



[www.coml.org](http://www.coml.org)

***Embargo: For use after 6 pm GMT, Sun. Feb. 15, 2009***

**Contacts:** Mr. Terry Collins, +1-416-878-8712; +1-416-538-8712; [terrycollins@rogers.com](mailto:terrycollins@rogers.com)  
Ms. Darlene Trew Crist, +1-401-295-1356; +1-401-952-7692; [darlene.crist@cox.net](mailto:darlene.crist@cox.net)  
Mr. Gregg Schmidt, +1-202- 448-1231; [gschmidt@oceanleadership.org](mailto:gschmidt@oceanleadership.org)

***Experts are available for advance interviews. Video and high-resolution images are online at [www.coml.org/embargo/polar2009](http://www.coml.org/embargo/polar2009)***

## ***Polar Bears and Penguins May Live at Opposite Poles, But Census of Marine Life Explorers Find Hundreds of Identical Species Thrive in Both Arctic and Antarctic***

***Researchers in North and South startled to find Polar oceans share 235 species;  
Changes in species distribution documented as warmer oceans spur migration;  
United by high-speed current, Antarctic benthos revealed as single bioregion;  
Smaller species replacing larger ones in some Arctic waters***

***Polar Year results are milestones towards historic 1<sup>st</sup> global oceans Census: Oct. 2010***

Earth's unique, forbidding ice oceans of the Arctic and Antarctic have revealed a trove of secrets to Census of Marine Life explorers, who were especially surprised to find at least 235 species live in both polar seas despite an 11,000-kilometer distance in between.

The scientists found marine life that both poles apparently share in common include marathoners such as some great whales ([blue www.eol.org/pages/328574](http://blue.eol.org/pages/328574)

; humpback [www.eol.org/pages/328575](http://www.eol.org/pages/328575); fin [www.eol.org/pages/328573](http://www.eol.org/pages/328573)) and birds, but also worms, crustaceans, and angelic snail-like pteropods, the latter discoveries opening a host of future research questions about where they originated and how they wound up at both ends of the Earth. DNA analysis is underway to confirm whether the species are indeed identical.

Among many other findings, the scientists also documented evidence of cold water-loving species shifting towards both poles to escape rising ocean temperatures.

The discoveries are the result of a series of landmark, often perilous voyages conducted during International Polar Year, 2007-2008. Biologists braved waves of up to 16 meters (48 feet) while getting to and from the Antarctic while their Arctic colleagues often worked under the watchful eye of an armed lookout to protect them from polar bears.

The studies by a global network of polar researchers have added substantially to human knowledge about the diversity, distribution and abundance of marine life, with results to be fully detailed in the world's first Census report, to be released in London Oct. 4, 2010.

“The polar seas, far from being biological deserts, teem with an amazing quantity and variety of life,” says Dr. Ian Poiner, Chair of the Census Scientific Steering Committee. “Only through the co-operation of 500 people from more than 25 countries could the daunting environmental challenges be overcome to produce research of such unprecedented scale and importance. And humanity is only starting to understand the nature of these regions.”

The polar Census teams are documenting:

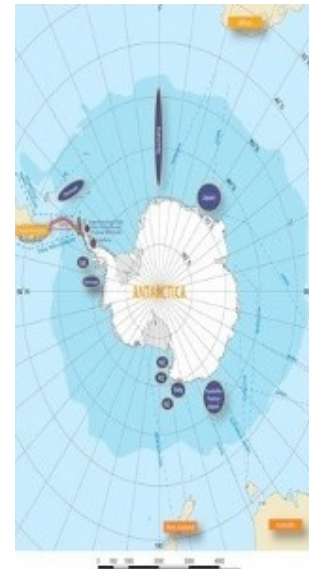
- The distribution of ocean animals – mapping their changing ranges and hotspots;
- The diversity of species (to date: 7,500 animals in the Antarctic and 5,500 in the Arctic, of a global marine life species total estimated at 230,000-250,000); and

- The abundance and sizes of major species groups at various levels in the food web, in order to gauge how they change over time;

### **Antarctic seafloor: a single bioregion, and a cold incubator for new species**

Previously thought to be low in species diversity and abundance, CAML researchers and collaborators have amassed biological data from nearly 1 million locations. Those places include seafloors exposed to light for the first time in as much as 100,000 years when ancient ice shelf lids melted and disintegrated in recent years.

