The International Waters of the Central Arctic Ocean

Life in an Emerging Ocean

AN EMERGING OCEAN TEEMS WITH LIFE

The Central Arctic Ocean is home to fish, invertebrates, migratory birds, and marine mammals. Until the past few summers, the region had been covered with permanent ice throughout human history. But the region is far from barren. Algae grow in and beneath the sea ice, blooming in spring to fuel a food web that includes plankton, Arctic cod, ringed seals, and polar bears. Dead plankton and other animals sink to feed crabs, brittle stars, mollusks, and other invertebrates on the seafloor.

As permanent ice diminishes, a new ocean is opening up. Scientists are just beginning to gather data about the biology of the Central Arctic Ocean because until now it has been difficult to access. Some of the preliminary results presented here illustrate that this emerging ocean is teeming with life and connected to the rest of the world's oceans.

Amphipods

Arctic cod

Polar bear

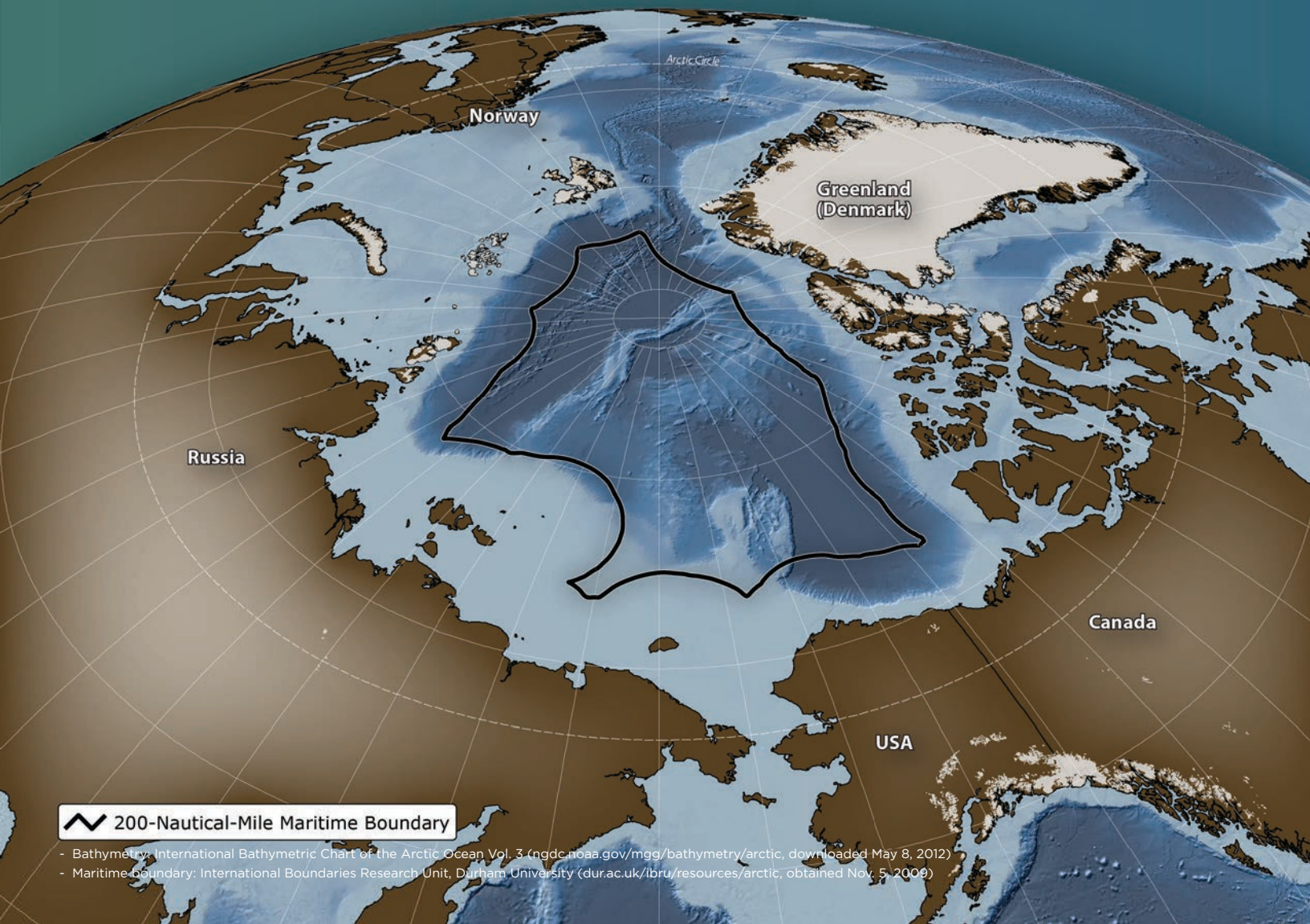
Background: Arctic coral (photo: NOAA)

