



**CANADIAN OCEAN SCIENCE NEWSLETTER**

**LE BULLETIN CANADIEN DES SCIENCES DE L'OCÉAN**

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## OCEAN SCIENCE PROGRAMS

### Assessing the Global Oceans

A new index to assess the health and benefits of the world's coastal oceans, those within an EEZ, has been described and tested in the online preprint of an article for the journal *Nature* ([click](#)). Benjamin Halpern and a lengthy list of co-authors have produced an index based on ten public goals for ocean sustainability and have calculated its value for every coastal nation. The average index score for the 171 countries was 60 (36-86), with only 5% scoring higher than 70. Co-incidentally, Canada's score was 70, placing us in the top 5% of countries in terms of coastal and oceans management but lower than some, for example the Seychelles.

Rooted in the fitness of comprehensive ecosystem-based management tools to address the needs of people and ecosystems, the index treats humans and nature as integrated parts of a desired, healthy system. The ten public goals evaluated were:

- Food provision, with sub-goals related to fisheries and mariculture;
- Artisanal fishing opportunity;
- Natural products;
- Coastal protection;
- Carbon storage
- Tourism and recreation;
- Coastal livelihoods and economies, with sub-goals for each;
- Sense of place, with sub-goals for iconic species and lasting special places;
- Clean waters, and
- Biodiversity, with sub-goals for habitats and species

Each country was rated against every goal by means of a complex matrix of data layers, with the results being aggregated to a deceptively simple index value.

Canada scored over 90 under the assessment of goals related to artisanal fishing opportunity, coastal protection and biodiversity. The country's poorest scores were for tourism and recreation (15), and carbon storage (55), results that may conflict with some impressions of our EEZ. The authors stated, however, that "results for individual goals may seem counterintuitive because we assessed ocean health through the lens of coupled human-natural systems", and the assessed values for tourism and recreation were consistently low for all countries.

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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

This index has the potential to become an important tool to guide oceans policy and oceans managers. It remains to be seen whether it will be accepted as such. One immediate benefit could be that, by calling attention to specific data layers and gaps, e.g., illegal fishing, habitat loss rates and point-source pollution, the index could stimulate better measurements.

### The State of Canada's Oceans

The few highlights below are extracted from a different report on the state of Canada's oceans, this one a new release from DFO ([click](#)). Aimed at a general audience, it discusses ecosystem shifts, ocean acidification, hypoxia, sea ice variability, ocean climate, invasive species, and cold water corals and sponges. The report summarizes scientific findings for DFO's five designated Large Ocean Management Areas (LOMAs): the Pacific North coast, Beaufort Sea, Gulf of St. Lawrence, Eastern Scotian Shelf, and Placentia Bay/Grand Banks. The availability of long-term data sets varied from sparse, e.g., in the Beaufort Sea, to extensive, e.g., for the Scotian shelf.

- A decline in extent of multi-year ice in the Beaufort has increased the amount of fresh water in the surface layer of the Beaufort Gyre since 2003, resulting in impacts on the marine food web. Increased stratification has reduced vertical mixing into the euphotic zone, increasing the number and proportion of picoplankton and reducing nanoplankton over the period 2004-2009. CNC-SCOR's 2012 tour speaker for Eastern Canada, Eddy Carmack, will review the Arctic's place in the global climate system in late November, highlighting changes in the physical world of ocean currents and sea ice cover, and then exploring what such changes – as components of a coupled system – mean in terms of marine life and ecosystems, invasive species, ocean acidification and challenges to governance. Please watch for details in a future newsletter.
- Research on the Scotian Shelf has revealed that the removal of top predators due to intensive fishing can cause large and possibly permanent changes to ocean ecosystems, completely restructuring the food web. Research published in the early 2000s to 2005 indicated that the food web was restructured when overfishing of top predators, such as large groundfishes, led to population collapses of these large benthic predators. Planktivorous, pelagic forage fish species and macroinvertebrates became dominant, and reached biomass levels 900% greater than those prevalent before large groundfish populations collapsed. Despite management measures, including fishing moratoria put in force in the early 1990s, the Scotian Shelf ecosystem has not reverted to its former structure. CNC-SCOR's 2012 tour speaker for Western Canada, Ken Frank of BIO, will talk about the ecosystem dynamics of exploited species in late November; details will appear in a future newsletter.
- Recent and historical data reveal that hypoxia is progressively worsening in the deep waters of the Gulf of St. Lawrence, especially at the heads of the Laurentian, Anticosti and Esquiman channels. The lowest levels of dissolved oxygen were recorded in the Laurentian Channel, where measurements have routinely been in the range of 20% saturation since the mid-1980s. This hypoxia caps a long decline in oxygen levels since 1932 (the earliest available data), when the bottom waters of the St. Lawrence Estuary averaged 38% saturation.

