deepest point in the SE Pacific (8065 m in the Richards Deep, Peru-Chile Trench)



DOSMARES: a new Spanish Research Project on the two deep seas around the Iberian Peninsula

Chiara Romano

Centre d'Estudis Avançats de Blanes (CEAB-CSIC), IEO, Spain

The DOSMARES project has two main objectives: (i) to understand the effects of the atmospheric teleconnections between the two seas around the Iberian Peninsula (the Cantabrian Sea and the north-western Mediterranean Sea) and their impacts on pelagic and benthonic deep ecosystems; (ii) to understand the way in which the transfer of the signal from the external forcings towards the deep ecosystem controls the community structure and population dynamics – thus affecting valuable living resources.

The DOSMARES project is led by Miquel Canals from the CRG Marine Geosciences group at the University of Barcelona, Ricardo Anadón and José Luis Acuña from the University of Oviedo, and Joan B. Company from the Marine Sciences Institute (ICM-CSIC) in Barcelona. The research team includes also researchers from various Spanish and European centres: , CEAB-CSIC (Spain), IEO, CNRS and CEFREM (France), Ghent University (Belgium) and Aveiro University (Portugal).

The project is structured along three axes of activity: i) characterization of external forcings and abiotic conditions; ii) links between abiotic conditions, populations and pelagic and benthopelagic resources; and iii) links between abiotic conditions and populations benthic resources. Six research cruises will be conducted in two working areas: the submarine canyons (and the adjacent continental slopes) of Aviles and Blanes, respectively in the Cantabrian Sea and the Mediterranean Sea. The effect of

external forcings and the transfer of matter and energy to the deep ecosystem will be investigated synchronously in the two areas. The study of the pelagic ecosystem and associated living resources will be given priority in the Cantabrian Sea, while the benthic ecosystem and associated living resources will be studied in the Mediterranean Sea.



Above: Study areas of the DOS MARES project and the two ships that will be used during the research cruises: R/V García del Cid (above) and R/V Sarmiento de Gamboa

SeepC: A Seascape Approach to Connectivity in the Deep Sea

CL Van Dover¹, C Cunningham², D Eggleston³, R He³, SA Maslakova⁴, CM Young⁴

¹Marine Laboratory, Nicholas School of the Environment, Duke University (clv3@duke.edu); ²Biology Department, Duke University; ³Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University; ⁴Oregon Institute of Marine Biology, University of Oregon, USA



Clams from the Manon seep site, Barbados Accretionary Wedge. Water color by Karen Jacobsen.

SeepC questions include:

- What phylogeographic breaks occur in the system?
- Are populations connected by ongoing migration?
- What biophysical processes underlie observed connectivity?

Our field programs employ time-series sampling of larvae at seeps with records of current velocities, water column sampling to determine larval distribution potential, shipboard studies of larval biology and behavior, and sampling of target benthic species. Next-generation phylogenetic and population genetic tools are used to explore historical and contemporary gene flow. The SeepC team is eager to work with colleagues around the world to contribute to our understanding of connectivity in the deep sea, especially across the Atlantic Basin.

SeepC is an interdisciplinary team from Duke University, the University of Oregon, and North Carolina State University that is investigating studies of oceanographic circulation, larval dispersal, invertebrate life histories, population genetics, and phylogeography to explore questions of contemporary and historical connectivity in relatively unexplored deep-sea chemosynthetic ecosystems. We target deep-sea seep systems of the Intra-American Sea (Caribbean, Gulf of Mexico, Mid-Atlantic Bight) to consider connectivity on spatial scales that match those at which vent systems are being studied (≥ 3500 km), include a set of nested seeps within which connectivity can be explored at more local spatial scales (30 to 130 km), and include species that span depth (~600 m to 3600 m) and geographic ranges (30 km to 3500 km) and that have diverse life-history characteristics.

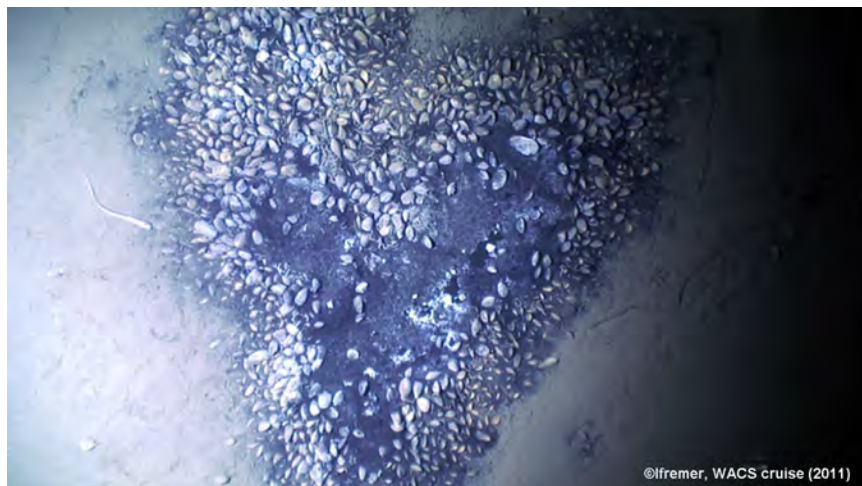
Love is in the Deep

Karine Olu¹, Carole Decker¹ & Christophe Rabouille²

¹IFREMER; ²CNRS, France

This pretty vesicomyid heart has been observed among the vast muddy area in the very deep Congo fan, at 4850m depth. The species living there is *Christineconcha regab* Cosel & Olu 2009, recently attributed to this new genus by Krylova & Cosel (2011). This bivalve of the Vesicomyidae family was initially described from the Regab pockmark, a cold-seep area located at 3200m depth not far from the deep channel.

The Congo deep-sea fan is one of the largest fans in the world still affected by presently active turbidity currents. This fan is composed



of several terminal lobes that receive huge inputs of mainly terrestrial organic matter because of the direct connection between the river and the canyon (Rabouille et al. 2009, Savoye et al. 2009). High organic carbon content, large sedimentation rate (19 mm.y⁻¹) and high mineralization rates of organic carbon were measured in this zone (Rabouille et al. 2009).

The vesicomid bivalves, associated with sulphide-oxidizing symbionts, likely rely on the production of hydrogen sulphide in anoxic sediment. Whether this reduced compound is produced by recent recycling of organic matter in subsurface sediment layers, or related to deeper sources remains questionable. The understanding of the functioning of this ecosystem is one of the objectives of the current project Congolobe lead by C. Rabouille.

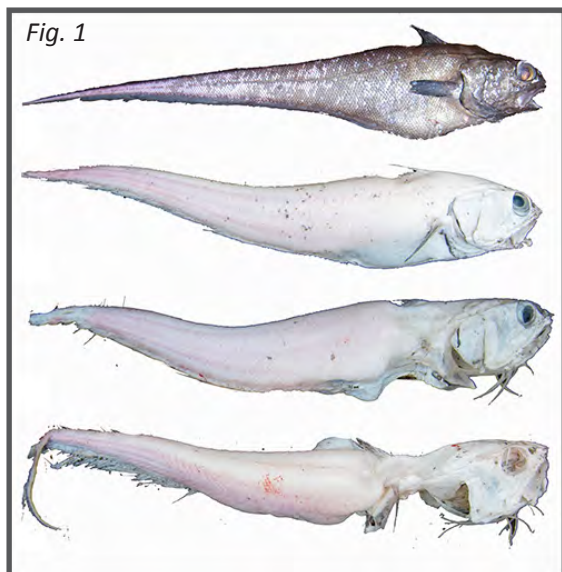
For a full reference list, please contact the author: Karine.Olu@ifremer.fr

Interactions between fish and amphipods in deep-water traps

Alexei M. Orlov

Russian Federal Research Institute of Fisheries and Oceanography, Russia

Fig. 1



Fishing traps are widely used for fishing and are considered as prospective fishing gear. One of the cons of stationary fishing gear (including traps) is the depredation of bait and catch by small crustaceans, including amphipods that decrease the efficiency of the fishing gear and quality of the catch.

In summer of 2011 exploratory deep-water trap fishing was conducted off the southeastern Kamchatka, in the western Bering Sea and off the Commander Islands. Results of this cruise enabled us to study interactions between fish and amphipods in deep-water traps. It was shown that intensity of depredation is subject to spatial-temporal dynamics.

The analysis showed that the most vulnerable species in relation to amphipod depredation is the giant grenadier *Albatrossia pectoralis* (Fig. 1). This species is characterized by loose scales, low motility, and flesh that contains too much water. It is an easy prey for amphipods. The proportion of giant grenadier preyed upon by amphipods in some catches reached 80%. Other vulnerable species were Greenland turbot *Reinhardtius matsuurae*, arrow-tooth flounder *Atheresthes stomias*, Kamchatka flounder *A. evermanni* (Fig. 2), shortspine thornyhead *Sebastolobus alascanus* (Fig. 3), and Matsubara skate *Bathyrja matsubarae* (Fig. 4). Sablefish *Anoplopoma fimbria* (Fig. 5) was the least vulnerable species to depredation by amphipods, most likely due to its small dense scales and high motility that prevents amphipods from causing serious injuries.

Results of this research may provide some basis for recommendations that will allow reduction of the negative impact of amphipod depredation to fisheries.

Fig. 2

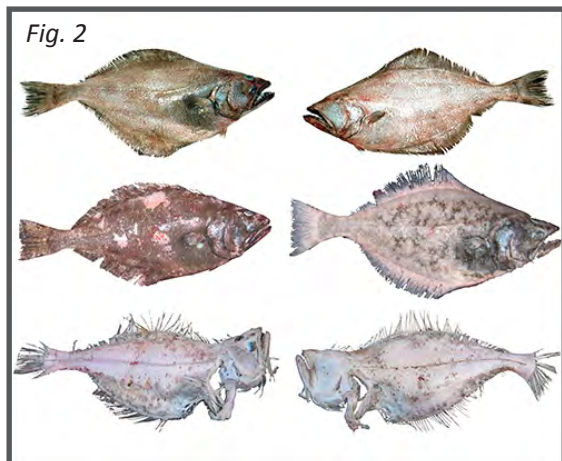
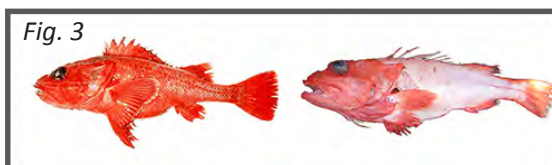


Fig. 3



Images (courtesy A. Orlov):
Fig 1: *Albatrossia pectoralis*;
Fig 2: *Albatrossia evermanni*;
Fig 3: *Sebastolobus alascanus*;
Fig 4: *Bathyrja matsubarae*;
Fig 5: *Anoplopoma fimbria*.

Fig. 5



Fig. 4



Latest news from INDEEP

Maria Baker, University of Southampton, UK



The International Network for Scientific Investigations of Deep-Sea Ecosystems (INDEEP) programme follows in the footsteps of the Census of Marine Life programme (2000-2010). It is the intention of INDEEP to capture the momentum of collaboration generated during the Census decade to ensure it continues and grows in the long-term and includes future generations of deep-sea scientists. INDEEP is focusing on determining the global biodiversity and functioning of deep-sea ecosystems in order to achieve a synthesis of sound knowledge that can be used in the formation of sustainable management strategies, bridging the gap between science and policy.

INDEEP is already leading to the development of new large-scale scientific proposals involving teams and infrastructure from different nations. INDEEP now has over 350 members from 35 countries and communication between these experts is progressing well. It is hoped that this newsletter, currently produced by the INDEEP office, will enhance these communications.

INDEEP is currently engaged in 5 major themes, listed here with a selection of their current activities:

WG1: Taxonomy and evolution (Lead: Adrian Glover, UK)

- World Register of Deep-Sea Species (WoRDS) developed by INDEEP in collaboration with WoRMS. Includes high-quality images and direct links to keys and guides for each species where available (see page 29, this newsletter)
- Production of deep-sea 'field guide in your pocket' mobile app (to be launched this month)
- Compilation of comprehensive up-to-date list of deep-sea taxonomists
- Preparations underway for major symposium on evolution in the deep sea

WG2: Global biodiversity and biogeography (Leads: Tim O'Hara, Australia & Lenaick Menot, France)

- Project underway to map global biogeographic assemblages for brittle-stars and squat lobsters
- Consultation Group – Mapping the Oceans: How do we do it?
- Workshop – Identification, calibration and analysis of the distribution of abyssal morphospecies from images and video in collaboration with the ISA (Summer, 2013, Germany)

WG3: Population connectivity (Lead: Anna Metaxas, Canada)

- INDEEP/SERPENT global colonization experiments underway. First frames deployed in 3 localities (Faroe-Shetland Channel, Baltimore Canyon, Cayman Trough Vents). More frames to be deployed in coming months
- Workshop – Training workshop on the identification of larvae and recruits using the frames above (Summer 2013, NOC, UK)
- Review paper underway: A synthesis of connectivity in deep-sea fauna and implications for MPA design (Baco-Taylor et al)

WG4: Ecosystem functioning (Lead: Andrew Thurber, USA)

- Following CLIDEEP workshop (May 2012), 2 review manuscripts underway on the impacts of climate change on deep-sea function and global quantitative predictions of how factors that drive deep-sea ecosystems and their biodiversity, production, and function will likely change

WG5: Anthropogenic impact and social policy (WG Leaders: Eva Ramirez-Llodra, Spain, Maria Baker, UK, and Andrew Sweetman, Norway)

- INDEEP contributions to Deep-Ocean Stewardship Initiative workshop – April 2013, Mexico
- Development of deep-sea experts database based on results of INDEEP "Bridging the Gap" questionnaire responses (www.deepseaxperts.org)
- Stakeholder pool creation/official links with policy bodies so INDEEP can provide scientific expertise
- Series of DIVE-INS depicting a variety of anthropogenic impacts
- National Geographic Kids INDEEP poetry competition on deep-ocean human impacts
- INDEEP/HERMIONE written and illustrated a deep-ocean book for children highlighting the impact of litter in the deep sea (Free to schools – 7 languages)



For further information, please contact INDEEP Project Manager, Dr Maria Baker – mb11@noc.soton.ac.uk

Far left: CLIDEEP meeting participants, Friday Harbor, May 2012; and left: settlement blocks recovered from Transocean oil rig, N. Atlantic.

