Proposal of a New SCOR Working Group

1. **Title: Biodiversity Patterns of the South Atlantic Mid-Ocean Ridge**

2. **Background and Rationale**

The deep sea is the largest continuous ecosystem of the planet, but is also the least explored and understood. The traditional perception was that it is comprised of vast, remote, life-poor, and stable environments, which are isolated from other ecosystems and not affected by global-scale changes. Yet efforts to understand the patterns of life in the deep oceanic waters have revealed that the deep sea can be diverse, productive, and dynamically linked to the sunlit levels of the water column. These vertical interactions not only seem to determine localized concentrations of deep fish stocks, increasingly targeted by the fishing industry, but may also influence distribution of surface predators including tunas and whales. More importantly, studies have also demonstrated that life in the deep ocean is vulnerable to the effects of climate change and human economic activities including fishing. The more that is learnt from this remote ecosystem, the greater is the need to further describe it, understand it, and observe it for future changes.

The Census of Marine Life - MAR-ECO project has investigated ecological patterns of the deep sea by combining modern technology, an intensive and well-planned sampling strategy, and the collaborative work of international scientific expertise. Over the North Atlantic mid-oceanic ridge system, pelagic and benthic habitats to a maximum of 3500 m were sampled by capture gears, acoustic and optical devices, and tracked by satellite transmitters. Sampling was conducted either continuously along the ship's track or at predetermined points, as for instance, by moored upward looking sonars. As promising as the MAR-ECO approach was to enhance understanding of the deep sea, an additional challenge is to expand investigations to other deep areas of the planet, particularly in the overlooked southern hemisphere.

A MAR-ECO spin-off project is taking this challenge to the South Atlantic where deep life has been highly undersampled. The South Atlantic Ocean is the newest of all major oceans, formed by the separation of South America and Africa 175 – 90 million years ago, and is the only ocean basin to be directly connected to all of them. It is also economically important as it sustains a large portion of the Atlantic pelagic (i.e. tropical tunas) and seamount fisheries. Despite its size and role in the world ocean ecosystem, our knowledge of aquatic organism deep-water diversity and distribution is scarce and mostly inferred by comparison with the north Atlantic. The South Atlantic MAR-ECO project was set out to develop a strategy, based on the MAR ECO approach, to establish a biota sampling program, spanning from microorganisms to whales, capable of (a) increasing data on South Atlantic deep pelagic and benthic diversity and distribution, and (b) integrating South American and African communities in the challenge of understanding the deep waters between them, identifying fishing opportunities and needs for conservation.

After a three-year planning phase (2007 – 2009) a first field effort took place in November 2009 on board of the R/V Akademik Ioffe and through a collaborative effort of the Shirshov Institute of Oceanology, Russia. During a 34-day cruise from Gran Canaria Island (Spain) to Cape Town (South Africa), a team of scientists from Brazil, Uruguay, Russia and New Zealand conducted a total of 63 pelagic and benthic sampling events up to 4.7 km deep over pre-determined areas of the southern Mid-Atlantic Ridge and the Walvis Ridge. Results are still preliminary and a considerable effort is still required to process all biological samples. However partial figures point at approximately 1000 records of organisms included in 175 fish taxa, 44

cephalopods and over 200 benthic invertebrates (Ascidiacea, Anellida, Porifera, Crustacea, Mollusca and other groups). Additional plankton diversity data shall result from collaboration with the Trans-Atlantic Commission I (DHN – Brazilian Navy) conducted by the Brazilian R/V Cruzeiro do Sul in the same period.

Summarizing, discussing and publishing the patterns of diversity and distribution revealed by this first field effort are important next steps to be taken by the SA MAR-ECO international science team. Exploring new opportunities for field work in the future is also a critical task. These actions have been conducted under the Census of Marine Life agenda and chiefly supported by the A.P. Sloan Foundation. As this initiative will come to an end in 2010, SCOR is seen as an adequate environment for continuation of the required international collaborative work. A Working Group under SCOR would allow all involved PIs to be concentrated around the aforementioned tasks and also provide a suitable framework for interactions with international activities. Until now these have included (a) the CoML deep-sea field projects such as CenSeam (A Global Census of Seamounts), (b) Brazilian large-scale oceanographic programs such as Trans-Atlantic Commission I (DHN – Brazilian Navy), (c) regional fisheries organizations principally SEAFO (Southeast Atlantic Fisheries Organization) and (d) other deep-sea projects such as the Joint Spanish-Namibian Commission of Cooperation. SCOR is strongly based on international and multidisciplinary collaboration towards oceanographic research. The South Atlantic Mid-oceanic ridge and related seamount chains are prominent structures of the deep seafloor that lie mostly outside EEZs of coastal countries, implying that commercial exploration, conservation and research initiatives have essentially been multinational and/or international enterprises. In that sense SCOR is believed to be a natural organization to promote a continuing international CoML-derived scientific initiative focused on expanding our understanding of these remote areas of the deep ocean. The South Atlantic will be the location focus but concepts and ideas that result from this initiative will be applicable and comparable with other mid-ocean ridges of the planet.

