

Trends in abundance of Cook Inlet beluga whales 2001-2010

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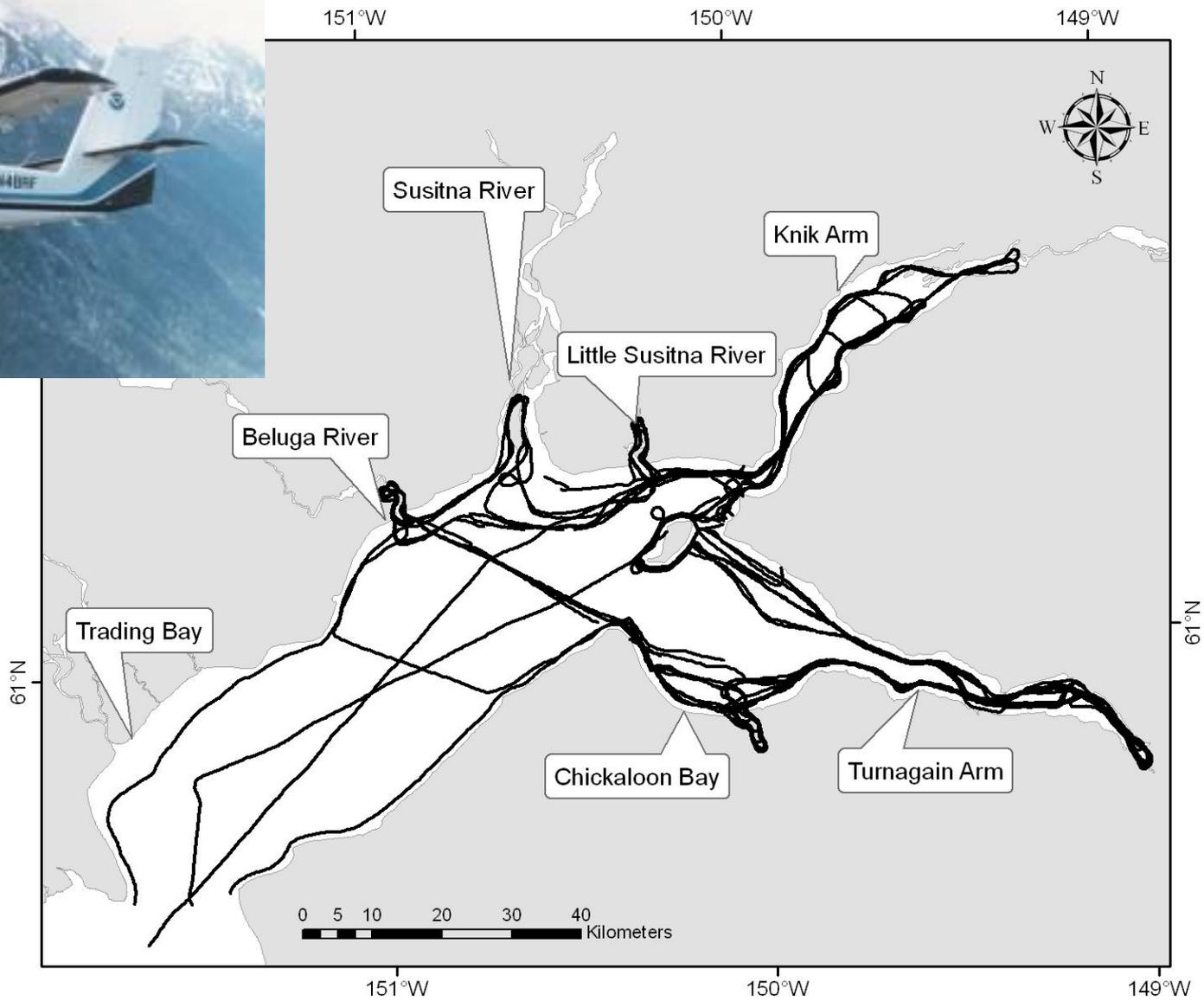
Research Groups