Benthic communities on the continental shelf and slope off Atlantic Canada: a cooperative research effort

Anna Metaxas

Department of Oceanography, Dalhousie University, Canada

In the northwest Atlantic, the Gulf of Maine Discovery Corridor is a swath of ocean extending from the Fundy Isles region of the lower Bay of Fundy, across the major banks and basins of the northern Gulf of Maine, and beyond Georges Bank to depths of 6000 metres (www.mar.dfo-mpo.gc.ca/e0011522). It has been the focus of research by university and government researchers since 2005, most recently by the Canadian Healthy Oceans Network (chone.marinebiodiversity.ca/). We are particularly interested in exploring relationships between biodiversity, ecosystem function and substrate complexity at various scales (e.g. coarse-scale descriptors of the relative contributions of sand, cobbles, boulders and bedrock; fine-scale rugosity or microtopography). We also focus on the factors that regulate populations of deep-water corals. Within the Discovery Corridor, the Northeast Channel Coral Conservation Area, which harbours abundant populations of *Paragorgia arborea*

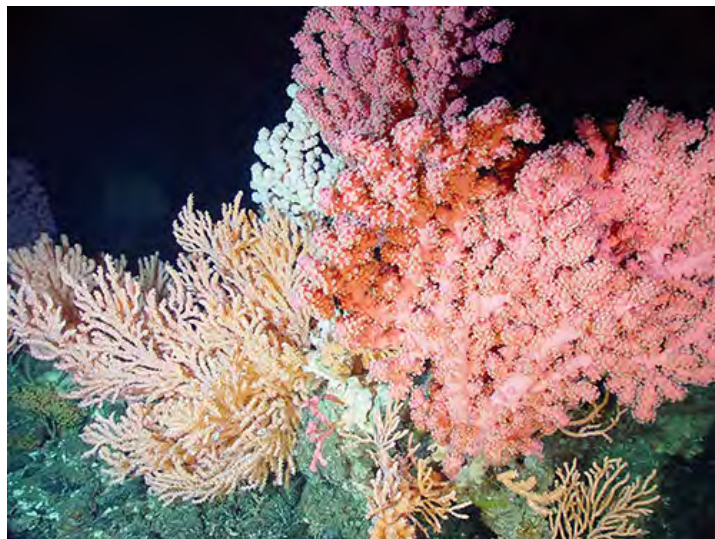


Image credit: Canadian Healthy Oceans Network, Canada

and *Primnoa resedaeformis*, was established in 2003 to protect coral damage and allow coral recovery from fishing. The success of the conservation area depends on the adequate supply of new recruits either through self-seeding or larval import from neighbouring populations. We recently obtained measures of high rates of settlement within the coral conservation area, but the larval source is unknown; however, we have identified potential locations of source populations within the Gulf of Maine and approaches, using a habitat suitability model. We are in the process of mounting an international effort with partners from both sides of the Canada-USA border to validate two different habitat suitability models and describe the deep-water coral populations across an entire ecoregion, the Gulf of Maine and associated continental slope. We hope that our cooperative efforts will lead to enhanced cross-boundary integration of the management of these vulnerable species.

Advancing the knowledge of deep-sea benthic diversity and species connectivity in the Brazilian margin

Angelo F. Bernardino¹ and Paulo Y.G. Sumida²

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The deep southwest Atlantic has historically been understudied in respect to its biodiversity and ecology when compared to most ocean basins. However, deep-sea ecosystems in the Atlantic Basin and specifically at the Brazilian margin are at similar risks of impacts and exploration as have been reported for several other margins around the globe. Although a number of studies are currently looking at several aspects of deep-sea diversity and ecology at the Brazilian margin, there is a continued gap in the regional description of chemosynthetic ecosystems, their ecology and patterns of species connectivity with other biogeographic regions. In 2012, the São Paulo Research Foundation (FAPESP) funded the first interdisciplinary and collaborative project to investigate communities associated with organic islands (whale bones and wood falls) on the Brazilian margin. This research will look at broad aspects of ecosystem diversity and function including taxonomic (from microbes to metazoans) and broad-scale comparisons of species connectivity with other similar experiments carried out by collaborators in the US and UK. The first research cruises to deploy the experiments are planned for early 2013, and we hope that these efforts set a landmark in the Brazilian deep-sea scientific community, and also highlight the need for continued and independent research at these poorly studied and threatened ecosystems across the southwest Atlantic.

The Mercier Lab

Annie Mercier

Department of Ocean Sciences of Memorial University, Newfoundland, Canada



The Mercier Lab, based at the Department of Ocean Sciences of Memorial University (Newfoundland, Canada), is a relatively young but dynamic player in deep-sea research. Over the past 7 years, our team has developed unique expertise in the collection, maintenance and long-term experimental study of live deep-sea organisms, with few parallels in the world, making our research both challenging and exciting. We look forward to the inauguration in the next few weeks of state-of-the-art facilities dedicated to deep-sea research. These include a deep/cold water source, additional laboratory space, and pressurized vessels (IPOCAMP®, PICCEL®; the first of their kind in North America). Our field segment has developed through occasional oceanographic missions and a partnership with Fisheries and Oceans Canada to obtain bycatch samples during routine deep-water surveys. Research in the Mercier Lab revolves mainly around chronobiology and the control of reproduction, with the recent discovery of lunar rhythms in several deep-sea taxa. We are also interested in trophic ecology and the characterization of species interactions (predator-prey relationships, symbioses). Last year, a PhD student in our team determined that larvae of commercial fish (redfish *Sebastes*

Image credit: Mercier Lab

spp.) shelter among the polyps of deep-water octocorals, identifying the latter as essential fish habitat (see profile of Sandrine Baillon on page 43). Ultimately, we strive toward a more complete understanding of deep-sea adaptations and remain deeply committed to the advancement of knowledge to assist in the protection and conservation of fragile marine ecosystems.

For more information and a list of projects and publications: <http://www.mun.ca/osc/amercier/bio.php>

New Chilean open-access web-based platform for biodiversity: from terrestrial to deep-sea biota

Dr Javier Sellanes (sellanes@ucn.cl)
Universidad Católica del Norte, Coquimbo, Chile

I am an Associate Professor at the Marine Biology Department, Universidad Católica del Norte, Coquimbo, Chile. My main research interests are the ecology of shelf and slope benthic animals, with particular emphasis on methane seep chemosynthetic communities, as well as the taxonomy of mollusks. For example, recent publications include the description of methane seep mollusks off Colombia, with Adriana Gracia (JMBA UK 96: 1367-1377, 2012), a new species of Buccinid Gastropod (*Eosipho zephyrus*) from deep waters off Chile (Nautilus 126:1, 33-37, 2012) with my colleague, Koen Fraussen from Belgium, new records of deep-water octopus of the genus *Graneledone* off Chile, with Christian Ibanez (Rev. Biol. Mar. Oceanog. 47: 439-450, 2012), and the use of seep sites as aggregation spots of the Patagonian toothfish off Chile (Lat. Am. J. Aquat. Res. 40: 980-991, 2012). Lately, we have been studying also some shallow-water reducing habitats like intertidal methane seeps and the communities associated to the seepage of reducing fluids at Chilean fjords.

Currently, I am the Director of a project aiming to generate an open-access web-based platform compiling Chilean biodiversity information from different sources (records, sightings and collections) that will include from terrestrial to deep-sea biota. This platform is also intended to assist the Chilean Ministry of the Environment to incorporate biodiversity data into planning and management. Interoperability with other global biodiversity initiatives like GBIF, EOL, and OBIS is also envisaged.

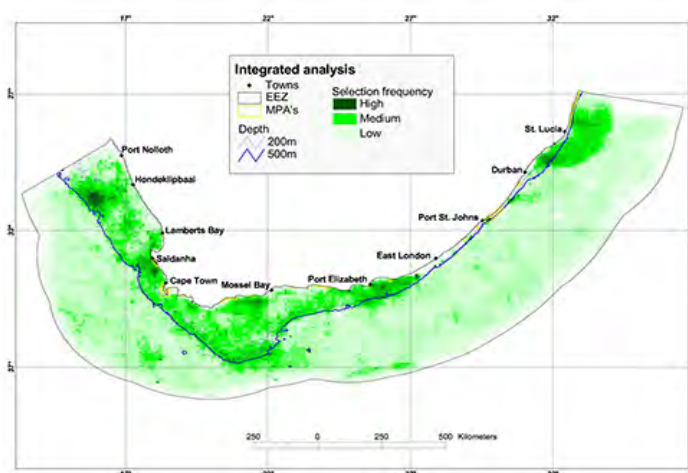


Systematic spatial planning identifies focus areas for offshore protection in South Africa

Kerry Sink

South African National Biodiversity Institute, South Africa

Offshore ecosystems emerged as the most poorly protected ecosystems in South Africa's recently launched National Biodiversity Assessment which reports on the state of biodiversity across all environments. This raised the importance of implementation of management measures in the focus areas for offshore protection identified by South Africa's Offshore Marine Protected Area (OMPA) project. This five-year collaborative project was undertaken to support the identification of a network of offshore spatial management measures. The network aims to represent offshore biodiversity, protect vulnerable marine ecosystems and threatened species, contribute to fisheries sustainability, support the management of bycatch, advance ecosystem based management in other sectors and provide for research and monitoring. As such, the proposed network is integrative and aims to support multiple objectives.



Focus areas were identified through systematic planning using Marxan. More than 500 spatial data layers were compiled to represent biodiversity pattern and a complex set of socio-economic and fisheries data. Multiple cost layers were developed and many planning scenarios were explored. An integrated analysis that included all objectives (as quantitative targets) was used to identify the focus areas with the different scenarios helping to interpret the results and to provide guidance on appropriate management measures within each area. The focus areas represent a spatially efficient design that can contribute to biodiversity targets in terms of protection, fisheries management and ecosystem based management of other sectors such as marine diamond mining, petroleum and shipping. This highlights the role of spatial planning in meeting converging targets such as the Aichi biodiversity targets.

Other benefits from the OMPA project included collaborative initiatives research with offshore industry sectors and the establishment of an Offshore Environment Forum to foster stewardship and the mainstreaming of biodiversity priorities into these offshore production sectors.



Images (top): Outputs from integrated systematic planning analyses were used to identify focus areas for offshore protection in South Africa; (left): Scientists and industry are undertaking co-operative research to build the offshore biodiversity knowledge base for South Africa (Kerry Sink)

InterRidge News

Debbie Milton, National Oceanography Centre, UK

The past 30 years have seen hydrothermal vent communities revolutionise our view and understanding of deep-sea biology. Equally, the emergence of new technologies provide us with new perspectives and data to address fundamental questions regarding the evolution of vent species, the on-going processes of selection and speciation, the connectivity of vent communities and the potential effects of global change on the survival of these biological assemblages.

In the context of global change, vent ecosystems seem far from harm. However, little is known of the potential effects of warming, acidification, and increasing hypoxia of the oceans on the vent communities. Although the deep-sea water surrounding hydrothermal vents is unlikely to be affected for many years to come, it is formed at the poles and its temperature is likely to increase. It will continue on its tracks and eventually reach the vent communities. The highly



Image credit: NERC ChEsSo Consortium

dynamic character of the environment would suggest the effects would be minimal. However, if the species are already living on the edge of their capacity to cope, then a minor change could have strong detrimental effects.

Although adapted to episodic extinction of sites, the ability of vent species to disperse, as well as the critical population size needed to allow recovery from perturbation, have not been studied in most species. The episodic disturbance that characterises vent sites will not affect all species equally and thus the ecological balance that sustains the coexistence of species with similar niches, and with similar function in vent communities, is likely to be sensitive to both the frequency and intensity of disturbance. This is particularly important in the context of deep-sea mining because long-term and large spatial scale effects are likely with the exploitation of sulphides that host the communities.

For the complete article on future challenges for biologists within the InterRidge Third Decadal Plan, go to: <http://www.interridge.org/thirddecade>

HADES: A new international collaboration to explore the Hadal Zone

Alan Jamieson

OceanLab, Aberdeen, Scotland, UK

The Hadal Ecosystems Studies (HADES) Program is an NSF funded collaborative program aimed to pursue the foremost questions in trench and hadal ecosystem science, determining the composition and distribution of hadal species, the role of pressure, food supply, physiology, depth, and seafloor topography on deep-ocean communities and the evolution of trench life. These factors will be examined using the world's first full-ocean depth hybrid remotely operated vehicle (HROV Nereus), full-ocean depth imaging landers (Hadal-Lander) and a new bespoke ROV manipulated animal respirometer.