Up to two-thirds of the decline in oxygen saturation since 1932 is due to a higher influx of warm, oxygen-poor North Atlantic Central Water and a reduced input of oxygen-rich water from the Labrador Current. The remainder of the decline appears to be caused by increased oxygen demand in the deep water and sediments. Greater oxygen demand is possibly due to higher bacterial respiration associated

with a nearly 2°C rise in the temperature of the deep water since the 1930s or with an increased supply of organic material from the ocean surface.

- Records dating back to about 1920 indicate that the largest multi-year changes in temperature and salinity on the Scotian Shelf occurred in the 1960s, when the intruding slope water was cooler and fresher. This arose from the enhanced flow of subpolar slope water around the Grand Bank during a period of negative NAO index (reduced wind forcing over the northern North Atlantic). The long-term trends in temperature and salinity on the Scotian Shelf vary with location and depth and are generally weak, in part because of the strong natural (e.g., NAO) climate variability in the region. However, there is an indication of surface warming at most locations, and of increasing upper-ocean stratification across the Scotian Shelf and Gulf of Maine that is associated with a varying combination of surface warming and freshening. These changes are in the directions expected from anthropogenic climate change, and thus point to the possible emergence of a biologically important longer-term trend.
- Researchers analyzed concentrations of coral and sponge taxa for the Newfoundland-Labrador Shelves Bioregion, using an approach developed by the Northwest Atlantic Fisheries Organization. The coral database for this bioregion contains 38 coral taxa, of which:
  - 61% were soft corals belonging to family *Nephtheidae*;
  - 18% were sea pens;
  - 9% were large gorgonians (species of *Paragorgia*, *Primnoa*, *Keratoisis* and others);
  - 7.4% were small gorgonians (species of *Acanella* and *Anthothela*);
  - 0.01% were black corals (antipatharians); and
  - 0.04% were small cup corals (solitary scleractinians).

Although relationships between deep-sea corals and groundfish have not been extensively studied in the Northwest Atlantic, soft corals, sea pens and small gorgonians are important to fish and invertebrates in this region. Research indicates correlations between coral biomass and diversity and fish biodiversity.

#### 40 Priority Research Questions

The Council of Canadian Academies (CCA) has released a 25-page report ([click](#), pdf) on the first phase of its investigation into ocean science issues. Its purpose is to help focus future Canadian research onto priority questions. In an effort to develop a comprehensive understanding of the needs facing Canadian ocean research, the Canadian Consortium of Ocean Research Universities asked the CCA last year to undertake a two-part initiative on ocean science. The objective of the first phase was to establish priorities on the basis of a web-based survey of Canada's ocean science community and an expert workshop. With the support of a core group of 22 ocean experts, 40 priority research questions were ultimately identified that, if answered, would have the greatest impact on addressing future opportunities and challenges relating to ocean science in Canada.

The questions were grouped into four research themes spanning a range of disciplines, issues, and scales:

1. **Improving fundamental scientific understanding**, including: climate change in the Arctic and more generally; feedback between the ocean, sea floor and atmosphere; and marine biodiversity and ecosystems. (17 questions)
2. **Monitoring, data, and information management**, including topics for monitoring and the development of adequate sensors and sound data management practices. (7 questions)

3. **Understanding impacts of human activities**, including: indicator-based assessments, topics related to stresses on the marine environment, and policy development. *(8 questions)*
4. **Informing management and governance**, including: types of information and institutional capacities needed for sustainable governance; and specific governance challenges. *(8 questions)*

The CCA says that the questions developed through their consultation could inform decisions on national research at several levels. For universities, research institutes and scientific networks, they could stimulate discussion on issues to be reflected in research planning and agendas. For policy-makers and individuals or agencies that fund science, the questions could inform the development of strategic priorities for research funding and investments in research capacity, infrastructure, and networks.

