

Tidal influences on narwhal movements and pod size

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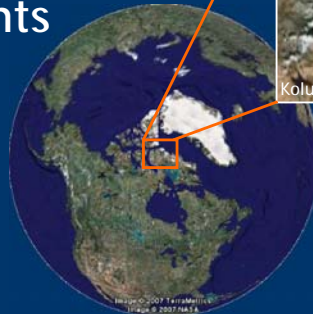
Rationale

In the summer, narwhals show daily movements in and out the fjords and bays of Baffin Island and Greenland. Past research has demonstrated that oceanic currents produced by the tide can influence daily movements. For example, species of cod, sole and silver heel travel with tidal currents to reduce the energetic costs of locomotion¹.

Do narwhals time their daily movements to travel with tidal currents?

Observations

- Shore of Koluktoo Bay, Baffin Island
- Variables: swimming direction and pod size
Pod: group of narwhals within 10 body widths of each other
- Tide height (Canadian Hydrographic Service²)
- Observation effort uniformly distributed around the tidal cycle

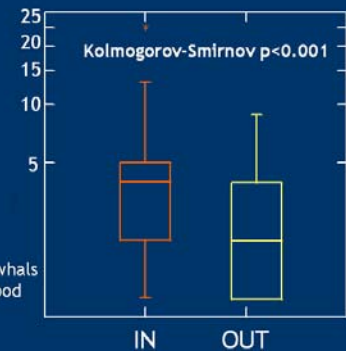


Preliminary results

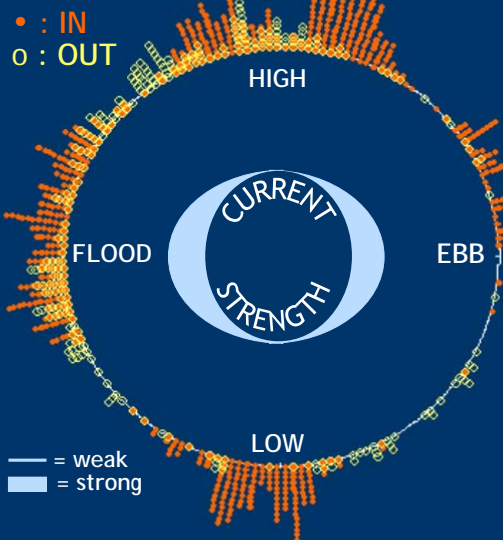
55 observation hours
4000 narwhals in 1000 pods

Fig.2 Observations of traveling pods on the tidal cycle

Fig.1 Pod size of narwhals travelling in and out the bay

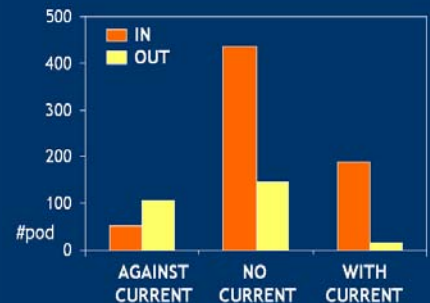


Narwhals enter the bay in bigger pods than when they leave.



- Narwhal movements in and out of the bay were neither uniformly nor normally distributed around the tidal cycle (Watson test: $p < 0.01$).
- Entries were highly clustered at high tide and to a lesser extent at low tide.
- Exits were more evenly distributed at high and flood tide.

Fig.3 Traveling direction relative to current



Narwhal movements occurred mainly when there was minimal current.

Discussion

- Several species use tidal transportation to decrease energetic costs¹. The narwhals do not seem to follow this pattern since they enter the bay when the current is normally presumed the weakest (high and low tide; fig. 3). Measurements of the currents *in situ* are required.
- Unlike other piscivores that synchronize their movements with the tide to follow their prey, narwhals do not feed in the bay^{4,5}.

- Given that the presence of narwhals in the bay probably relates more to social behaviour than to foraging behaviour⁶, we suggest that the tide serves as a cue to synchronize the gathering of narwhals in the bay.



Acknowledgements

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References

¹Pugh DT (1987) Tides, surges and mean sea-level: A handbook for engineers and scientists. John Wiley & Sons. Chichester ²Canadian Hydrographic Service, <http://www.tides.gc.ca/> (accessed on August 8, 2006) ³Mendes S, Turrell W, Lutkebohle T, Paul Thompson P (2002) Influence of the tidal cycle and a tidal intrusion front on the spatio-temporal distribution of coastal bottlenose dolphins. Mar Ecol Prog Ser 239: 221-229. ⁴Laidre KL, Heide-Jørgensen MP (2005) Winter feeding intensity of narwhals (*Monodon monoceros*). Mar Mamm Sci 21:45-57. ⁵Finley KJ, Gibb EJ (1982) Summer diet of the narwhal (*Monodon monoceros*) in Pond Inlet, northern Baffin Island. Can J Zool 60: 3353-3363 ⁶Silverman, H.B. 1979. Social organization and behaviour of the narwhal, *Monodon monoceros* L. in Lancaster Sound, Pond Inlet, and Tremblay Sound, N.W.T. M.Sc. thesis, McGill University, Montreal, PQ. xi + 147 leaves.