- Aerial Surveys: Dave Rugh, Kim Shelden, Barbara Mahoney, Brad Smith, Kim Goetz, Christy Sims, Linda Vate-Bratstrom, Julie Mocklin, Rod Hobbs
- Video Analysis: Christy Sims, Linda Vate-Bratstrom, Stephanie Norman, Janice Waite, Rod Hobbs
- Distribution and Habitat: Dave Rugh, Kim Shelden, Kim Goetz, Rod Hobbs
- Abundance and Trends: Rod Hobbs
- Extinction Risk Analysis: Rod Hobbs, Kim Shelden

June 1994-2010 Cook Inlet surveys

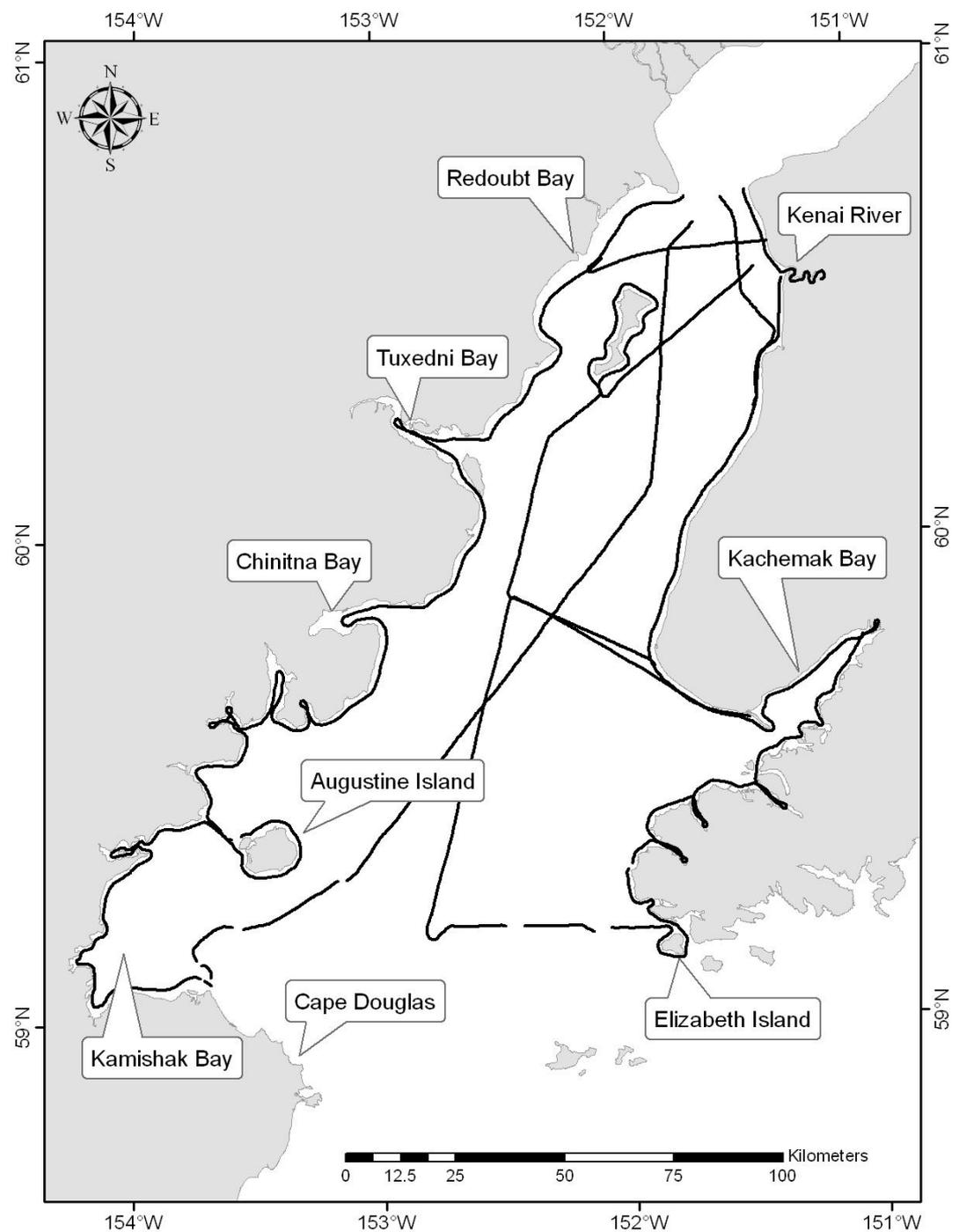
- Aerial survey project: First and second weeks of June
- Aerocommander Aircraft (two years with NOAA Twin Otter aircraft) high wing with bubble windows.
- Three to six complete surveys of upper Cook Inlet (i.e., covering the entire upper inlet coastline during one day)
- Two flights covering lower Cook Inlet
- typical number of groups seen per day: 4-12