In the second phase of their assessment, the CCA will establish an expert panel to assess Canada's needs and capacities regarding these questions.

## MEETINGS

### **L'heure juste sur la santé des océans, Montréal, le 7-9 nov. 2012**

Québec-Océan célèbre son 10<sup>e</sup> anniversaire le 7 au 9 novembre avec un Colloque ouvert à tous ceux qui s'intéressent à l'avenir de nos océans. Il accueillera le grand public, les chercheurs et étudiants en sciences marines, les membres d'organisations gouvernementales et non-gouvernementales, les intervenants du secteur privé et des médias. Pour donner « L'heure juste sur la santé des océans », le programme examinera les stress majeurs qui affectent les océans ainsi que leurs impacts sur les écosystèmes marins. Le Colloque amorcera aussi une réflexion sur les façons d'atténuer ces impacts et de s'adapter aux changements.

La programme, les conférences invitées, et toute l'information nécessaire à votre participation se trouvent sur le site Internet du Colloque ([cliquer](#)) .

### **2<sup>nd</sup> CLIOTOP Symposium, Noumea, 11-15 Feb. 2013**

A CLIOTOP symposium -- Certainty of change in pelagic systems – detection, attribution, and prediction – will be held in New Caledonia next February. The deadline for abstract submission is **1 October 2012** ([click](#)). The organizing committee writes that the oceans of the world are changing 'over and above' the signals from

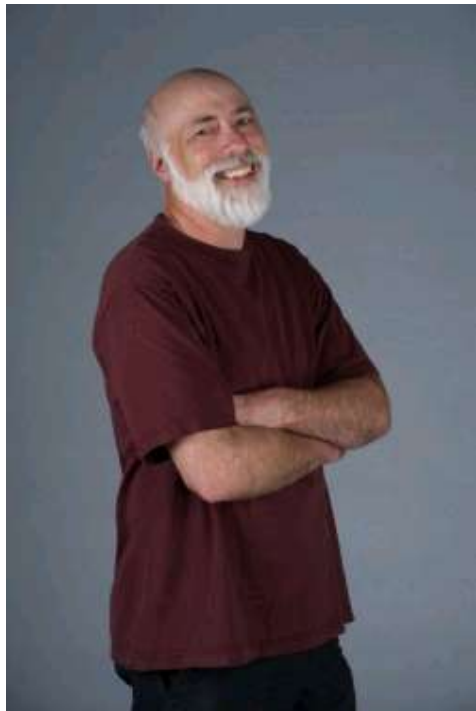
### **A Reality Check on Oceans' Health, Montreal, 7-9 Nov 2012**

Québec-Océan celebrates its tenth anniversary with a symposium open to all those interested in the future of our oceans. It is open to the public, scientists and students in marine sciences, members of governmental and non-governmental organizations, the private sector and the media. To provide "A Reality Check on Oceans' Health", the programme will address the major stresses that affect all oceans and their impacts on marine ecosystems. The Symposium will also stimulate discussion on ways to attenuate these impacts and to adapt to the changes.

The programme can be found at the Symposium's website ([click](#)), together with a list of invited speakers and all the information needed to register and participate.

interannual and decadal variability. The conference will discuss projections for the responses and adaptations to climate change of pelagic species and the economies they support.

## PERSONNEL



### Len Zedel

Dr. Len Zedel has been appointed the new associate dean of science (research and graduate) at Memorial University. His three-year term is effective Sept. 1.

Dr. Zedel received his B.Sc. and M.Sc. from the University of Victoria and holds a Ph.D. from the University of British Columbia. He joined Memorial University in 1991 and has been a committee member of CNC-SCOR since 2009. His research activities involve exploring oceanographic processes through the use of acoustic systems. His current interests include the processes responsible for ambient sound in the ocean, the use of coherent Doppler sonar for high resolution water velocity profiling, the suspension of sediment in the nearshore zone and the application of acoustic systems to fisheries acoustics.

## JOBS & TRAINING

### Associate Director of Engineering, NEPTUNE Canada, Victoria BC

Competition is open for a new Associate Director of Engineering at NEPTUNE Canada. This position is one of four key management (Associate Director) positions reporting to the Director and is located at the University of Victoria. The successful candidate will provide management and leadership in the ongoing completion, maintenance, repair, and improvement of the program's subsea infrastructure. Responsibilities also include design, planning, contracting and implementation of expansion of the NEPTUNE Canada network. The successful candidate will be responsible for all engineering aspects of the Shore Station in Port Alberni and for financial and human resource management of the largest component, the wet plant, of the NEPTUNE Canada infrastructure, valued at \$150M.

