

The reckoning

Why science is trying to address concerns that marine seismic surveys are harming whales and other aquatic life in the North Atlantic

BY DARREN CAMPBELL

Photo: Getty Images

Heather Smith has made a career out of researching marine mammals. Her work has taken her to Alaska to study beluga whales, Florida to research manatees, and Baffin Island to observe narwhals. She never tires of seeing marine mammals—particularly large whales—on the high seas.

“I find it amazing. I feel very lucky my job takes me to places where this is what I’m doing during my work day,” Smith says. “These animals are so huge and we’re able to catch a glimpse of them when they are blowing [water] or doing a social display at the surface. That’s something I really enjoy.”

Smith works for LGL Limited, an environmental research and consulting firm based in King City, Ontario. In 2017, she was given the opportunity to see marine mammals in their environment off the shores of Nova Scotia and Newfoundland and Labrador. She was involved in a research project sponsored by the federal government’s Environmental Studies Research Fund. The project is just one of a series sponsored by the fund aimed at gathering information about the impact of the oil and gas industry’s seismic activity on marine mammals and other aquatic life in Atlantic Canada. More specifically, how can it be mitigated.

This is important work. Seismic surveys are the lifeblood of oil and gas exploration activities, using sound waves to compile information about the geological structures lying beneath the surface.

During marine seismic surveys, compressed air is released into the water, creating a sound energy pulse.

The pulse concentrates the sound energy toward the ocean bottom. The sound waves bounce off the bottom back to the surface where they are monitored by a ship towing “air source arrays” and one or more cables (“streamers”) that contain sound receivers or other instruments. The data taken from these surveys provides information on the depth, position and shape of underground geological formations. That data is used by oil and gas companies to help them decide if they will bid on offshore parcels during land sales and to identify exploration drilling targets.

But as with anything, where there is a cause, there is often an effect. Some marine mammals—such as whales—rely heavily on using underwater sound to communicate. What if marine seismic surveys are somehow changing whale behaviour or even changing an organism’s physical state? Should seismic activity even be allowed in Atlantic Canada’s offshore if that were the case?

The Leeway Odyssey was the vessel used for one part of a marine mammal detection study done in 2017. Photo courtesy of LGL Limited



A LONG-STANDING ISSUE

In 2004, federal and provincial advisors, and national and scientific experts reviewed the science around marine seismic activity as well as effective mitigation measures used around the world. The result of this research was the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment. The statement sets out minimum standards that apply in Canada's non-ice-covered waters to all seismic activities that use air source arrays.

One example of the standards is a 500 metre 'safety zone' that must be established and monitored around seismic air source arrays. Recognizing that sound is most intense closest to the air source and that potential impacts from seismic are greatest at the shortest distances, seismic vessels must use a qualified marine mammal observer to watch the safety zone. If a whale, dolphin, porpoise or sea

turtle is seen by the observer within the zone, the air source array can't be started up until the area is clear.

However, the statement of practice is a living document. "As new scientific information and improved mitigation technologies and practices emerge, these will be considered for incorporation into the Statement," reads the Department of Fisheries and Oceans Statement of Practice home page.

Gathering new information is why Heather Smith found herself on the North Atlantic in the summer of 2017. This research project compared three ways to detect marine mammals: marine mammal observers; passive acoustic monitoring; and, an infrared automatic detection system. Marine mammal observers and passive acoustic monitoring are commonly used on seismic surveys to detect mammals in the ocean. But the infrared automatic detection system is a new technology, and Smith says her company wanted to test it and see if it could be used in Atlantic Canada.

\$1.38 billion

The total received in bids from oil and gas companies during the C-NLOPB's 2018 Call for Bids

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I’m happy to be in a position to contribute to trying to conserve our environment by providing guidance to the seismic industry.

Heather Smith, marine ecologist, LGL Limited

A marine mammal observer looks for signs of aquatic life from a booth on the bridge of the *Leeway Odyssey* in the summer of 2017. Photo courtesy LGL Limited

The infrared system could improve the detection of marine mammals because the other two methods aren’t foolproof. Marine mammal observers are always stationed on the bridge of a vessel and use binoculars to scan around the vessel. But they can’t see in all directions. Nor can they see underwater. And at night time? Forget about it. As for passive acoustic monitoring, which involves towing hydrophone arrays from a vessel to pick up noise from marine mammals underwater, Smith says it has limited ability to detect low frequency sound—the kind made by large whales like the endangered North Atlantic Right Whale. Also, if a marine mammal isn’t making any noise, the system is useless. It can’t detect what it can’t hear.

