

**CANADIAN OCEAN SCIENCE NEWSLETTER  
LE BULLETIN CANADIEN DES SCIENCES DE L'OcéAN**

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## OCEAN SCIENCE PROGRAMS

### SCOR Working Group 128 on Coastal Hypoxia - Final Status Report

by Denis Gilbert, DFO, Maurice Lamontagne Institute, Mont Joli, QC ([click](#))

SCOR WG 128 on “Natural and Human-Induced Hypoxia and Consequences for Coastal Areas”, co-chaired by Jing Zhang (China) and Denis Gilbert (Canada) has now completed its activities. In addition to the two co-chairs, the working group was composed of 17 members ([click](#)) including Angelica Peña from Canada. The group’s main term of reference was to synthesize the state of the science on the following aspects of coastal hypoxia: (a) prevalence and spatio-temporal variability; (b) natural and human causes; (c) effects on the biogeochemistry and ecology; and (d) resistance, resilience and recovery of ecosystems. This was accomplished through the publication of eleven synthesis papers, the first ten of which were published online from July 2009 to July 2010 in a special issue of *Biogeosciences*, an open access journal from which the papers can be freely downloaded at the link below.

[http://www.biogeosciences.net/special\\_issue34.html](http://www.biogeosciences.net/special_issue34.html)

Here we only give the titles for brevity:

1. Natural and human-induced hypoxia and consequences for coastal areas: synthesis and future development (Zhang *et al.*)
2. Coastal hypoxia and sediment biogeochemistry (Middelburg and Levin)
3. Historical records of coastal eutrophication-induced hypoxia (Gooday *et al.*)
4. Effects of natural and human-induced hypoxia on coastal benthos (Levin *et al.*)
5. Impacts of hypoxia on the structure and processes in pelagic communities (zooplankton, macro-invertebrates and fish) (Ekau *et al.*)
6. Temporal responses of coastal hypoxia to nutrient loading and physical controls (Kemp *et al.*)
7. Dynamics and distribution of natural and human-caused hypoxia (Rabalais *et al.*)
8. Modeling dissolved oxygen dynamics and hypoxia (Peña *et al.*)
9. Marine hypoxia/anoxia as a source of CH<sub>4</sub> and N<sub>2</sub>O (Naqvi *et al.*)

## CNC-SCOR

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The Canadian National Committee of the Scientific Committee for Oceanic Research (CNC-SCOR) fosters and facilitates international cooperation. It is a non-governmental body that reflects the multi-disciplinary nature of ocean science and marine technology.

Le Comité national canadien du Comité scientifique de la recherche océanographique (SCOR) favorise et facilite la coopération internationale. Il reflète la nature multidisciplinaire de la science océanique et de la technologie marine.

10. Evidence for greater oxygen decline rates in the coastal ocean than in the open ocean (Gilbert *et al.*)
11. The role of open ocean boundary forcing on seasonal to decadal-scale variability and long-term change of natural shelf hypoxia (Monteiro *et al.*)

The eleventh paper was published later (May 2011) and could not appear in the *Biogeosciences* special issue on hypoxia due to time constraints, but can be found at <http://iopscience.iop.org/1748-9326/6/2/025002/>. From a biological perspective, a broad range of effects of hypoxia, from sublethal to lethal, are summarized in Figure 1. The SCOR Working Group 128 decided to adopt the < 30% oxygen saturation level as its operational definition of hypoxia. This threshold was chosen mostly because the number of species affected by hypoxia greatly increases around 30% oxygen saturation (Figure 1). However, we recognized that various scientists will continue to use different definitions for hypoxia depending on the species or biogeochemical processes that are the focus of their studies and for which the threshold would be different.

