ECODIM¹-Namibia, a Node in a proposed RGNO² for southern Africa

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Summary
We are proposing postgraduate discovery camps on the Ecology and Diversity of marine Microorganisms (ECODIM) at the Sam Nujoma Marine & Coastal Resources Research Centre (SANUMARC) of the University of Namibia (UNAM). A “discovery camp” is a training opportunity for advanced Master students and PhD candidates in their formative years to learn about new developments in evolving scientific fields and to experience collaboration by carrying out guided research projects in a team for a few weeks. The project intends to become a node of a Regional Graduate Network in Oceanography (RGNO) in southern Africa as originally inspired by SCOR³. The proposed ECODIM courses contribute to capacity building and development through scientific training in diverse fields of microbial oceanography in and for countries of the Southern African Development Community (SADC⁴). RGNO initiatives respond through training and know-how transfer to needs for scientific, engineering and technical expertise for economic and social development and ocean observation in areas of the world where this is needed most.

Three interdisciplinary research projects will be carried out over a period of four years. They are application-motivated and linked to each other:
(1) Coupled cycling of nitrogen and sulfur in redox transition zones,
(2) Role of microorganisms in pelagic and benthic carbon balancing and
(3) Organic biomarker molecules in sediment matter and phosphorite-containing glauconites as proxies for former and present microbially mediated depositional processes.

The research themes are unique for the Benguela Current system and investigating them will advance the knowledge about microbially driven geochemical and nutrient cycling. Participants will be introduced to microbiology from the community level to the “omics” level, to lipid biomarker molecules and to dominant authigenic minerals for the reconstruction of paleoenvironmental conditions. With this research we will train students to address questions of national and regional importance (e.g. causes of variability of fish and shellfish populations, stability of current-induced upwelling during past and future global changes, consequences of mining at the sea bottom and prospecting for marine biotechnology). The research topics have been defined based on knowledge of past, ongoing and anticipated research projects in the Benguela Current region. Course instructors will be recruited from the investigators of these projects. Some experiments and measurements require advanced methodologies and expensive equipment, which is not necessarily available at the course site.

Footnotes:
¹ ECODIM = Ecology and Diversity of Microorganisms
² RGNO = Regional Graduate Network in Oceanography of SCOR; http://www.scor-int.org/RGSO_Design_Principles.pdf
This technical limitation shall be overcome by creating South-South and South-North networks, which will allow students to carry out analyses at well-equipped laboratories during internships.

An ECODIM discovery camp is an intensive, exploratory research experience with four main objectives: (1) to design original research projects leading to the discovery of novel microorganisms and understanding their role in nature, (2) to build confidence in doing exciting research of high quality in interdisciplinary teams, (3) to work critically with the scientific literature and to embed the research results into the existing knowledge base, by reading and writing about the research topics and (4) to be trained for inquiry-based teaching and field work.

Some of the proposed research themes are linked to similar investigations carried out in the Humboldt Current System (Chile, Peru) and the Santa Barbara Basin in the North-South flowing California Current. We can thus compare the Namibian ECODIM observations with ongoing investigations in other regions of the world.

The “Benguela research” is very well supported by a number of programs and institutions which we hope will become partners in the proposed RGNO: the GENUS\(^5\) and SPACES\(^6\) initiatives and projects carried out through SANCOR\(^7\), ICEMASA\(^8\), ACCESS\(^9\), Ma-Re\(^10\) and Norway’s Nansen-Tutu Centre for Marine Environmental Research at UCT\(^11\).

During the years 2014 - 2017, we aim to offer 4 ECODIM courses, 3 emphasizing marine microbial ecology and one aquatic geomicrobiology. Over the same period, we would like to develop the conditions and infrastructure at SANUMARC to the point, that researchers trained abroad and returning to Namibia will find it attractive to work here. This will allow them to successfully compete for research grants and to provide training and capacity building by themselves.

So far, neither marine microbial and molecular ecology nor geomicrobiology of the ocean are offered anywhere in southern Africa; ECODIM-Namibia is thus responding to a need. Expertise for these fields is available from work in similar discovery camps in Concepción (ECODIM-Chile), the Microbial Diversity Courses in Woods Hole (USA) and the GeoBiology Courses on Catalina Island (USA).

We are in the process of assembling a regional support group with representatives from institutions of the marine research corridor along the coast: NatMIRC, the Geological Survey of Namibia, the Benguela Current Commission, SCOR and POGO and the Universities of Namibia (UNAM) and Cape Town (UCT). The group will coordinate postgraduate training within the southern African RGNO and with similar activities elsewhere. The members of the support group should be in a position to open doors locally and abroad that lead to challenges and incentives and to the recognition of RGNO courses as parts of university degree programs.

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\(^5\) GENUS = Geochemistry and Ecology of the Namibian Upwelling System: [http://genus.zmaw.de](http://genus.zmaw.de)

\(^6\) SPACES = Science for the Assessment of Complex Earth System Processes

\(^7\) SANCOR = South African Network for Coastal and Oceanic Research, [http://sancor.nrf.ac.za](http://sancor.nrf.ac.za)

\(^8\) ICEMASA = International Centre for Education, Marine and Atmospheric Sciences over Africa, [http://www.icemas.org](http://www.icemas.org)

\(^9\) ACCESS = Applied Center for Climate and Earth Systems Science: [http://www.access.ac.za](http://www.access.ac.za)

\(^10\) Ma-Re = Marine Research Institute: [http://ma-re.uct.ac.za](http://ma-re.uct.ac.za)

\(^11\) Nansen Tutu Center at the University of Cape Town: [http://ma-re.uct.ac.za/nansen-tutu-centre/](http://ma-re.uct.ac.za/nansen-tutu-centre/)