The thermal infrared system Smith’s research team tested holds promise because it can identify differences in temperature between water and an animal’s skin or breath. That difference shows up with contrasting colours between

the water and, say, a whale, thus identifying a marine mammal even if it can’t be seen or heard. The camera used also has a 360-degree view, so it won’t miss animals when it’s looking in the wrong direction.

The research project started in the summers of 2015 and 2016 onshore at Cape Race, Newfoundland and Labrador using visual observations of marine mammals and collecting thermal imaging data. During the summer of 2017, from July 30 until August 23, the three detection methods were used at the same time on the *Leeway Odyssey* 38-metre oceanographic research vessel in the North Atlantic.

Smith says LGL Limited LGL is preparing a report that will make recommendations based on the results of this research project on what can be done to improve the detection of marine mammals during monitoring and mitigation programs implemented for seismic surveys in Atlantic Canada. However, she couldn’t share the

project findings as this magazine went to press because they are in the process of submitting the results to scientific journals for publication and can’t submit the results to those journals if they have been already been published elsewhere.

OPPOSITION IS OUT THERE

Critics of the oil and gas industry say there is plenty of room for improvement in how seismic surveys are done. In Nova Scotia, the Clean Ocean Action Committee, which says it represents more than 9,000 people who are directly dependent on the renewable resources of the Scotian Shelf, has been a frequent critic of seismic surveys being conducted or proposed in Nova Scotia waters. It contends regulations on seismic impacts are inadequate and most preventative measures

focus on reducing impacts in close range of the airgun array, but don't adequately address impacts that may occur at greater distances outside the 500-metre safety zone.

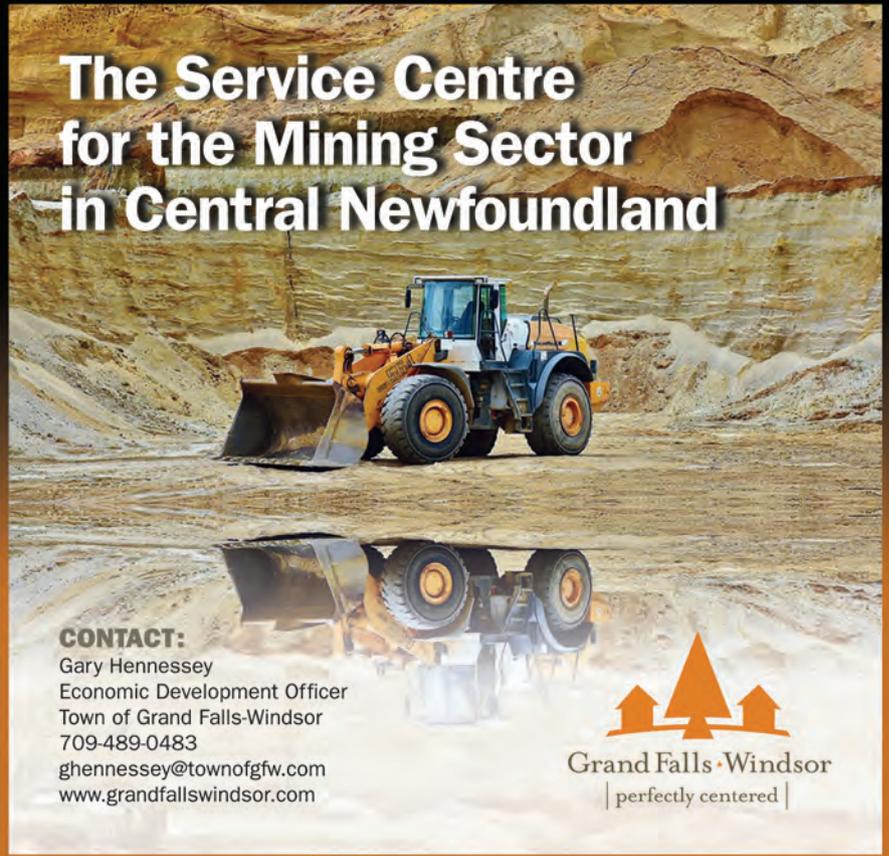
In Newfoundland and Labrador, seismic surveys have been credited with generating substantial interest from the oil and gas sector in its offshore acreage even during an industry-wide downturn that started in 2014 and 2015 when oil prices cratered. Crown corporation Nalcor Energy carried out seismic surveys that by the end of 2016 resulted in it acquiring over 145,000 kilometres of two-dimensional data that is available to the oil and gas industry.