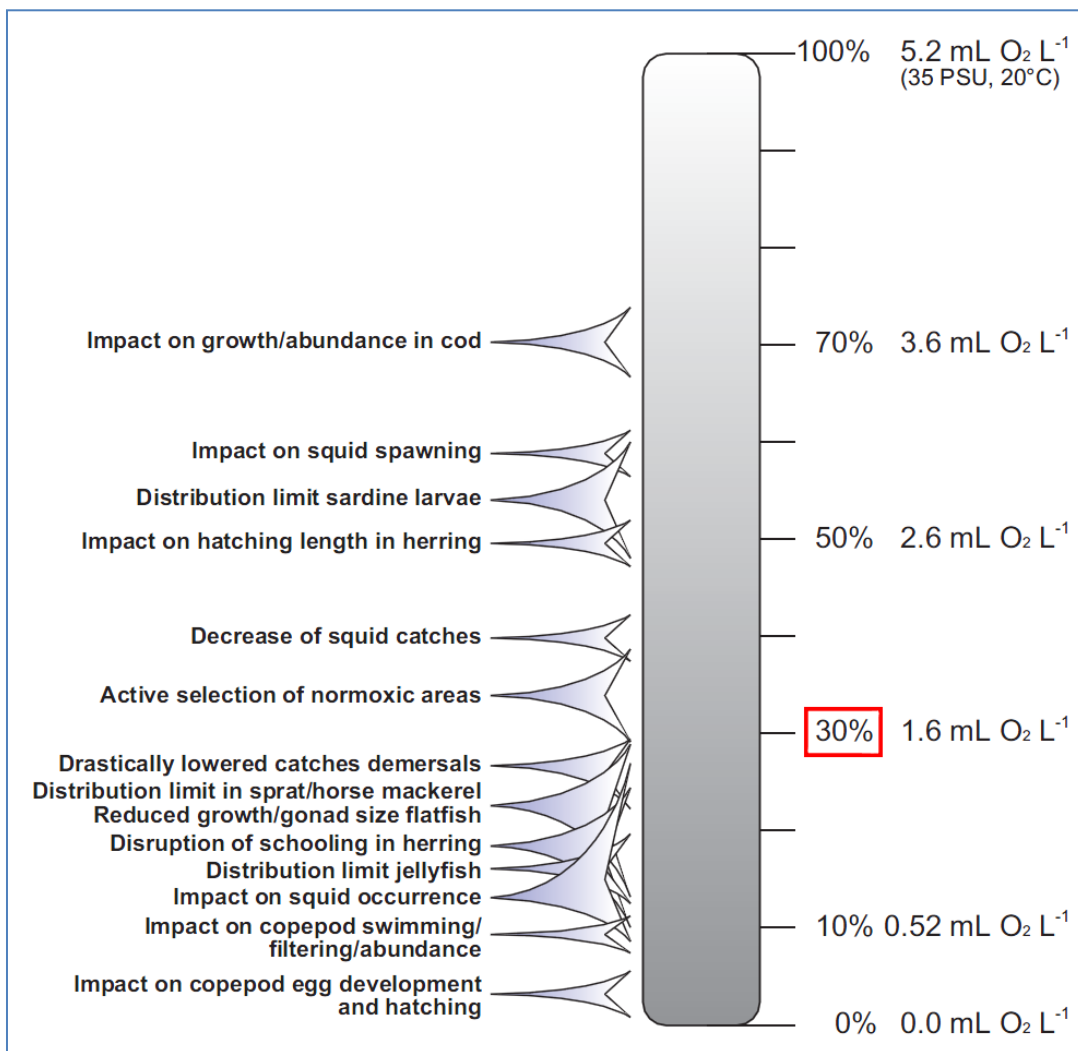


Figure 1. Behaviour and physiology responses of marine organisms to various oxygen saturation levels (Ekau *et al.* 2010, *Biogeosciences*, 7: 1669-1699).

The number of coastal hypoxic sites greatly increased since the 1960's, and this is not simply an artefact of better oxygen monitoring programs. While increased nutrient load and ensuing eutrophication may be responsible for hypoxia in a number of estuaries, other causes could play a role too. For instance, increased stratification resulting from surface layer warming could reduce upper thermocline ventilation and diminish oxygen levels in the ocean interior. And finally, the working group expressed its concern that if global warming were to cause more prevalent and intense hypoxia, this in turn would most likely lead to an increase in the flux from the ocean to the atmosphere of nitrous oxide (N<sub>2</sub>O), a potent greenhouse gas.

### **Update: WG 136 on Climatic Importance of the Greater Agulhas System**

SCOR/WCRP/IAPSO WG 136 published a review in the 28 April issue of *Nature* (Beal *et al.*; [click](#)) with evidence that the influence of Agulhas leakage on the overturning circulation in the Atlantic Ocean could counteract changes predicted in the North Atlantic Ocean due to climate change. The authors contend that the Agulhas system has largely been overlooked in studies of climatic feedback mechanisms.