The HADES collaboration consists of nine principal investigators from the Woods Hole Oceanographic Institute (USA), University of Hawaii (USA), Whitman College (USA), University of Aberdeen (UK), NIWA (NZ) and NOCS (UK).

The project will undertake a large cruise to both the Kermadec Trench in the Southwest Pacific on the RV *Revelle* in early 2014 and another to the Mariana Trench in the Central Pacific on the RV *Falcor* in mid-2014.

There are 6 main project objectives currently planned: (1)

Examine the abyssal and hadal benthic community structure, (2) map the distribution of food supply in the trenches, (3) investigate the energetic demands and metabolic rates of hadal fauna, (4) investigate high hydrostatic pressure adaptation (enzyme function and osmolytes), (5) genetic diversity and connectivity of hadal communities and (7) establish ecological theory at inter- and intra-trench levels.



HADES group photo at WHOI with HROV Nereus in the background. (L-R), A. Jamieson, T. Shank, T. Heyl, J. Drazen, C. Nunnally, P. Yancey, M. Ichino, S. Pierney, M. Clarke, C. Machado. Not present: D. Mayor, H. Ruhl, A. Rowden.

What does it take to become a symbiont of deep-sea invertebrates?

Nicole Dubilier

Symbiosis Group, Max Planck Institute for Marine Microbiology, Bremen, Germany



The common perception of symbioses between chemosynthetic bacteria and invertebrates from hydrothermal vents and cold seeps is that these have evolved only rarely from a few bacterial lineages uniquely adapted to a symbiotic lifestyle. In a recent paper from our research group we examined how many times during evolution deep-sea bathymodiolin mussels from hot vents, cold seeps and other chemosynthetic environments were colonized by free-living bacteria (Petersen et

al. 2012. *Biol. Bull.* 223: 123- 137). Our results suggest that bathymodiolin mussels were colonized multiple times by many different lineages of bacteria. At least four different lineages of sulfur-oxidizing bacteria and six different lineages of methane-oxidizing bacteria have established symbioses with bathymodiolin mussels. So if free-living bacteria have been able to establish themselves as intracellular symbionts so often in the course of evolution, this suggests that it takes very little to become a symbiont. We are now comparing the genomes of the sulfur-oxidizing symbionts of bathymodiolin with their closest free-living relatives, highly ubiquitous pelagic sulfur-oxidizers called SUP05 or GSO bacteria that dominate oxygen minimum zones worldwide, and have also been found in hydrothermal vent plumes (Anantharaman et al. 2013. *PNAS* 110:330-335). I am excited about these comparative genomic analyses because they may allow us to finally understand what it takes to become a symbiont. In the symbiosis between squid and their luminescent *Vibrio* bacteria, Mark Mandel and Ned Ruby elegantly showed that only a single regulatory gene was sufficient to enable free-living *Vibrio* bacteria to become symbiotic (Mandel et al. 2009. *Nature* 458:415-417). What a difference a gene makes!

New Discoveries at the Mid-Atlantic Canyons

Sandra Brooke¹ and Steve W. Ross²

¹University of Oregon; ²University of North Carolina at Wilmington, USA



Top: Sandra Brooke. Above: Steve Ross

Submarine canyons are dominant features on the outer continental slope along the US Atlantic coast; these ecologically significant features support a diverse biota, including productive commercial fisheries. They are also potential areas for oil and gas exploration. In 2010 the Bureau of Ocean Energy Management (BOEM) and NOAA funded a four-year project to conduct multidisciplinary research that will be used to manage canyon ecosystems. In August 2012, an international team of scientists boarded the NOAA ship *Nancy Foster* for a 43 day research cruise to explore and study Norfolk and Baltimore canyons. Multibeam maps helped guide the ROV *Kraken II* (Univ. of Connecticut), which recorded high definition video and collected samples for research. Benthic landers and moorings were placed in both canyons to record environmental data, collect sediment samples and deploy experiments. One of our objectives was to locate a methane cold seep first discovered over 30 years ago using a towed camera. We found the seep on the flank of Baltimore Canyon, conducted



Top: A large Cusk sheltering under a rocky ledge, surrounded by live seep mussels. Above: A red crab trying to crack open a mussel in the middle of the methane seep

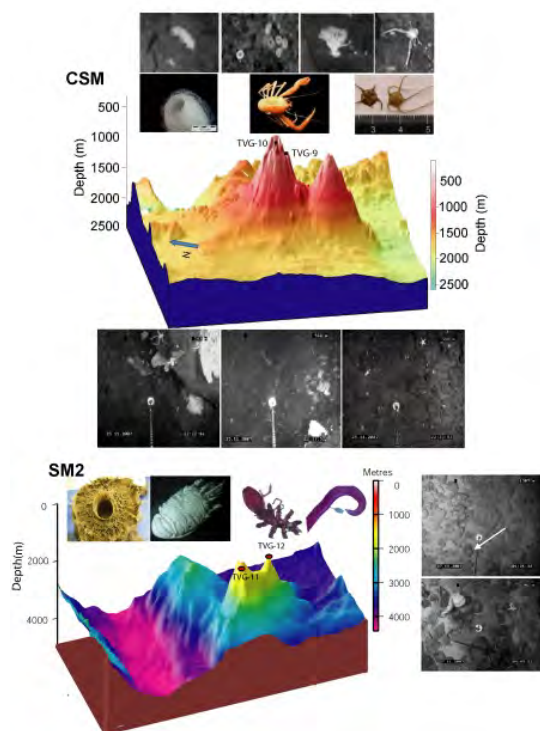
a detailed survey and made collections of the seep mussels for genetics, reproduction and isotopic analysis. We discovered colonies of the reef-building coral *Lophelia pertusa* in both canyons; these are the first records of this species in the mid-Atlantic region, and they fill a prior distribution gap between *Lophelia* reefs off the southeastern US and records from the New England canyons. We also found large stands of *Paragorgia* (bubblegum) coral on the rugged canyon walls, and explored several WW-I warships and other marine archaeological sites. We will return in May this year with the Jason ROV to continue exploring these canyons.

Deep Indian Ocean explored

Baban Ingole and group*

National Institute of Oceanography (CSIR), Dona Paula, Goa, India

*Group consists of Dr. Sini Pavitran, Dr. Sanita Shivadas, Dr. Mandar Nanajkar, Mr. Sabyasachi Sautya, Mr. Ravial Singh & Ms. Reshama Goltekar



Benthic biodiversity in the deep-sea, particularly in the Indian Ocean, is poorly explored compared to other deep oceanic regions. During the last decade the National Institute of Oceanography (CSIR) Dona Paula Goa, India explored some interesting deep-sea habitats such as seamounts, back-arc basins, mid-oceanic ridges, and the Central Indian Ocean Basin (CIOB) and their associated benthic communities. This work has resulted in two PhD thesis and 32 research publications:

(1) Ms. Sini Pavitran (2007) *Deep-sea treasure of macrobenthic communities*, PhD. thesis submitted to Goa University, 139 pp.

(2) Sabyasachi Sautya (2013) *Response of benthic community structure to the habitat heterogeneity in Indian Ocean*, being submitted (March/April 2013)

Seamount and Andaman Back-arc basin:

The newly-found Cratered seamount (CSM), SM2 seamount and Andaman Back-arc basin were studied via underwater video survey. The CSM demonstrated a large component of hard substrates with higher species abundance and diversity. The sponge *Euplectella* sp. was dominant on the flank of CSM. The SM2 seamount is characterized by cobbles and fine sediment, with medium faunal abundance and diversity. The bird-nest sponge *Pheronema* sp. was dominant on the flank of SM2. The basin area was dominated by fine sediments and very poor faunal abundance and diversity. Echinoderms were dominant in the basin area.

Mega faunal community structure: Two different depth regions were investigated via underwater video survey in the Indian Ocean. The data were analysed using GIS techniques to determine mega faunal community structure at the habitat scale. The shallower depths located at off-axial highs revealed mostly sediments with basalt substratum where Cnidarians were dominant. The deeper regions showed a variety of substrate types which were characterised by greater diversity with a higher abundance of Echinoderms.

Central Indian Ocean Basin (CIOB) area:

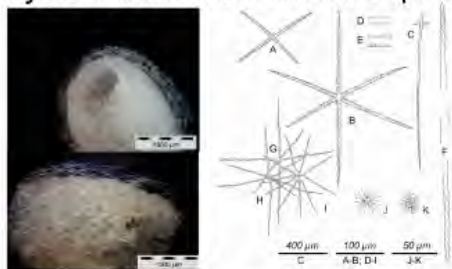
Silty clay sediments were observed with higher macrofaunal density than previously reported from the Central Indian Ocean Basin (CIOB) area, and Tanaidacea and Polycheta were the dominant macroinvertebrate, and Nematoda prevailing taxa. Generally the surface deposit-feeding habits with motile macrofauna were dominant at CIOB. The nematofauna was represented by 113 genera belonging to 30 families. The CIOB consists of cosmopolitan nematode species like *Acantholaimus* sp, *Halalaimus* sp and *Desmoscolex* sp. The composition and diversity of nematofauna from the CIOB generally corresponds with the nematodes from other oceanic regions. However, the density of nematodes was considerably lower than reported for other oceans.

New discoveries:

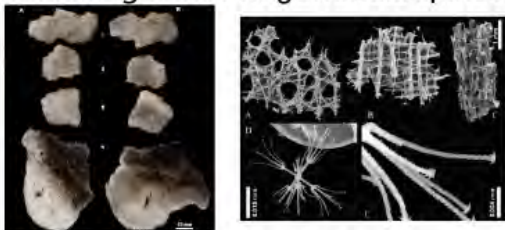
Through these efforts we (NIO Goa group) have been able to report new discoveries (sponges and brittle stars) of benthic species from the Indian Ocean. However, much more remains to be explored.

Above: figure from PLoS ONE 6 (1)e16162: 1-15 ;
Below: figure from: J. Mar. Biol. Assoc. UK., 92 (05):1195-1208

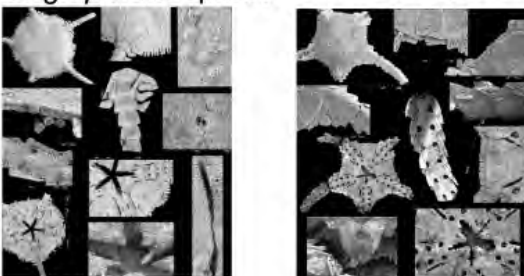
Hyalascus andamanensis sp.nov



Indiella gen.nov *ridgenensis* sp.nov



Ophiroleuce longispinum sp.nov *Ophiophyllum minimum* sp.nov



Researching benthic biodiversity in North-West Africa

Ana Ramos

IEO Vigo, Spain

Over the last decade, the Spanish Oceanographic Institute (IEO), in collaboration with Vigo University, have carried out 21 surveys on shelves and slopes of Atlantic and Indian waters, starting up a project devoted to the research of biodiversity of African benthic ecosystems (ECOAFRIK).

The research program began in 2010 within the framework of CCLME and EAF-Nansen Projects, in cooperation with the Institute of Marine Research (IMR) and the University of Bergen. Twelve multidisciplinary surveys have been conducted in NW Africa, from Guinea to Gibraltar Strait (Morocco), onboard Spanish and Norwegian vessels ('Vizconde de Eza' and 'Dr. Fridtjof Nansen'). Impressive collections, made up of more than 40,000 exemplars and enormous quantitative databases, have been created using identical methodology. The taxonomical study and information analyses will allow us to obtain an overview of the biodiversity of coastal and deep NW African benthos, as well as allowing us to locate and characterise the main and vulnerable benthic habitats.

The implementation of a training program in benthic taxonomy for African researchers of the CCLME and GCLME regions and the creation of a 'benthic' network in northwestern Africa, are the other two main aims of the Spanish-Norwegian research team.

The hardest stumbling blocks, the taxonomic study and the training program, could finally come to fruition if the MAVA Foundation and the FAO support the co-funding of these activities.



Images, top: Benthos sampling on board of O/V 'Vizconde de Eza' during 'MAURIT-1011' Survey in deep Mauritanian waters; above: Scientific team on board of O/V 'Dr. Fridtjof Nansen' during the 1st leg of CCLME ecosystemic survey on 2011.

News

EU Parliament should act now to protect the deep sea

John Briley

The Pew Charitable Trusts

Right now the European Parliament is considering a proposal from the European Commission to phase out deep-sea bottom trawling by the European fleet in the North East Atlantic. Taking this step would help safeguard this last remaining deep-ocean frontier – a place of fascinating fish, corals and other life forms that are integral to an increasingly imperiled ecosystem.

Parliamentarians have a chance to leave a legacy of forward-thinking environmental protection while promoting sustainable fisheries and creating jobs for the long term. The Pew Charitable Trusts has been working hard alongside other groups, notably the Deep Sea Conservation Coalition, to protect the deep from destructive fishing.

Deep-sea bottom trawlers drag massive, heavy nets affixed to steel plates and cables across the deep seabed, wiping out everything in their paths, including corals and sponges that have flourished



(c) OCEAN 2012

for thousands of years. Photos and videos of bottom trawled areas reveal barren wastelands, speckled with broken corals. Contrast these with images of the un-trawled deep sea, where reefs and seamounts teem with bizarre fish and crustaceans, and massive fan-like coral formations, called sea pens, sway in the currents.