This three-year term position runs from 1 Nov. 2012 to 31 Oct. 2015. A full job description and application details can be found on NEPTUNE Canada's website ([click](#)); the application deadline is **17 Sep 2012**.

### Early Career Training

Young scientists interested in training might want to bookmark the "Summer school" portal hosted by the Intergovernmental Oceanographic Commission ([click](#)). Designed initially to provide an international coordination



point for summer schools, the site actually hosts information about similar training opportunities in other seasons as well.

**AUSTRAL SUMMER INSTITUTE XIII (ASI XIII)**

Department of Oceanography & COPAS Sur-Austral  
University of Concepcion, Chile  
December 2012 – January 2013

*Understanding physical, chemical and biological processes in the marine environment*

**Symposium UV radiation and marine ecosystems: Current research and strategies for the future**  
5–7 December 2012  
Cristina Dorador, Universidad de Antofagasta, Chile  
Camila Fernández, Observatoire Océanologique de Banyuls sur Mer, France  
Ernesto Gramsch, Universidad de Santiago, Chile  
Walter Hebling, Estación de Fotobiología Playa Unión, Argentina  
Klaudia Hernández, Universidad Austral de Chile, Chile  
Wade Jeffrey, University of West Florida, USA  
Fabien Joux, Observatoire Océanologique de Banyuls sur Mer, France  
Verónica Molina, Universidad Andrés Bello, Chile  
Eliás Ovalle, Universidad de Concepción, Chile  
Virginia Villafañe, Estación de Fotobiología Playa Unión, Argentina

**Circulación y masas de agua en el Atlántico Sudoccidental**  
7–11 January 2013  
Alberto Piola, Departamento de Oceanografía, Servicio de Hidrografía Naval, Argentina

**Why do diseases emerge in marine aquaculture? And what can we do to limit this?**  
7–11 January 2013  
Alexander Murray, Marine Scotland Science, Scotland  
Nabeel Salama, Marine Scotland Science, Scotland

**Trace metals in the oceanic carbon cycle**  
14–18 January 2013  
Maria C. Nilsdotter, University of Southampton, National Oceanography Centre Southampton, UK

**Coastal Antarctic ecosystems and the case of the Larsen Ice Shelf System**  
14–18 January 2013  
Marie Vernet, Scripps Institution of Oceanography, USA

**Análisis de series de tiempo en oceanografía y ecología**  
14–25 January 2013  
Rodrigo Montes, Universidad de Concepción, Chile

**Chemical and biological characteristics of the oceanic phosphorous cycle**  
21–25 January 2013  
Ian Salter, Observatoire Océanologique de Banyuls sur Mer, France

**Directora Austral Summer Institute**  
Séverine Frenot, G.  
Cadeira UNESCO-IOC  
Universidad de Concepción, Chile

**Co Directora Austral Summer Institute 2012**  
Camila Fernández  
Observatoire Océanologique  
de Banyuls sur Mer, France

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Los cursos están abiertos para estudiantes de postgrado y pregrado avanzado, profesionales y académicos de Chile y el extranjero  
Fecha límite de postulación: 1 de Octubre de 2012  
Matrícula: US\$ 250. Becas disponibles para postulantes calificados

International oceanographic opportunities are posted on the CMOS site ([click](#)).

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

## GENERAL

### Theses and Dissertations in Ocean Science

The CNC-SCOR Secretariat maintains a list of theses and dissertations completed in ocean science at Canadian universities, a proxy for the number of graduate degrees awarded. The compilation was begun in 2002 by Dick Stoddart (CNC-SCOR Secretary from 2002 to 2009) using contacts at an expanding number of universities, presently 15. With entries back to 2000, the list has been updated through 2011 with some entries for 2012 ([click](#)).