2010 Aerial surveys of upper Cook Inlet



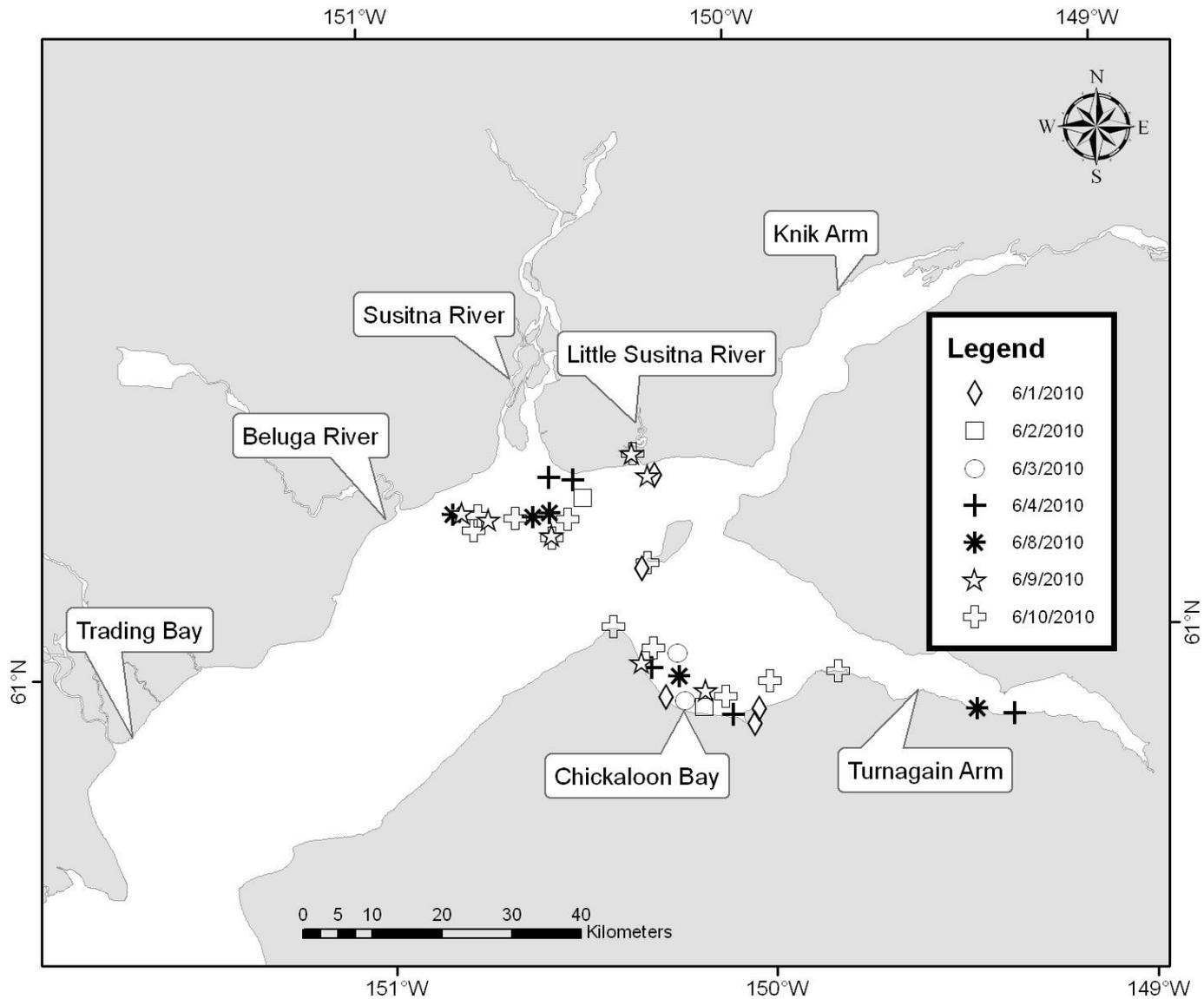
2010 Aerial surveys of lower Cook Inlet

(black lines indicate
flight paths)