Led by Drs. Michael Stoddart and Victoria Wadley of the Australian Antarctic Division, and Dr. Colin Summerhayes, Executive Director of the Scientific Committee on Antarctic Research, the Census of Antarctic Marine Life (CAML, [www.caml.aq](http://www.caml.aq)) coordinated 18 major research voyages during IPY (2007-2008), the tracks of the voyages shown at right. That compares with two or three expeditions in a normal year.



The extensive sampling has provided both an immediate picture of unexpectedly rich marine life around Antarctica and the means to test important theories.

Research in the 1970's suggested separate bioregions around Antarctica. CAML's efforts, however, reveal life on the seafloor encircling Antarctica forms a single biological province, even though 8,500 km of ocean separates opposite sides of the continent.

Scientists are now analyzing hundreds of open ocean (pelagic) samples from all compass points around Antarctica to establish whether, as suspected, marine life distribution has been evened by the churn of the Antarctic Circumpolar Current. That swift-flowing

current circles the polar continent twice as fast as the Gulf Stream flows from the Gulf of Mexico towards Europe.

And they report species of cold-water snail (pteropods) migrating southward as ocean temperatures rise further north.

Meanwhile, the polar marine explorers were startled when molecular techniques revealed that glacial cycles over millions of years made the Antarctic the cold incubator of many species residing today in more northern waters.

Census researchers last year established that several octopus types have repeatedly colonized the deep sea, each migration coinciding with retreating Antarctic ice over 30 million years.

Today they theorize that the Antarctic also regularly refreshes the world's oceans with new varieties of sea spiders, isopods (crustaceans related to shrimp and crabs), and others as well. They believe the new species evolve when expansions of ice cloister Antarctica; when the ice retreats, they radiate northward along the same pathways followed by the octopuses.

The abundance of Antarctic marine biodiversity is recorded in the SCAR-MarBIN database, which today contains close to 1 million marine life observations below the Antarctic Circle. About half of Antarctic species are found nowhere else on Earth.

Says Victoria Wadley: "One hundred years ago, Antarctic explorers like Scott and Shackleton saw mostly ice. In 2009, we see life everywhere."

### **The Arctic: changes recorded**

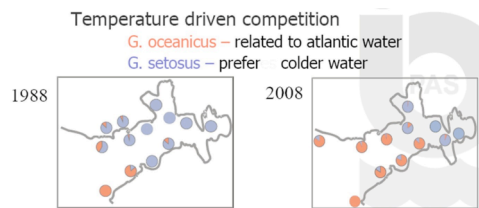
Many global collaborators teamed with the Census' project on Arctic Ocean Diversity (ArcOD, [www.arcodiv.org](http://www.arcodiv.org)), led by Drs. Rolf Gradinger, Bodil Bluhm and Russ

Hopcroft of the University of Alaska, and Dr. Andrey Gebruk of the Shirshov Institute, Moscow. Together they completed 14 IPY expeditions, including 10 cruises.

Field work will continue this summer, including a cruise to the Beaufort Sea to investigate the potentially important role sea ice ridges could play as a refuge for marine life if ice loss continues long-term.

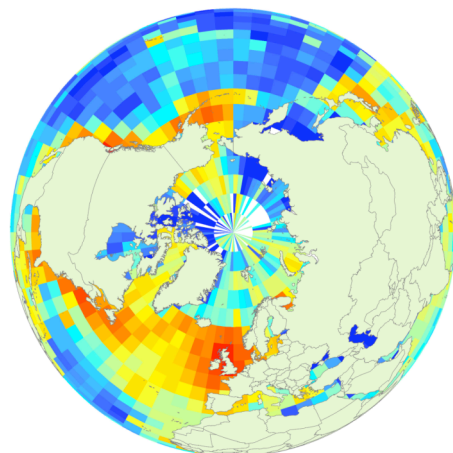
ArcOD researchers say subtle effects on marine life distribution, abundance and diversity due to recent warming in the Arctic have started appearing, most notably:

- A rising ratio of warm water to cold water-loving amphipod crustaceans in Hornsund fjord in Norway's Svalbard Island group (also called Spitsbergen, midway between Norway and the North Pole); and
- Documentation from the Chukchi Sea of range extensions to the north of at least three species – in two cases by up to 500 km – plus a growing number of snow crabs.