Cover (from left): copepod and Arctic sea butterfly (Photos: Russ Hopcroft/NOAA), Arctic cod (Photo: Shawn Harper), polar bear (Photo: Michelle Valberg)

Photo: Jeremy Potter/NOAA

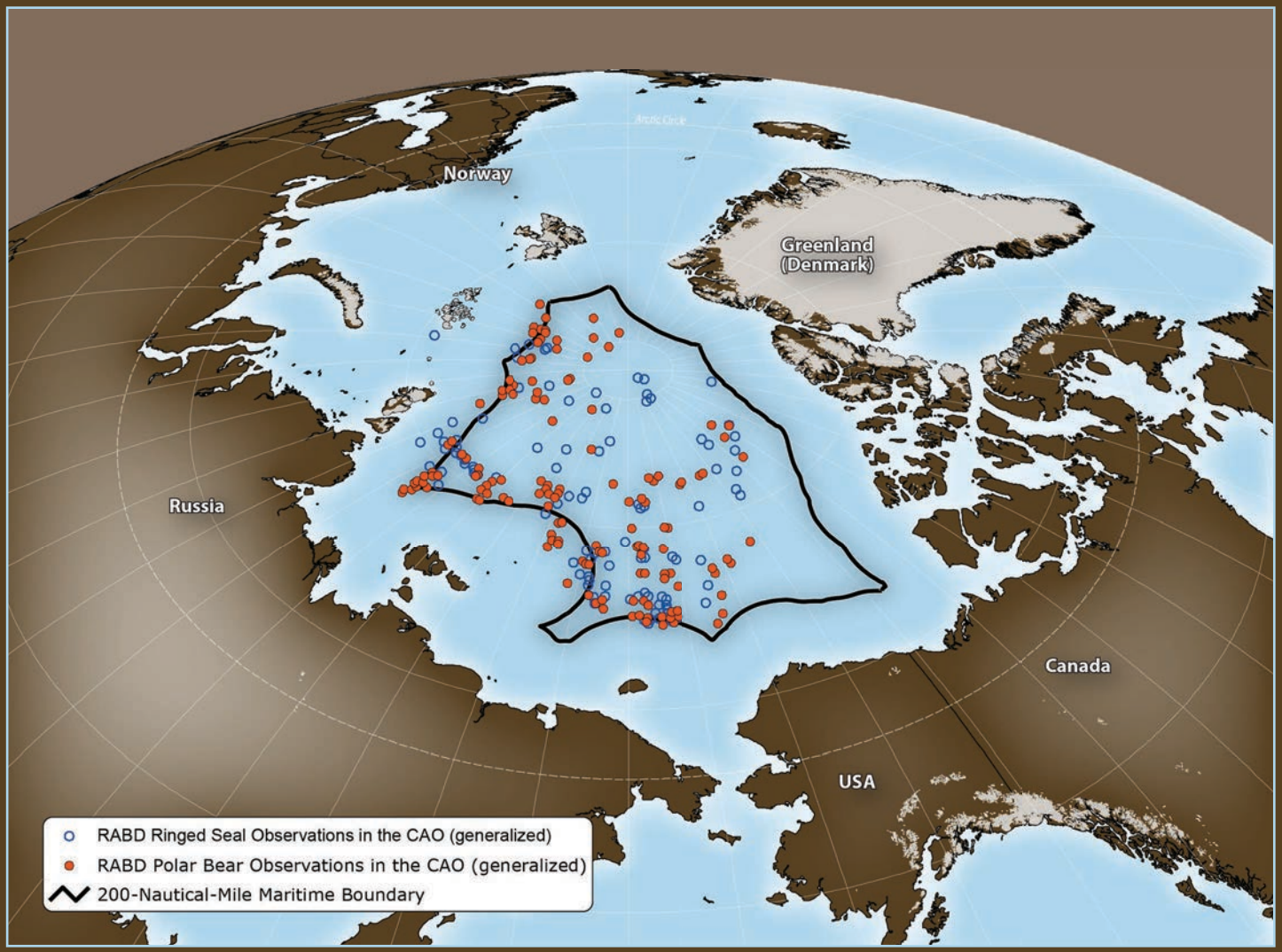
The Central Arctic Ocean

The Central Arctic Ocean boundary is defined by the 200-nautical-mile exclusive economic zones of the five Arctic coastal countries, beyond which commercial fisheries are unregulated without an international agreement. Throughout this publication, "Central Arctic Ocean" refers to these international waters.



- Bathymetry: International Bathymetric Chart of the Arctic Ocean Vol. 3 (ngdc.noaa.gov/mgg/bathymetry/arctic, downloaded May 8, 2012)
- Maritime boundary: International Boundaries Research Unit, Durham University (dur.ac.uk/ibru/resources/arctic, obtained Nov. 5, 2009)

MARINE MAMMALS: CONNECTING ARCTIC REGIONS



Polar Bear and Ringed Seal Observations (Russian data)