### **Proposals for New SCOR Working Groups**

Eight proposals were submitted for new SCOR working groups to start in 2012:

1. Investigating Physical and Biological Determinants of Population Connectivity: Are Perceived Temperate-Tropical Differences Real?
2. Organic Ligands – A Key Control on Trace Metal Biogeochemistry in the Ocean
3. Deep-sea biodiversity Patterns of the South Atlantic Ocean
4. Common Challenges in Establishing Ocean Observatories
5. Subterranean Estuaries
6. Patterns of rocky shore dynamics in coastal ecosystems: Comparative analysis
7. Biogeochemical Exchange Processes at the Sea-Ice Interfaces (BEPsII)
8. Understanding the global impacts and implications of range-shifting species in marine systems

It is likely that funding will be available to support two new groups. The international review process is open; comments from within Canada are being consolidated by CNC-SCOR. If you'd like to read one of these proposals, please contact the Secretary ([click](#)).

## **PERSONNEL**

### **Allyn Clarke**

Dr. Allyn Clarke, an Emeritus Scientist with Fisheries and Oceans Canada (DFO) at the Bedford Institute of Oceanography, recently received international recognition as a Guest of Honour at a scientific symposium organized by the International Council for the Exploration of the Sea (ICES) and the Northwest Atlantic Fisheries Organization (NAFO). The symposium, held at Santander, Spain on the "Variability of the North Atlantic and its Marine Ecosystems during 2000-2009", represented the continuation of a series of decadal symposia on oceanographic variability in the North Atlantic over the past half century.



*Photo: Alicia Lavin Montero*

Dr. Clarke was one of six Guests of Honour who were acknowledged for their contributions to enhancing our understanding of the marine environment, and who were recognized as leaders and long-time contributors to the study of environmental variation in the North Atlantic and effects on biota over many decades within ICES and NAFO. The other five honourees were from France, Germany, the United Kingdom and the United States.

Dr. Clarke's primary scientific interest has been the circulation of the high-latitude North Atlantic and its role in the global climate system. His research papers include both theoretical and observational results. During his 35 years of distinguished service with DFO he made many significant contributions to our present understanding of circulation and water mass transformations in the northwest Atlantic Ocean. He led numerous research cruises in the North Atlantic including memorable winter visits to the Labrador and Greenland Seas in search of deep convection. He served unselfishly as Head, Ocean Circulation Section (1985–1997) and Manager, Ocean Sciences Division (1997–2002), and played lead roles in international climate programs such as the World Ocean Circulation Experiment (WOCE) and the Climate Variability and Prediction program (CLIVAR). His counsel and advice to senior management contributed to decisions and policy at all levels of government. As a scientist and manager, he provided scientific leadership in ocean and related climate research at local, national, and international levels. He earned the respect of his colleagues for his scientific productivity, strong leadership, and timely and scientifically-sound advice.

### **Jinyu Sheng**



The Lloyd's Register Educational Trust (The LRET), an independent charity, is funding a research program in Modeling and Prediction of Marine Environmental Extremes, **at Dalhousie University**. Jinyu Sheng, professor in the Department of Oceanography, has been named as the chair.

“The purpose of the research is to provide more accurate short-term predictions and projections of marine extremes such as coastal flooding, tropical storms, hurricanes and storm surges,” **said** Dr. Sheng. “The research will help lead to better forecasts of extreme marine events and help decision-makers, scientists and the public mitigate the damage these events can cause.”

## MEETINGS

### IGARSS, Vancouver, 24-29 July

The 2011 IEEE International Geoscience and Remote Sensing Symposium has a five-day oral track on remote sensing for the oceans ([click](#)).

### SCOR/POGO International Quiet Ocean Experiment, Paris, 30 Aug – 1 Sep 2011

Speakers, chairs, and rapporteurs are in place for the Open Science Meeting (OSM) for the International Quiet Ocean Experiment (IQOE; [click](#)). The OSM will be held on 30 August-1 September 2011 at UNESCO Headquarters in Paris, France. Early registration is available until 31 July ([click](#)). The purpose of the open science meeting is to develop a Science Plan for the IQOE, a focused international research effort that may last a decade or so. This plan will include background information to document the importance of the issue of sound in the ocean and its effects on marine organisms; identify information gaps; and describe research, observations, and modeling activities needed to fill these gaps. A justification for the IQOE and a summary of the foundational workshop was published in the June 2011 issue of *Oceanography* (Boyd *et al.*; [click](#)).