Meanwhile, researchers say smaller marine species are replacing larger ones in some Arctic waters. The reasons behind the shift are obscure but the implications for the Arctic food web may be profound.

The Census database known as OBIS (the Ocean Biogeographic Information System) today contains almost 1 million observations of more than 5,500 distinct taxa in Arctic waters, with more being added at an ever quickening pace.



The map at right depicts the number of records in OBIS for all Arctic marine life, where white indicates no records.

Says Russ Hopcroft: “We have filled in major blank spots on the Arctic map, and continue to add more, though big unobserved areas remain.”

## **New technologies**

New technologies are dramatically speeding Census research into the abundance, diversity and distribution of marine biodiversity.

Census researchers are using cell phone-like devices to learn about the distribution of large animals at both poles. For example, tracking devices fitted to narwhals, the ocean unicorn ([www.eol.org/pages/328542](http://www.eol.org/pages/328542)), record their Arctic migrations and provide as a by-product a wealth of rich data on the status of polar oceans, lending a major assist to science. Seals (<http://eol.org/pages/1052724>), meanwhile, captured before and after observations of the 2008 collapse of a large part of Antarctica’s Wilkins ice shelf.

SCUBA divers were deployed for observations in heavy Arctic ice and advanced, deep water optical systems on Remotely Operated Vehicles (ROVs) enabled detailed studies of delicate marine animals too fragile to collect. Similar approaches recorded videos of penguins and seals under Antarctic ice.

And DNA sequences, or barcodes, will dramatically accelerate the cataloguing of life’s diversity, helping to identify new and cryptic species. In partnership with Canada’s University of Guelph, ArcOD, CAML, their sister project, the Census of Marine Zooplankton (CMarZ, [www.cmarz.org](http://www.cmarz.org)), and others are collaborating in the Polar Barcode of Life project, with Belgium’s SCAR-MarBIN ([www.scarmarbin.be](http://www.scarmarbin.be)) creating data storage, analysis and visualization tools. CAML is barcoding some 3,000 Antarctic species; ArcOD has barcoded about 300 to date. With a completed molecular catalog,

analysis of genetic variation within polar marine environments and at different depths will be far quicker and easier.

\* \* \* \* \*

Others among the 17 Census of Marine Life projects contributing to the progress of understanding in polar regions is the International Census of Marine Microbes (ICoMM, <http://icomm.mbl.edu>), which was recently able to sequence the DNA of more than 370,000 individual microbes living in 2-to-10 liter seawater samples drawn from 16 points around the Antarctic. Work is underway to distinguish the species captured.

The History of Marine Animal Populations (HMAP, [www.hmapcoml.org](http://www.hmapcoml.org)) project researchers, meanwhile, studied monastic and government records dating back to the 1600s to reconstruct populations of walruses in the White and Barents seas.

Benefits to society accruing already from Census research include the identification of vulnerable marine habitats in the Southern Ocean, based on CAML information. Meanwhile, the marine component of a multi-national Circumpolar Biodiversity Monitoring Program (<http://arcticportal.org/en/caff/cbmp>) is in development with ArcOD participation.

Braving often bitter cold and perilous ocean conditions, the outstanding accomplishments of dedicated polar marine researchers have been honored recently in a number of countries. On a 2008 visit to Antarctica, for example, Brazilian President Luiz Inácio Lula da Silva, presented CAML scientist Dr. Lucia Campos with a national award for her work in that region. Researcher Dr. Angelika Brandt of Germany was awarded the prestigious biennial SCAR medal by the Scientific Committee on Antarctic Research. And Census scientists Drs. Eduardo Klein and Elizabeth Huck of the Universidad Simon Bolivar received Venezuela's highest civilian honor for their studies of Antarctic biodiversity.

Photography by ArcOD team members has earned a place in galleries from Alaska to the Smithsonian Institution in Washington DC, and inspired an exhibition of paintings based on the images. CAML and ArcOD researchers, meanwhile, have both provided marine life photos used for stamps in Canada and Australia commemorating IPY.

\* \* \* \* \*

Concludes Ian Poiner: “In these unique oceans, where the water temperature is colder at the surface than below, we are establishing the first benchmarks of marine biodiversity against which change may be measured, a significant polar year legacy for future generations. The significant investment of nations, the skills of scientists from the many ocean research disciplines, and the social network of the Census of Marine Life made it happen.”