Beluga sightings June 2010

(total sightings from all 7 surveys – no belugas were seen in lower Cook Inlet)



Belugas in upper Cook Inlet as seen from the air



How many belugas are in that group?



tidal mudflat

Two independent observers search simultaneously for whales and whale groups



6



1



1

silty water

Video data and analyst counts

- A wide angle video records the entire group
- A zoomed video records a sub sample of the group
- Two analysts count whales independently from video records
- 4-8 passes of a group result in 4-8 video records of the group and 8-16 counts of the group by analysts

Paired wide angle and zoomed video cameras provide a consistently nested view of the entire beluga group and a high resolution sub sample of the group



Computer-enhanced counts of belugas from video data: repeatable and documented

1Jun05 g1p2.mov : 1Jun05 g1p2 data : 16.205

Click Location of Whale [&] to change size Press 'x' to Set

Play 1/2 Speed

Scan Times (M)ag Add (N)ote

(L)oad Movie (S)ave Data

Load (D)ata (Q)uit

#	Color	Size	Zoom
21	1,1,0	10,11,0	0,0
(20)	0,0,0	0,0,0	0,0
19	1,1,0	10,9,0	0,0
(18)	0,0,0	0,0,0	0,0
(17)	0,0,0	0,0,0	0,0
16	2,2,0	5,5,0	0,0
(15)	0,0,0	0,0,0	0,0
(14)	0,0,0	0,0,0	0,0
(13)	0,0,0	0,0,0	0,0
(12)	0,0,0	0,0,0	0,0
11	2,2,0	6,5,0	0,0

(#)=Off-Screen

Surveyor 1:

Surveyor 2:

Zoom Send to Excel (U)ndo

Start: 13.853 Change

Stop: 14.891 Change

(M)idpoint Remove Move Label

Off-Screen Zoom

back 4 frames

beluga HD

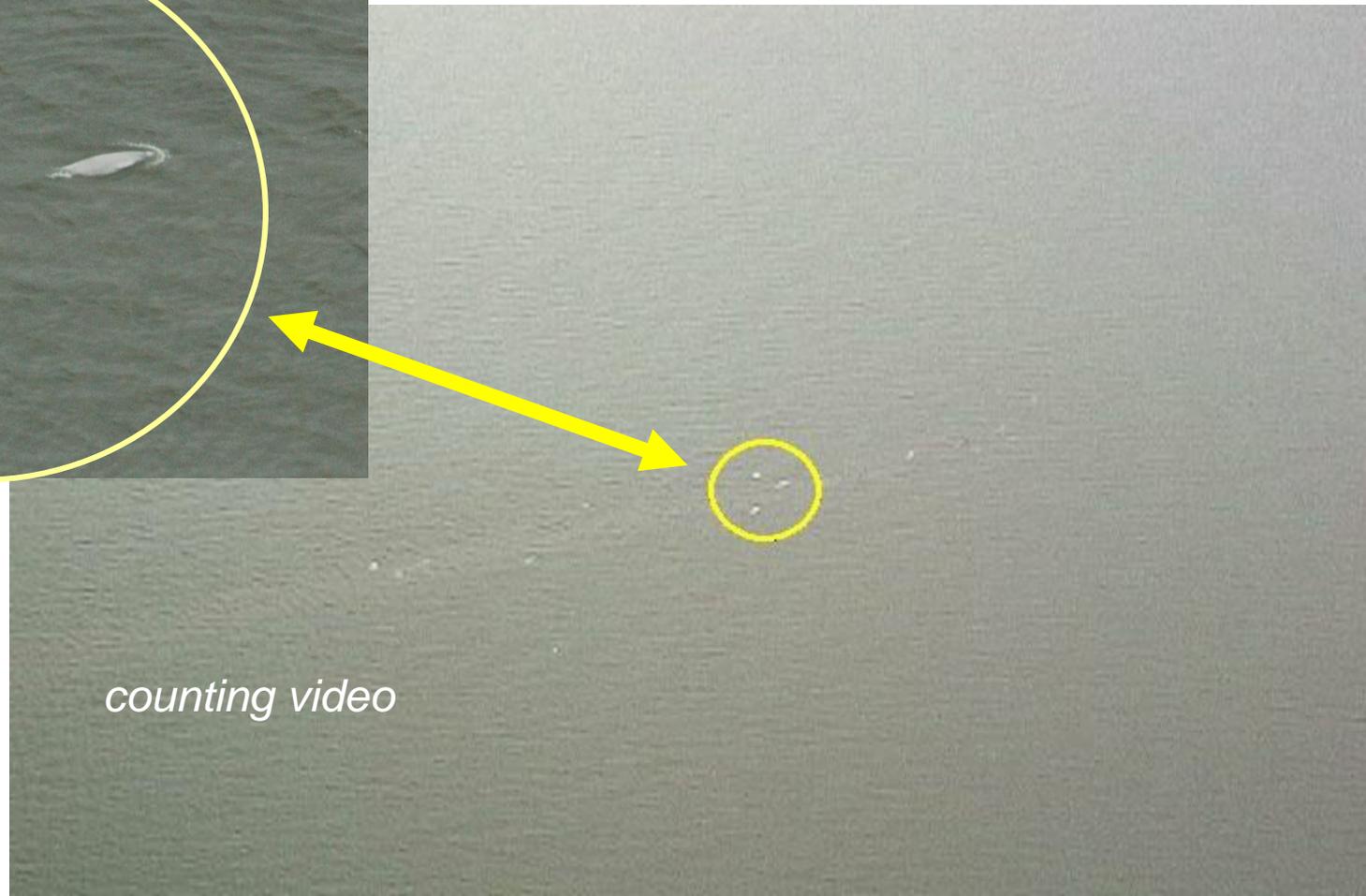
beluga 2005 video

IPY.doc Beluga_Archive

positional CONTRIBUTION.doc BRugs

PATOB_Canada.doc Christy Beluga wo

Images from zoomed video are compared to the counting video to determine the fraction missed due to image size



Light and dark gray whales are clearly visible in the zoomed video (note that the dark whale would have been missed in the counting video)

Screen from software for beluga video analysis

14Jun2006 G7P4.mov : 14Jun2006 G7P4.txt : 30.4226

Ready

Play 1/2 Speed

Scan Times (M)ag

(L)oad Movie (S)ave Data

Load (D)ata (Q)uit

#	Color	Size	Zoom
(62)	0,0,0	0,0,0	0,0
61	2,0,0	6,0,0	0,0
60	2,0,0	5,0,0	0,0
59	2,0,0	6,0,0	0,0
58	1,0,0	6,0,0	0,0
57	2,0,0	5,0,0	0,0
56	1,0,0	6,0,0	0,0
55	1,0,0	6,0,0	0,0
54	2,0,0	6,0,0	0,0
53	2,0,0	5,0,0	0,0
52	2,0,0	7,0,0	0,0

(#)=Off-Screen

Surveyor 1: cls

Surveyor 2:

Zoom Send to Excel (U)ndo



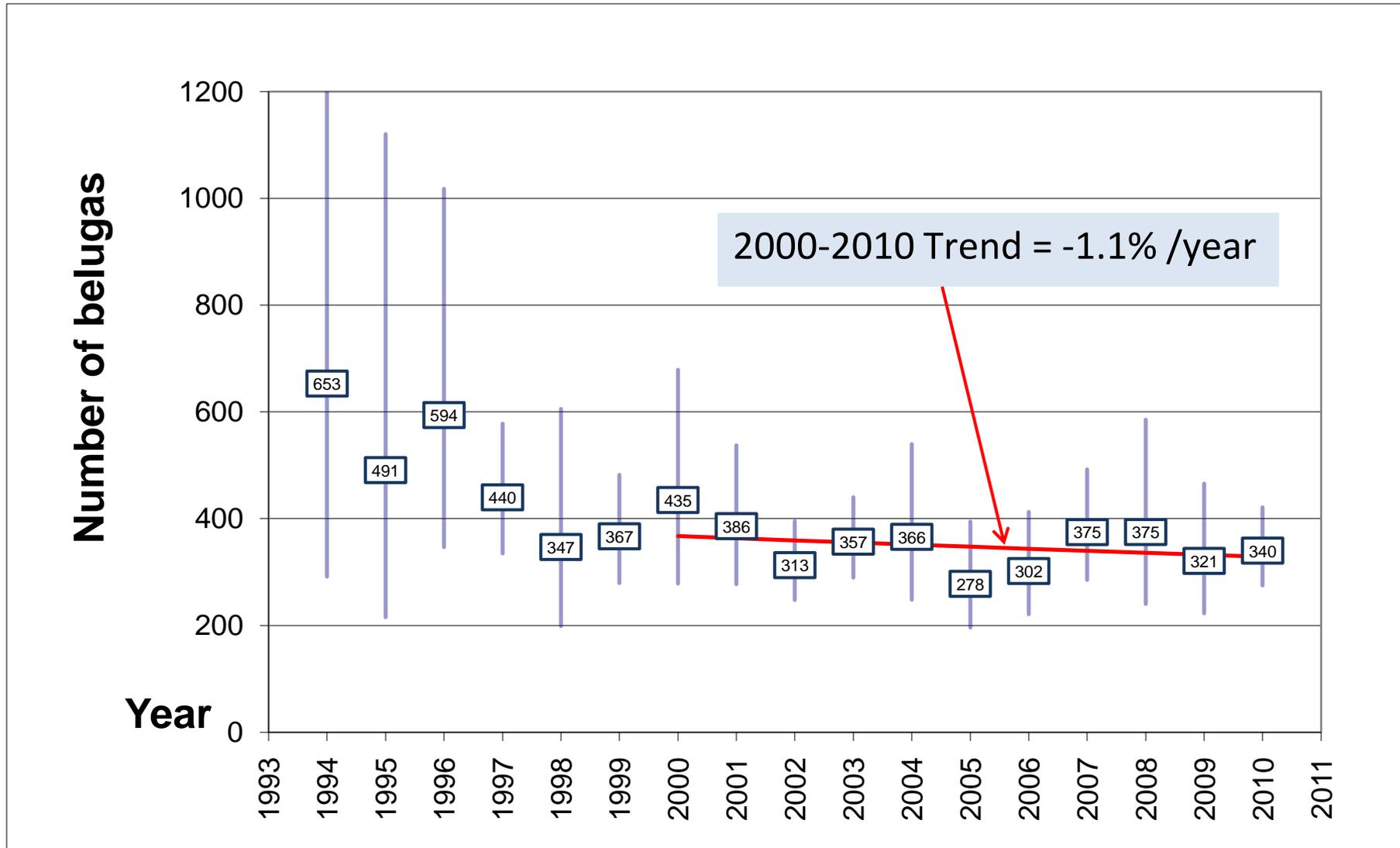
Missed whales

- Missed due to image size (Correction from zoomed video)
- Missed due to submersion (Correction from surface and dive data and scan time)
- Missed group in survey area (Correction from dual independent observer data)
- Missed group outside survey area (survey day not used in estimate)

