

# Diving Behavior of Narwhals (*Monodon monoceros*) at Two Coastal Localities in the Canadian Arctic

**Kristin L. Laidre**  
University of Washington  
School of Aquatic and Fishery Sciences  
Box 355020, Seattle, WA 98195, USA  
contact author: Kristin.Laidre@noaa.gov

**Mads Peter Heide-Jørgensen**  
Greenland Institute of Natural Resources  
Box 570, DK-3900 Nuuk, Greenland

**Rune Dietz**  
National Environmental Research Institute  
Department for Arctic Environment  
Fredeniksborgvej 399, Postboks 358, Roskilde, Denmark

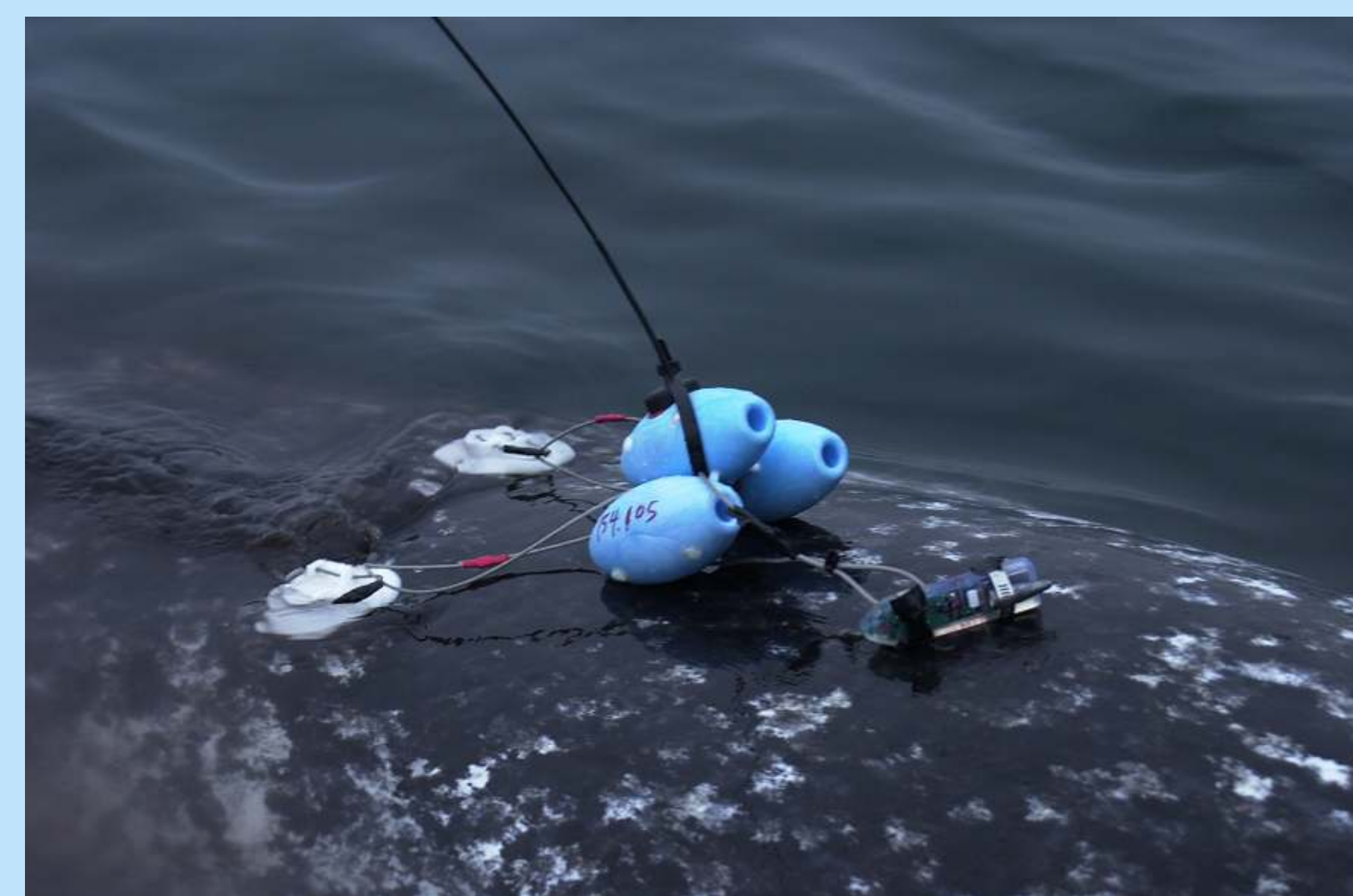
## Abstract

In August 1999 and 2000, four suction cup attached Time Depth Recorders (TDRs) were deployed and retrieved from narwhals in Tremblay Sound, Baffin Island and Creswell Bay, Somerset Island, Canada. The tags (Mk7, Wildlife Computers, Redmond, WA) remained on the whales for between 12 and 33 hours. The two whales tagged in Tremblay Sound exhibited significant differences in diving behavior, which could not be attributed to sex or body size, as both whales were males of similar length. In Tremblay Sound, narwhal 1 made longer, deeper dives (mean depth 50.8 m, mean duration 4.9 min) and spent less time at the surface than narwhal 2 (mean depth 20.3, mean duration 2.6 min). In Creswell Bay, both narwhals made short, shallow dives (mean depths 20.8 m and 34.4 m, mean durations 3.4 min and 4.3 min), most likely due to the shallow water in the bay. The percentage of time spent at or above specific depths was calculated for both narwhals tagged in Tremblay Sound. Only these two tags provided the resolution necessary for this analysis. In Tremblay Sound, narwhals 1 and 2 spent 30.3% and 52.9% of their time in depths less than 5 m. Correction factors, generally applied to aerial survey data to account for whales that are below depths at which they can be counted from the air, ranged from 1.9-3.3.

## Methods



Narwhals were live-captured from the beach using set nets deployed perpendicular from the shore. Whales were handled in the nets immediately and belts were placed around the mid-section, tail, head, and tusk for restraint. Whales were positioned between two inflatable boats and TDRs were attached.



The TDRs were attached to a flotation device consisting of three oval net buoys held together with 6mm nylon pins, made to withstand pressure at over 400 m. A cylindrical hole drilled in the center of the three buoys contained a VHF transmitter, with an antenna perpendicular to the surface of the water. The antenna position provided both successful VHF tracking of the instrumented animal and successful retrieval when the instrument fell off and washed ashore. The TDR and buoys were mounted on the back of the whale behind the blowhole with two suction cups.

