RESEARCH NOTE

# Evidence of a narwhal (*Monodon monoceros*) summer ground in Nares Strait

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## Abstract

Our limited knowledge of the marine mammal fauna in northernmost Greenland and Canada, specifically north of 80°N, relies largely on opportunistic observations collected during expeditions with different objectives. The narwhal (*Monodon monoceros*) migrates long distances in response to ice formation and decay and is notoriously skittish, avoiding areas with ice breakers. Scattered observations from the past 20 years, assessed together with historical observations after 1881, suggest that there is a population of narwhals that uses Hall Basin and its adjacent fjord systems—for example, Nares Strait—as a summer ground. Dating the tusks and bones that have been found shows that narwhals were present in this area as far back as nearly 7000 years ago. The wintering locations of these narwhals remain unknown, highlighting the need to investigate whether they are vulnerable to hunting activities in north-west Greenland. By gaining a better understanding of the narwhals' winter behaviour and potential hunting risks, we can develop more informed conservation and management strategies for this population.

**Keywords**
High Arctic; cetaceans; glacier fronts; Canadian Arctic Archipelago; whale hunting

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## Introduction

Many areas of the Arctic are infrequently visited, mainly because of the logistical difficulties in reaching these remote regions. The absence of systematic and quantitative data from these areas often necessitates reliance on opportunistic observations collected during other activities. An example of this can be seen in the mapping of the fauna in northernmost Greenland and Canada. No comprehensive range-wide censuses of animals have been conducted in this area, and most knowledge is derived from expeditions that had diverse objectives and visited restricted localities. For marine mammals that migrate in and out of ice-covered areas and spend a significant amount of time submerged, there is only sporadic information available on their occurrence north of 80°N. However, valuable information can be obtained by compiling time series of opportunistic observations from specific areas.

The narwhal is traditionally believed to exist in a metapopulation structure, with subpopulations demonstrating strong site fidelity to isolated summer grounds (Heide-Jørgensen et al. 2013; Heide-Jørgensen et al. 2015). The largest segment of the global narwhal population is concentrated in the Canadian Arctic Archipelago, Hudson Bay and north-west Greenland (Hobbs et al. 2019). The summer stocks of narwhals in these areas are well-defined, and their abundance is regularly updated to monitor the sustainability of the traditional narwhal hunt (Doniol-Valcroze et al. 2020). An observation of narwhals at 81.5°N, at Archer Fjord, in August 2019, was surprising, considering that the northernmost recognized stock of narwhals in west Greenland is found at 78°N (Carlyle et al. 2021; Fig. 1). In this report, we present additional unpublished observations from that area and review historical evidence of a narwhal population in Hall Basin and off northern Ellesmere Island and northern Greenland.

## Recent observations

The modern observations include narwhals that were observed during a kayak expedition in late August 1999 in Kennedy Channel and Nares Strait (John Andersen, pers. comm. 2023). Later, on 15 July 2009, a pod of 14 narwhals was observed at Petermann Glacier (Fig. 2). Amongst them were eight individuals with tusks, two potentially one-year-old calves and four adult tuskless,


