

1 **Supplementary Materials 1**

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3 Table S1: Sex and estimated body length of the seven bowhead whales that were satellite tagged in Foxe
4 Basin in July 2013 and whose telemetry data was analysed in this study. Sex was determined genetically
5 while body size was coarsely estimated using the boat from which whales were tagged as a gauge. Tags
6 were programmed to only transmit once per week after November 2013 and those data were not analyzed.

Year	Region	Sex	Length (m)	PTT	Tag model	Date deployed	Duration
2013	Foxe Basin	F	11-12	128145	SPLASH10	2013-07-03	148 days
2013	Foxe Basin	F	13-14	128146	SPLASH10	2013-07-03	148 days
2013	Foxe Basin	F	13	128148	SPLASH10	2013-07-09	144 days
2013	Foxe Basin	F	10	128150	SPLASH10	2013-07-09	143 days
2013	Foxe Basin	M	9-10	128151	SPLASH10	2013-07-09	143 days
2013	Foxe Basin	M	9-10	128152	SPLASH10	2013-07-09	143 days
2013	Foxe Basin	M	11-12	128154	SPLASH10	2013-07-03	148 days

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8 Table S2: Location and sex and age class data of the three satellite tagged killer whales whose telemetry
9 data was analysed in this study. Sex/age class was determined visually from relative dorsal fin size and
10 total body length.

Year	Region	Sex	PTT	Tag model	Date deployed	Duration
2013	Tremblay Sound	Adult male	129471	SPOT5	2013-08-12	29 days
2013	Tremblay Sound	Adult male	129469	SPOT5	2013-08-12	58 days
2013	Tremblay Sound	Adult female/ Immature male	129470	SPOT5	2013-08-12	18 days

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12 Table S3: Selection table for behavioral state of specific hypotheses addressing the effect of predation
13 threat on SSM-inferred behavioral state. See Online Supplementary Material 2 for a complete model
14 selection table across a much larger potential model set.

Model	d.f.	AIC	Δ AIC
$\text{logit}(B) \sim D_{kw} + D_{sh} + SI_{conc} + D_{sh}:D_{kw}$	8	5403.7	0
$\text{logit}(B) \sim D_{kw} + D_{sh} + D_{sh}:D_{kw}$	7	5404.8	1.1
$\text{logit}(B) \sim D_{sh} + SI_{conc}$	6	5407.1	3.4
$\text{logit}(B) \sim D_{kw} + D_{sh} + SI_{conc} + D_{sh}:D_{kw}$	5	5408.0	4.2
$\text{logit}(B) \sim D_{kw} + D_{sh} + SI_{conc}$	8	5411.1	7.4
$\text{logit}(B) \sim D_{sh}$	5	5414.4	10.7
$\text{logit}(B) \sim \text{intercept only (null)}$	4	5416.7	13.0
$\text{logit}(B) \sim \text{Depth}$	5	5417.3	13.6
$\text{logit}(B) \sim i_{s_{ice}}$	5	5417.4	13.8
$\text{logit}(B) \sim D_{edge}$	5	5417.9	14.2
$\text{logit}(B) \sim D_{kw}$	7	5418.4	14.7

17 Table S4: Fitted parameters for best-fitting model (see Table S3) predicting movement behavior as a
 18 function of environmental covariates and predation threat. The fitted parameters shown were used to
 19 project predicted behavioral state onto space in Fig. 3 of the main text.

Variable	Coef	SE	z	P
<i>Intercept</i>	-1.295	1.154	1.121	0.262
<i>D_{kw}</i>	-0.294	0.174	-1.683	0.092
<i>D_{sh}</i>	-0.515	0.229	-2.249	0.025
<i>SI_{conc}</i>	-0.027	0.015	-1.782	0.075
<i>D_{kw}:D_{sh}</i>	0.098	0.035	2.725	0.0065
Φ (autocorrelation)	0.927	-	-	-

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 21 Multimedia Supplement 1. Dynamic movie of state-space model fitted tracks of killer whales
 22 and bowhead whales showing predator-prey interactions and their interactions with sea ice.
 23 The three killer whales are indicated by black circles, and color of bowhead tracks represents
 24 SSM fitted behavioral states. Red is inferred resident behavior, while blue is inferred transit
 25 behavior. Lower intensity colors indicate less certain behavioral states, with white being
 26 completely uncertain.

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