

Caution required: Seismic blasting harms whales

Media briefing on the impacts of seismic blasting on Arctic marine life. Based on the report 'A Review of the Impact of Seismic Survey Noise on Narwhal & other Arctic Cetaceans'

*by Cucknell, A c, Boisseau, o and Moscrop, A 2015, of Marine Conservation Research Ltd.
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Introduction

It is indisputable that seismic noise has adverse impacts on marine life, a new report from Marine Conservation Research concludes. The report brings together existing field research on the impacts of seismic mapping on whales in the Arctic. While it is evident that there is a massive research gap in this field, based on available data the authors 'urge for extreme caution' amongst decision makers before allowing seismic activity in the Arctic. From the research at hand, it is clear that noise from seismic activity impacts whales. It can damage their hearing, ability to communicate, disrupt diving behavior, feeding and migration patterns. There are increasing indications that this could cause serious injury to whales. It may also disrupt reproductive success and increase the risk of strandings and ice entrapments.

Impacts on whales from seismic activities

HEARING LOSS

Marine mammals, especially whales, rely on sound to navigate, communicate, respond to predators and search for food, hence noise pollution poses a serious threat and is known to have harmful consequences. Whales have been found to develop temporary hearing loss at close ranges to seismic airguns. A trial with beluga whale showed that they developed temporary hearing loss at a sound exposure level of 186 dB from a single pulse and at 226 dB from peak-to-peak (highest to lowest amplitude) pressure. This means that a beluga whale would develop temporary hearing loss at the distance of 1 kilometer from a 2D seismic blasting operation including 14 airguns.

Hearing loss is amongst the most extreme and immediate form of physiological harm to marine mammals from exposure to seismic blasting. However, a number of other severe impacts have also been documented.

”It is clear that noise from seismic activity has an impact on whales as it can damage their hearing, ability to communicate and also displace animals, affecting diving behavior, feeding and migration patterns. There are increasing indications that this could cause serious injury, and may also disrupt reproductive success and increase the risk of strandings and ice entrapments. “

– Dr Oliver Boisseau, Senior Research Scientist, Marine Conservation Research

AVOIDANCE

Some whales react to seismic sounds tens of kilometers away by attempting to avoid them. Although it is often considered that avoidance behavior protects cetacean species from more serious damage and impact from anthropogenic noise sources such as seismic airguns, the knock-on effects of the avoidance can have significant population level impacts.

Avoidance can also cause secondary lethal and chronic impacts on whales in a less dramatic way, since moving away from noise can also mean moving away from critical and familiar habitats and food sources. Different studies also show how foraging activities were significantly reduced during seismic activity. Even small reductions in food could have negative consequences for the population.

A unique characteristic of the narwhale is their tendency to ‘freeze and sink’ in response to a threat such as noise, rather than fleeing the area. This means narwhals are more susceptible to damage from airgun blasts as they are not inclined to avoid regions impacted by noise.

ICE ENTRAPMENT

Blasts from seismic vessels can disrupt whale migrations, which can lead to entrapment in ice. A recent study by a prominent whale expert situated in Greenland links seismic activities to three large and unusual entrapments of narwhals in 2008 to 2010. While seismic activities occurred, narwhals remained in their coastal summering zones, delaying their autumn migration period. This disruption of their migratory routine caused the narwhale to travel when sea ice reformed. Thousands of narwhals then became entrapped in the winter sea ice and died. Entrapments of narwhale have never been reported before in this area and over those three summers, seismic testing took place in the north of Baffin Bay.

STRANDINGS

Whale strandings have been documented to be linked to man-made noise in a range of species. Causal links to seismic activities have specifically been made in relation to strandings of humpback whales, minke whales, and beaked whales. To date, no strandings of Arctic whale species have been reported, which could mean they have not occurred or that they have not been reported due to the remoteness and extremely thin population density.

COMMUNICATION

Seismic activity is documented to stop whales from communicating. One study documents how 250 fin whales stopped singing for several weeks during a seismic test, resuming within hours or days after the test ended. Another study recording humpback whale song for nine months documented a significant reduction during seismic testing up to 200 km away.

STRESS

Seismic testing can cause stress in whales, as stress hormones increase in a number of species in response to seismic sound. The loud, impulsive noise produced from a seismic airgun caused significantly increased mean norepinephrine, epinephrine, and dopamine levels immediately after a high level of exposure in a captive beluga whale. All three of these stress hormones increased significantly when increasing noise levels. These hormone levels remained high even one hour after noise exposure, which is surprising given their short half-life. Stress effects or physiological changes, if chronic, can inhibit the immune system or otherwise compromise the health of animals.

FOOD SOURCES

This report also states an indirect threat to whales from seismic blasting as it impacts the prey, or food sources for whales. Loud noise may have an impact on the development, physiology and survival of invertebrates, larvae and fish eggs and seismic airgun noise is proven to cause certain species of fish to migrate horizontally and vertically within the water column.

Recommendations

MORE RESEARCH

There is a significant research gap on the impacts of seismic blasting on marine mammals in the Arctic. Even more so, information detailing the impact of seismic noise specifically on young whales is extremely sparse. This is an area which urgently needs more research attention, as young whales of all species are being influenced by seismic noise sources around the world on a daily basis, while the lack of data and limited understanding of the impacts on especially Arctic species is immense.

”It is alarming to consider the vast amount of seismic activity being planned and conducted in the High Arctic, given the fragile nature of the ecosystem and the potential for disturbance and harm to whales. It seems justified to urge for extreme caution given both the lack of data and the limited understanding of the short and long term impact of seismic noise on sensitive Arctic species, especially the narwhal.”

– Dr Oliver Boisseau, Senior Research Scientist, Marine Conservation Research

PRECAUTIONARY PRINCIPLE

As we await further research on the impacts of seismic activities on whales, the report urges for extreme caution when considering the seismic activities planned and conducted around Greenland and Canada. When it comes to Baffin Bay, which is the main habitat for the narwhal, the report states that it is imperative that seismic surveys do not occur during migration periods for narwhal. Exclusion of narwhal from their critical habitat (i.e. summering/wintering grounds), and disruption to their migrations, even without the increased risk of ice entrapment, could have knock on impacts for this species in Baffin Bay, which already exists there under extreme environmental constraints.

AVOID SENSITIVE AREAS

There are a number of ways to reduce the impacts of seismic blasting to whales discussed in the report. However, there's widespread uncertainty about the effectiveness of measures to reduce impacts. This has even been noted in New Zealand's Code of Conduct for minimising disturbance to marine mammals from seismic survey operations, which notes that the best course of action may simply be to avoid conducting seismic surveys in "sensitive areas" until less disturbing technologies are in regular use. The report concludes that the High Arctic may well be defined as one such sensitive area.

WHAT IS SEISMIC BLASTING?

Seismic blasting (also labelled as 'seismic surveying' or 'seismic testing') is a scientific method to locate oil and gas deposit under the sea bed. The seismic vessel tows an array of airguns continuously blasting loud, low frequency sound waves down through the water column and into the seabed with intervals as short as ten seconds. The operations can go on for weeks on end, depending on the size of area designated for the survey. Hydrophones are also towed behind the vessel to record sound waves reflected by the various sediment formations below the seabed. Marine seismic blasting takes place from a specialised vessel often accompanied by support and supply vessels and the complete set of equipment can cover a distance of several kilometers.

When sufficient data has been acquired, oil companies can begin exploratory drilling in areas showing potential for oil and gas deposits.

