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Central and Arctic Region

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ABUNDANCE ESTIMATE OF THE NORTHERN HUDSON BAY NARWHAL POPULATION FROM THE 2018 AERIAL SURVEY

*Narwhal (*Monodon monoceros*).*

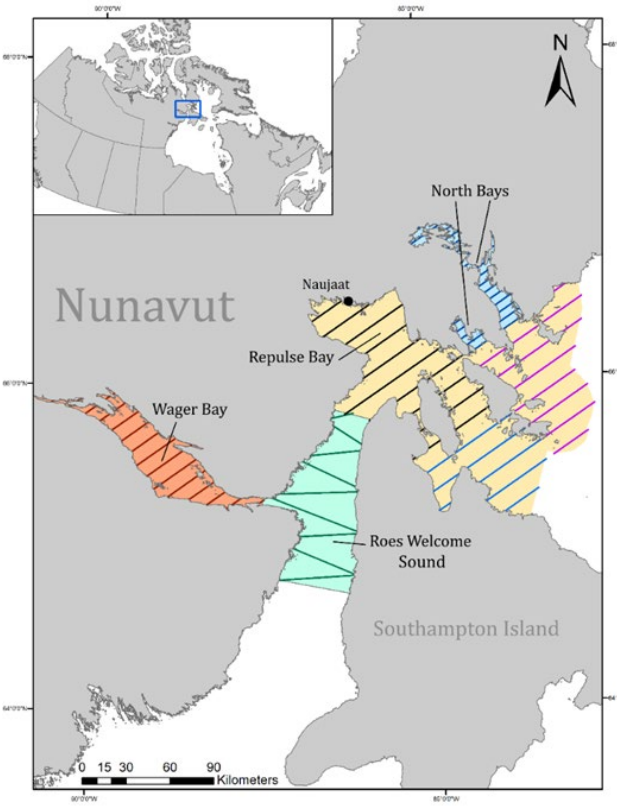

Figure 1. Map indicating four strata and transect lines surveyed in the 2018 visual aerial survey in Northern Hudson Bay. Different colored lines on the Repulse Bay stratum indicate lines flown on three different days.

Context:

Inuit subsistence harvests of Northern Hudson Bay (NHB) narwhal occur mainly in the Kivalliq Region of Nunavut, with smaller subsistence harvests in the Qikiqtaaluk and Nunavik regions.

Subsistence harvests of NHB narwhal are currently managed by Total Allowable Landed Catch (TALC) advice from Fisheries and Oceans Canada (DFO) Science, developed from aerial surveys of the NHB narwhal summer range. For the harvest to remain within sustainable limits, the Total Allowable Harvest (TAH) cannot be exceeded. The current TAH of NHB narwhal was established by the Nunavut Wildlife Management Board, based on DFO aerial surveys flown in 2011. An aerial survey was completed in 2018. DFO Science was requested to review this survey to provide an updated estimate of abundance.

SUMMARY

- Visual aerial surveys conducted from 3–14 August 2018 provided an updated estimate of abundance for the Northern Hudson Bay (NHB) narwhal population. Adjusting the near-surface estimate for submerged whales and whales missed by observers, produced an estimated abundance of 19,200 (95% CI = 11,300–32,900) narwhal.
- The previous aerial survey of NHB narwhal occurred in 2011 and resulted in an adjusted estimate of 12,500 (95% CI = 7,500–20,700) narwhal.
- The 2018 survey replicated the 2011 survey design, with increased coverage in Wager Bay, as recommended by the Arviq Hunters and Trappers Organization in Naujaat.
- The 2018 abundance estimate adds to a time series of survey-based estimates that may allow us to estimate population abundance and provide management advice using a model-based approach.

INTRODUCTION

Narwhals (*Monodon monoceros*) from Northern Hudson Bay (NHB) form a genetically and geographically distinct narwhal population. Systematic aerial surveys of NHB narwhals have been conducted in the early 1980's, 2000, and 2011. In 2011, a combination of visual and photographic methods produced a population estimate of 12,500 (95% Confidence Interval [CI] = 7,500–20,700) (rounded to the nearest hundred) narwhal. To provide an updated abundance estimate for NHB narwhal, a survey was conducted in August 2018.

ASSESSMENT

Survey

A visual aerial survey was flown 3–14 August, 2018 in Northern Hudson Bay. The survey area was divided into four strata: Wager Bay, Roes Welcome Sound, Repulse Bay and North Bays, which included Gore Bay and Lyon Inlet (Figure 1). The 2018 survey was designed to replicate the 2011 survey, with increased coverage in Wager Bay, as recommended by the Arviq Hunters and Trappers Organization in Naujaat.

All strata were surveyed once, except North Bays, which was replicated. For the North Bays stratum, an average of the two surveys, weighted by the coefficient of variation (CV), was calculated and used in the final estimate of abundance. Survey abundance estimates were adjusted for diving animals that are not visible at the surface, known as availability bias, and perception bias, since some observers may miss visible whales on the track line. A weighted availability bias adjustment factor of 2.80 (CV = 0.05) was calculated using the time nine narwhal satellite tagged in NHB in 2006–2007 spent within 0–2 m of the surface, the dive cycle for three narwhal tagged with time-depth-recorders from the Baffin Bay population in 1999–2000, and the time a whale was in view during the 2011 survey. Perception bias was calculated using data collected in the 2018 visual survey and the estimated adjustment factor was 1.36 (CV = 0.09).

ANALYSIS

The estimated number of narwhal at the surface for all strata was 5,100 (95% CI = 3,000–8,500). Adjusting for perception and availability bias resulted in an estimate of 19,200 (95% CI = 11,300–32,900) narwhal.

Sources of Uncertainty

The availability bias adjustment factor used to adjust the survey estimates for animals that are not visible at the surface is the best value currently available for NHB; however, they are derived from only nine whales tagged in NHB in 2006–2007 and three whales tagged from the Baffin Bay population in 1999–2000. Additional satellite tags on narwhal, preferably deployed to spatially and temporally coincide with the survey, would result in a better understanding of narwhal behaviour. A large sample of tagged NHB narwhals would also improve our understanding of diving and movement behaviour in different environmental conditions and habitats.

We assume that this survey covered the known range of NHB narwhal; however, there were observations of narwhal at the perimeter of the study area.

CONCLUSION

The updated abundance estimate from the 2018 NHB narwhal survey is 19,200 (95% CI = 11,300–32,900) narwhal. In a future analysis, the addition of this survey estimate may allow us to estimate population abundance and provide management advice for the NHB narwhal population using a model-based approach.

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SOURCES OF INFORMATION

This Science Advisory Report is from the February 17–22, 2020 meeting on Northern Hudson Bay Narwhal – Abundance Estimate and Sustainable Harvest Advice. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

Watt, C.A., Hornby, C., and Hudson, J. 2020. Narwhal (*Monodon monoceros*) abundance estimate from the 2018 aerial survey of the Northern Hudson Bay population. DFO Can. Sci. Advis. Sec. Res. Doc. 2020/073. iv + 15 p.

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