Because they live in extremely cold water with zero exposure to sunlight, most deep-sea creatures mature slowly and reproduce late in their long lives. The orange roughy fish, for example, can live to 150 years old but does not reproduce until it is 25 to 30 years old.

Armed with sound science and the vision to wisely manage our most precious resources, the EU Parliament should do the right thing and approve the commission's proposal.



(c) OCEAN 2012

Ecosystem dynamics at deep-sea hydrothermal vents based on observatory data – results coming in!

Daphne Cuvelier

Department of Physical Resources and Deep-Sea Ecosystems (REM), Ifremer, France

There are currently two datasets from deep-sea observatories focusing on deep-sea hydrothermal vents available. The ecological modules of the observatories record imagery and environmental variables (temperature, iron and oxygen), and are called TEMPO (1700m depth, MoMAR observatory, Lucky Strike vent field, Mid-Atlantic Ridge) and TEMPO-mini (2180m depth, NEPTUNE Canada, Main Endeavour Field, North East Pacific), and both are developed by Ifremer. A large amount of data is thus available, allowing an insight into the day to day life of hydrothermal vent fauna.

A degree of originality was needed to analyse the data to their full potential, as the datasets are huge, combine different frequencies of recordings and contain holes (e.g. black-outs or just a failed recording). To this end, novel statistical methods have been used and developed in R, comprising dbMEM analyses, variation partitioning, WR periodograms etc.

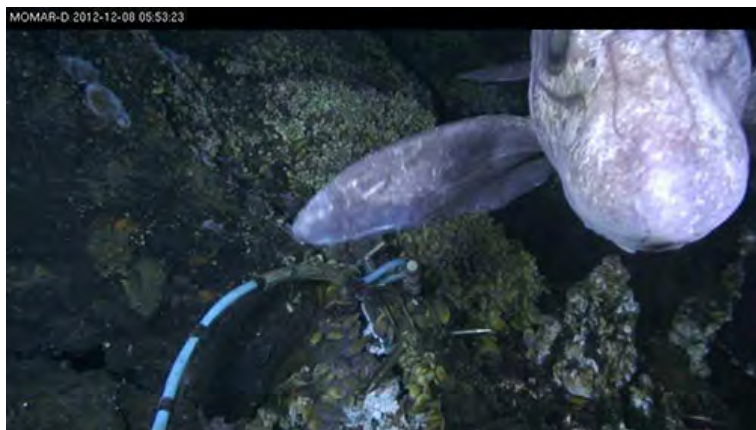


Image of a *Chimeara* (*Hydrolagus pallidus*) visiting the MoMAR observatory at the Mid-Atlantic Ridge (Lucky Strike vent field). © Ifremer -2012

first detailed comparison between faunal and environmental dynamics in Atlantic and Pacific are underway.

More data will be available as TEMPO will be recovered this summer from the MAR and a new deployment of TEMPO-mini on NEPTUNE Canada is planned for May 2013!

Some of these techniques were applied for the first time on such time-series, resulting in unexpected errors and thus exposed previously unknown limitations. However, solutions were found and results are pouring in!

Main results revealed semi-diurnal and diurnal periodicities in the environmental variables such as temperature as well as the influence of the lunar cycle. The impact of these environmental variables and their periodicities on the local fauna were assessed.

Behaviour and species interactions were annotated, e.g. visualising attacks from polynoid polychaetes on tubeworms, visits from fish to the hydrothermal assemblage, and other interactions between fauna. A

25th Anniversary of the MIR submersible

P.P. Shirshov Institute of Oceanology, Russia

In December 2012, the MIR submersibles celebrated the 25th anniversary of their creation. Building of the submersible began on 16th May 1985 by the USSR Academy of Sciences, and was finished on 17th December 1987 by Rauma Repola. The head of the project was Prof. Igor Mikhaltsev (1923 – 2010). His deputy was Dr. Anatoly Sagalevich, who worked for Rauma Repola for the whole duration of the building of the MIR submersible – from 1985 – 1987. The chief engineer on the Finnish side was Suali Ruohonen: he led the team of Finnish engineers and technicians who took part in the submersibles' construction. The ideas and design of the systems, elements, navigation equipment and scientific instruments are attributed to these three men.

The submersibles were built in an extremely short time frame. Deep-ocean trials were carried out in the Atlantic with MIR 1 reaching 6170 m water depth on 12th December 1987 and MIR 2 reaching 6120 m water depth on 13th December 1987. Between August and October of the same year, Rauma Repola refitted the R/V Akademik Mstislav Keldysh to be a support vessel for the MIRS. The state then became the owner of the World's only deep-ocean research complex with two manned sixthousanders aboard.

If we take into consideration that during the last 25 years only 4 manned submersibles exist that are capable of diving to 6000m (there are two more, one in France and one in Japan), Russia was the undisputed leader in deep-ocean exploration. This has been recognized by scientists and deep-ocean experts world-wide. In 1994, the MIR submersibles were recognized as the best in the world by the World Technology Evaluation Center.

Different aspects of the MIRs' operations over the last 25 years have been discussed in a recent article by Dr. Anatoly Sagalevich, published in the December issue of Sea Technology, entitled "Quarter century of research with the MIR-1 and MIR-2 submersibles."

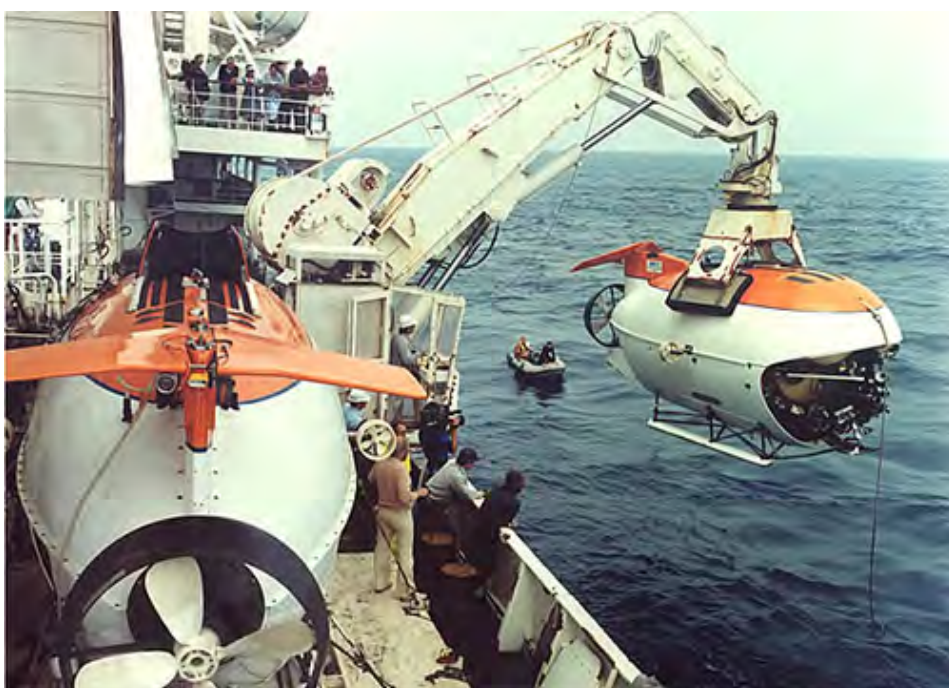


Image credit: P.P. Shirshov Institute of Oceanology

A Deep-Sea Biology Society

¹Bhavani Narayanaswamy & ²Craig McClain

¹SAMS, UK & ²National Evolutionary Synthesis Center, USA

At the last deep-sea symposium we (namely Bhavani Narayanaswamy and Craig McClain) proposed that a Deep-Sea Biology Society should be formed. Many of you will have received the e-mail through the INDEEP mailing list asking for volunteers to form a steering committee that would create the mission, core values, scope, and by-laws for such a society. The committee would also construct a process that would allow all relevant parties to provide feedback and vote on these items. After approval by the community, the committee initiate the legal/financial process to form the society and establish process for election officers.

We were inundated and overwhelmed with support from researchers at different stages in their career from postgraduate students to retired professors all offering help, support and guidance. We are really grateful for all the information and wisdom (and pitfalls to avoid!) that people have been kind enough to pass on.

A steering committee for forming the society has now been formed and we have tried to ensure that there is a good representation across continents, age groups, disciplines and gender. We will be working closely with the committee on the various aspects and formalities required to set up a new society and we hope that by the time of the next newsletter we will have more information about the society....so watch this space!!!

For further information please contact Bhavani at: Bhavani.Narayanaswamy@sams.ac.uk

The World Register of Deep-Sea Species (WoRDSS)

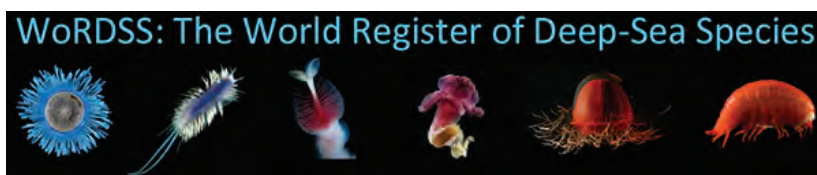
Tammy Horton

NOCS, UK

The 13th Deep-Sea Biology Symposium saw the launch of the World Register of Deep-Sea Species, a new web portal which aims to bring together the most up-to-date taxonomy with a suite of identification tools (online keys, monographs and papers) recommended by taxonomic experts. The

primary goal of the project is to build a comprehensive database of known deep-sea species and to present this as a thematic species database (TSD) of the World Register of Marine Species (WoRMS), with all data dynamically linked to WoRMS and their team of taxonomic editors. Additionally, taxon pages are being supplemented with high quality, verified images where possible to aid identification. All deep-sea biologists will be able to use this website as a rapid tool to search for deep-sea species, create deep-sea species lists and browse using an up-to-date taxonomy. A secondary goal has been to accumulate high quality specimen images of deep-sea species and to present these on both the website and an iOS app (Deep-Sea ID which will be available on itunes very soon. Deep-Sea ID is a field guide interface to WoRDSS that will store on your device (for offline access), the taxonomic information for over 20,000 deep-sea species, over 350 high-resolution photographs of deep-sea specimens as well as links to online taxonomic tools, sources and important references. The app is designed for the scientific community but also offers a visual tour of the remarkable biodiversity of deep-sea life that is of interest to educators and the general public.

This work is funded by INDEEP (<http://www.indeep-project.org>) and managed by Adrian Glover (NHMUK), Nick Higgs (University of Plymouth) and Tammy Horton (NOC). <http://www.marinespecies.org/deepsea/>



Deep-sea biodiversity seminar day at the Banyuls marine station

Nadine LeBris

UPMC CNRS, France

About 40 scientists and students attended the second edition of the Deep-Sea Biodiversity Seminar Day which took place at the University Pierre and Marie Curie marine station in Banyuls on December 11th, 2012. The event aimed to promote exchanges between deep-sea scientists and Masters students, while presenting recent advances in the knowledge of deep-sea biodiversity and ecosystem functioning from a variety of innovative approaches. It was jointly organized by the Fondation TOTAL & UPMC as part of the research and training Chair on Extreme Marine Environments, Biodiversity and



Global Change, coordinated by Nadine Le Bris.

Seminars emphasized the relevance of deep-sea research in revealing unique ecological functions and evolutionary patterns, such as the capacity of scavengers from hadal depths to exploit limited energy resources, the dynamic microbial networks colonizing wood at depth, and the role of deep-sea fungal lineages in the evolution of early life. They also addressed the issue of the future of deep-sea biodiversity in a world of climate change through the investigations of deep-sea species adaptation to changes in temperature, pressure and oxygen, and of cold water coral in situ growth in a climate-influenced deep-sea ecosystem. This year, we were also pleased to welcome Eva Ramirez who presented the recent achievements and future plans of INDEEP. It was also an opportunity to present recent results to board

members of the Fondation Total.

The Deep-Sea Biodiversity Seminar Day is part of the PROMEX course on deep-sea ecosystems and extreme marine environment, organized every year in Banyuls, within the framework of the Oceanography and Marine Environment UPMC Masters programme and the ERASMUS Mundus Marine Biodiversity and Conservation Masters programme. The 3-week course is open to graduate and undergraduate students from all countries.

Contact : lebris@obs-banyuls.fr

Benthic Ecogeochemistry Lab., UPMC CNRS UMR8222, Banyuls, France

Ecological and biologically significant areas approved by the eleventh conference of the parties to the convention on biological diversity (CBD)

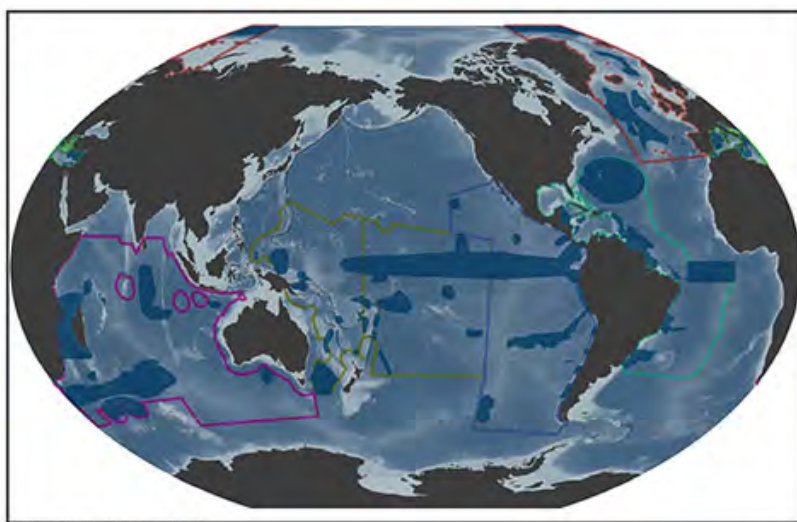
Patricio Bernal
GOBI

After several years of work and overcoming strong initial opposition, a final agreement on EBSAs was unanimously adopted at Hyderabad on October 19th 2012, instructing the Executive Secretary of CBD to include the first batch of 48 EBSAs in the CBD repository and to send the scientific information used to describe them to the UN General Assembly and to all competent international organizations.