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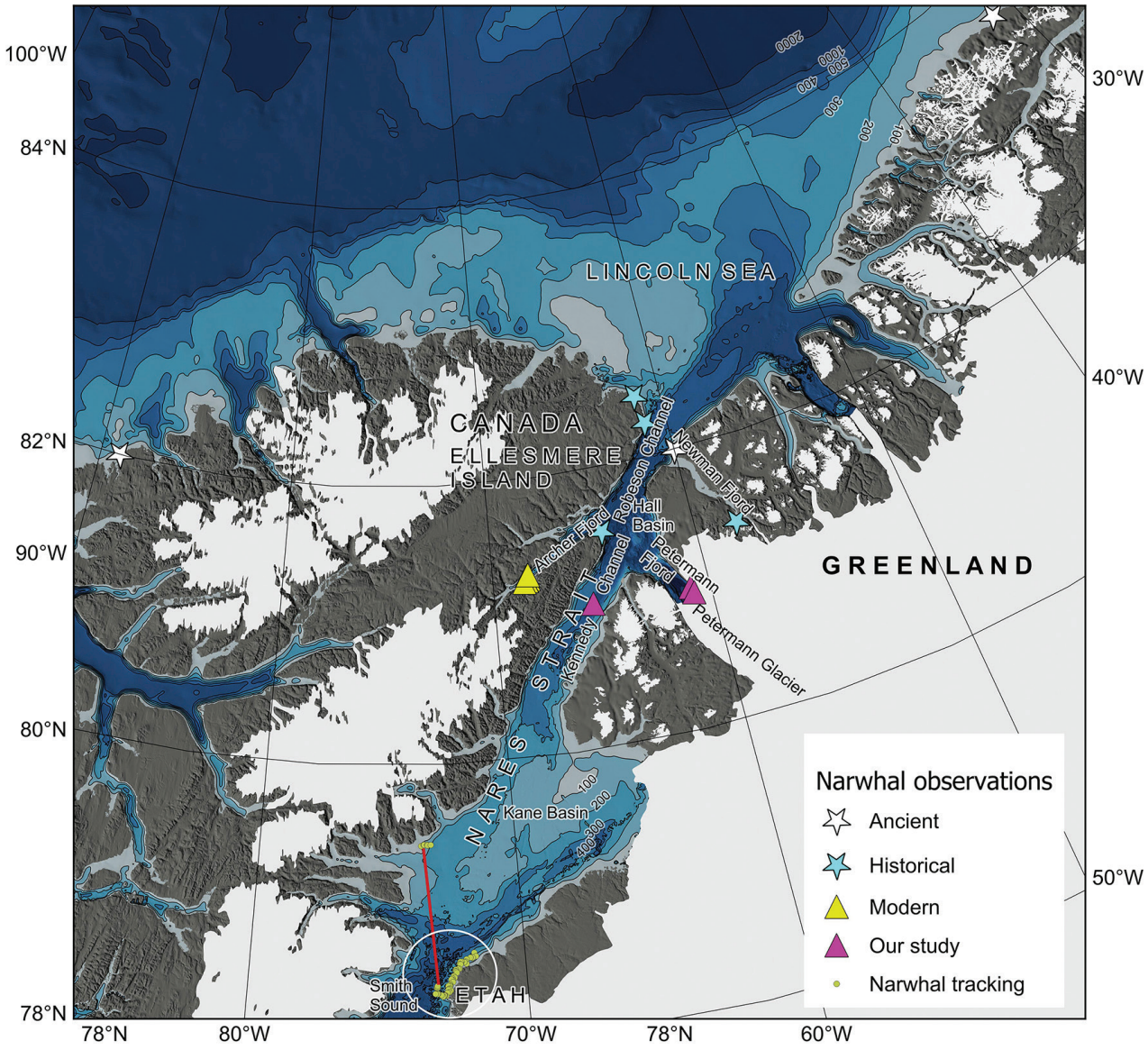


**Fig. 1** Ancient (>2000 years), historical (1880–1998) and modern (1999–2019) evidence of narwhal in Nares Strait, between Greenland and Canada, and Archer Fjord and Petermann Fjord, including direct observations and palaeontological finds. The red line is the track of a narwhal that was instrumented with a satellite transmitter at Etah on 15 June 2013; it moved to Cape Louis Napoleon on 18 June 2013. The white circle indicates the area with hunting. The bathymetry is from the *International Bathymetric Chart of the Arctic Ocean*, version 4.2 (Jakobsson et al. 2020).

likely female individuals. In August 2012, a group of approximately 30 narwhals was recorded from a helicopter overflight in Petermann Fjord. The group was observed in the south-eastern area of the fjord near Belgrave Glacier in an area that became exposed during a large calving event in 2012 (K. Lomac-MacNair, pers. comm. 2023). On 1 September 2019, a few groups of up to 30 individuals were observed close to the Belgrave Glacier, in Petermann Fjord, from a small boat (Fig. 3). The whales, which were moving back and forth in front of the outlet glacier, could be approached within 10–20 m.

Petermann Fjord is rarely visited by expeditions, and the likelihood of observing narwhals in this area depends heavily on access to helicopters, airplanes or small boats. Narwhals are known to be skittish and to avoid the noise produced by ice-breaking or seismic survey vessels from a long distance (Finley et al. 1990; Heide-Jørgensen et al. 2021). Therefore, they are unlikely to be detected during ice-breaking expeditions or seismic surveys (Tervo et al. 2021). During an expedition to Petermann Fjord in 2015, about 70 hours seismic reflection profiles (210 cubic inch GI airgun and seven hours with a Sparker) were acquired



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**Fig. 2** Narwhal observed from a helicopter on 1 September 2019 in front of the Petermann Glacier (photo: Jason Box).

**Fig. 3** A few groups of up to 30 individuals were observed near the ice tongue of the Petermann Glacier on 1 September 2019. The photograph shows a group of three individuals sighted near Belgrave Glacier, one of the smaller outlet glaciers that drain into Petermann Fjord along the eastern fjord wall (photo: Martin Jakobsson).

in Hall Basin, with one profile at the entrance to Petermann Fjord. Mammal observations were conducted during the full 27 days of work in Petermann Fjord and adjacent part of Nares Strait, including the seismic profiling; however, no narwhals were sighted (Lomac-MacNair et al. 2018). It remains uncertain whether the three days of seismic survey had any influence on the absence of narwhal sightings during the Petermann 2015 expedition.

