

# Marine Wildlife Surveys: Pebble Project EBD and later

Robert Day  
Adrian Gall  
Brian Lawhead  
Alex Prichard  
Ann Wildman  
Steve Murphy

**ABR**  
inc.  
*environmental research & services*

Pebble Project EBD  
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# Primary Objective

- Determine whether birds or mammals classified as threatened, endangered, or of conservation concern occur in the marine waters in the Cook Inlet study area:
  - Steller's Eider, Kittlitz's Murrelet
  - Sea Otter, Steller's Sea Lion, Beluga

# Secondary Objectives

- Describe the seasonal distribution and abundance of birds and mammals in the Cook Inlet study area
- Document breeding activity by birds and mammals in the Cook Inlet study area

# Methods (2004–2008)

## 8 boat-based wildlife surveys (2004–2006)

- Year-round (spring, summer, early winter, late winter)
- Nearshore surveys
- Offshore surveys
- Excluded Chinitna Bay

## 20 fixed-wing bird surveys (2004–2005)

- Spring and fall migration
- Included Chinitna Bay (2005)

# Methods (2004–2008 cont'd.)

26 helicopter-based wildlife survey periods  
(2006–2008)

- 6 in 2006, 14 in 2007, 6 in 2008
- Emphasized Steller's Eiders and Sea Otters, but included all species; fall-winter
- Included Chinitna Bay (2007–2008)

36 fixed-wing Harbor Seal survey flights (2005, 2007–2008)

- 19 in 2005, 8 in 2007, 9 in 2008
- Seasonal use & population estimation
- Included Chinitna Bay (all years)

# Methods (2009–2011)

47 helicopter-based wildlife survey periods  
(2009–2011)

- 16 in 2009, 19 in 2010, 19 in 2011
- Emphasized Steller's Eiders and Sea Otters; year-round
- Excluded Chinitna Bay

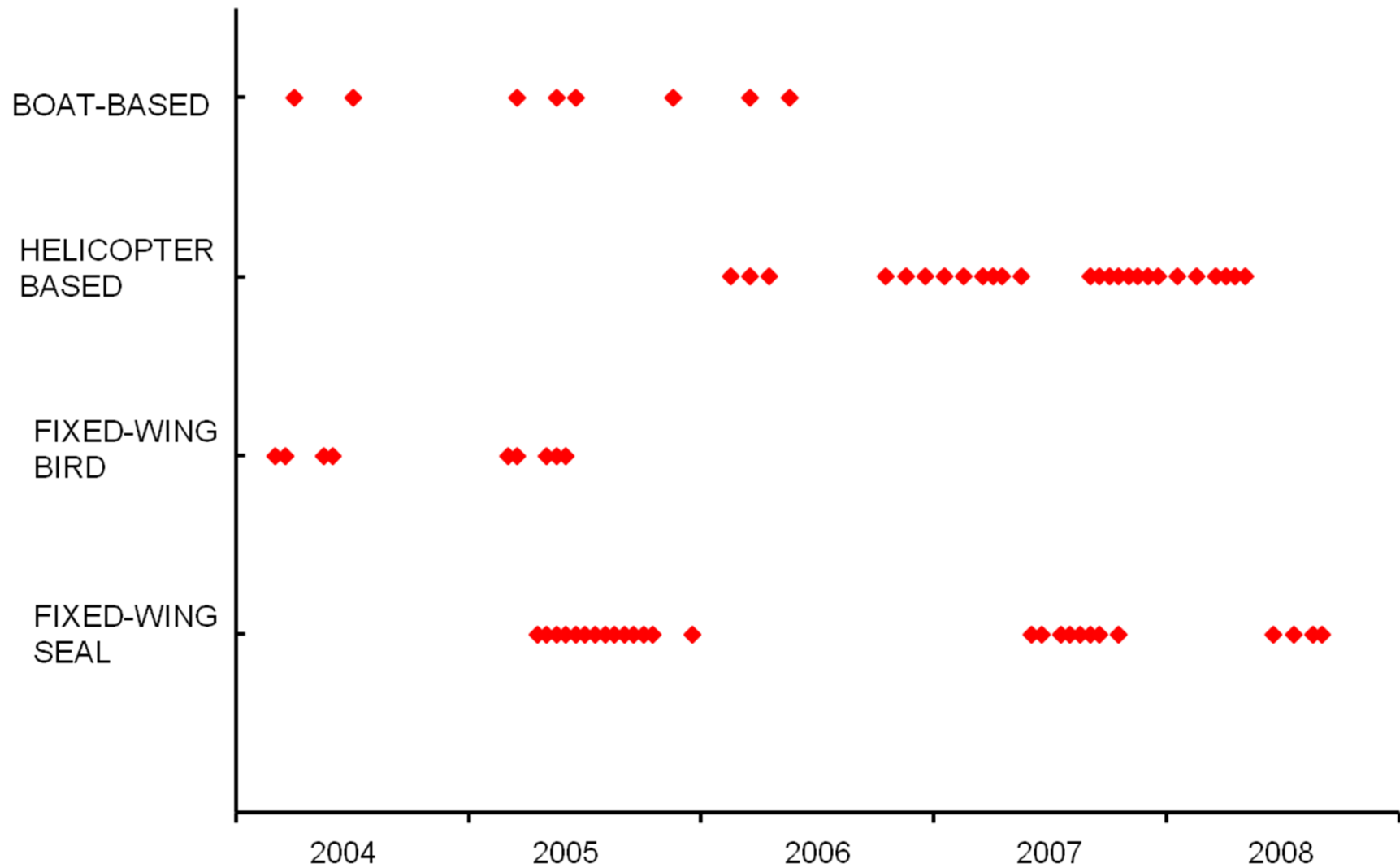
Breeding-bird surveys (2010, 2011)