During 2011 and 2012 a series of Regional Workshops with the participation of intergovernmental experts, have identified areas that fulfill one or several of the seven scientific criteria established by the Convention in 2008. An annex to the Decision adopted in Hyderabad contains the description of 48 areas meeting the EBSA criteria in the Western South Pacific and in the Wider Caribbean and Western Mid-Atlantic region, and 80 additional areas that could meet the EBSA criteria in the Mediterranean region. There is another list of 40+ areas from the Southern Indian Ocean and the Eastern Pacific (Mexico to Chile) that will be examined by the Scientific and Technical body of the Convention in 2013.

The 48 initial EBSAs were described in two Regional workshops gathering scientific experts designated by governments in Fiji for the West Pacific and in Recife (Brazil) for the Wider Caribbean and Western Mid Atlantic.

Recognizing the paucity of data and information in



In deep blue: Ocean areas identified by Regional Workshops of CBD as fulfilling one or several of the seven scientific criteria established by the Convention to describe EBSAs. Coloured Polygons: Geographic boundaries of the different CBD Workshops: Purple = South Indian Ocean; Yellow-green = South West Pacific; Blue = East Pacific; Green = Wider Caribbean and Western Mid-Atlantic. In red the limits of the Workshop jointly organized in 2011 by OSPAR/NEAFC and CBD. The OSPAR, South Indian Ocean and Eastern Pacific workshops still await final decision by governments. (MGEL, Duke University)

many regions of the ocean, in particular the deep sea, the COP decision also states that the scientific description of areas meeting the EBSA criteria is “an open and evolving process that should be continued to allow ongoing improvement and updating when improved scientific and technical information becomes available in each region.” This statement clearly lends support to the need of continuing with the exploration and research of deep sea habitats and ecosystems.

In several of the Workshops organized by CBD, the EEZ of participating countries were included in the technical discussions. This probably reflects the maturation of the EBSA process under CBD, since participating experts recognized EBSAs as a new valuable scientific tool contributing to guide decisions of competent authorities when establishing management systems to protect biodiversity in the world ocean, clearly distinguishing them from MPAs.

Technical discussions also included information on the pelagic domain and pelagic trophic chains, incorporating a wealth of knowledge of dominant oceanographic processes acting in the different regions, as well as the impact of basin wide scale processes like the ENSO phenomena in the Pacific. The shared understanding developed in these workshops enabled the definition of large EBSAs, including inside EEZ, where active management processes are well established for many years and currently underway. For the deep sea realm, it is of particular importance the attention given in these workshops to systems like the Sala y Gomez and Nazca Ridges and their connectivity with the pelagic systems above them.

In some cases the inclusion of large extensions of High Seas within coastal EBSAs was proposed, where experts considered that important biological and oceanographic processes critical for the maintenance of key ecological services occur. This gave rise to rich and complex discussions about the scale of processes and interconnectedness of systems. Through these discussions, experts obtained completely differing insights as how to apply the criteria when approaching the dynamic and distribution of single species, multi-species complex or the protection of core areas of large ecosystems, where in general several of the seven scientific criteria may apply simultaneously. It was recognized at the meeting that part of the richness of the EBSA process is precisely that these are not necessarily mutually exclusive options.

The work of CBD on EBSAs continues. In January 2013 a Capacity building seminar was organized in Dakar (Senegal) for the countries in the East Atlantic and two upcoming CBD regional workshops to facilitate the description of ecologically or biologically significant marine areas (EBSAs) will take place in: i) North Pacific (Moscow, Russia – 25 February to 1 March 2013); and ii) South-Eastern Atlantic (Namibia – 8 to 12 April 2013).

What's new in high seas/deep-sea policy?

Kristina M. Gjerde

Senior High Seas Advisor, IUCN



In May 2013 two workshops will take place at the United Nations that may determine whether the United Nations General Assembly decides to launch negotiations for a new agreement on marine biodiversity in the high seas and deep seas beyond national jurisdiction. These workshops are part of a larger UN-based process charged with improving the effectiveness of the legal framework for marine conservation and sustainable use beyond national boundaries. Last June, at the United Nations Conference on Sustainable Development, known as “Rio + 20”, government leaders committed to decide on whether to proceed with a new agreement, or not, by December 2014.

Many are convinced that a new legal agreement under UNCLOS is essential to provide a framework to establish marine protected areas, to promote prior assessments of activities that may cause significant harm, and to facilitate access and benefit sharing of marine genetic resources. A few remain unconvinced.

At the UN workshops some fundamental questions will be addressed that would benefit from the input of the INDEEP community. These include:

what are the impacts and challenges to marine biodiversity beyond areas of national jurisdiction? How do you assess cumulative impacts? What are the new and emerging uses of marine biodiversity and marine genetic resources? What types of research programmes are available to promote international cooperation and coordination as well as capacity building and the transfer of marine technology? Are additional efforts needed?

References to articles addressing these questions would be most welcome. Please contact me for further information (kgjerde@eip.com.pl).

Are you looking for a deep-sea expert? A new database may help...

Maria Baker

University of Southampton, UK



We have an astonishing abundance of knowledge and skills among our deep-sea community and expertise in a wide variety of disciplines. Such knowledge is of ever-increasing importance to the future health and well-being of our planet. The INDEEP (International Network for Scientific Investigations of Deep-Sea Ecosystems) office and INDEEP WG5 on Anthropogenic Impact and Social Policy launched a questionnaire in October 2012 in order to generate information to develop a searchable database of deep-sea experts' profiles from across the

globe. We have so far had responses and permission from 119 deep-sea experts to display their information online so as to make it available to fellow scientists, management organisations, policy makers and all deep-sea stakeholders. The intended function of the database is to help "bridge the gap" between accurate scientific information and management of our deep oceans. The proactive step taken by so many will ultimately aid in the protection of our deep oceans which are facing ever-increasing pressure from intensifying human activities and pollution, climate change and ocean acidification. The database can be accessed at the following address: www.deepseaxperts.org

We would welcome further contributions to the database and if you wish to do so, please complete the short questionnaire: <https://www.surveymonkey.com/s/INDEEP>

For Deep-Sea Cephalod Fans Everywhere...

Mike Vecchione

NOAA, USA

The Smithsonian Collections Search Center is an online catalog containing most of Smithsonian major collections from their museums, archives, libraries, and research units. There are 7.99 million catalog records relating to areas for Art & Design, History & Culture, and Science & Technology with 819,800 images, videos, audio files, podcasts, blog posts and electronic journals.

A new addition has recently been made to this catalog collection. Jim Felley has populated the catalog with a unique collection of videos of deep-sea cephalopods (previously found on an obscure Smithsonian website). From this new collection, you will find links to the videos on YouTube. They can be accessed through the following search:



Stauroteuthis sp. courtesy of David Shale:
<http://www.deepseaimages.co.uk/core/Welcome.html>

http://collections.si.edu/search/results.htm?tag.cstype=all&q=record_ID%3Ayt_%2A&fq=tax_class%3A%22Cephalopoda%22

Stunning Deep-Sea Exhibit

Di Tracey

NIWA, NZ



A new exhibition of stunning deep-sea animal specimens and imagery opened in Te Papa in December just prior to the 13th DSBS, and will remain open for a year. The specimens on display have never been seen by the public before, and many are new to science. The exhibition showcases the diversity of habitats around NZ such as vents, seeps, seamounts, rocky slopes, muddy plains and the deep pelagic realm. It shows some of the spectacular creatures such as crabs, tubeworms, precious corals, fish, molluscs and sponges that live in New Zealand's deep ocean – many displayed in specimen jars. The exhibition was developed by Te Papa in association with NIWA and GNS Science. Images of these deep-sea animals have been captured on video by NIWA's Deep Towed Imaging System (DTIS). 'Living on the ocean floor' shows deep-sea animals filmed by Te Papa researchers using a baited lander. This includes rare footage of a shark attacking a hagfish, and the hagfish defending itself by choking the shark with slime. A good proportion of New Zealand's deep-sea biodiversity is represented by specimens held in NIWA's Invertebrate Collection and in Te Papa's Natural Environment collections. NIWA's Invertebrate Collection holds 50 years' worth of biological collections from around the South Pacific and New Zealand. Te Papa's collection was begun by Sir James Hector in 1865, when he was asked by the Government to establish a colonial museum.

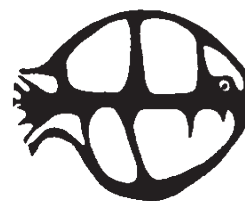
Meetings & Workshops

FISHERIES SOCIETY OF THE BRITISH ISLES ANNUAL SYMPOSIUM 2013



University
of Glasgow

8 - 11 July 2013



CONVENORS:

Dr David Bailey
(Institute of Biodiversity, Animal
Health and Comparative Medicine,
University of Glasgow)

Dr Jeffrey Drazen
(Department of Oceanography,
University of Hawaii, Manoa)

Dr Francis Neat
(Marine Scotland – Science, Marine
laboratory, Aberdeen)

IMPORTANT DATES:

**31 JANUARY 2013: DEAD-LINE
FOR ABSTRACT SUBMISSIONS
AND EARLY BIRD DISCOUNTED
REGISTRATION**

**1 MARCH 2013 - DEAD-LINE FOR
SUBMISSION OF MANUSCRIPTS
TO BE PUBLISHED IN THE
SPECIAL EDITION OF JOURNAL
OF FISH BIOLOGY**

**24 JUNE 2013 - DEADLINE FOR
REGISTRATION**

FOR DETAILS SEE WEBSITE

The deep sea, the largest marine ecosystem on the planet, contains a remarkable diversity of fishes. This timely symposium will bring together biologists from around the world who have a particular interest in deep-sea fishes. The aim is to review progress in the field and present the latest research findings.

THEME SESSIONS:

- Life histories
- Population structure and genetics
- Physiological adaptations and bioluminescence
- Community structure and food-webs
- Benthic-pelagic coupling
- Behaviour and reproduction
- Phylogeny, systematics, taxonomy and new discoveries
- Parasites and symbioses
- Methodological advances
- Conservation and management

INVITED SPEAKERS

Jack Jones Memorial Lecture:

Odd Aksel Bergstad
(Institute of Marine Research,
Norway)

Keynote Speakers:

Monty Priede (University of
Aberdeen, Scotland)

Dick Haedrich (Memorial
University, Canada)

Ivone Figueiredo (IPIMAR,
Portugal)

Tracey Sutton (Virginia Institute of
Marine Science, USA)

Clive Trueman (University of
Southampton, England)

<http://www.fsbi.org.uk/conference2013/symposium-theme/>

10th MBA Postgraduate Conference

Aberystwyth University, UK

8-10 May 2013



Aberystwyth University has been chosen to host the 10th annual postgraduate conference of the Marine Biological Association of the UK (MBA). This exciting meeting will bring together up to 100 marine biologists from across the UK and Europe.

The MBA Postgraduate Conference is an annual scientific gathering of postgraduate students undertaking research in marine biology and related fields. The event serves as an invaluable opportunity for early career scientists to present their research to fellow students and marine biologists in a friendly, yet rigorous, environment.

This year the meeting will be organised by postgraduates from Aberystwyth University's Institute of Biological, Environmental and Rural Sciences (IBERS), a world class research and teaching centre with a growing emphasis on marine science.

Aberystwyth offers a beautiful and unique backdrop to the conference. In the cultural hub of mid-Wales, delegates will have the opportunity to experience a tour of the National Library of Wales, a beachside BBQ, and a conference dinner with spectacular views of the town and the sea. Cardigan Bay is home to one of only two resident bottlenose dolphin populations in the UK, and delegates will be invited to join local wildlife group the Cardigan Bay Marine Wildlife Centre on one of their monitoring cruises in the bay.

Registration and abstract submission is now open and information about how to register can be found on the conference website:

<http://users.aber.ac.uk/mpcstaff/>

Further information:

Email: ibers-mba-conference@aber.ac.uk

Prospective authors are invited to submit abstract(s) to:

OMS-2013 Szczecin

The 10th Ocean Mining & Gas Hydrates Symposium

Szczecin, Poland, September 22-26, 2013

www.isopec.org ; www.deepoceanmining.org

The 10th (2013) ISOPE Ocean Mining & Gas Hydrates Symposium (OMS-2013) is being organized by the ISOPE OMS-2012 International Organizing Committee (IOC) and ISOPE Ocean Mining Working Group (OMWG). It will be held in Szczecin, Poland. The 1st ISOPE OMS-95 in Tsukuba, OMS-97 Seoul, OMS-99 Goa, OMS-2001 Szczecin, OMS-2003 Tsukuba, OMS-2005 Changsha, OMS-2007 Lisbon, OMS-2009 Chennai and OMS-2011 Maui were successfully held with the participation from 17 countries.