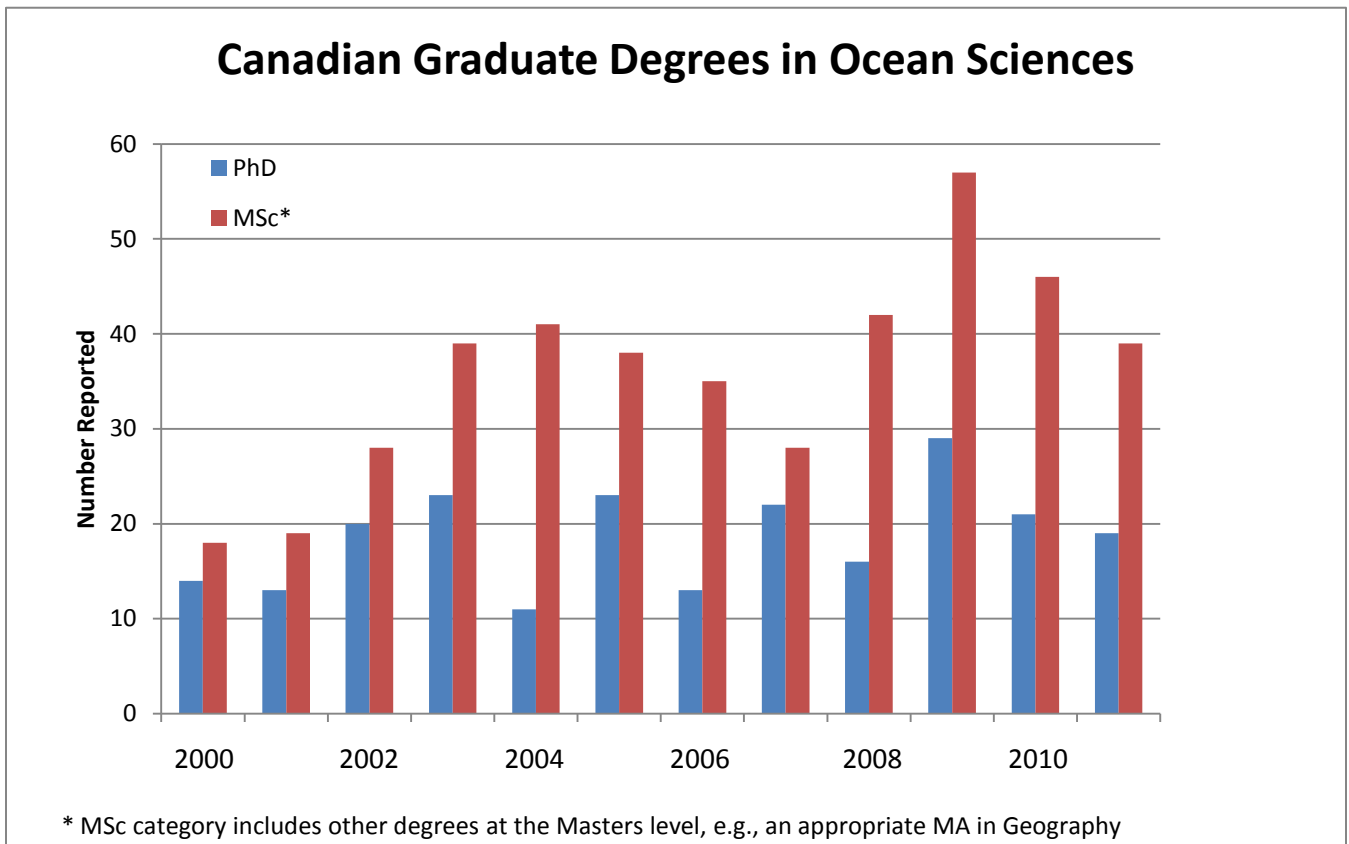


Figure 1: Summary statistics for degrees granted in ocean science at Canadian universities. The data collection methodology for years before 2009 differs from that for later years.

Data were collected solely from university contacts for the period up to and including 2010. However, the entries for 2009 and later years have been revised using retrievals from library catalogues and the Thesis Canada portal, a technique that increased the number of entries for most universities in these later years. Any trend apparent in the summary statistics (Fig. 1) should be viewed with caution because of this change in methodology and the expanding number of universities included.

### A New Record Low for Arctic Sea Ice

A record low for sea ice extent in the Arctic will be set this year, although, with two or three weeks left in the melt season, the final figure isn't known yet. The National Snow and Ice Data Center (NSIDC) has released



illustrations comparing the extent for August 26, 2012, with the same date in 2007, the year of the previous record minimum ([click](#)). Like 2007, this year's data are well outside two standard deviations of the 1979-2000 average (Fig. 1). According to the NSIDC, the six lowest years in the three decades since satellite observations began are the six most recent years.

