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SS14.03

April 23, 2014

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Scientists Identify Source of Mysterious Low-Frequency Sound Heard for Decades in the Southern Ocean

Scientists have conclusive evidence that the source of a unique rhythmic sound, recorded for decades in the Southern Ocean and called the "bio-duck," is the Antarctic minke whale (*Balaenoptera bonaerensis*). First described and named by submarine personnel in the 1960s who thought it sounded like a duck, the bio-duck sound has been recorded at various locations in the Southern Ocean, but its source has remained a mystery, until now.

In February 2013, an international team of researchers deployed acoustic tags on two Antarctic minke whales in Wilhelmina Bay off the western Antarctic Peninsula. These tags were the first acoustic tags successfully deployed on this species. The acoustic analysis of the data, which contained the bio-duck sound, was led by Denise Risch of NOAA's Northeast Fisheries Science Center (NEFSC) and was published April 23, 2014 in *Biology Letters*.

The bio-duck sound is heard mainly during the austral winter in the Southern Ocean around Antarctica and off Australia's west coast. Described as a series of pulses in a highly repetitive pattern, the bio-duck's presence in higher and lower latitudes during the winter season also contributed to its mystery. No one knew the minke whales were there. The identification of the Antarctic minke whale as the source of the sound now indicates that some minke whales stay in ice-covered Antarctic waters year-round, while others undertake seasonal migrations to lower latitudes.

"These results have important implications for our understanding of this species," said Risch, a member of the Passive Acoustics Group at the NEFSC's Woods Hole Laboratory. "We don't know very much about this species, but now, using passive acoustic monitoring, we have an opportunity to change that, especially in remote areas of the Antarctic and Southern Ocean."

The acoustic tags, which also recorded water temperature and pressure, were placed on the animals using a hand-held carbon fiber pole by researchers working from a rigid-hulled inflatable boat. Animals were visually tracked from the boat during daylight hours to identify behavior and group composition. No other marine mammal species were observed in the area when calls were recorded, providing further evidence that the recorded sounds were produced by the tagged whale or other nearby Antarctic minke whales.

The mysterious sounds were thought to be made by submarines, by some oceanographic phenomenon, or even by fish. They were eventually identified as the bio-duck through comparisons with sounds in the published literature. They also matched recordings on long-term, bottom-mounted recorders from several other locations in the Antarctic, including the Perennial Acoustic Observatory in the Antarctic Ocean (PALAOA), and near Dumont d'Urville and Ross Island. Germany's PALAOA is an autonomous observatory with underwater hydrophones, or microphones, located on the Ekström Ice Shelf in western Antarctica. Dumont d'Urville on Petrel Island is the main French scientific research station in Eastern Antarctica.

Findings from this study will allow researchers to interpret numerous long-term, acoustic recordings, and improve understanding of the distribution, abundance, and behavior of this species. Minke whales are the smallest of the "great whales" or rorquals, a group that includes the blue whale, Bryde's whale, and humpback, fin, and sei whales. Rorqual whales are relatively streamlined in appearance, have pointed heads and, with the exception of humpback whales, small pointed fins.

The authors note that identifying the bio-duck sound will allow for broader studies of the presence of minke whales in other seasons and areas. That ability to monitor minke whales is critical for a species that inhabits an environment that is difficult to access, has rapidly changing sea-ice conditions, and "has been the subject of contentious lethal sampling efforts and international legal actions."

In addition to lead author Risch and NEFSC colleague Sofie van Parijs, other authors represent the Australian Antarctic Division in Tasmania, Australia; NOAA Fisheries Office of Science and Technology in Silver Spring, Maryland; Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany; Duke University Marine Laboratory in Beaufort, North Carolina; Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover Foundation in Büsum, Germany; and the Marine Mammal Institute, Hatfield Marine Science Center at Oregon State University in Newport, Oregon.

The study was supported by a grant from the National Science Foundation's Office of Polar Programs and conducted under National Marine Fisheries Service Permit 14097, Antarctic Conservation Act Permit 2009-013, and Duke University Permit IACUCA49-12-02. Denise Risch's research was also supported by the U.S. Navy Environmental Readiness Division (N45).

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A tagged minke whale. Credit: Ari S. Friedlaender, Oregon State University

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A group of Antarctic minke whales. Credit: Ari S. Friedlaender, Oregon State University

Audio:

Your browser does not support the audio element.
Bio-duck sound sample. Credit: Denise Risch, NEFSC/NOAA

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Bio-duck downsweep sample. Credit: Denise Risch, NEFSC/NOAA

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