3. Terms of Reference

- Produce a comprehensive and geo-referenced synthesis of published studies on biodiversity and oceanographic patterns associated to the South Atlantic Mid-Ocean ridge and associated mountain chains (St. Peter's and St. Paul's Rocks, Walvis Ridge and Rio Grande Rise).
- Convene International Workshops to compile and analyze results produced by the first South Atlantic MAR-ECO cruise (November 2009) and the Trans-Atlantic Commission I (plankton diversity), and to publish a special volume in an internationally recognized peer-reviewed journal.
- Coordinate the process of entry of South Atlantic Mid-Ocean ridge biodiversity records into Ocean Biogeographic Information System (OBIS - CoML).
- Promote networking activity to explore opportunities for continued field work on the South Atlantic and other oceans mid-ocean ridges and mountain chains. This activity will include: (a) to expand scientific collaboration principally among South America and African countries, (b) to identify suitable vessels that could be used for deep-water sampling in the South Atlantic, (c) to find the means to secure shiptime within the project time-schedule and (d) to form an international consortium that could combine marine research funds from several sources including those available in South Atlantic countries, other partner countries, international funds and the private sector.

4. Working Group Composition

Proposed members for the WG on Biodiversity Patterns of the South Atlantic Mid-Ocean Ridge

Name	Affiliation	Country	Expertise
José Angel Alvarez Perez *(proposed chair of the group)*	University of Vale do Itajaí Laboratory of Biological Oceanography	Brazil	• Chair of the South Atlantic MAR-ECO project Steering Group • Deep-water fishery • Cephalopods
Andrey Gebruk	Shirshov Institute of Oceanology	Russia	• Member of the MAR-ECO project Steering Group • Benthic invertebrates
José Henrique Muelbert	Federal University of Rio Grande Department of Oceanography	Brazil	• MAR-ECO PI • Ichthyoplankton • Physical-Biological Oceanographic Processes
Luiz Fernando Loureiro Fernandes	Federal University of Espírito Santo Department of Ecology and Natural Resources	Brazil	• MAR-ECO PI • Zooplankton
Malcolm Clark	National Institute of Water and Atmospheric Research	New Zealand	• Member of the South Atlantic MAR-ECO project Steering Group • Chair of the CenSeam project – CoML • Seamount ecology and fisheries
Marek Lipinski	National Marine Information and Research Centre Ministry of Fisheries and Marine Resources	South Africa	• Cephalopods • Demersal fish ecology
Patricio Arana	Escuela de Ciencias del Mar Universidad Católica de Valparaíso	Chile	• Deepwater fisheries • Seamount ecology
Odd Aksell Bergstad	Institute of Marine Research	Norway	• Chair of the MAR-ECO project Steering Group • Demersal fish ecology

Ricardo Serrão Santos	Department of Oceanography and Fisheries University of Azores	Portugal	• Member of the MAR-ECO project Steering Group • Deepwater Fish
Ben Van Zyl	National Marine Information and Research Centre Ministry of Fisheries and Marine Resources	Namibia	• Member of the South Atlantic MAR-ECO project Steering Group • Executive Secretary SEAFO • Deep-water fisheries

Other potential members or collaborators

Name	Affiliation	Country	Expertise
Débora Pires	Federal University of Rio de Janeiro National Museum	Brazil	• Member of the South Atlantic MAR-ECO project Steering Group • Deep-water corals
Johan Augustin	National Marine Information and Research Centre Ministry of Fisheries and Marine Resources	South Africa	• Member of the South Atlantic MAR-ECO project Steering Group • Deep-water fisheries
André O.S. Lima	University of Vale do Itajaí Laboratory of Applied Microbiology	Brazil	• MAR-ECO PI • Microbiology and Bioprospection
Luís Abellán	Instituto Oceanográfico Español	Spain	• Seamount ecology • Deepwater crustaceans