\* \* \* \* \*

### **Census of Marine Life**

Started in the year 2000, CoML is an international science research program uniting thousands of researchers worldwide with the goal of assessing and explaining the diversity, distribution and abundance of marine life – past, present and future – by 2010.

In 2009, researchers will pursue adventurous expeditions to sample a range of key habitats. They will conduct the first exploration of the world’s deepest known ocean volcanoes, for example, found more than 5,000 meters below surface in a Caribbean seafloor rift between Jamaica and the Cayman Islands.

Of particular note also is sampling scheduled in the largely unexplored areas of the Indian Ocean off Madagascar, where experts expect to meet hundreds of new species in all taxonomic groups. Since the mid 1990s, collectors have been intrigued by the seashells of unknown mollusc species offered for sale by local lobster fishermen. Advanced



amateurs have since sampled and described more than 35 mollusk species that appear unique to this area.

The Census of Marine Life is supported by private sources and government agencies the world over. A list of all supporters is online at [www.comlsecretariat.org/Dev2Go.web?id=302846&rnd=27348](http://www.comlsecretariat.org/Dev2Go.web?id=302846&rnd=27348).

\* \* \* \* \*

**International Polar Year** ([www.ipy.org](http://www.ipy.org))

Organized by the International Council for Science and the World Meteorological Organization, IPY has been a scientific program focused on the Arctic and Antarctic from March 2007 to March 2009.

Several thousand scientists spanning over 200 projects and 60 nations participated.

Funded by national agencies, projects endorsed by the IPY Joint Committee were grouped into thematic clusters, each with a lead project (a projects overview is online at: <http://classic.ipy.org/development/eoi>). The Census' Arctic and Antarctic projects lead IPY's biodiversity clusters.

The Census' polar team aims to develop by 2010 projections of shifts in marine biomes that might accompany climatic and other changes drawing on the data collected during IPY.

Says Dr. Ian Allison, one of the leaders of IPY: "CAML and ArcOD have been outstanding examples of collaboration during the International Polar Year, achieving major biological advances and doing much to further our understanding of the diversity of the polar seas."

## Image captions for Ice Oceans Release with thumbnails

High resolution images available for download at <http://coml.org/embargo/polar2009>



Image 1: Sand fleas (amphipod crustaceans) under nearshore ice in the Beaufort Sea. Ice-associated amphipods are a major food source for Arctic cod (<http://eol.org/pages/203867>), in turn the main prey for ice seals (<http://eol.org/pages/1052724>). Photo credit: Shawn Harper, University of Alaska Fairbanks.



Image 2. The swimming snail, *Limacina helicina*, was found in both Arctic and Antarctic waters. It feeds on its fellow pteropod, *Cliona limacina* (below). Credit Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 3. The pteropod or swimming snail, *Cliona limacina*, found in both Arctic and Antarctic waters, serves as a food source for *Limacina helicina* (above). Credit Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 4. Arctic krill, *Thysanoessa raschii*, was found in high densities under sea ice in the Arctic and its marginal seas, where they feed seasonally on algae associated with the sea ice, similar to the behavior of the Antarctic Krill. Credit Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 5: *Calyropsis borchgrevinkii*, is one of the more common hydromedusae encountered in Antarctic waters. This marble-sized jellyfish was photographed during the CEAMARC 2008 expedition aboard the R/V *Umitaka Maru* to the Antarctic, part of a joint CAML/ArcOD/CMarZ effort. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 6: *Chionodraco hamatus*, one of the Antarctic's ice fish, can withstand temperatures that freeze the blood of all other types of fish. This finger-lengthed juvenile was photographed during the CEAMARC 2008 expedition aboard the R/V *Umitaka Maru* to the Antarctic, part of a joint CAML/ArcOD/CMarZ effort. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 7: Sand-fleas such as *Hyperoche capucinus*, are common predators swimming in polar waters. This specimen, about the width of a finger, was photographed during the CEAMARC 2008 expedition aboard the R/V *Umitaka Maru* to the Antarctic, part of a joint CAML/ArcOD/CMarZ effort. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 8: The nemertean *Pelagonemertes rollestoni*, hunts for zooplankton prey that it will harpoon with a dart attached to the tongue coiled within it. Its yellow stomach reaches out to feed all parts of the body. About 3 cm long, it was photographed during the CEAMARC 2008 expedition aboard the R/V *Umitaka Maru* to the Antarctic, part of a joint CAML/ArcOD/CMarZ effort. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 9: The ghost-like sea-angel, *Platybrachium antarcticum*, flies through the deep Antarctic waters hunting the shelled pteropods (another type of snail) on which it feeds. This 3 cm long slug was photographed during the CEAMARC 2008 expedition aboard the R/V *Umitaka Maru* to the Antarctic, part of a joint CAML/ArcOD/CMarZ effort. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 10: Census of Marine Life Arctic researchers have discovered more than 50 gelatinous zooplankton living in the arctic, about a quarter of which are new to the Arctic Ocean or new to science. *Bolinopsis infundibulum* is one example of the variety of shapes and sizes collected. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 11: The copepod *Gaetanus brevispinus* is found worldwide but is most commonly collected in polar waters where its cold-water habitat comes closer to the ocean's surface. In mid-latitudes it occurs as deep as 3000 m. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.