### Ocean Deoxygenation, Toulouse, 24-26 Oct. 2011

The EurOceans Consortium is sponsoring a conference on ocean deoxygenation and its implications for marine biogeochemical cycles and ecosystems ([click](#)). This conference aims to bring together biological, biogeochemical, and physical oceanographers to discuss the issue of deoxygenation in the world ocean and its implications for ocean productivity, nutrient cycling, carbon cycling, and marine habitats.

Some scientific related specific issues include: What is the complete influence of the OMZs on climate change, taking into account the impact of the greenhouse gases, cloud formation and control of O<sub>3</sub> and O<sub>2</sub>? How sensitive the OMZs characteristics are to changes in oceanic circulation associated to global warming? What are the mechanisms associated with a bio-, photo-, or chemo-degradation of organic matter (including CDOM) for the production of greenhouse gases, e.g. the switch from an aerobic (O<sub>2</sub>-respiration) to an anaerobic (via NO<sub>3</sub>, SO<sub>4</sub>, methanogenesis, IO<sub>3</sub>, Fe) remineralization?

## JOBS & TRAINING

### Lecturer, UBC

The Department of Earth and Ocean Sciences (EOS) at the University of British Columbia invites applications for a Lecturer position in Earth Sciences ([click](#), [pdf](#)). The appointment will be for one year with the possibility of an extension. The successful applicant will contribute to the teaching, organization and administration of undergraduate distance-education and lecture courses in natural disasters, oceanography, and other topics. The applicant will also mentor distance education instructors, and will help write course proposals and associated curricula for new on-line distance-education courses. The applicant will incorporate new pedagogies such as promoted by the Carl Wieman Science Education Initiative. The application deadline is July 17<sup>th</sup>.

Looking for work? Try the CMOS site ([click](#))

## GENERAL

### Update to the GSW Oceanographic Toolbox

SCOR WG-127 has released Version 3.0 of the GSW Oceanographic Toolbox ([click](#)). The GSW toolbox has undergone extensive improvements since the release of version 2.0 in October 2010, and it also contains several new functions. The major improvements are :

- (1) an improved routine to calculate Absolute Salinity which takes into account ocean dilution and evaporation;
- (2) many of the functions in the GSW Toolbox are based on the 48-term computationally efficient expression for density. The use of this equation ensures consistency between the different branches of oceanography, namely observational, theoretical oceanography and ocean modelling;
- (3) freezing temperature and latent heats of melting and evaporation; and
- (4) minor bug fixes.

The WG urges oceanographers to upgrade their TEOS-10 software to version 3.0. No significant changes to the code are planned now apart from minor bug fixes.

### Snow, Water, Ice, Permafrost in the Arctic

The Arctic cryosphere is changing faster than predicted just a few years ago. AMAP (the Arctic Monitoring and Assessment Program) has released a new report on the Arctic, together with several videos targeted at media and teachers ([click](#)).

### CCGS Amundsen

The Canadian research icebreaker *CCGS Amundsen* will be featured on the reverse of the new \$50 bill ([click](#)), to be released in March 2012. The new red and white \$50 will be the second in the Bank of Canada's series to be printed on a plastic polymer sheet instead of paper, and will have a portrait of Mackenzie King on the face.

The *Amundsen* is about to sail from Québec on a four-month cruise through the Labrador Sea to the Beaufort. Fifty dollars doesn't take you as far as it once did: it might buy about 150 metres in the passage to the Beaufort.

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Previous newsletters may be found on the CNC/SCOR web site.  
Les bulletins antérieurs se retrouvent sur le site web du CNC/SCOR.

Newsletter #59 will be distributed on August 31, 2011. Please send contributions to Bob Wilson, [wilson@telus.net](mailto:wilson@telus.net)  
Bulletin #58 sera distribué le 31 août 2011. Veuillez faire parvenir vos contributions à Bob Wilson, [wilson@telus.net](mailto:wilson@telus.net)

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