- Incomplete survey in 2010 (inclement weather)
- Complete survey in 2011

# Recent Work (2006–2011)

- Primarily helicopter-based wildlife surveys; some work on breeding birds (2010–2011)
- Helo surveys replace fixed-wing bird and boat-based wildlife surveys; include all wildlife species (2006–2008) or just eiders, otters, and other marine mammals (2009–2011)
- Also improve ability to monitor Steller's Eiders and wildlife in offshore zone—not sampled well with boats

# Sampling Effort (2004-2008)





# Helicopter-based Wildlife Surveys

- Robinson R-44 on floats (2006–2008); Hughes 500 on floats (2009–2011)
- Flown at 80–130 km/h and ~150 m asl
- Avoid low tide  $\pm$  2 hr (hauled-out seals)
- Complete nearshore surveys
- Partial offshore surveys for Steller's Eiders and all marine mammals
- All Steller's Eiders and Sea Otters recorded, no matter where seen



# Fixed-wing Seal Surveys

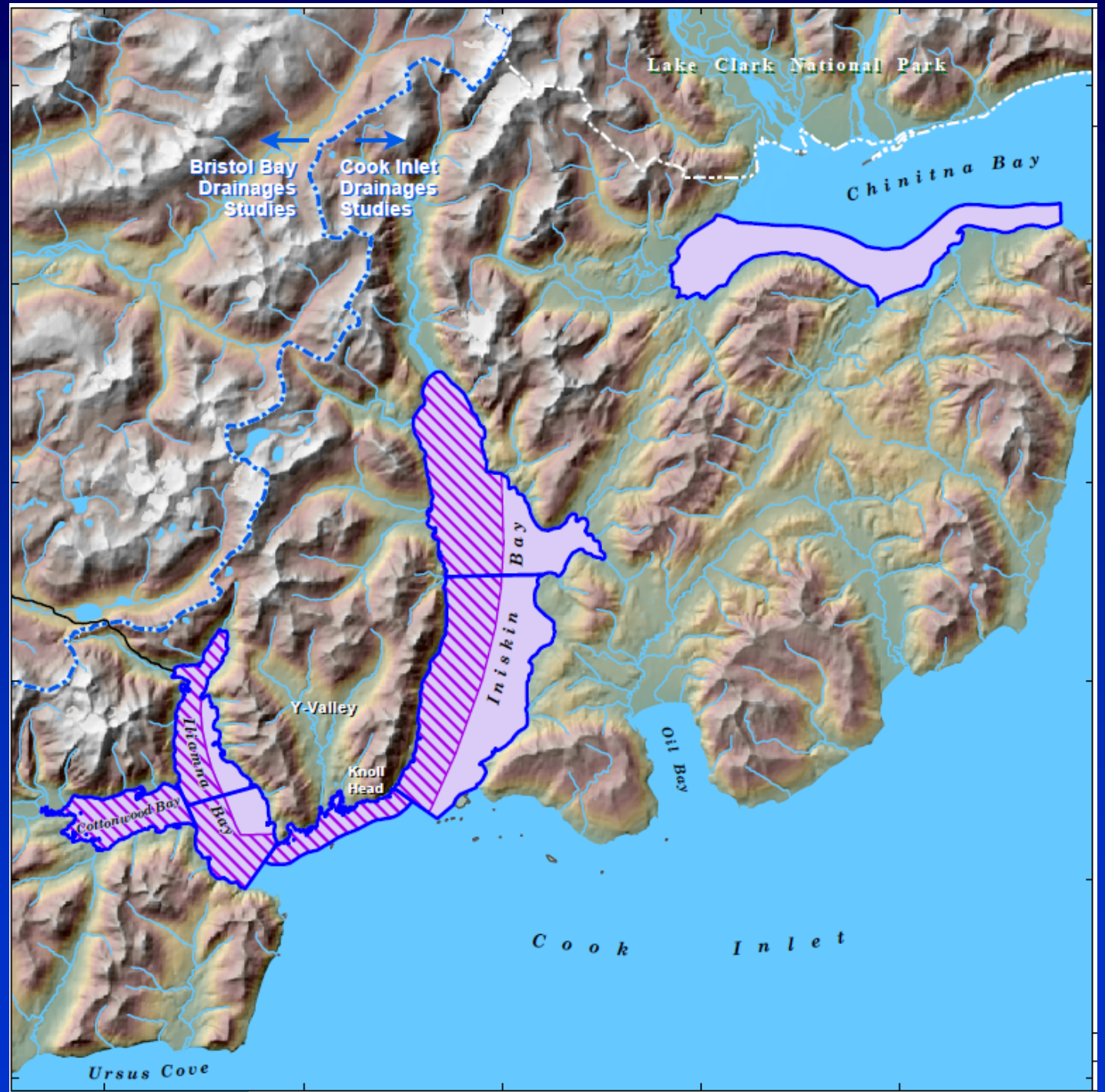
- Cessna 206 or Piper Super Cub
- Flown at ~300 m asl
- Within 2 hr of low tide
- Survey of consistently-used haulouts
- Other haulouts occasionally used (e.g., mudflats)
- All group sizes estimated and photographed for later counting
- All locations mapped