## Results

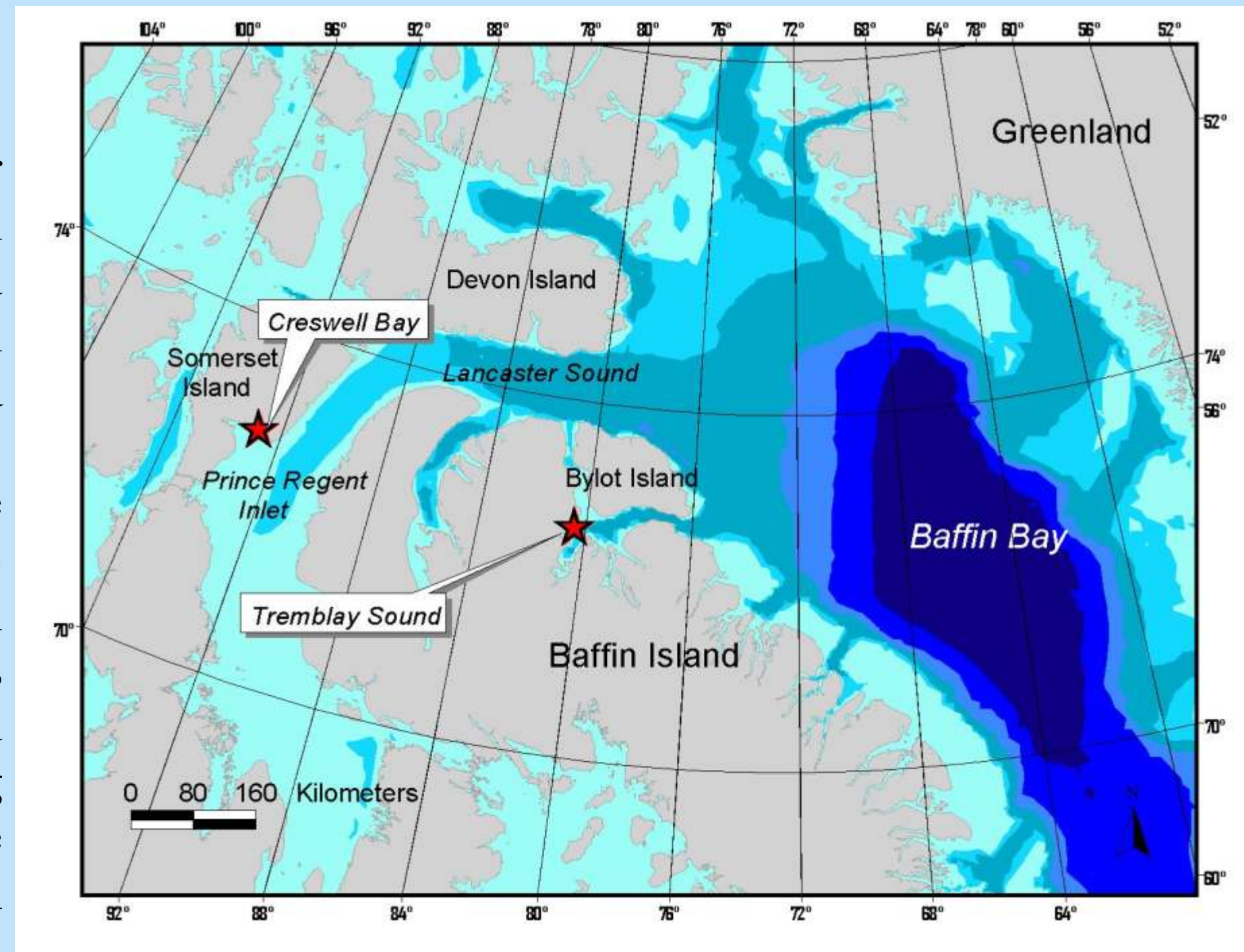


Figure 1. Map of study area.