The polar bear and ringed seal observations were derived from maps produced for The Pew Charitable Trusts by S. Belikov and V. Prydatko in March 2013. The original maps were created using data from the Russian Arctic Biogeographical Database (RABD), which contains marine mammal observations between 1957 and 2011.

Beluga whales

Walrus

Ringed seal

Narwhal

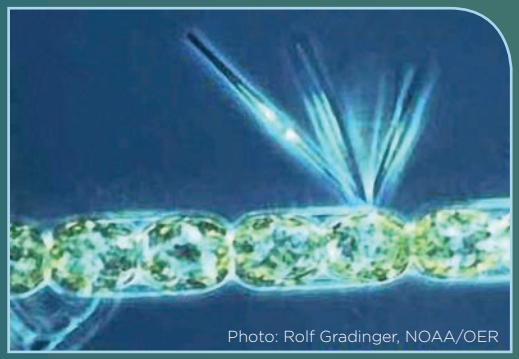
Bowhead whale (inset below) | Photo: Outi Tervo

Although their distributions and population densities are relatively unknown, marine mammals use the Central Arctic Ocean in whole or in part as habitat. Polar bears and ringed seals range throughout this area. Specific regions of the Central Arctic Ocean are used by beluga whales from the Canadian Beaufort Sea, narwhal from Russia's Kara and Laptev seas, and walrus from the Chukchi Sea.

Marine mammal data collected in the region, such as observations of polar bears and ringed seals from Russian scientists *(see map on facing page),* need to be combined, analyzed, and augmented to form a more complete picture of how marine mammals use these waters. But preliminary information shows the Central Arctic Ocean provides marine mammal habitat that connects Arctic regions.