# Boat-based Wildlife Surveys (2004–2006)

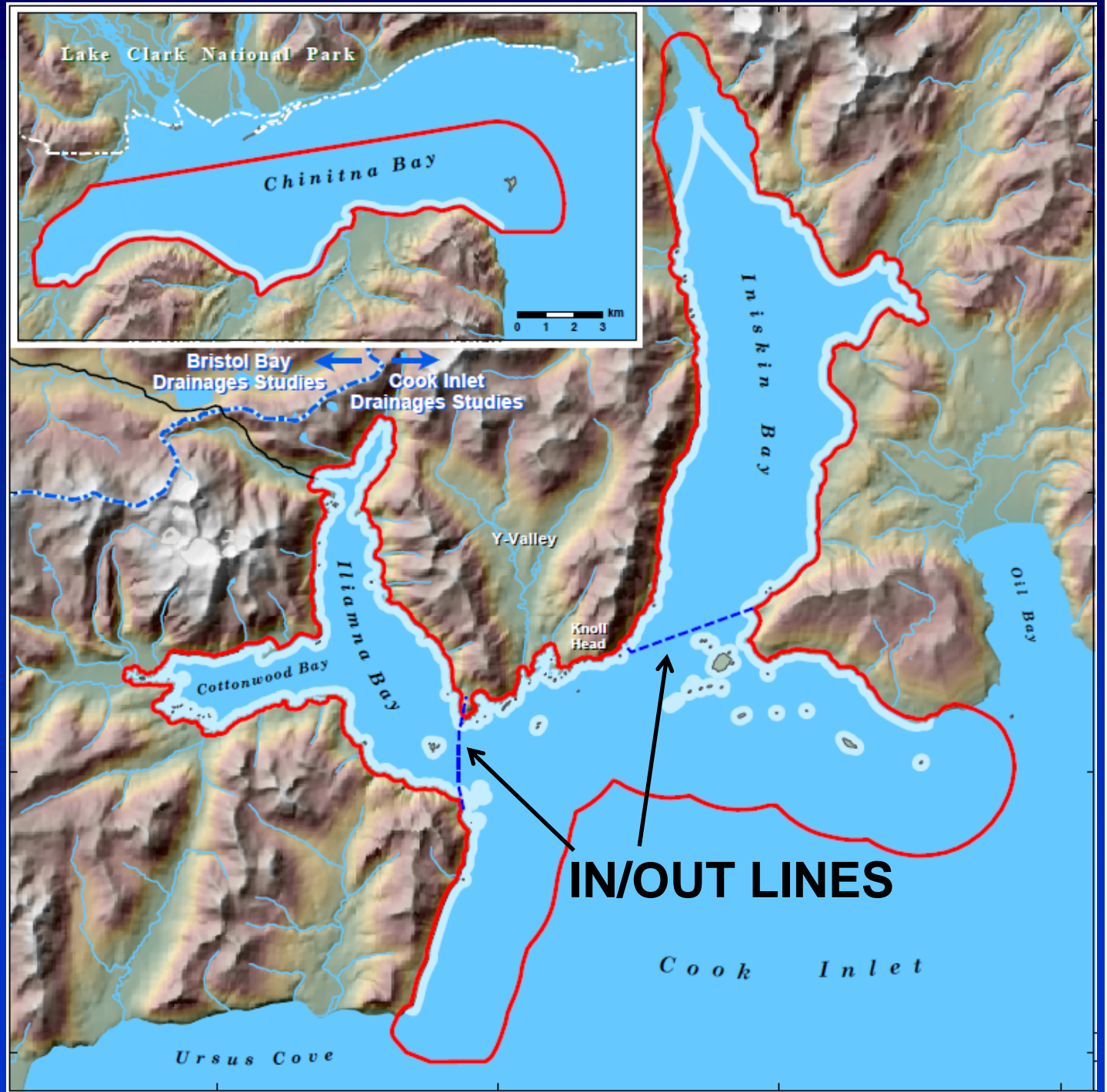


# Fixed-wing Wildlife Surveys (2004–2005)