The observations made in Petermann Fjord in 2009, 2012 and 2019, however, suggest that narwhals are regular inhabitants of the fjord. Notably, the observations in Archer Fjord, on the Canadian side, were also recorded in 2019 (Carlyle et al. 2021; Florko et al. 2021). These two locations are less than 100 km apart, a distance that narwhals can travel in less than two days. Both Archer and Petermann fjords are covered with fast ice during winter, and the narwhals would need to move out into areas with predictable polynyas or more mobile pack ice to find open water for breathing. The mating season occurs in spring when whales from both fjords are expected to congregate in small ice-free areas or to be heading northwards towards their summer ground, inevitably resulting in long-term genetic mixing. It is therefore highly likely that Hall Basin and its adjacent fjords harbour a permanent summer population of narwhals, which we hereafter refer to as the Nares Strait population.

## Older evidence

The discovery of an early Holocene narwhal tusk at 82°N, on the northern coast of Ellesmere Island, dating to approximately 6900 years before the present, indicates the historical presence of narwhals there (Evans 1989). Narwhal vertebrae dating back less than 2000 years have been found at 82°N 60°W in Newman Bay, north Greenland (Bennike et al. 1989). Furthermore, similar finds of narwhal vertebrae have been made at 83.65°N 31.43°W—the northern tip of Greenland—with a specific date of 6097 years before the present (Funder et al. 2011).

Historical records include three observations of narwhal groups at the southern entrance to Archer Fjord in August 1881 and one group in August 1883 at the same location (Greely 1886). In 1881, a narwhal skull was found at Floeberg Beach, at the north-eastern tip of Ellesmere Island (Greely 1886) and a narwhal hunt took place in 1909 at Cape Union, in the same area (Peary 1910). In north Greenland, Peary (1907) observed narwhals in 1905 at Newman Bay, and Koch (1925) reported that Inughuit hunters from north-west Greenland regularly sighted narwhals in Kennedy Channel during late summers.

## Discussion

Despite the limited number of expeditions to this area during the past 150 years, the few observations of narwhal confirm their regular presence in this area for centuries; other evidence extends this back by millennia.

Narwhals are known to exhibit a preference for cold waters (<2°C) found in fjords with glacial outlets or areas influenced by cold polar water (Chambault et al. 2020; Heide-Jørgensen et al. 2020). It has been suggested that increasing ocean temperatures will lead to a northward displacement of narwhal habitats (Chambault et al. 2022). Recent observations of narwhals in large

numbers in new areas off north-east Greenland and southern Ellesmere Island (Doniol-Valcroze et al. 2020; Hansen et al. 2024) may indicate distributional shifts attributed to rising ocean temperatures. However, the historical observations of narwhals in Nares Strait date back over a century, suggesting that their presence in the area predates recent climate change and ocean warming. The modern occurrence of narwhals in the Nares Strait, particularly after 1998, is unlikely to be solely attributed to these environmental factors. Instead, it is reasonable to consider the existence of a previously unrecognized summer population of narwhals in the Nares Strait and neighbouring fjord systems. This isolated population may have inhabited the area since the early Holocene.

An important question is where the modern population of narwhals from this area can be found in winter. Typically, narwhals exhibit highly predictable migrations and display strong site fidelity to well-defined winter grounds (Heide-Jørgensen et al. 2013; Heide-Jørgensen et al. 2015; Shuert et al. 2023). Both Archer and Petermann fjords are covered with fast ice from October through mid-July. Narwhals in this region would need to either remain in the loose, but fast-moving, pack ice in Nares Strait or travel south to the North Water polynya in Smith Sound. Moving to the North Water Polynya for the winter may expose them to hunting in spring in north-west Greenland, specifically in Smith Sound, near Etah.

The potential movement of narwhals in Smith Sound is supported by the satellite tracking of one narwhal instrumented at Etah on 14 June 2013. This whale left the Greenland coast on 15 June and travelled 122 km north in just two days, reaching Cape Louis Napoleon on Ellesmere Island. Cape Louis Napoleon is only 285 km away from Hall Basin, which would take approximately five days of travel (Heide-Jørgensen et al. 2021; Fig. 1). These tracking data indicate that narwhals wintering in the North Water Polynya have the ability to move to Hall Basin during summer. Considering the recent increase in the narwhal hunting quota at Etah from 5 to 15 in north-west Greenland (Government of Greenland 2023), it is prudent to assess any possible relationship between the putative Nares Strait population and stocks of narwhals located further south, and to demonstrate its distinct behaviour and genetic characteristics.

Examining the genetic identity of the Nares Strait population of narwhal would illuminate the relationship between the putative population in the Nares Strait and whales found at summer grounds further south. Such genetic studies would provide insights into the genetic distinctiveness of these narwhals and their potential connections to other populations. Furthermore, tracking the migration patterns and wintering locations of these whales would yield insights into the connectivity between different populations and would show whether the Nares Strait narwhals are potentially exposed to hunting activities in north-west Greenland.

## Disclosure statement

The authors report no conflict of interest.

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