To close this issue on an only generally related note, bird biologist Bill Montevecchi (Memorial University) told news media last week that adult gannets at the Cape St. Mary's rookery, in south-eastern Newfoundland, have been abandoning their chicks in record numbers. Guides at the popular bird sanctuary noticed the unusual phenomenon earlier this month, with Montevecchi tying it to sea-surface temperatures 3-4 C higher than usual and reporting that the adults appear to have moved to cooler Labrador coastal waters to find food.

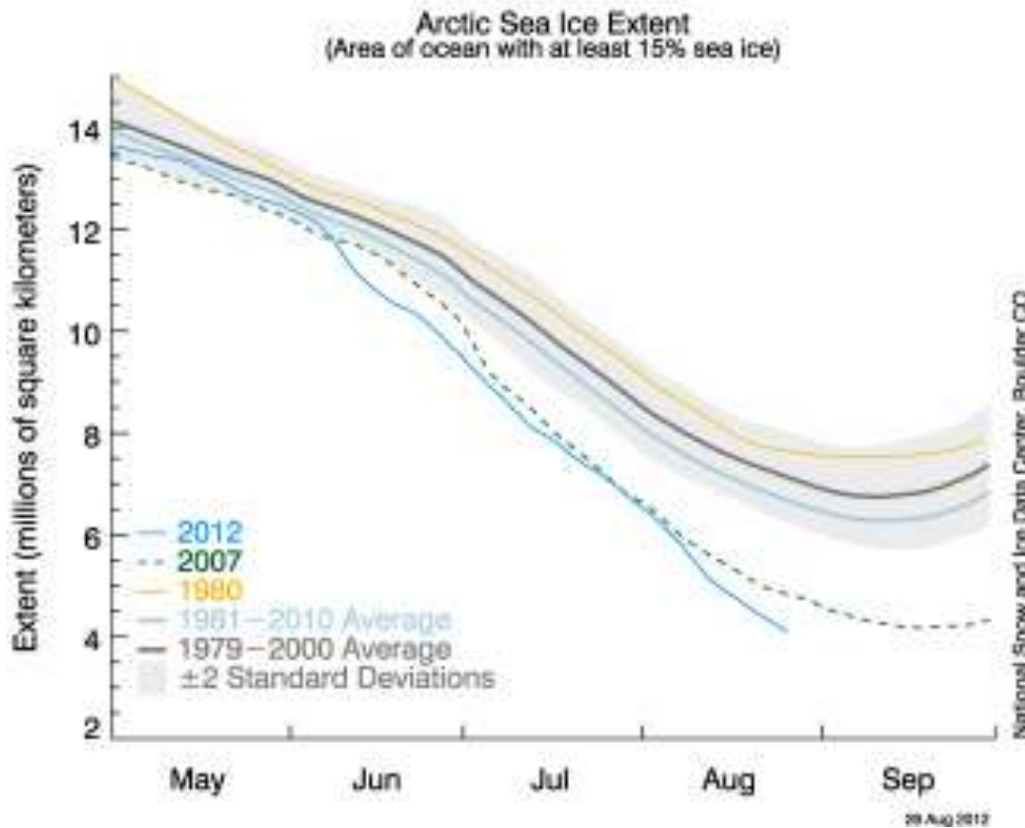


Fig. 1: Arctic sea ice extent as of August 26 (darker blue line), along with daily ice extent data for 2007, the previous low year (green), and 1980, the record high year since satellite observations began (orange). The 1979-2000 average is shown as a grey line, with lighter grey shading indicating two standard deviations for those data. Source: National Sea Ice Data Center.

The picture for Arctic sea ice volume is sobering. Figure 2 shows the minimum annual sea ice volume between 1979 and 2012, the latter being only for data through July. Sea ice volume has been calculated from the Pan-Arctic Ice Ocean Modelling and Assimilation System at the University of Washington's

Polar Science Center ([click](#)). The linear trend on this graph explains 82% of the variance, the quadratic trend 92%. The better fit of the quadratic regression indicates that the loss of sea ice volume is accelerating. The x-intercept of the quadratic regression is 2017.