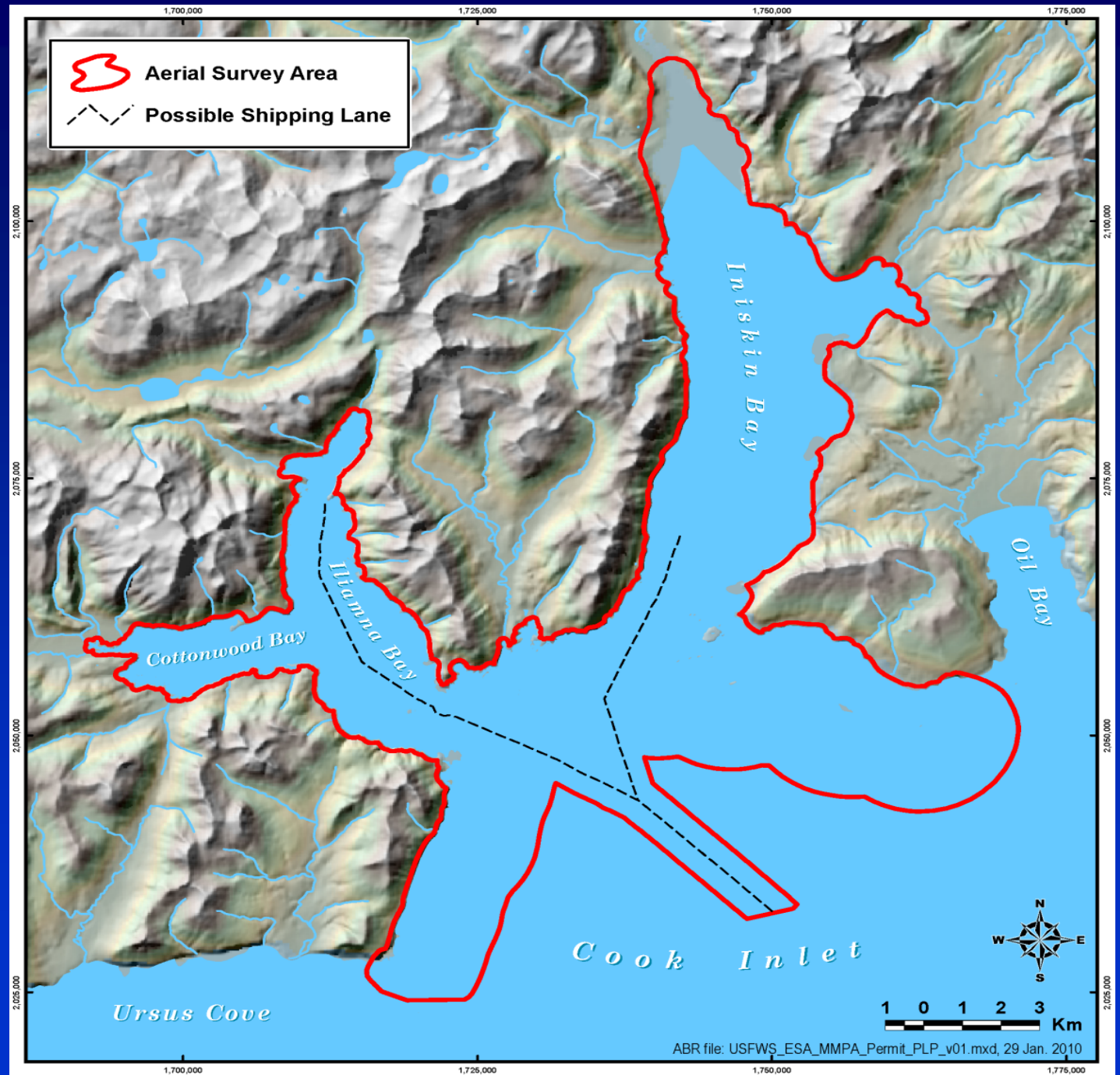
-  2004 Survey Area
-  2005 Survey Area



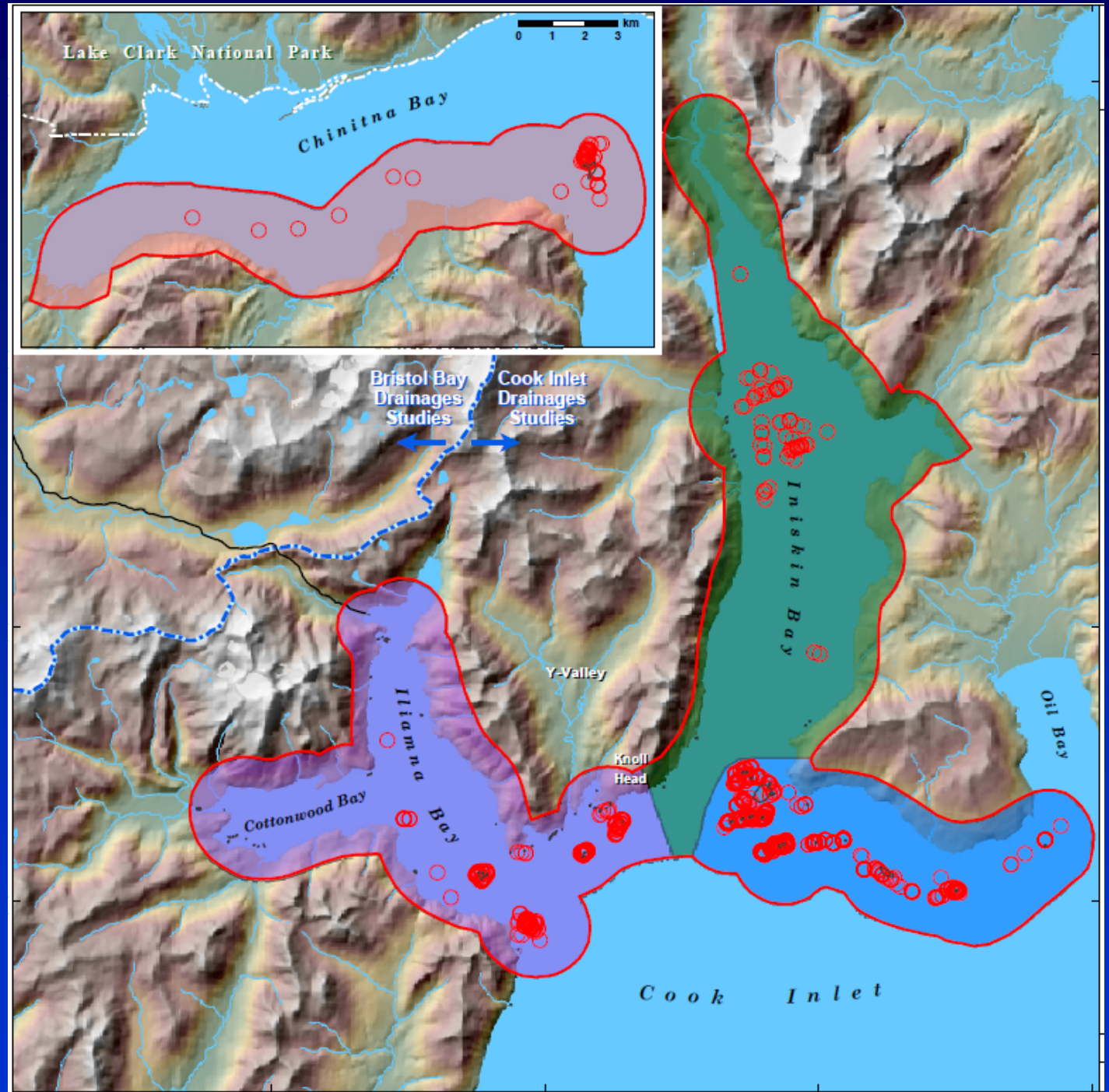
# Helicopter -based Wildlife Surveys (2006- 2008)



# Helicopter -based Wildlife Surveys (2009- 2011)



Fixed-wing  
Harbor  
Seal  
Surveys  
(2005,  
2007-  
2008)



