

NARWHALS

The decrease of the Monodon monoceros population

By Caitlin Seppi

Motivation

- Watched a NatGeo video on narwhals
- They migrate in pods – interesting population ecology
- Migrate through cracks in ice in the Arctic
- Environmental Science major – learn about climate change frequently



Goals

- The population of narwhals has decreased over the past twenty years.
- How do life history strategies affect population?
- What are the factors that contribute to this decline?
- How does climate change affect narwhal populations?

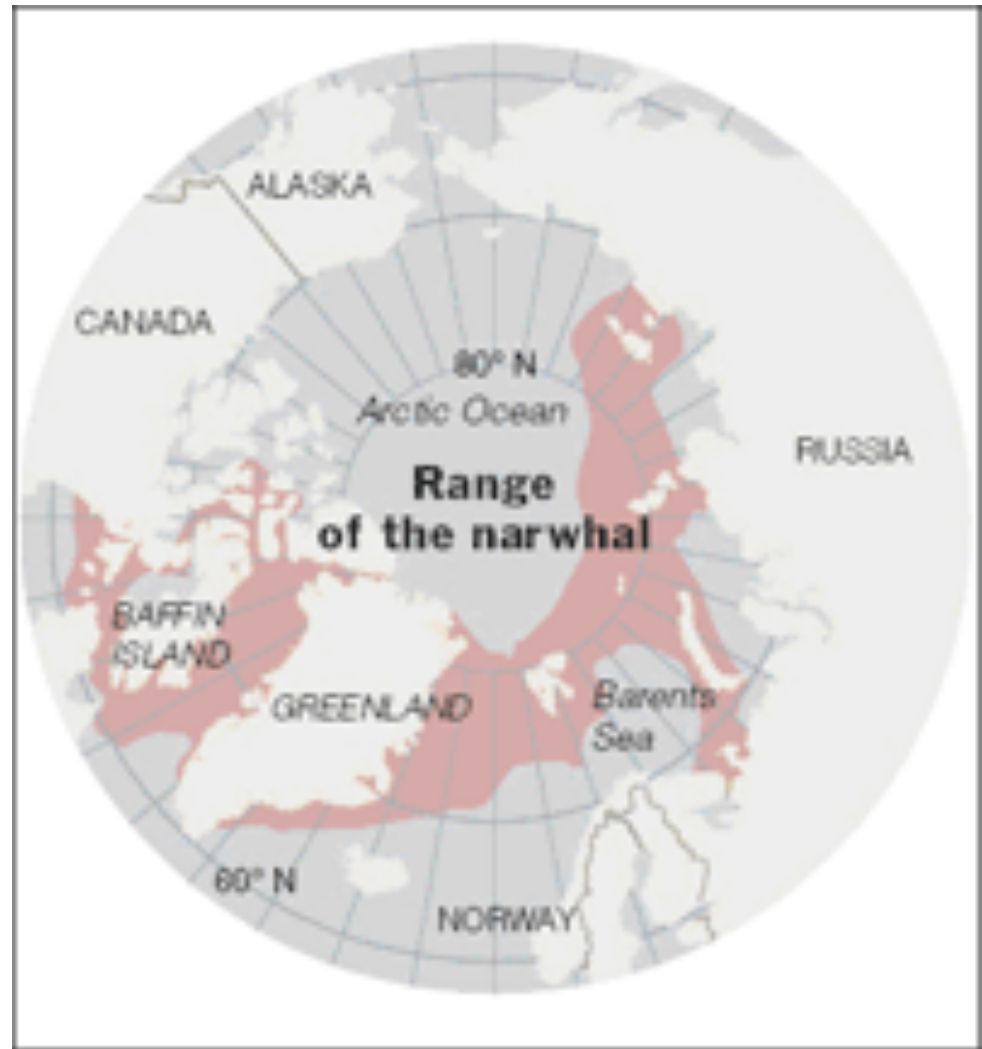
Introduction



- Narwhals are a type of whale in the Monodontidae family, most closely related to the Beluga whale
- Around 13-16 feet long, males weigh up to 3500 pounds, females up to 2200 pounds
- Feed on Greenland halibut, the polar and Arctic cod, shrimp and *Gonatus* squid
- Narwhals prefer waters far offshore covered in sea ice where they eat at great depths in complete darkness.