The purpose of the Symposium is to provide a timely international forum for researchers and engineers interested in ocean mining and technology and promote technical cooperation at an international level. We hope that this occasion will provide an excellent opportunity for researchers and engineers to discuss technical progress and cooperation.



First

Call For Papers

Update on
www.isopec.org
www.deepoceanmining.org

DEADLINES	Abstract Submission	February 1, 2013
	Tentative Abstract Acceptance Notice	February 15, 2013
	Manuscript for Review	April 20, 2013

Prospective authors are invited to **e-mail** your abstract(s) in 300-400 words to:

- (a) One of **IOC members**,
- (b) ISOPE OMS-2013 International Organizing Committee (IOC), 495 North Whisman Road, Suite 300, Mountain View, California 94043-5711, USA (jschung@isopec.org; Fax 1-650-254-2038)
- (c) **Local host committee: Interoceanmetal, Szczecin, Poland, tabramowski@iom.gov.pl**

The abstract **must include** the paper title, all authors' names, affiliations, full addresses, and telephone and fax numbers and E-mail address of the corresponding author. The Symposium Proceedings will be available during the Symposium and later from ISOPE.

ISOPE OMS Symposium papers are all peer-reviewed and indexed by Engineering Index. The papers published since 1995 are a major source of peer-reviewed papers worldwide. **Online digital subscription worldwide** was launched in July 2012. Major worldwide libraries of academia and industry are the subscribers, as for entire ISOPE (1991-2012) publications.

Fields of Interest:

Nodules, Crusts, Sulphide, Rare Earth Materials
Exploration and Seamount Crusts
Materials for Deep-Ocean Mining
Mineral Processing: Science and Engineering
Environments

Gas Hydrates and Engineering
Ocean Mining: Deeper water vs. Deep Ocean
Oceanfloor Vehicles, Control and Systems
Mining and Economics
Student Poster session

Mining Systems, Production and Technology: Total Integrated System (TIS) and Innovative Approach
Ship, Pipe, Transport, Buffer, Miner/Collector Subsystems, Deployment and Control, Transshipment

Initial Members of the International Organizing Committee (IOC):

Dr. T Abramowski (IOM, Poland); **Dr. M.A. Atmanand** (NIOT, India); **Prof. Jin S. Chung** (ISOPE, California, USA); **Dr. V K. Banakar** (NIO, India); **Dr. S Hong** (MOERI, Korea); **Dr. Ti Komai** (Nat'l Inst of AIST, Japan); **Dr. R Kotlinski** (IOM, Poland); **Dr. T Kuhn** (BGR, Germany); **Prof. S Liu** (Central South Univ, China); **Prof. K Otsuka** (Osaka Prefecture Univ, Japan); **Dr. G Schriever** (BioLabForschungsinstitut, Germany); **Prof. J Sobota** (Univ of Wroclaw, Poland); **Mr. M Singh** (Mineral Resources Authority, Papua New Guinea); **Dr. V Stoyanova** (IOM, Poland); **Dr. N Yang** (CRIMM, China); **Dr. C H Yoon** (KIGAM, Korea).

Sponsor Society: International Society of Offshore and Polar Engineers (ISOPE)

Host: Interoceanmetal, Szczecin, Poland

Cooperating Organizations: NSF (USA), COMRA (China), MMIJ (Japan), IOM (Poland), NIO and NIOT (India), KADOM (Korea), KSOE (Korea), JASNAOE (Japan), MRA (Papua New Guinea).

9th World Sponge Conference

Freemantle, W. Australia

4 - 8 November 2013

<http://www.spongeconference2013.org/>



The ongoing discovery of new and highly diverse sponges in Western Australia, combined with recent advances in molecular technologies, sets the stage for the conference theme of 'New Frontiers in Sponge Science' at the Ninth World Sponge Conference in Fremantle, Western Australia from 4 – 8th November 2013.

The key mission of this conference is to highlight this diversity and inspire research within these habitats, thus providing a perfect backdrop for the international gathering of hundreds of scientists with disciplines spanning ecology, evolution, microbiology, marine natural products chemistry, taxonomy, genetics and molecular biology.

Attendance at this meeting will provide an invaluable opportunity to both access and showcase the advances and frontiers in research currently being attained in sponge and benthic science. This will stimulate research interest from marine scientists around the globe, and reach beyond sponge science.

Importantly, this conference aims to bring together industry with scientists so the benefits of sponge science can be taken up by the resource, policy and environmental sectors.

Our venue is the historical port of Fremantle at the mouth of the Swan River. It is a stunning setting in which to meet and network and we very much hope you can join us "down under" for this exciting conference.

High throughput sequencing in the deep-sea

Sophie Plouviez & Andrew Thaler

Duke University, USA



To assess the needs of the deep-sea community who are interested in high-throughput sequencing approaches, Sophie Plouviez and Andrew Thaler organized an evening discussion at the 13th International Deep Sea Biology Symposium (Wellington, New Zealand, December 6th, 2012) funded by INDEEP. Approximately 20 scientists participated in this discussion, with topics ranging from sharing protocols and scripts, troubleshooting problems, facilitating access to data, and building collaborations. Special emphasis was paid to fostering networks of young investigators using next-generation sequencing approaches. The primary outcome of this meeting was the creation of the "deepseq" mailing list to continue the discussion. Subscription information for "deepseq" can be found at <http://lists.practicalcomputing.org/listinfo.cgi/deepseq-practicalcomputing.org>.

Left: Sophie Plouviez & Andrew Thaler

It's Your Opinion

Ringing the changes

Paul Tyler

University of Southampton, UK

When I was an undergraduate, N.B. (Freddie) Marshall, the deep-sea fish biologist, came to Swansea and gave a lecture about deep-sea fish. At the dinner afterwards I asked him how one got into deep-sea biology and his response was 'With great difficulty'!



Above: The new generation

Even in the early 1980s, research cruises were organised and peopled by the major world marine institutes such as, inter alia, Woods Hole, IOS and Ifremer. Many of these cruises were to the slopes and abyssal plains because one needed large areas to deploy trawls. Small scale studies together with a rapid expansion in deep-sea biologists started in 1979, after the first biological cruise led by Fred Grassle to the vents along the Galapagos Rift. At about the same time, I started working with Dave Billett and Tony Rice, and students of Bob Hessler, including Dave Thistle and Craig Smith, started their careers in deep-sea biology. In the later 80s and 90s, many students started going on deep-sea cruises and as they graduated they extended the community of deep-sea biologists into Universities and Institutes that had no previous history of deep-sea research. The early 90s saw another new innovation, particularly in Europe. The EU established the MAST programme and whereas deep-sea biology had been conducted at a national level it was now being organised at an international level, admittedly with relatively few participants at first, but expanding so that virtually every maritime nation in Europe had participants in the EU-HERMES and EU HERMIONE deep-sea programmes. These programmes encouraged many new aspirants into deep-sea biology and so the ripples spread out. The deep-sea biology meetings were also expanding from maybe 120 participants in the early 80s to over 300 in 2006. More and more nations became involved at an international level. Soviet deep-sea explorations were legendary, but accessing the data in the west was difficult. With, inter alia, the Shirshov Institute, Russia has joined the family of deep-sea nations as well as Japan who have made exceptional progress in the study of all chemosynthetic environments in the NW Pacific. Chile, Brazil and India all host enthusiastic deep-sea biological groups. Technology has also changed rapidly in the last two decades. Although submersibles have been around for over 40 years, the technological development of ROVs has made them become important tools in our armoury of deep-sea techniques (as well as being affordable). With their present HD video, just about everyone with a television or computer can see images from the deep sea. We are also more discriminate in the animals we collect. ROVs and submersibles allow us to select just what we need

At that time, in the early 1970s, all active deep-sea research was carried out in research institutes and by men. Such a situation continued throughout most of the 1970s, until academics from Universities started getting more involved in deep-sea operations. I first met John Gage at the EMBS meeting in Galway in 1976 and, with much bravery, asked him if there was any chance of joining him on a research cruise to Rockall. John's positive reply was a great relief and, in April 1977, I did my first trip on *Challenger*. A student of John Allen's (Millport) was on that cruise and he was one of the first PhD students to go to sea regularly. John also had one of the firsts taking his female research assistant, Margaret Pearson, to sea not without much negative comment from both crew and scientists! The anti-women at sea attitude persisted amongst some crew as late as the 1990s.



Above: Paul enjoying the MIR submersible and KP nuts!



for research rather than the mass indiscriminate collections recovered with trawls. I feel deep-sea biology is maturing rapidly as a respected aspect of environmental science. Many of those who were in at the beginning of the new age in the 60s and 70s are retired or retiring and there is a new generation applying modern techniques to this fascinating area of research. I wonder what will be the major new discoveries over the next 30 years.

Paul Tyler January 2013

Left: Paul and a few deep-sea friends on a day off in Madeira (most of them called Craig)

Diversifying the deep-sea science community

Lisa Levin

Scripps Institution of Oceanography, USA

While the majority of deep-sea expertise and technology rests largely with Europe, the USA, Japan, New Zealand, and Russia, there is a critical need to engage the many remaining countries of the world in deep-sea science. These countries host within their EEZs a vast arena of unexplored seafloor and many of the deep-water mineral, energy and fisheries resources most susceptible to current or future exploitation. They are also primary stakeholders in high-seas resources of growing interest. The majority of non-western countries in the world lack deep-sea biologists, facilities to conduct exploration, environmental lawyers or deep-sea/high-seas policy experts. Thus few laws are in place to regulate exploitation. They often have significant underemployment and an endless need for financial resources that leave them open to engagement from resource extraction industries. Limited infrastructure including poor/expensive internet access, lack of research funds and research vessels, or PhD programs to train scientists prevent a balanced, sustainable approach to resource development. Capacity building by the 'developed' world science community, in the form of education, technological assistance, and creation of political will, can facilitate much stewardship of the deep-ocean for future generations. How can we help? For those of us with the ability and facilities, consider (a) opening berths at sea to scientists and students from less developed nations (b) offering your time to international training programs (c) donating your journals, books, equipment or even ships, and (d) publishing in open access journals that don't require costly subscriptions. Help build and diversify a truly global deep-sea network of scientists.



SCOR (Scientific Committee on Ocean Research - <http://www.scor-int.org/capacity.htm>) and POGO (Partnership for Observations of Global Oceans - <http://www.ocean-partners.org/training-and-education>) are two bodies that are actively involved in capacity building initiatives, including providing travel awards, visiting fellowships and educational networks. Contact Maria Baker (mb11@soton.ac.uk), INDEEP Office, SCOR or POGO if you are able to offer any help with these initiatives.

At the intersect of art and science

Lily Simonson

Artist, USA

My most beloved muse, *Kiwa hirsuta*, with mammal-like setae, glamorously mysterious habitat, and otherworldly morphology, first entered into my paintings seven years ago. Since then, the yeti crab's siren song has brought me back to the deep ocean again and again, painting the exquisite range of deep-sea life forms on large-scale canvases—from brachiopods to tubeworms, to *Kiwa hirsuta*'s more recently discovered relatives, *Kiwa puravida* and "the Hoff" crab. By



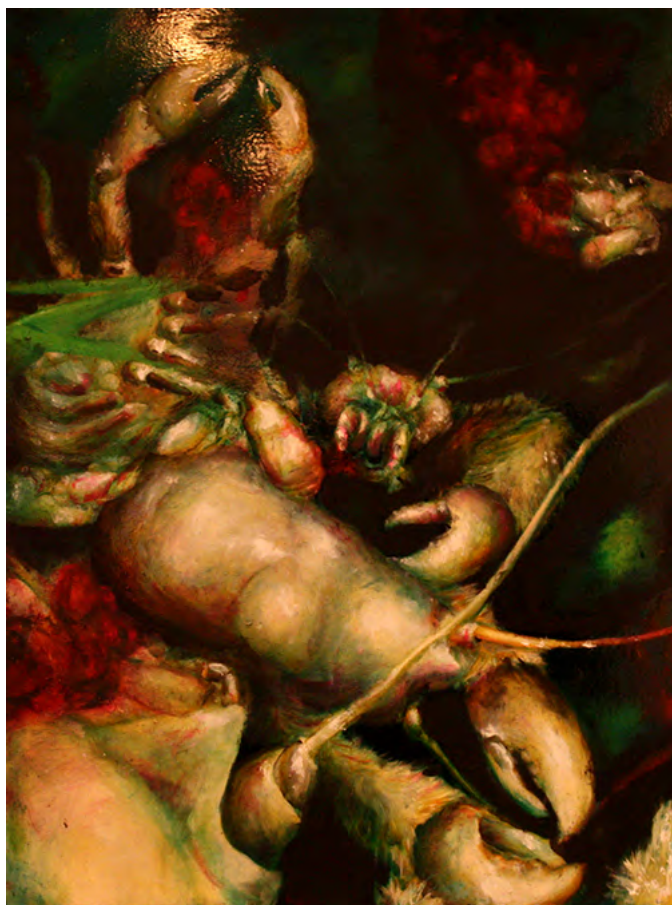
magnifying the subjects to human scale, the paintings delve into their extraordinary morphology and emphasize the affinities between the viewer and subject. Since I prefer to paint from direct observation, I began visiting laboratories around the world, mining their collections for new deep-sea subjects. This summer, I experienced a thrilling breakthrough when I had the opportunity to join my first oceanographic cruise as a part of the San Diego Seafloor Expedition. Aboard the R/V *Melville*, I finally could paint from life for the first time, observing the worms, clams, and other benthic fauna while they were still full of color and movement. In addition, the cruise introduced me to a brand new medium. Each day, after we sorted fauna from the sediment brought up by the ship's multicorer, I used the remaining mud to paint murals on the wall of the ship.

