

A Question of Availability



frobertson@fisheries.ubc.ca

¹Marine Mammal Research Unit, Fisheries Centre,
University of British Columbia, Vancouver, BC, Canada,

²LGL Ltd. environmental research associates, King City, ON,
Canada, ³Greeneridge Sciences Inc., Santa Barbara CA, USA,

⁴Department of Marine Biology, Texas A&M University at
Galveston, TX USA

Seismic survey sound affects the visual detectability of bowhead whales

^{*1,2}Frances C. Robertson, ²W.R. Koski, ²T.A. Thomas,
³J.R. Brandon, ²W. J. Richardson, ⁴B. Würsig & ¹A. W. Trites

PROBLEM

- ★ Age, whale activity & season affect bowhead whale dive-cycle behaviors.
- ★ Seismic survey sounds also alter bowhead dive-cycle behaviors.
- ★ **So, do behavioral reactions to seismic sounds affect the availability of bowhead whales for visual detection during aerial surveys?**



c. A. Foote 2011-Qeqertarsuaq bowhead whale research

OBJECTIVE

To assess the availability of bowhead whales for visual detection given age, activity state, season and the effect of seismic sounds.

METHODS

- ★ We analyzed behavior data collected by government & industry aerial observation studies (1980 to 2000).
- ★ Mean surface & dive times in the presence & absence of seismic sounds were calculated for each category of age, season & whale activity state (Fig. 1).
- ★ We estimated the field of view for the aerial survey platform (Fig. 2).
- ★ We calculated the probability of a bowhead being available for visual detection in the presence & absence of seismic.



86011-814-LGL G. Miller

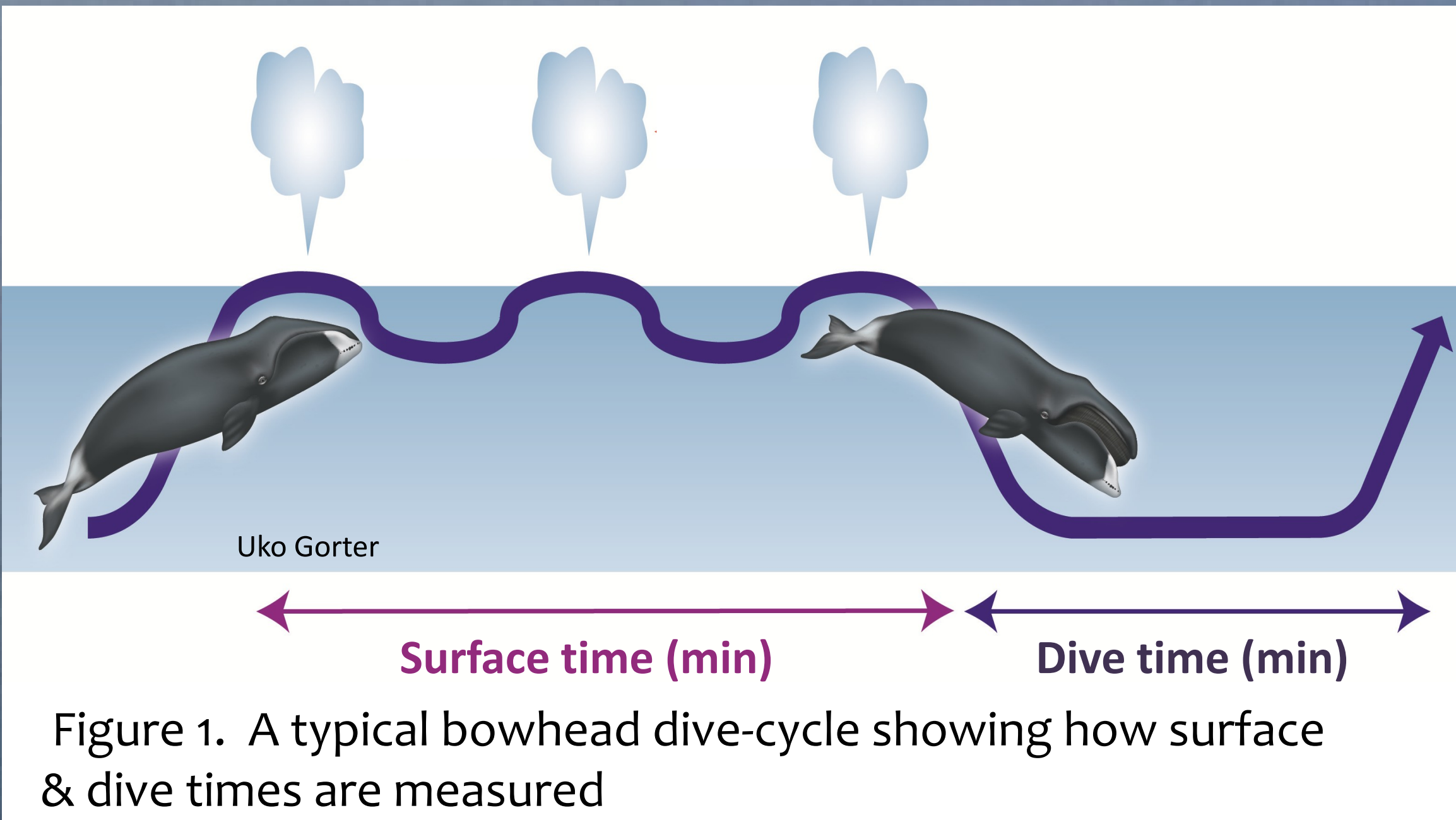


Figure 1. A typical bowhead dive-cycle showing how surface & dive times are measured