Abundance estimate

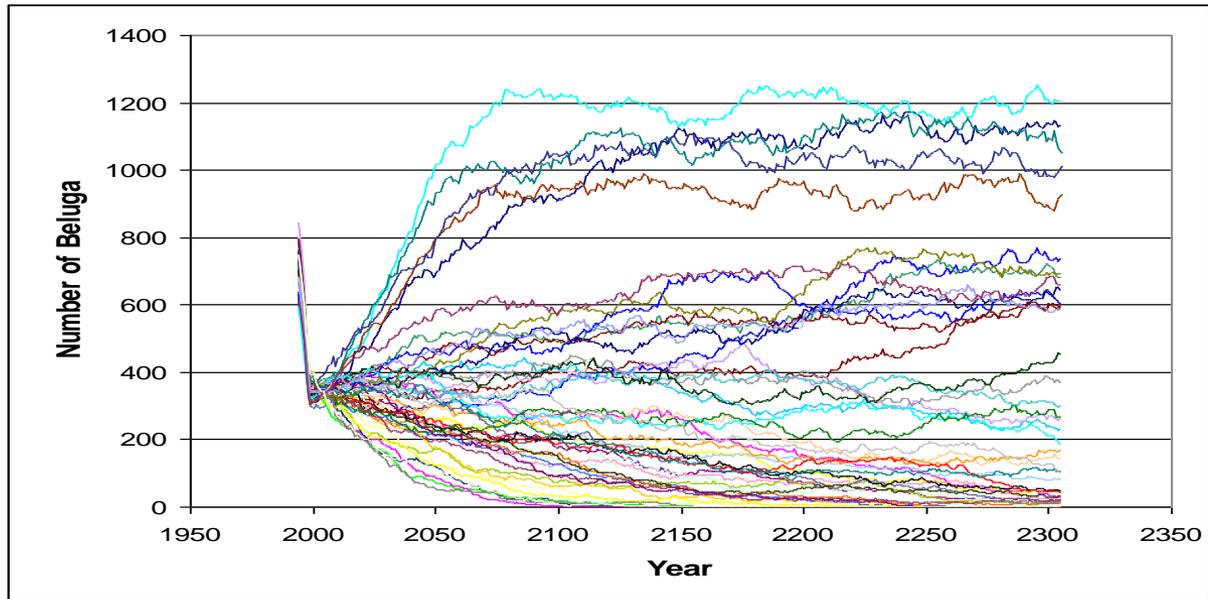
- 1994-2002 Abundance summed by day and days averaged for three survey areas: Susitna-Knik, Chickloon-Turnagain, Southern inlet.
- 2003-2010 Abundance summed by day and days averaged for Northern inlet as a unit, no sightings in Southern inlet.
- Survey days that are deemed to be not representative of the population (e.g. incomplete survey or missing groups) are excluded.