PLANKTON: FEEDING THE ARCTIC FOOD WEB

As the sun returns in spring, algae blooms cloud the waters of the Arctic Ocean. An assortment of crustaceans gorge on the algae, storing up as much fat as possible to survive the harsh environment. This rich zooplankton is the primary food source for Arctic cod, marine birds, and bowhead whales in many parts of the Arctic. The presence of this plankton in the Central Arctic Ocean suggests similar food web dynamics and could explain the presence of Arctic cod, marine mammals, and seabirds in the region.



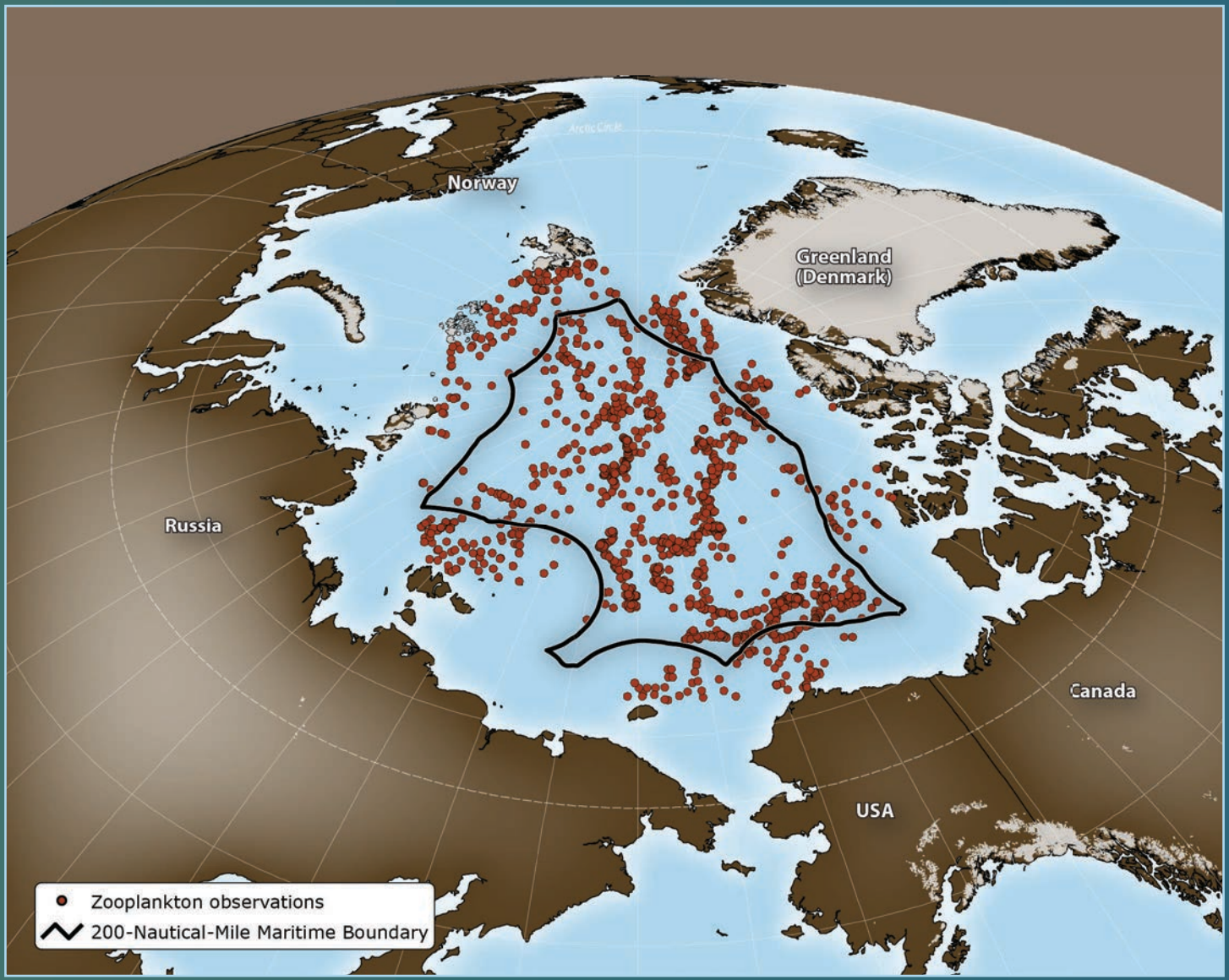
Arctic ice diatoms

Black guillemot

Bowhead whale

Beluga whale

Arctic copepod (center) | Photo: Russ Hopcroft/NOAA



Plankton Records in the Arctic Basin

These zooplankton data were obtained from UNESCO's Ocean Biogeographic Information System (iobis.org) and represent marine crustacean records for the Arctic Ocean in the OBIS database (downloaded March 22, 2013).

ARCTIC COD: TRANSFERRING ARCTIC ENERGY


Photo: Shawn Harper

Arctic cod