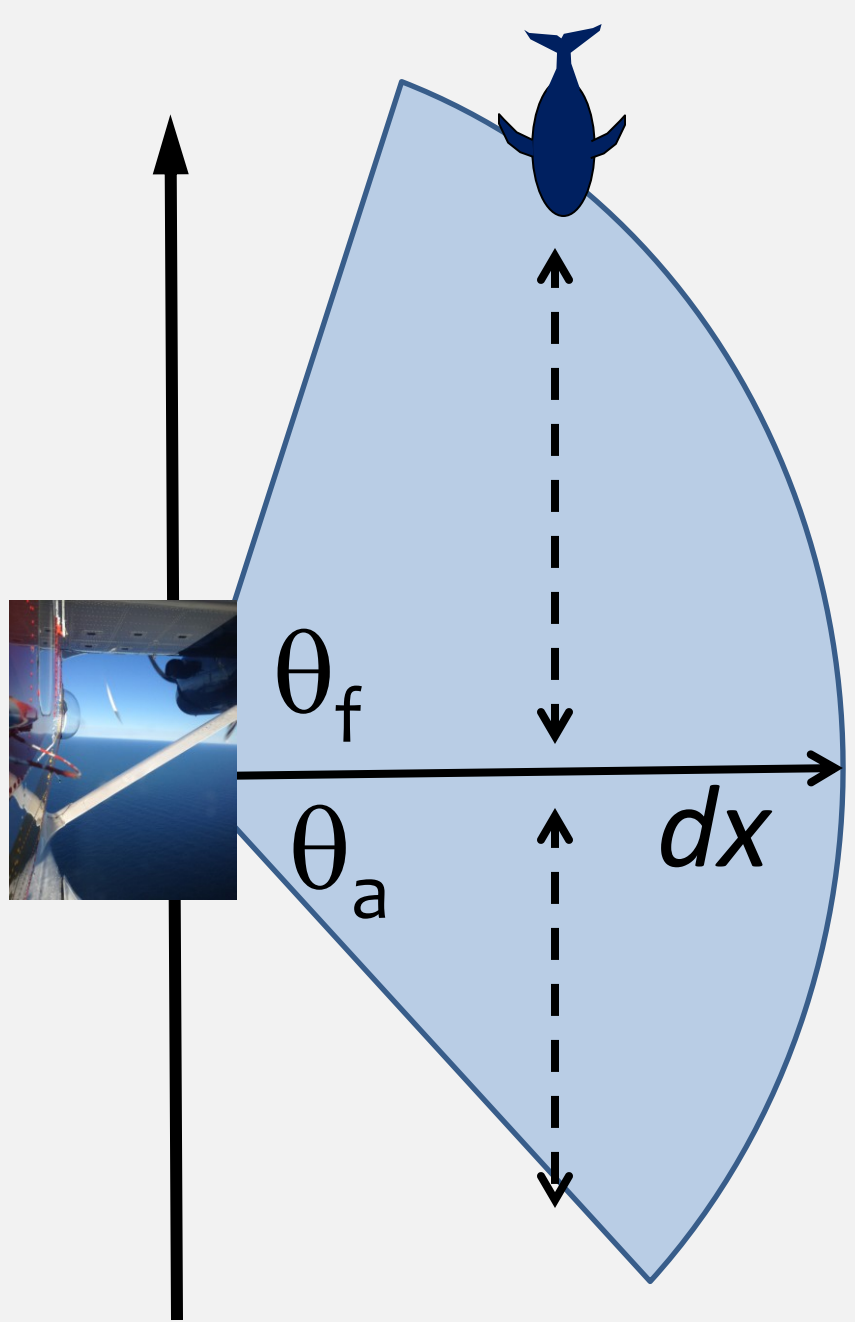


Figure 2. Depiction of the field of view (t) for an aerial survey plane. t is the time (sec) that a portion of the track line is in the observers view. This is determined by the speed of the survey craft, altitude, perpendicular distance (dx) from the track line and the search area available to the observers. Observers typically search the blue pie slice from an average forward angle of θ_f to a rear angle of θ_a . t is calculated through basic trigonometry.

SOLUTION

- ★ **YES! Bowhead whales are less available for visual detection in the presence of seismic sounds.**
- ★ Incorporating availability correction factors into analyses of aerial survey sighting data will provide more accurate assessments of bowhead whale density near seismic operations.

RESULTS

- ★ The probability of a whale being available for visual detection is lower in the presence of seismic sounds for most measures of field of view.
- ★ Availability was lowest for non-calf whales in the presence of seismic during fall. Probability of detection decreased by more than one third. A similar result was evident for socializing whales.

Table 1. Availability correction factors for undisturbed bowhead whales & when exposed to seismic sounds.

Category	Undisturbed	Seismic
Non-calf	0.220	0.194
Mother	0.239	0.180
Summer	0.258	0.254
Fall	0.213	0.133
Traveling	0.182	0.153
Socializing	0.314	0.203
Feed shallow	0.275	0.233
Feed deep	0.202	0.177