Abundance 1994-2010



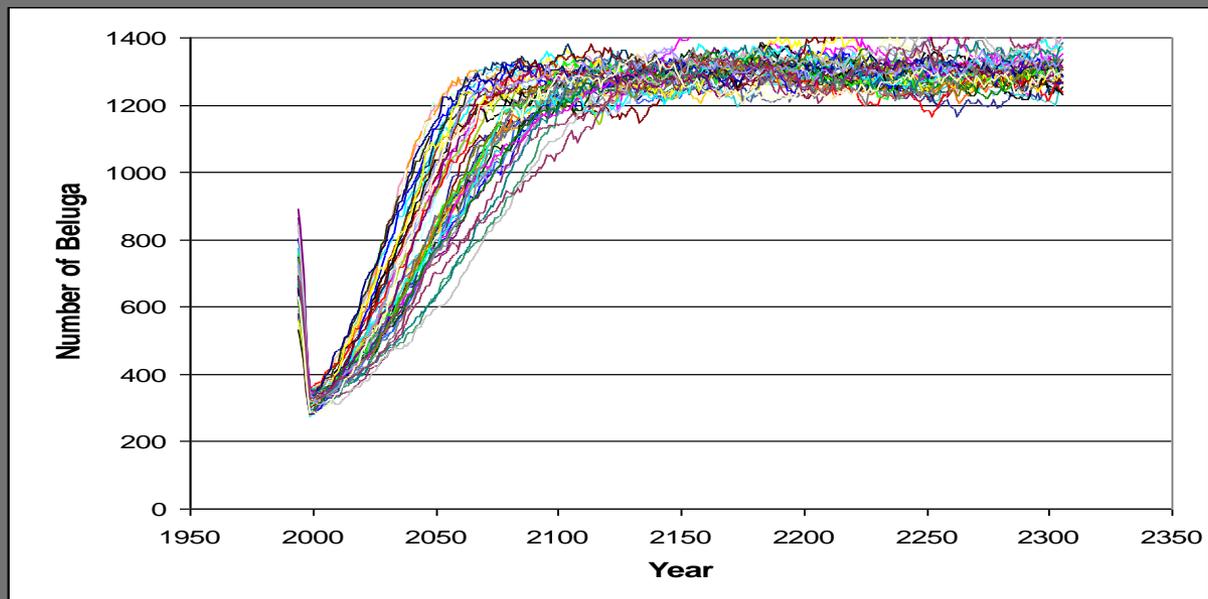
a. Baseline Model

ϕ_0 drawn from $U(0.94-1.06)$

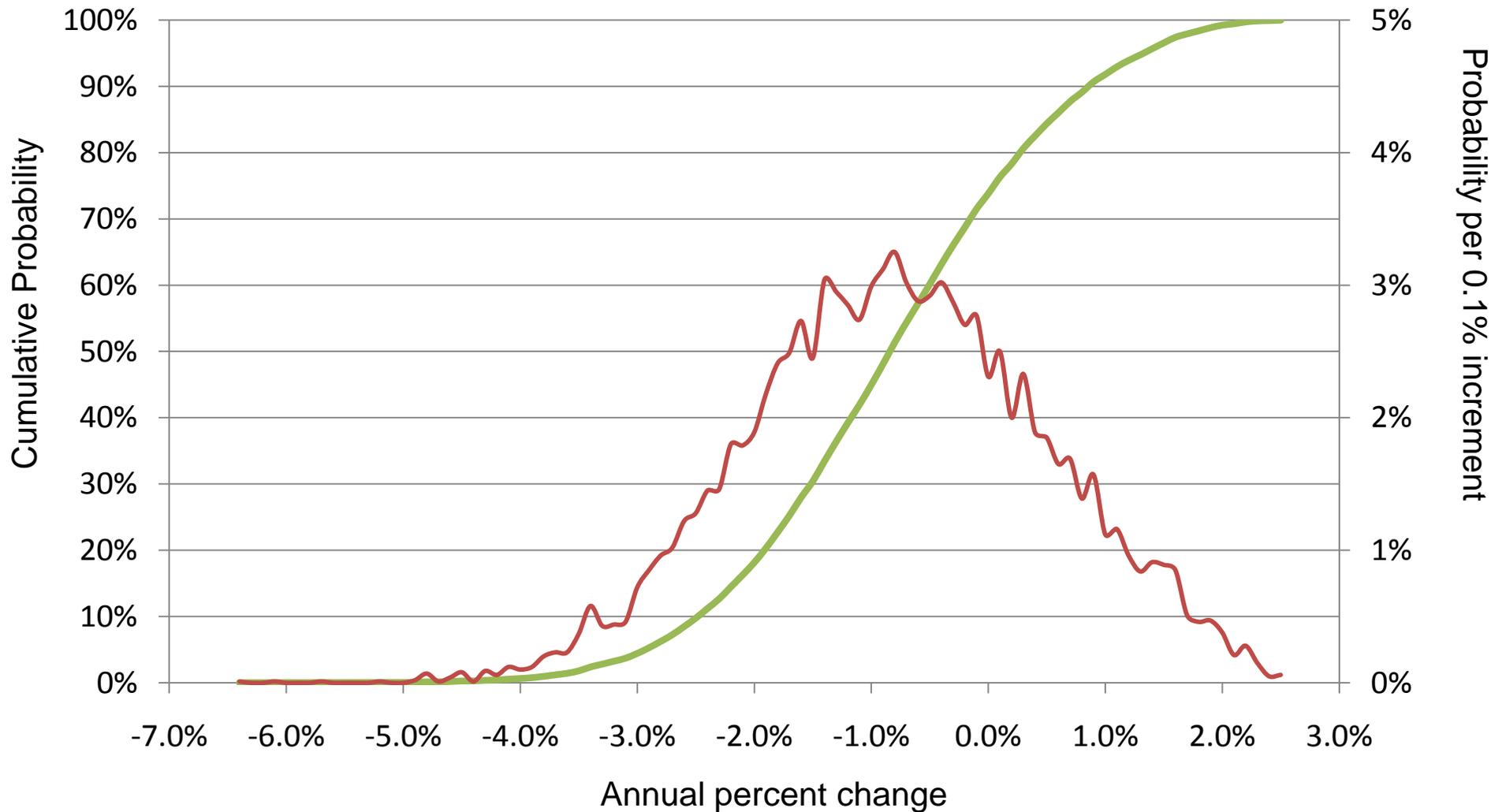


b. Healthy Population Model

ϕ_0 drawn from $U(1.02-1.06)$



Annual Rate of Change from Population model



Thank you

