# Tidal influences on narwhal movements and pod size


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### Rationale

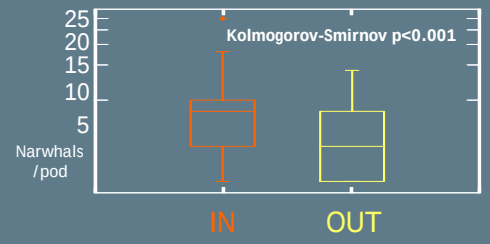
In the summer, narwhals show daily movements in and out the fjords and bays of Baffin Island and Greenland. Past research has demonstrated that oceanic currents produced by the tide can influence daily movements. For example, species of cod, sole and silver heel travel with tidal currents to reduce the energetic costs of locomotion[1].

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

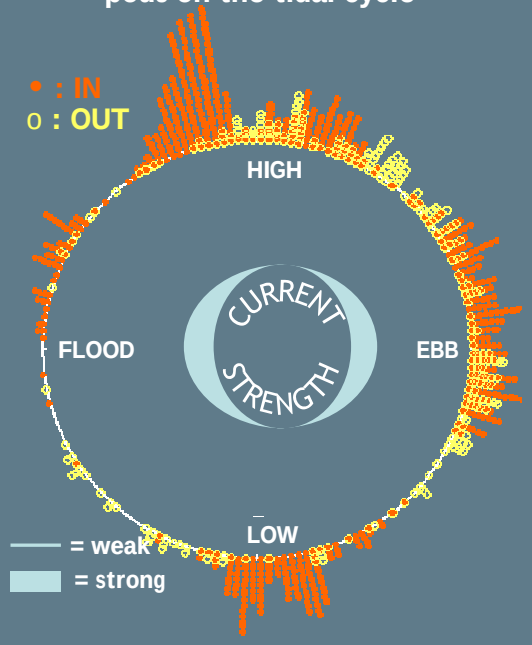
### Observations

- 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 Service[2])
- Observation effort uniformly distributed around the tidal cycle

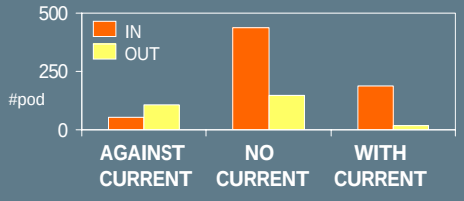

### Fig.1 Pod size of narwhals travelling in and out the bay




### Fig.2 Observations of traveling pods on the tidal cycle




### Fig.3 Traveling direction relative to current




### Preliminary results

- 55 observation hours, 4000 narwhals in 1000 pods.
- Narwhals enter the bay in bigger pods than when they leave (fig.1).
- Narwhal movements in an out of the bay are neither uniformly nor normally distributed around the tidal cycle (Watson test: $p < 0.01$).
- Narwhal entries were highly clustered at high tide and to a lesser extend at low tide (fig.2).
- Narwhal exits were more evenly distributed at high and flood tide (fig.2).
- Narwhal movements occurred mainly when there was minimal current (fig.3).

### Discussion

- Several species use tidal transportation to decrease energetic costs[1]. 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 behaviour[6], we suggest that the tide serves as a cue to synchronize the gathering of narwhals in the bay.

### Broader project objectives

- Elucidate the social organization of the narwhals.
- Describe and characterize their vocalization and dialect.
- Quantify population size, behaviour, and habitat preferences in Koluktoo Bay.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