Arctic cod *(Boreogadus saida)* are the central link in the food web, transferring energy from algae and plankton to birds and marine mammals. Although scientists know these fish are distributed throughout the Arctic Ocean, including under the North Pole, little systematic information has been gathered about their abundance, their spawning areas, and the patterns of their movements and interactions in the region.

With so much depending on a single species, more research is needed to assess the impacts of human activities such as fishing. Although no commercial fishing for Arctic cod has begun yet in the Central Arctic Ocean, farther south, in the Barents Sea, such a fishery has existed since the 1970s. Unregulated commercial fishing in the Central Arctic Ocean, before adequate scientific research is completed and appropriate management measures are implemented, could harm future fisheries and the marine mammals and seabirds that rely on this vital element of the Arctic ecosystem.


Photo: Steven Kazlowski/SeaPics.com

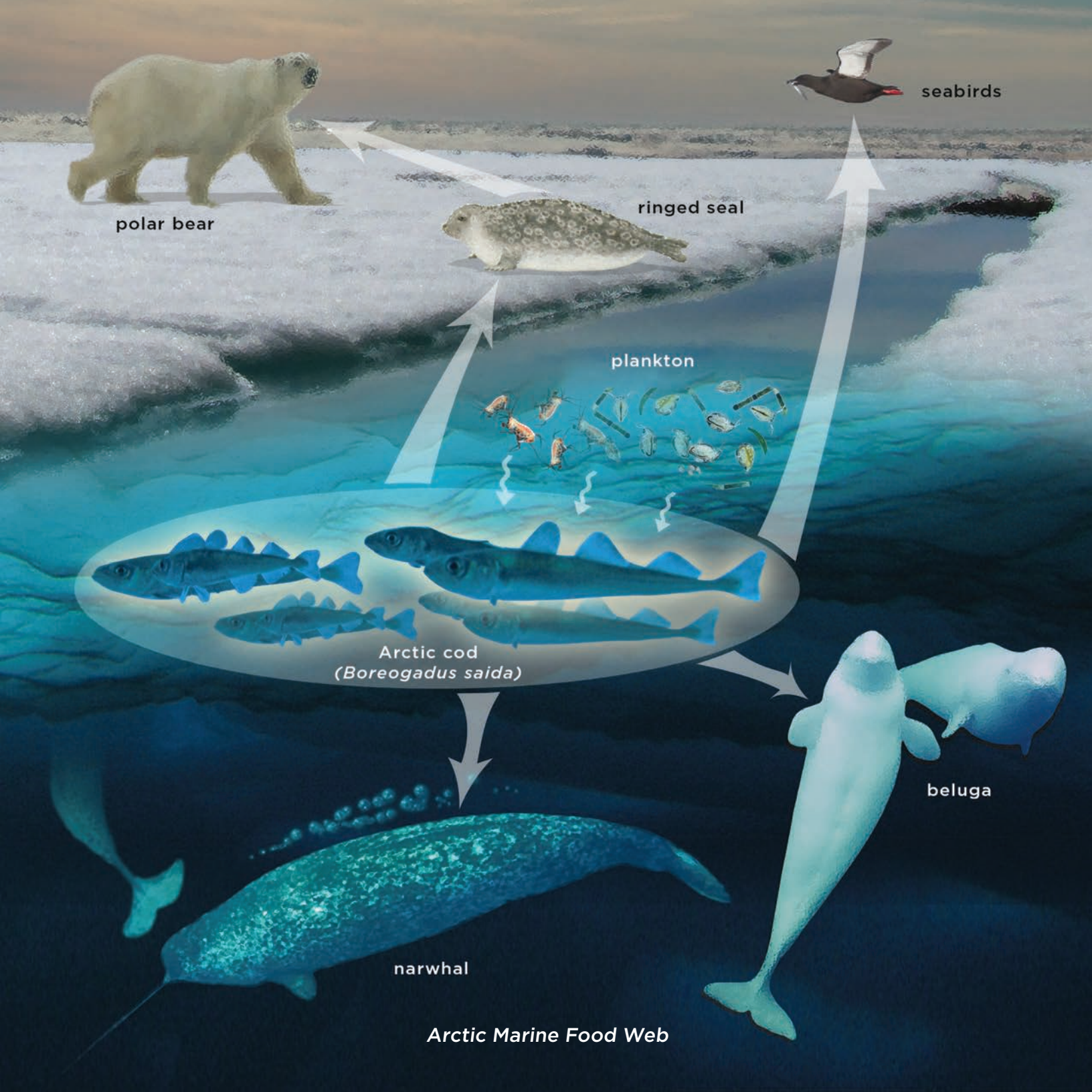
"Arctic Cod" vs. "Polar Cod"