Range

- 25,000-45,000 left, listed as **Near Threatened** by IUCN
- Habitat range is mostly the Atlantic Arctic, narwhal is one of the most northern cetaceans
- Lots of studies done in the Baffin Bay (between Greenland and Canada)



Age Distribution

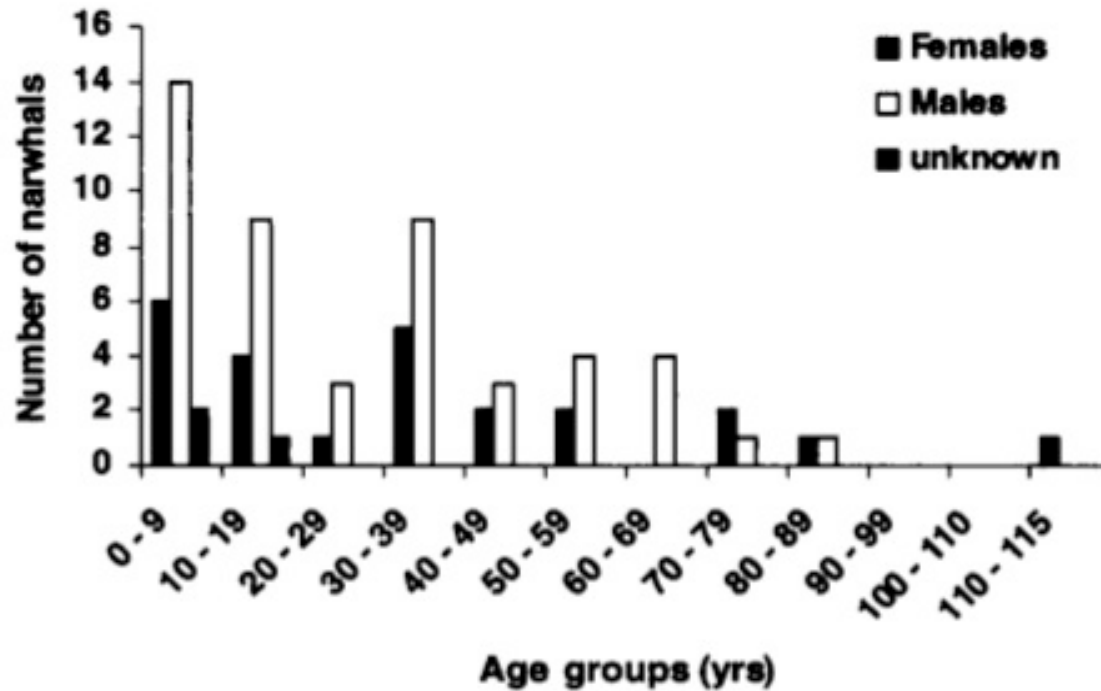


FIG. 3.—Age distribution in groups of 10 years of the 75 narwhals used in this study. Average ages of females and males are 34.7 and 27.4 years, respectively.

- Evolutionary strategy= high longevity, part of optimal life history
- Longevity of narwhals could be seen as adaptation to mitigate the population effects of drastic changes in climate

Reproduction

TABLE 2.—Longevity, mean adult body length, age at sexual maturity, and mean annual calving intervals for selected cetaceans.

Whale species	Maximum age (years)	Mean adult body length (m) (F/M) ^a	Age at sexual maturity (years) (F/M) ^a	Mean annual calving intervals (years)	Reference ^b
Toothed whales (Odontocetes)					
Narwhal (<i>Monodon monoceros</i>)	115	4/4.75	6–7/9	3	1, 2
Killer whale (<i>Orcinus orca</i>)	90	9/7.7	12–16/15	3	3, 4
Sperm whale (<i>Physeter catodon</i>)	70	10.6/16	9/20+	5	5, 6
Short-finned pilot whale (<i>Globicephala macrorhynchus</i>)	63	6	9/13–16	3–10	5, 7
Long-finned pilot whale (<i>Globicephala melas</i>)	55	6	8/12	3.3+	5, 7, 8
Beluga (<i>Delphinapterus leucas</i>)	30	5	4–7/8–9	3	9
Baleen whales (Mysticeti)					
Bowhead whale (<i>Balaena mysticetus</i>)	211	16–18/14–17	25	3–4	5, 10
Fin whale (<i>Balaenoptera physalus</i>)	100	20/18.5	7–8/6–7	2–3	5, 11, 12
Blue whale (<i>Balaenoptera musculus</i>)	90	26.5/25	8–10	2–3	5, 13
Gray whale (<i>Eschrichtius robustus</i>)	80	14.1/13	6–12	2	14
Sei whale (<i>Balaenoptera borealis</i>)	60	15	6–10	2	15, 16
Humpback whale (<i>Megaptera novaeangliae</i>)	48	14–15	5	2	17, 18
Minke whale (<i>Balaenoptera acutorostrata</i>)	47	8.5/7.8	6/7	1	19, 20

^a F = female; M = male.

^b 1 = Present study; 2 = Heide-Jørgensen 2002; 3 = Olesiuk et al. 1990; 4 = Foed 2002; 5 = Evans 1987; 6 = Whitehead 2002; 7 = Olsen and Reilley 2002; 8 = Bloch and Lockyer 1993; 9 = Heide-Jørgensen and Teilmann 1994; 10 = George et al. 1999; 11 = Lockyer and Sigurjónsson 1992; 12 = Aguilar 2002; 13 = Sears 2002; 14 = Jones and Swartz 2002; 15 = Gambell 1985; 16 = Horwood 2002; 17 = Clapham 2002; 18 = Winn and Reichley 1985; 19 = Olsen and Sunde 2002; 20 = Perrin and Brownell 2002.