In the Canada-Newfoundland and Labrador Offshore Petroleum Board's 2018 land sale, a record \$1.38 billion in bids were received for offshore acreage, including a record bid of \$621 million for one parcel made by BHP Billiton Petroleum. Those results provide evidence that Nalcor's investment in seismic work pays dividends, and the bids will surely result in more applications for marine seismic surveys as oil and gas companies try to better understand the geology of the offshore parcels they have. In Atlantic Canada, and Newfoundland and Labrador in particular, seismic is here to stay.

However, it's not just whales and dolphins that may be impacted by the blasts of sound coming from seismic surveys. Shellfish and fish may also be affected. A 2018 report written by Dalhousie University's Lindy Weigart looking at the impact of noise pollution on fish and invertebrates found in its review of 155 studies that noise can cause body malformations, higher egg or immature mortality, slower growth rates and other nasty impacts.

Even in Newfoundland and Labrador where the oil and gas sector is so important to the economy, there are concerns about the effect marine seismic surveys might have on fish and marine mammals. In the province's snow crab fishery, the most valuable in the province with a landed value of approximately \$295 million during the 2018 fishing season, the catch of the species has dropped from a high of 53,000 metric tonnes in 1999 to 28,000 metric tonnes in 2018. Late in 2018, the Department of Fisheries and Oceans presented research that fewer male

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Researchers haul snow crab out of the crab pots to observe and measure them for a project done off the Grand Bank from 2015-2018 looking into potential impacts seismic surveys might be having on commercial snow crab catch rates. Photos courtesy Corey Morris

53,000 metric tonnes

The amount of snow crab caught in 1999 in Newfoundland and Labrador

28,000 metric tonnes

The amount of snow crab caught in 2018 in Newfoundland and Labrador

snow crabs are growing to a fishable size. This research has the snow crab industry concerned DFO will cut quotas this spring for the 2019 season, which will lead to job losses across the province—especially in small coastal communities.

Keith Sullivan, president of the Fish, Food and Allied Workers Union that represents over 10,000 people working in the province's \$1.5 billion fishing industry, says his members are concerned marine seismic surveys may be one of the reasons the snow crab population is under stress. "We want more work and study done on the impacts of the oil and gas industry," Sullivan says. "There might be impacts from seismic activity on catch rates. We've seen it in turbot, shrimp and even some groundfish. But we don't know enough yet."

Sullivan accuses the federal and provincial governments of favouring the oil and gas industry over the fishing industry and not doing enough to study the impacts oil and gas activity is having on fisheries like the snow crab. "This double standard is not going unnoticed by the people living in coastal communities in Newfoundland and Labrador," Sullivan says. "We are not an insignificant industry. If fishing collapses, it has economic consequences as well."

But there is work being done on this. From 2015-2018, a research project was carried out on the eastern edge of the Grand Banks. The study focused on potential effects

of seismic surveys on commercial snow crab catch rates by measuring changes in snow crab movement, catchability and physiological effects in response to seismic air gun operations.

Corey Morris, a research scientist with DFO in St. John's and the project lead, says the results of the project will be released this spring. "The data collected from our experiments on seismic noise could not identify consistent changes that were attributable to seismic exploration in a predictable way upon commercial snow crab," Morris wrote in a response to *Natural Resources Magazine*. "This project helps to address that issue, but we recognize that a single research project cannot address all questions about seismic."

Indeed. The questions about what damage—if any—marine seismic surveys have on aquatic life in oceans all over the world will continue to be raised and will likely keep researchers like Morris and Smith busy for years to come.

"There is a lot of talk of coming up with an international standard for guidelines during seismic," Smith says. "It's not just in Atlantic Canada where we are working on this. Internationally, people are looking to find solutions to this. It's important on a global stage because there is seismic work happening everywhere." |nrm

FEEDBACK

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