Throughout these collaborations, I have come to realize that artists and scientists share a passion for exploration, mystery, and the unknown. My paintings investigate not only the intersection of human beings with the deep sea, but also the intersection of art and science—fields at once disparate and kindred.

To view Lily's paintings:

Recent paintings: <http://www.cb1gallery.com/privateview/lily-simonson/wet-and-wild/>

Website: oldgenres.com



Images: top: Lily in front of one of her murals; above: Lily Simonson, *Octopus*, 2012, *Sediment* on R/V *Melville*, 84x108 inches (both image credits: Lisa Levin); left: Lily Simonson, *Kiwa Rave*, 2012, Oil and canvas, 48x36 inches (credit: Lily Simonson)

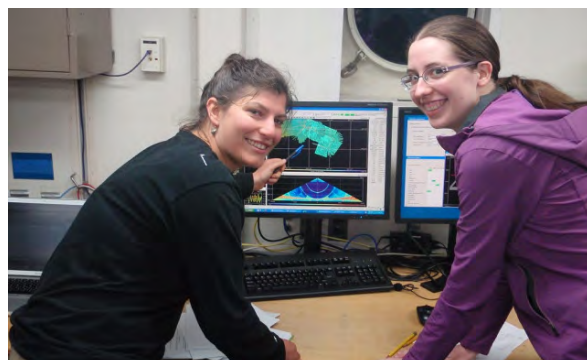
Student Profiles

Jamie Wagner

Marine Science and Conservation Division at the Duke University Marine Laboratory, USA

As a first year PhD student in Dr. Cindy Van Dover's lab in the Marine Science and Conservation Division at the Duke University Marine Laboratory (USA), I have been thrilled by the opportunity to immediately begin immersing myself in deep-sea research. My first opportunity has been to examine the habitat community structure at the Blake Ridge and Cape Fear cold seeps on the Blake Plateau, off the east coast of the US. I have focused on integrating maps of the megafaunal chemosynthetic communities (primarily clams and mussels) with data from bathymetry, sidescan sonar, and chemical sensors. This will reveal patterns in inter- and intra-species spatial organization around seeps. Additionally, I am interested in exploring methodologies to maximally utilize data collected from AUV surveys to increase the efficiency of return sampling cruises.

I intend to integrate questions from an ecological standpoint with genetic approaches to population structure. I will soon begin incorporating population genetic studies into my research, examining patterns of connectivity as revealed by phylogeography, to add to the developing picture of chemosynthetic faunal evolutionary history and current life strategies. I was involved in a cruise last summer collecting samples from seeps off the coast of Barbados, and plan to use these and future samples to examine gene flow. Growing interest in exploitation of natural resources in the deep sea motivate studies of population structure and connectivity; I am fortunate to join the Van Dover lab in generating knowledge that can inform policy and environmental management decisions.



Ravail Singh

Senckenberg am Meer, DZMB, Germany



INVESTIGATION OF NEMATOFUNA FROM POLYMETALLIC NODULE AREAS OF THE WORLD: My PhD is devoted to the investigation of nematode assemblages inhabiting polymetallic nodule areas in the deep sea. Commercial deep-sea mining of polymetallic nodules is predicted to have a significant impact over a huge area. In order to diminish and mitigate mining impacts, it is important to properly study the composition and distribution of the fauna inhabiting nodule fields. Nematodes have potential to be biomonitors of the impact of commercial mining activity but their natural biodiversity in the deep-sea is still not fully known. Many nematode species have only recently been discovered and their true extent and geographical coverage have still not been fully investigated. This present work will help us to understand the large-scale distribution of nematode species.

Nematode assemblages from two distant nodule areas are being studied: from the Central Indian Ocean Basin (CIOB) and from the Clarion Clipperton Zone (CCZ), Pacific Ocean. To date, I have completed the first study of its kind in the relatively unexplored CIOB to report on species/genus level data of free-living marine nematodes. Samples were collected from four stations (12°20'–13°00' S ; 74°18'–75°30' E, depth 5000 – 5200 m) using a box corer, and nematodes were subsequently identified and assigned to different functional categories. The total average nematode density was 13.09 ± 2.7 inds/10 cm². The average value of nematode biomass was 54.6 ± 10.0 mg/m². A total of 284 morphotypes belonging to 113 genera and 30 families were distinguished. Most of the diversity indices varied insignificantly at different stations. This work will be published shortly.

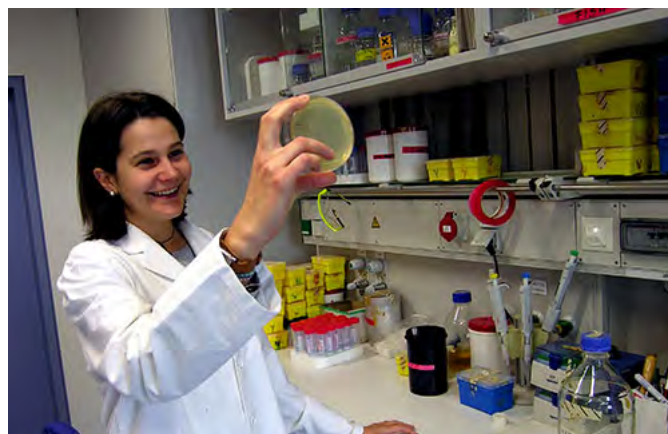
I am now working towards a comparison of Nematode assemblages from two distant areas of the globe (CIOB) and (CCZ, Pacific Ocean). Samples were collected during the MANGAN cruise (SO 205 – RV Sonne) in 2010 and my analysis is well underway. My PhD supervisor is Pedro Martínez Arbizu.

Amandine Nunes-Jorge

Symbiosis Group, Max Planck Institute for Marine Microbiology, Bremen, Germany

My academic studies have always been driven by the immense interest I have in studying deep-sea ecosystems. As an undergraduate at the University of Pierre and Marie Curie in Paris, I used stable isotopes analyses to define trophic relationships among hydrothermal vent organisms from the East Pacific Rise. I also worked on a molecular imaging method called FISH (fluorescence in situ hybridization) for the identification of deep-sea larvae.

For my PhD thesis I have been studying the fascinating symbiosis between bacteria and deep-sea wood-boring clams. Sunken wood provides a valuable carbon source to the nutrient-poor deep-sea and wood-borers are keystone species for the recycling of carbon in wood-fall ecosystems. However wood is degraded by cellulases which are usually produced by symbiotic bacteria. In the shallow-water wood-boring bivalves from the Teredinidae family these bacteria live in their gills and this symbiosis has been well characterized. Gammaproteobacterial symbionts have been isolated and cultivated from the gills of these hosts and were shown to be cellulolytic and nitrogen fixers. Deep-sea wood-boring bivalves from the Pholadidae family (subfamily: Xylophaginae) occupy the same ecological niche but nothing is currently known about their symbiotic bacteria. With the help of molecular tools (16S rRNA sequence analysis, FISH) I am focusing on the diversity of symbionts in several species of deep-sea wood-borers from the eastern Mediterranean and Atlantic. I can show that the gill associated bacteria in the deep-sea Xylophaginae are closely related to the symbionts of the shallow-water Teredinidae. Studies on biodiversity and biogeography are my main topics but the challenge of investigating the evolutionary history of species in such remote deep-sea environments is also very appealing to me.



Abbe LaBella

Duke University Marine Laboratory (USA)

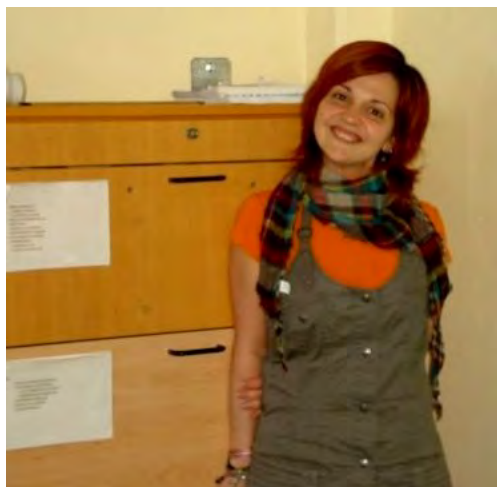


As a graduate student in genetics and genomics at Duke University (supervised by Cindy van Dover), I have had the opportunity to add phylogenetics to the multidisciplinary SeepC team. SeepC's goals include exploration of connectivity in deep-sea chemosynthetic ecosystems using insight from larval biology, physical oceanography, and genetics. My research focuses on advances in next-generation sequencing that make it possible to concurrently investigate contemporary gene flow and phylogeography. Our approach yields sequences for thousands of linked polymorphisms that reside in conserved and variable regions from which we can resolve both recent and historical connections.

I am applying these techniques to examine patterns of connectivity within the deep-sea clam family Vesicomidae. The Atlantic vesicomid species *Abyssogena southwardae* occurs at cold seeps and hydrothermal vent habitats across the Atlantic Basins. We have individuals from multiple seep sites in waters off Barbados to explore local patterns of gene flow. Additionally, we plan to sequence individuals taken at vents and seeps across the Atlantic to examine the process by which a deep-sea species colonizes and spreads to geographically distant sites. Exploring these two levels of connectivity will advance our understanding of how deep-sea organisms colonize new ocean basins and remain connected today—both important concepts for developing conservation efforts.

Vicky Kalogeropoulou

Hellenic Centre for Marine Research, Institute of Oceanography, Greece



I am a marine biologist currently working and living in Greece, finalizing my PhD work. My research interests include the ecology and biodiversity of meiofaunal organisms in a variety of habitats (ranging from shallow to deep-sea areas including extreme environments), the taxonomy of both free-living nematodes and harpacticoid copepods, and the response of meiobenthos to physical and/or anthropogenic disturbance. Since 2006 my work and expertise field is the ecology and taxonomy of meiofaunal taxa in the deep sea (abyssal plains) and extreme ecosystems (mud volcanoes, seamounts). My Ph.D. research is related to the investigation of the long-term changes in community structure, biodiversity and functional diversity of the deep-sea meiofaunal assemblages at the Porcupine Abyssal Plain, NE Atlantic (PAP-SO site, 48°50'N 16°30'W, 4800 m), during a 15-year period (1989 – 2004) and has been carried out under the supervision of Dr. Andrew Gooday, Dr. Nikolaos Lampadariou, Prof. Pedro Martinez Arbizu, Prof. Anastasios Tselepidis and Prof. Ann Vanreusel. During my research I investigated

meiofaunal assemblages in several levels, from the major taxa densities to the species and functional groups, in order to determine which level of identification better reflects the environmental changes occurring in deep-sea benthic ecosystems. During my studies I have been involved in a large number of international/collaborative research projects such as HERMES (Hotspot Ecosystem Research on the Margins of European Seas), MarBEF and DEEPSETS (Deep-sea & Extreme Environments, Patterns of Species and Ecosystem Time Series), LEVAR (LEvantine Basin Biodiversity VARIability), MEDECO (Mediterranean Deep-Sea Ecosystems), BioFUN (Biodiversity and ecosystem functioning in contrasting southern European deep-sea environments), HERMIONE (Hotspot Ecosystem Research and Man's Impact On European Seas) and REDECO (Regional Drivers of Ecosystem Change and its Influence on Deep-Sea populations in the Mediterranean). Combined with six deep-sea cruises that I have joined since 2006, this has significantly enhanced my scientific experience increasing my communication skills and ability to work in a team. Being given any future opportunity after my Ph.D., I would like to keep on with temporal investigations of meiobenthic assemblages, including in situ and mesocosm experiments, trying to identify the missing links in the pathway of energy transfer in the deepest basins. Additionally, I would like to investigate deeper into the physiology, biology and life history of the meiobenthic major taxa in order to determine their exact functional role in the ecosystem.

Natasha Karenyi

South African National Biodiversity Institute and Nelson Mandela Metropolitan University, South Africa



SOUTH AFRICAN WEST COAST SEDIMENT HABITATS BASED ON MACRO-INFAUNA COMMUNITY DISTRIBUTION PATTERNS AND ASSOCIATED PROCESSES:

Macro-infauna are the most abundant and easily accessible fauna in sediments for ecological studies. In South Africa, macro-infauna research has mostly been limited to EIA's, particular areas of interest and shallower depths (i.e. <100 m). My research aimed to determine macro-infauna community distribution patterns across the entire shelf, from beach to shelf edge (i.e. 0-412 m) over the length of the west coast.

I used fine resolution macro-infauna data – collected by spade, suction and grab sampling – from 5 transects over a large scale in order to determine community distribution patterns. Physical

processes known to influence the shelf, including upwelling, hypoxia and terrigenous sediment deposition were related to these community patterns. From this, I defined shelf habitats for future inclusion in conservation planning frameworks in South Africa.

Beyond 200 m (i.e. deep sea), I defined two zones - the outer shelf and shelf edge - which extended for the entire length of the west coast. The distinction between them was not based on depth but rather on proximity to the shelf break, which

I believe is related to turbulence under the upwelling front. Similar patterns were evident in west coast demersal fish and epifauna. Sediment type - a secondary driver of communities – varied substantially between shelf edge sites, reflected also in communities and species abundances.