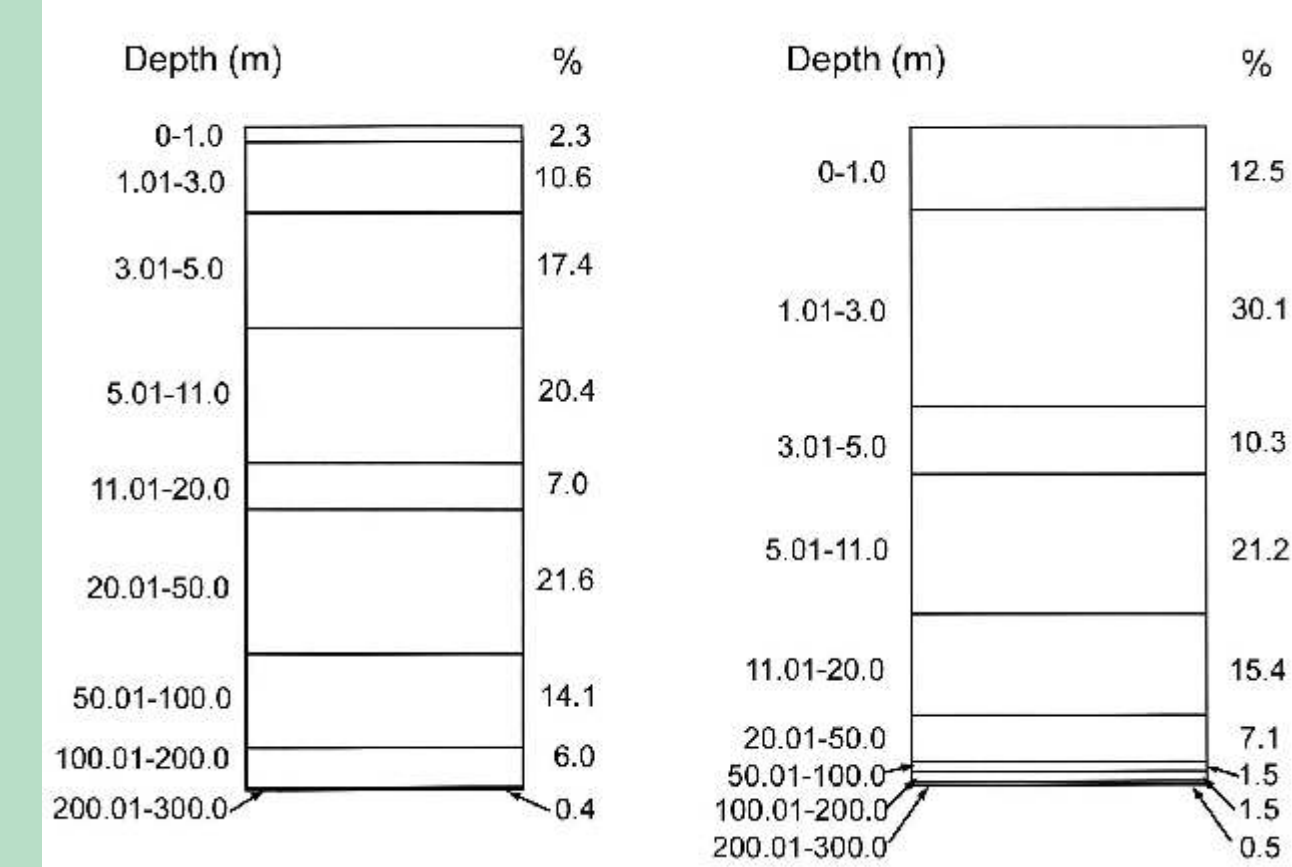


Figure 2. Percentage of time spent at certain destination depths for two male whales tagged in Tremblay Sound. Narwhals can be seen and positively identified from the air or on aerial photos at depths of 2-7 m.

The proportion of time spent in water depths where narwhals can be visible from a standard aerial survey is of particular interest to methods of estimating abundance. Generally, a correction factor is applied to aerial survey data to account for animals that are below the surface, or below depths which they could be counted from the air or seen from aerial photographs.