Image 12: The US Coast Guard Cutter Healy often has to break its way through ice, here in the Bering Sea. The R/V *Healy* provides excellent support to many Arctic scientific expeditions in the Amerasian Arctic. Credit: Rolf Gradinger, University of Alaska Fairbanks, Census of Marine Life.



Image 13: The R/V *Polarstern* breaks a path through the Southern Ocean. Operated by the Alfred V. Wegener Institute, the R/V *Polarstern* provides an excellent platform for exploring below the Antarctic ice. Credit: J. Ziegler, CAML.



Image 14: Census explorers face dangers from icy decks, huge waves and polar bears to advance knowledge about marine life in the polar regions. Credit: Victoria Wadley, Australian Marine Science, Census of Marine Life.

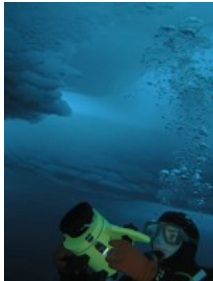


Image 15: Elizabeth Siddon dives below the ice in the Canada Basin, tethered to a tender for her safety. Credit: Shawn Harper, University of Alaska Fairbanks.



Image 16: A remotely operated vehicle equipped with a video camera was used to record life in the Southern Ocean during an expedition aboard the R/V *Aurora Australis*. Shown here is scientist Rob Beaman removing the camera from its waterproof case. Credit S. Mouge.

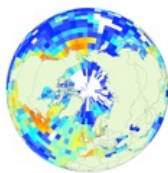


Image 17. Sampling intensity varies widely at the polar regions. Shown here is northern polar region fish data available in OBIS, the Census database. White indicates areas with little or no data. Red indicates a high value of records available, blue low. Credit: Edward Vanden Berghe, OBIS.



Image 18. The Census project Arctic Ocean Diversity led 14 cluster projects exploring the Arctic during IPY. Shown here are areas in which expeditions were undertaken. Credit: Bodil Bluhm, University of Alaska Fairbanks, Census of Marine Life.



Image 19. The copepod *Gaetanus brevispinus* has a world-wide distribution, but is most commonly collected in polar waters where its cold-water habitat comes closer to the ocean's surface. In mid-latitudes it occurs as deep as 3000 m. Credit: Russ Hopcroft, University of Alaska Fairbanks, Census of Marine Life.

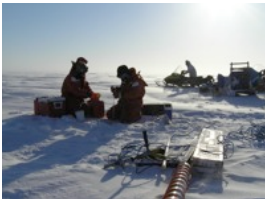


Image 20. Ice sampling camp - Sea ice sampling in nearshore fast ice near Barrow, Alaska. Snow machines, sleds and polar bear watch are essential support for Arctic research. Rolf Gradinger, University of Alaska Fairbanks, Census of Marine Life.



Image 21. Twenty years ago the shores of inner basins of the Arctic Hornsund fjord (Svalbard archipelago) were barren, as solid fast ice staying in average of 8-9 months per year scoured all the macroorganisms. Today, with the fast ice present no more than 4-5 months algae are climbing up the shore creating a new, rich habitat in the former desert. Marcin Gorski, ArcOD.