- Reach sexual maturity between 6-9 years
- Females give birth to a calf every 3 years, with a gestation period about 14 months and they give birth in spring

Narwhal's Tusk



- In males, the left of two teeth will grow and become its tusk, usually about a third to half the length of it, about 6 feet!
- Recent discovery: Martin Nweeia has discovered that the narwhal's tooth has **hydrodynamic sensor capabilities** with millions of tiny nerve connections, capable of detecting changes in water temperature, pressure, and particle gradients (salinity)
- Other theories say that it is used for capturing prey or making holes in sea ice
- Females almost never have a tusk meaning it cannot serve a critical function for survival

Narwhal's Tusk – Mating

- The most accepted view is that male narwhals use the tusk to determine social rank
- Male narwhals can be seen carefully crossing their tusks as though sword fighting
- Behavior might help maintain dominance hierarchies
- Have not been observed using their tusk for fighting or other aggressive behavior



Narwhal's Tusk – Exploitation

- Tusks exported from the Arctic, perhaps by the Vikings, reached Europe, the Mediterranean, and even the Far East as early as the Middle Ages.
- The large tusks of adult males are sold in the specialty souvenir market both inside Canada and in the global marketplace, the price of narwhal ivory has increased substantially over the past years



Migration

- Narwhals migrate to their southern wintering grounds in Oct/Nov, traveling by leads and cracks in ice pack
- Baffin Bay is one of the few areas with increased sea ice concentrations and sea ice thickness
- Reductions in the availability of open water in the Baffin Bay pack ice may have deleterious consequences because of recurring migration paths



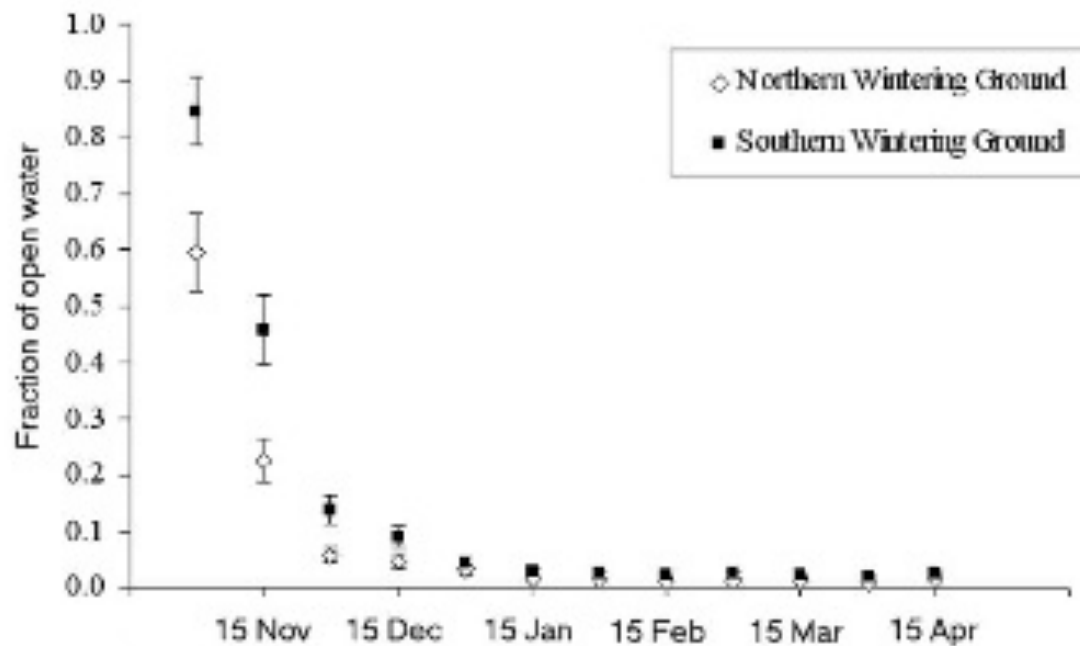


Fig. 3. Average fraction of water (\pm SE) on the wintering grounds in two-week intervals between November 1 and April 15, 1978–2001. Note the higher availability of open water on the southern wintering ground in all weeks.

Climate Change and Narwhals

- A recent assessment of the sensitivity of all Arctic marine mammals to climate change ranked the narwhal as one of the three most sensitive species, primarily due to its “narrow geographic distribution, specialized feeding and habitat choice, and high site fidelity” (Laidre *et al.* 2005)
- Sudden changes in weather conditions freeze shut the leads and cracks they were using, causing ice entrapments where hundreds can be trapped in a small opening and die



Conclusion

- Narwhals are amazing and unique creatures, and although they are not severely struggling now, scientists predict a more critical population level in the future
- How to combat this?
 - Make narwhal trade illegal worldwide!
 - Mitigate climate change
 - Further research should include:
 - Best management practices in terms of conservation
 - Response of narwhal habitat from climate change impacts
 - Climate change's impact on foraging and prey availability

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Any questions? Thanks!