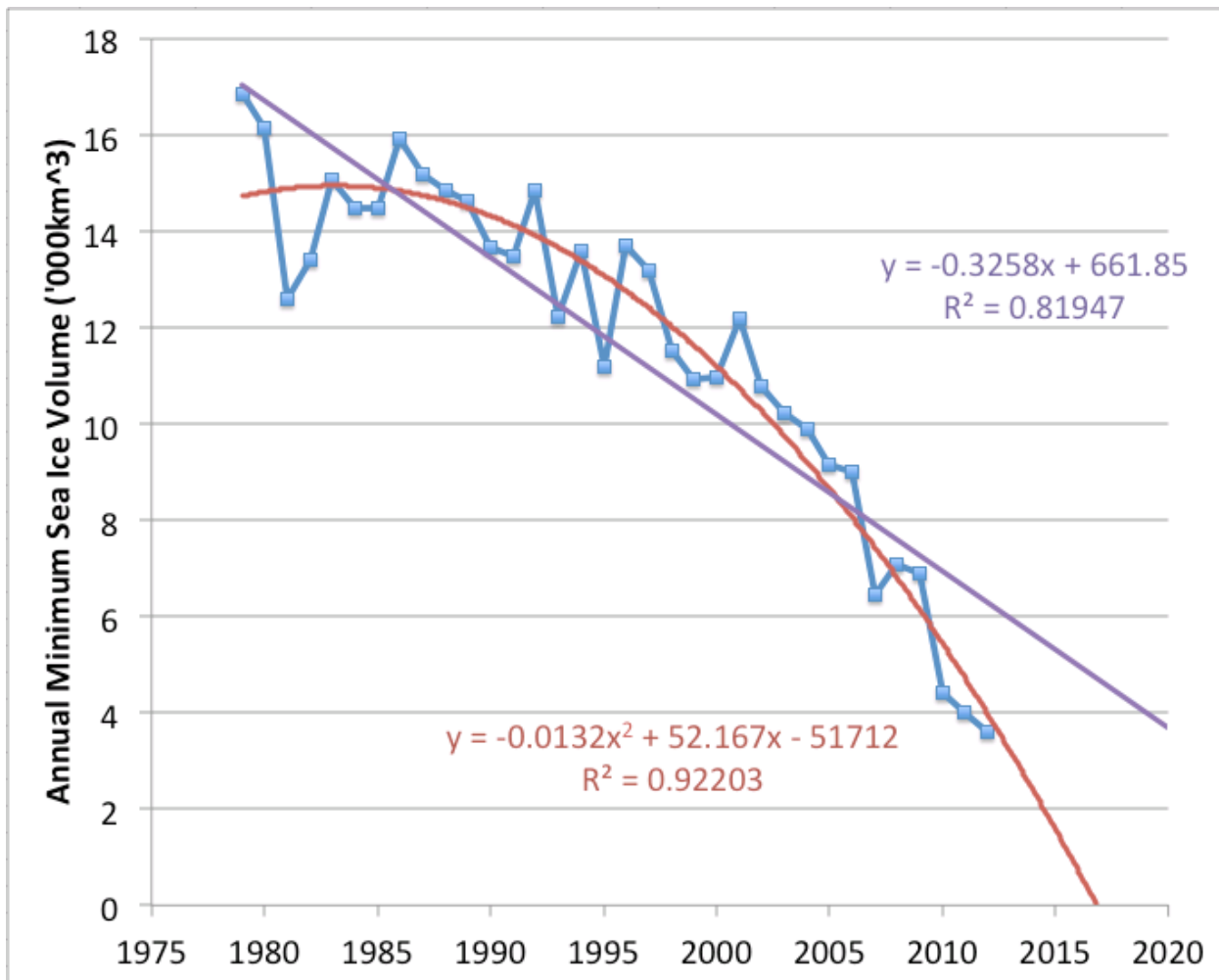


Fig. 2: Annual minimum Arctic sea-ice volume from January 1979 through July 2012. The purple line is a linear regression and the red curve a quadratic regression. Graph credit: Stuart Staniford, [earlywarn.blogspot.ca](http://earlywarn.blogspot.ca)

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Newsletter #67 will be distributed on October 15, 2012. Please send contributions to Bob Wilson, [wilson@telus.net](mailto:wilson@telus.net)  
Bulletin #67 sera distribué le 15 octobre 2012. Veuillez faire parvenir vos contributions à Bob Wilson, [wilson@telus.net](mailto:wilson@telus.net)

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