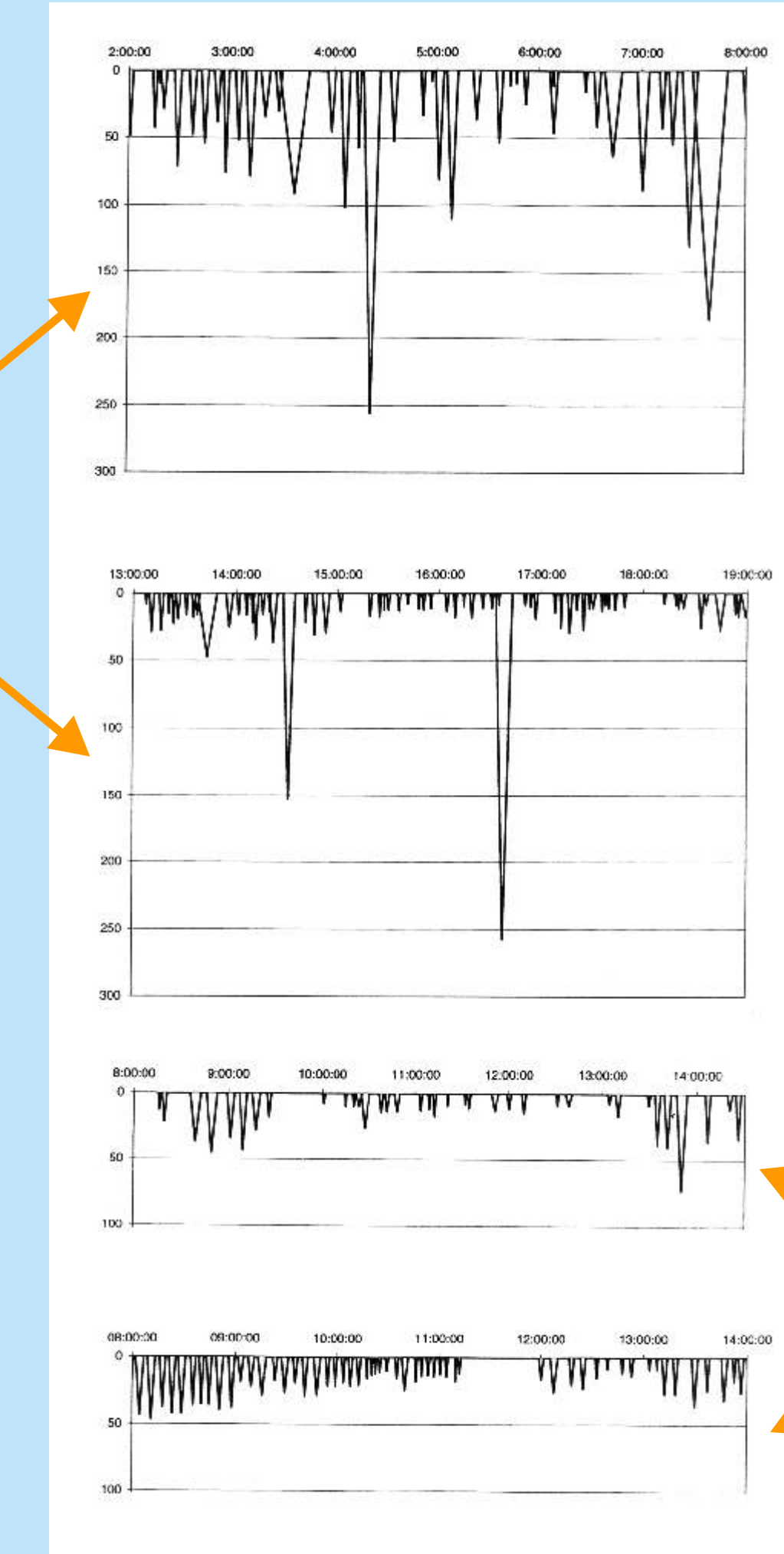


Figure 3. Representative 8-hour sub-sample of dive profiles for each tagged whale.

Dive profiles of two male whales tagged in Tremblay Sound. Maximum depths ranged between 256-258 m.

Dive profiles of two female whales tagged in Creswell Bay. Maximum depths ranged between 73-75 m.

- 25.5 hours of dive data were collected from two male narwhals tagged in Tremblay Sound in 1999, and 39 hours of dive data were collected from two female narwhals tagged in Creswell Bay in 2000.
- We observed no effects of an adverse reaction to the tagging procedure. Dive depths and velocity were high after release, however, similar depths and speeds were observed later on during the data collection.
- There was a positive correlation between depth and duration for all four whales, most likely due to the longer transport time required for deeper depths.
- Mean ascent and descent rates for all whales were not significantly different from one another. Distinct bursts of speed were not observed for any of the four whales. This may suggest whales were foraging in a fairly passive manner, or not foraging at all.
- Direction changed very little on both the ascent and descent portions of dives, and the consistency in dive profiles indicated whales were not actively chasing prey underwater. It is possible whales were merely traveling in and between bays and fjords in these regions.

## Conclusions

- Narwhals exhibit shallow diving behavior on the summering grounds relative to their deep diving behavior in Baffin Bay in winter.
- Whales do however reach the bottom regularly, and are physically restricted in diving beyond the maximum depths recorded here due to the shallow habitat of their summering grounds.
- The high-resolution TDR data facilitated a detailed calculation of time at depth between each meter of the water column.

