Back from the ice: Research team returns from Fram Strait

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The crew of the Swedish Polar Research Secretariat's icebreaker, the Oden, pick up a hydrophone buoy that marine mammal observers used to listen to the sound of the ship moving through the ice. Credit: Jan Durinck, Marine Observers

They rammed through ice ridges, took 360-degree pictures of the ice, tracked the movement of icebergs and measured the underwater sounds of an icebreaker crunching through an ice ridge.

Those were just a few of the many research objectives achieved by a

multinational team of 33 researchers who have just completed a two-week cruise in the icy waters off northeast Greenland.

"This gave us a great opportunity to test out many of our new technologies," said Raed Lubbad, cruise director. "We were able to build our database and collect as much full-scale data as possible."

Lubbad is an associate professor at the Norwegian University of Science and Technology's (NTNU) centre for Sustainable Arctic Marine and Coastal Technology (SAMCoT), which coordinated the cruise.

The Swedish icebreaker Oden left Longyearbyen, Svalbard on 19 August and returned late in the evening on 1 September. The two-week cruise was designed to allow the 28 ice engineers and scientists to measure and quantify different aspects of sea ice, icebergs and their interaction with the ship.

Five marine mammal researchers were also aboard the vessel, where they conducted acoustic research and combined conventional marine mammal observations with more high-tech approaches.

Silent but noisy

Researchers in the Marine Mammal Observation group reported that they were very excited about their measurements of underwater sounds as the icebreaker moved past icebergs and broke through larger ice flows.

The group says that the Arctic Ocean can be seen as both the most silent and most noisy of all oceans. The breakup or collapse of an iceberg can be noisy, but a thick layer of ice can insulate the underwater world from surface noises.

As researcher Michel André observed, however, scientists have relatively little data on how man-made underwater sounds, such as the crunching of the boat through ice ridges, propagate under the ice.

André, who is director of the Laboratory of Applied Bioacoustics at the Technical University of Catalonia BarcelonaTech (UPC) in Spain, says that the data the group collected from the cruise is particularly valuable for this reason, especially as increased activity in the Arctic Ocean boosts the amount of man-made noise in the water. The information can be used to conduct a risk assessment for the possible impact of noise on marine mammals.

The scientists measured the sound using a buoy equipped with a hydrophone and a sound recorder, deployed from the ship and left in the ocean during the ice breaking trials.

"Then the buoy has to be found again, and this is itself a challenging task," said Statoil biologist Jürgen Weissenberger, who coordinated the marine mammal group. "Finding and taking a small buoy on board requires the skills of an experienced ice breaker crew, and that we had on board Oden."

Researchers from the Oden Arctic Technology Research Cruise, coordinated by the Norwegian University of Science and Technology's Sustainable Arctic Marine and Coastal Technology research centre, drill an ice core on a floe off the northeast coast of Greenland. Credit: Taisiya Sinitsyna, NTNU

A patch of animals

The marine mammal group also got a rare treat as the Oden crossed onto the edge of the continental shelf on its return to Svalbard. Suddenly, they said, the ocean was alive with whales, all taking advantage of the rich habitat that is typically found in this region.

Over a roughly 2.5 hour period, the group reported dozens of sightings, including sperm whales, white-beaked dolphins, humpbacked whales, fin whales and minke whales.

"It was one of the best whale areas I have ever been to," said Jan

Durinck, from Marine Observers in Denmark, who has more than 20 years of experience as a marine mammal observer.

"We know this is an area where we find animals, but their distribution can be quite patchy," Weissenberger said. "We just got lucky."

In the end, the biologists reported approximately 150 sightings of marine mammals during the course of the cruise.

Collect and redeploy

Cruise director Lubbad said researchers were able to achieve virtually all their research objectives during the two-week journey, including the collection of and redeployment of four buoys containing instruments for measuring currents and other information.

These underwater moorings have been busily collecting ice and ocean current data for the last year, and retrieving them was one of Oden's most important tasks on this cruise.

One of the moorings was missing its instrument package, most likely because the mooring was dragged by an iceberg, which would have snapped the line, Lubbad said.

And researchers successfully deployed four more moorings for collection next year.

A 360-degree view

While the cruise offered many opportunities for researchers to test new equipment or collect new data to validate models, Lubbad said he was particularly impressed by the performance of a 360-degree camera that

researchers designed to test on the cruise.

The set-up involved a series of simple cameras installed on the very top of the ship, which continuously recorded the view of the ice surrounding the Oden.

"It looks like you are taking pictures from a helicopter hovering just over the ship," Lubbad said. Researchers can then take the images to study how the ice behaved during the experiments they conducted aboard Oden.

"You can see how the ice interacts with the structure, what happens in the interaction zone, how the ice breaks and cracks, " he said. "This is a real field of innovation."

A multinational group

The cruise participants came from NTNU, the University Centre in Svalbard (UNIS), TU-Delft in the Netherlands, Saint Petersburg State University, the Technical University of Catalonia BarcelonaTech (UPC) in Spain, the University of Alaska-Fairbanks, the University of Delaware, the Norwegian oil company Statoil, Maritime Robotics, ASL Environmental Sciences in Canada, Marine Observers in Denmark, and the Ship Modelling and Simulation Centre AS in Norway.

The cruise was made possible in part by a memorandum of understanding between NTNU and the Swedish Polar Research Secretariat, and was conducted with support from Statoil and in collaboration with the Swedish Maritime Administration, which owns Oden.

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