Two species of fish found in the Arctic are sometimes referred to interchangeably as "Arctic" cod and "polar" cod. For consistency, we use the term "Arctic cod" to refer to *Boreogadus saida*, the most abundant and ubiquitous Arctic fish.

Arctic cod, *Boreogadus saida*

Polar cod, *Arctogadus glacialis*

Illustrations: Jón Baldur Hlíðberg/FAUNA



Arctic Marine Food Web

THE PRECAUTIONARY CHOICE: PROTECT AND STUDY

As the permanent ice recedes in summer, icebreakers, including research vessels, are traveling more often into the Central Arctic Ocean. More research is being done, although the rapid changes in sea ice are likely to mean swift shifts in species composition, distribution, and abundance as well. Yesterday's answers lead to today's questions. An international fisheries accord in the Central Arctic Ocean should include an agreement to cooperate on a systematic approach to ecological monitoring.

Ships visiting the region could take consistent oceanographic measurements and biological samples, in addition to conducting research projects on other topics. These measurements and samples would improve our understanding of life in the Central Arctic Ocean, how it is changing, and what is required of humans to avoid irrevocable disturbance. Only in this way can we pass on to our children and grandchildren a Central Arctic Ocean with the potential for a truly sustainable future.

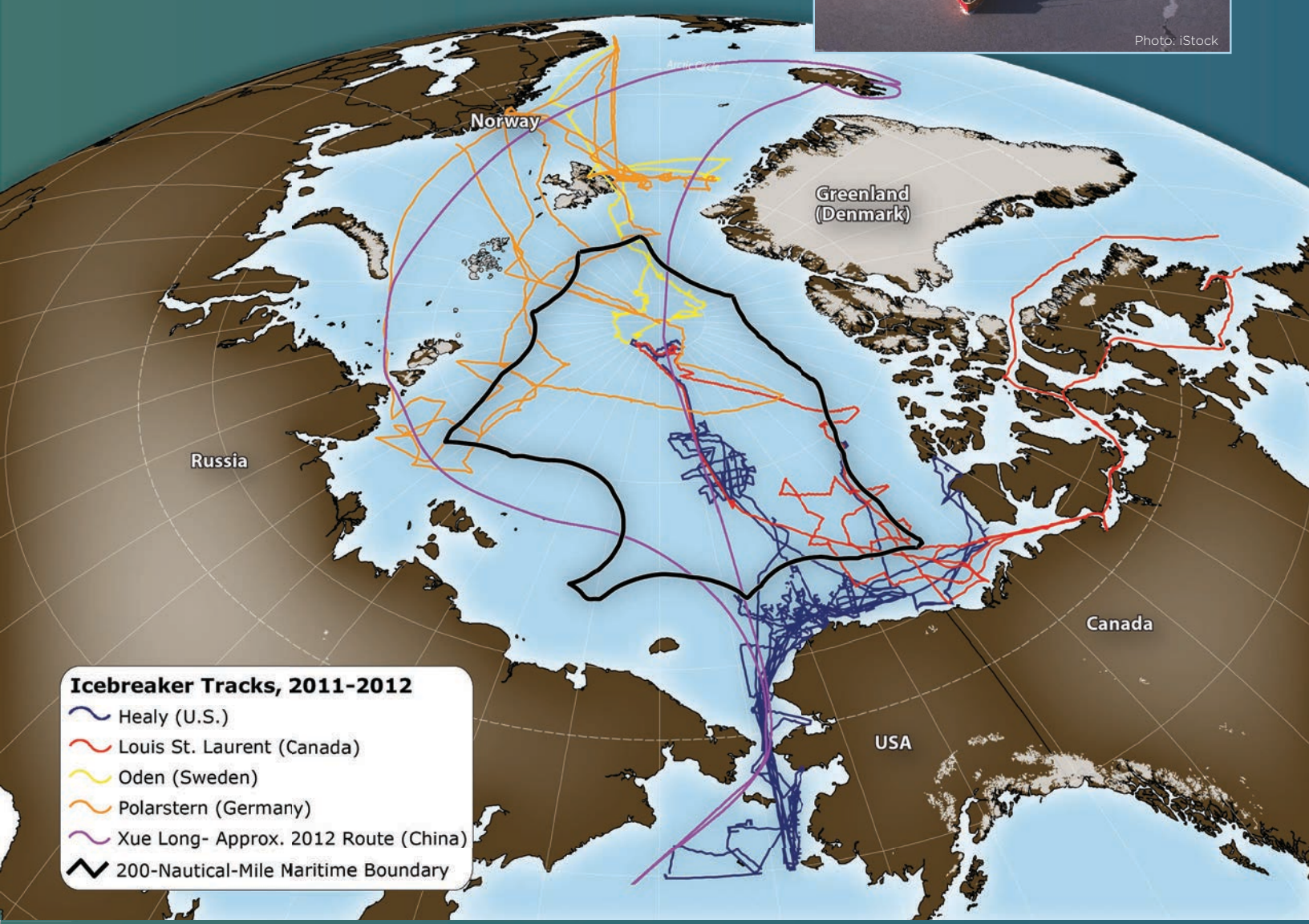
Photo: NOAA

Photo: Henry Huntington

Background: Sepp Friedhuber/iStockphoto.com

Icebreaker Routes by Country
Across the Central Arctic Ocean


Photo: iStock



The 2011-2012 icebreaker tracks were obtained as Automatic Identification System (AIS) data points from sailwx.info on March 22, 2013, and were converted to lines for illustration purposes. The 2012 Xue Long track was derived from data published on the Arctic Portal website (portal.inter-map.com), accessed on March 22, 2013.

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THE PEW CHARITABLE TRUSTS

THE PEW CHARITABLE TRUSTS' INTERNATIONAL ARCTIC PROGRAM

is working with Arctic countries, scientists, the fishing industry, and indigenous peoples to support an agreement that would protect the international waters of the Central Arctic Ocean and its living marine resources from unregulated or unsustainable commercial fishing.