My project is the first of its kind in South Africa for macro-infauna and has led to collaborations with oceanographers and geologists in an effort to better understand the ecology of the South African west coast.

Sandrine Baillon

Department of Ocean Sciences, Memorial University, Canada



I am a 3rd year Ph.D. biology student working on deep-sea pennatulacean corals (sea pens) under the supervision of Dr. Annie Mercier at the Department of Ocean Sciences (Memorial University, Canada). I am interested in the ecology of deep-sea invertebrates, particularly corals and their associated species. My thesis focuses on three of the most common species of sea pens in the northwest Atlantic (*Anthoptilum grandiflorum*, *Halopteris finmarchica* and *Pennatula aculeata*). First, I looked at intra and inter-colony variation in macroscopic and microscopic biometrics. Inter-colony variations were examined according to depth and region showing for example a decrease in colony length with depth. Secondly, since reproduction of deep-water sea pens is not well known, I decided to focus on the fecundity and reproductive periodicity of the two first species to get a better idea of their resilience. Finally, to determine their importance as a biogenic habitat, I assessed the presence of associated species on and around sea pens and other soft corals. Sea pens present only a few associated species, but they range from obligatory (parasitic copepods) to facultative associates (sea anemones) and include important functional relationships (redfish larvae). My recently published results confirm the importance of deep-water sea pens as a biogenic habitat by providing the first direct evidence of their use as a nursery by fish. All these results will hopefully help in the development of measures to protect sea pens and other deep-sea corals in Canada and worldwide.

Ronan Becheler

Ifremer, France

The relationships between genetic diversity and the stability of populations is the central topic of my PhD. We are focusing on species structuring two marine ecosystems: the cold-water coral *Lophelia pertusa* and the seagrass *Zostera marina*. These species are partially clonal, i.e. able to alternate both sexual and vegetative reproductions. This property deeply influences the population dynamics, as well as evolutionary trajectories. Using molecular markers, we are able to assess the clonal architecture and the genetic composition of populations. Our aim is to infer the extent of clonal growth and rate and the dispersal of species in relation with past and present disturbances. In particular, human activities (bottom-trawling, plastic pollution, global change) may affect levels of genetic diversity of cold-water corals. To assess this human fingerprint, I participated to three cruises to sample reefs from the Bay of Biscay, Logachev Mounds, and the South Iceland, for genetics purposes. Genetic data were crossed with estimates of the human impacts (trawling traces, plastic bags, long-lines...) and demographic status of corals (density of colonies, size...) obtained through video analysis. Preliminary results suggest that humans may affect the spatial genetic structure of *Lophelia* (equilibrium between clonal growth and recruitments of larvae). These results will also contribute to the study of the pattern of connectivity among *Lophelia* populations, at the scale of the North Atlantic in collaboration with a Swedish team. This thesis is supported by the European project CoralFish, and I personally hope this may provide useful information for management decisions.



Opportunities

Fisheries Scientist NIWA, Wellington, New Zealand

NIWA is a leading environmental research institute and key provider of atmospheric, freshwater and marine research and consultancy services in New Zealand.

NIWA uses a variety of statistical and mathematical techniques to study the distribution, abundance and dynamics of exploited fish species and bycatch species such as seabirds and marine mammals, impact of fishing on the benthic and by-catch species, and to study marine ecosystems. This work is done in projects contracted to NIWA by the Ministry of Primary Industries, the Department of Conservation, and the fishing industry. Much of this research underpins advice given to clients for managing exploitation and by-catch issues; research on marine ecosystem dynamics may also be involved.

Our Wellington office needs a senior fisheries scientist to carry out a wide range of research including stock assessments for deepwater, middle depth and inshore fisheries and be part of a team developing an ecosystem based approach to fisheries management.

The successful applicant will hold a PhD in fisheries, and have at least 10 years' experience in fisheries research. They will have a fisheries biology background with strong quantitative skills including the ability to conduct stock assessments. They will also have excellent communication skills and experience with working with industry and fisheries regulatory bodies. It is very important that the applicants enjoy working in teams and will be expected to contribute to the overall management of fisheries research in NIWA.

Applications should contain a transcript of degree course grades and a record of work experience.

For further information, a detailed position description and online applications please visit www.careers.niwa.co.nz

Associate/Full Professor of Marine Sciences Department of Biological and Environmental Sciences, Qatar University

Qatar University Profile:

Qatar University is the premier national institution of higher education with a mission to produce well-rounded graduates with academic knowledge of quality and excellence coupled with a keen spirit of volunteerism and civic responsibility. This is underpinned by committed leadership and an experienced and motivated faculty and staff body.

College Profile:

The College of Arts and Sciences (CAS) houses ten departments, covering a wide range of undergraduate specializations in the Arts and Sciences including English Literature & Linguistics and Arabic Languages, History, Sociology, Social Work, International Affairs, Mass Communication, Psychology, Policy, Planning & Development, Statistics, Chemistry, Biological Sciences, Environmental Sciences, Public Health, Biomedical Sciences and Human Nutrition. The College also houses four Master Programs which are in Environmental Sciences, Biomedical Sciences, Gulf Studies, and Arabic Language. In Fall 2013, CAS will launch a new master program in Material Sciences and a PhD in Biological and Environmental Sciences. Additionally, the College offers a Program of Arabic for Non- Native Speakers.

It is worth mentioning that as members of QU, CAS faculty members have excellent opportunities to secure intramural and extramural funding for their research ideas. Qatar National Research Fund (QNRF) is major source of research funding, with individual project funding limit exceeding 1 million/project (5 million exceptional projects) along with student research funding programs. As the national and largest University in the country, Qatar University is the recipient of most

of QNRF awards, with many research- active faculty members able to win multiple grants.

Duties & Responsibilities

1. Teach general courses in marine sciences, marine biology, plankton and productivity.
2. Employ modern tools of multi-disciplinary science to develop research area in marine science, marine biodiversity and productivity.
3. Preparing research proposals, and augment dissemination of research findings for publication in internationally reputable peer reviewed journals.
4. Supervise students research projects and thesis

Qualifications

1. A Ph.D. in Marine Biology
2. Teaching experience (5years or more)
3. Publication with clear research agenda

Required documents:

1. Current Curriculum Vitae.
2. Cover letter.
3. Teaching, research, and service philosophy.
4. Three referees' contact information (physical and email addresses as well their telephones contact).
5. Copy of highest earned credential (transcript of highest degree if graduated from an institution where course work was completed. However, if no course work was completed, an copy of certificate letter from the registrar of your highest credential granting institution regarding your highest academic degree).
6. Any additional documentation that you feel is relevant to your application.

Benefits:

1. A three-year renewable contract.
2. Salary is commensurate with experience.
3. Tax-free salary.
4. Furnished accommodation in accordance with QU HR policies.
5. Annual round trip air tickets for faculty member and dependents in accordance with QUHR policies.
6. Educational allowance for candidate's children (eligible candidates only) in accordance with QU HR policies.
7. Private health care and health insurance in accordance with QU HR policies.
8. Annual leave in accordance with QU HR policies.
9. End-of-contract indemnity.

Link to job advert: www.qu.edu.qa/artssciences/job/biology.php

Director of Shannon Point Marine Center

Western Washington University, USA

Western Washington University (Western) invites applications for Director of Shannon Point Marine Center (SPMC). The Director reports to the Provost and Vice President for Academic Affairs and is responsible for providing academic and administrative leadership for all programs and facilities within SPMC and for its outreach efforts. As a key member of the University's leadership team, the Director works in collaboration with others to implement the University's mission. The Director will assume office on or before September 1, 2013.

Shannon Point Marine Center: SPMC supports and promotes Western Washington University's undergraduate and master's programs in the marine sciences; supports research by WWU and SPMC scientists across marine related fields; provides access to facilities for visiting scientists from around the world; supports supervised, independent research for undergraduates nationwide via federally-funded programs; and promotes ocean literacy among the general public through targeted K-12 and public education initiatives.

Local facilities, including a flow-through seawater system, a research vessel fleet, SCUBA support, oceanographic

instrumentation, and a well-equipped analytical chemistry laboratory, support the research activities of WWU faculty researchers and resident scientists. In addition to supporting the research of M.S. students in WWU's Marine and Estuarine Science Program, SPMC is nationally recognized for involving undergraduates, including members of under-represented minority groups, in the research programs of its faculty, operating an NSF Research Experiences for Undergraduates Site program, the NSF-funded and award-winning Multicultural Initiative in the Marine Sciences: Undergraduate Participation (MIMSUP) program, and NSF Centers for Ocean Science Education Excellence (COSEE) Pacific Partnership programs. More information about SPMC is available online: <http://www.wvu.edu/spmc>

Position Responsibilities:

Western seeks a Director who is a nationally recognized, respected, and visionary leader in marine science. The Director should have the experience and professional qualifications necessary to keep SPMC at the forefront of marine science education, research, and service. The new Director is expected to collaboratively develop and successfully implement a vision for a vibrant marine research center with a strong focus on student involvement and promoting ocean literacy. The Director should have a broad understanding of and experience with the interdisciplinary aspects of marine science and should promote and value high-quality, competitive research that involves undergraduate and graduate students and programs that seek to increase diversity in the marine sciences. We seek candidates who understand and support the values of public higher education and the liberal arts and who will participate in and foster collaboration across academic units.

The Director of SPMC is responsible for academic planning, budget and resource management, fund raising, program assessment, faculty and staff appointment, development and evaluation, and facilities development and management. The new Director will successfully manage relationships between the marine center and main campus programs coordinating and aligning the SPMC vision with Western's strategic plans. Western seeks a Director who has an open and collegial style and is committed to inclusiveness and cultural diversity.

Required Qualifications:

- A PhD or appropriate terminal degree.
- Evidence of an active, marine-related research program that has resulted in a significant record of scholarship.
- Administrative experience that includes budget management and personnel supervision.
- Demonstrated leadership skills including proficiency in communication and organization, effective decision-making, and development of constructive interpersonal relations.
- Demonstrated experience in program development and in securing external funding.
- Demonstrated leadership in promoting equity and diversity.

Preferred Qualifications:

- A record of academic and professional achievement and scholarship sufficient to warrant tenure and appointment at the rank of associate or full professor.
- Experience fostering interdisciplinary collaboration.
- Successful experience as a creative and resourceful fundraiser.
- Experience partnering with governmental and non-governmental organizations, and private enterprise.
- Experience with development and management of facilities.

Application Instructions and Requested Documents: Applications should be submitted online using the university's electronic application system: <https://jobs.wvu.edu/JobPosting.aspx?JPID=3939>. The following information is required: 1) A cover letter; 2) curriculum vita; 3) and contact information for four references. Application review will begin January 28, 2013 and will continue until the position is filled. All applications and inquiries will be kept confidential. For further information, potential applicants should contact Bev Jones, Assistant to the Provost, by email: Bev.Jones@wvu.edu.

InterRidge Student and Postdoctoral Fellowships, \$5000

The call for proposals for the 2013 Student and Postdoctoral Fellowship Programme is now open. As part of InterRidge's mission to promote international, collaborative, and interdisciplinary studies of oceanic spreading centres, they invite proposals for InterRidge Student and Postdoctoral Fellowships of up to \$5000 US each. Deadline: 31 March 2013 Further details: <http://www.interridge.org/fellowship/2013>. Applications to: coordinator@interridge.org.

Obituaries

In Memoriam, Carlo Heip



Professor Carlo Heip died in his sleep on Friday 15 February. Carlo Heip was professor at the universities of Ghent and Groningen and he was director at NIOO-CEME (Centre for Estuarine and Marine Ecology) in Yerseke and later at NIOZ (Royal Netherlands Institute for Sea Research).

Carlo Heip (1945) studied Biology at Ghent University, where he started a research group for marine biology after he graduated. In 1987, he was appointed director of the Delta Institute in Yerseke, which was incorporated into the Netherlands Institute for Ecology (NIOO) as the Centre for Estuarine and Marine Ecology (CEME) in 1992 and has been a division of NIOZ since 2012. In 2006, Carlo Heip was appointed general director at NIOZ on Texel. He retired in 2011. After that, he stayed on as an advisor at NIOZ and he became the general editor of the Journal of Sea Research.

His first research project involved population dynamics, ecology and the ecotoxicology of benthic life. Later, his focus shifted to the link between biodiversity and the functioning of ecosystems.

Carlo Heip has over 150 articles to his name and he has edited several books. He was a source of inspiration for many national and international initiatives in the field of marine research. He played an important part in European research into land-ocean

interaction, and into ecological processes in estuaries in particular. He was responsible for numerous EU projects. The most important of these EU projects was MARBEF (Marine Biodiversity and Ecosystem Functioning), in which taxonomists and ecologists worked together on a European scale to come up with scientific grounds for the protection of marine biodiversity. This project has made a significant contribution to worldwide initiatives to better describe and understand the variety of organisms in the sea.

Carlo Heip was an eminent scientist and a committed intellectual who as a researcher contributed to the better preservation of the marine environment. He was a director and organiser with vision and leadership. We will remember him as a warm and dedicated person.

We hope you have enjoyed reading this first edition of Deep-Sea Life. We welcome your comments and suggestions. We also welcome your text and images for the next edition - coming in October (ish). Please send any comments or text for the October edition (using template Maria will provide) to Maria (mb11@noc.soton.ac.uk).