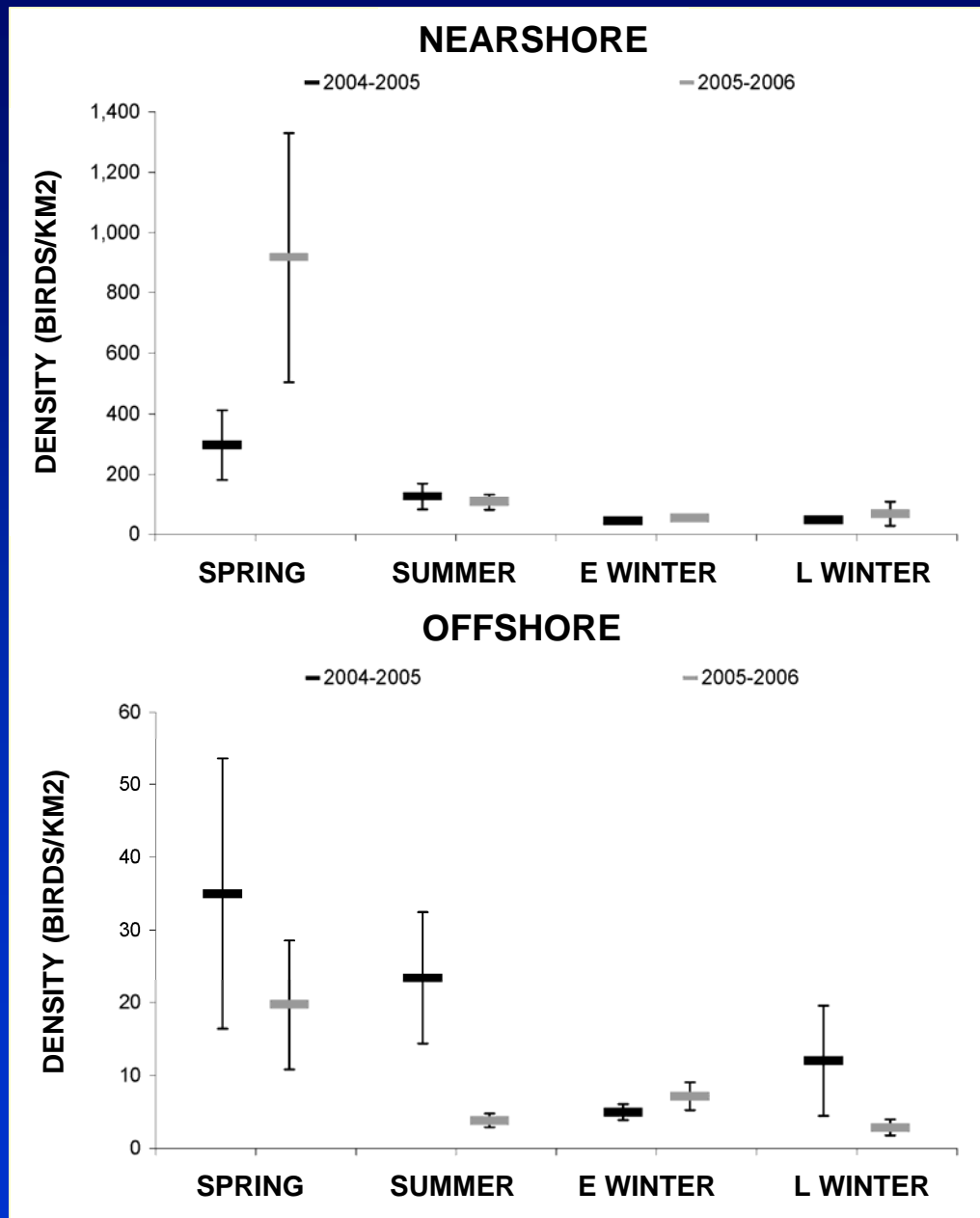
# Birds (2004-2006)



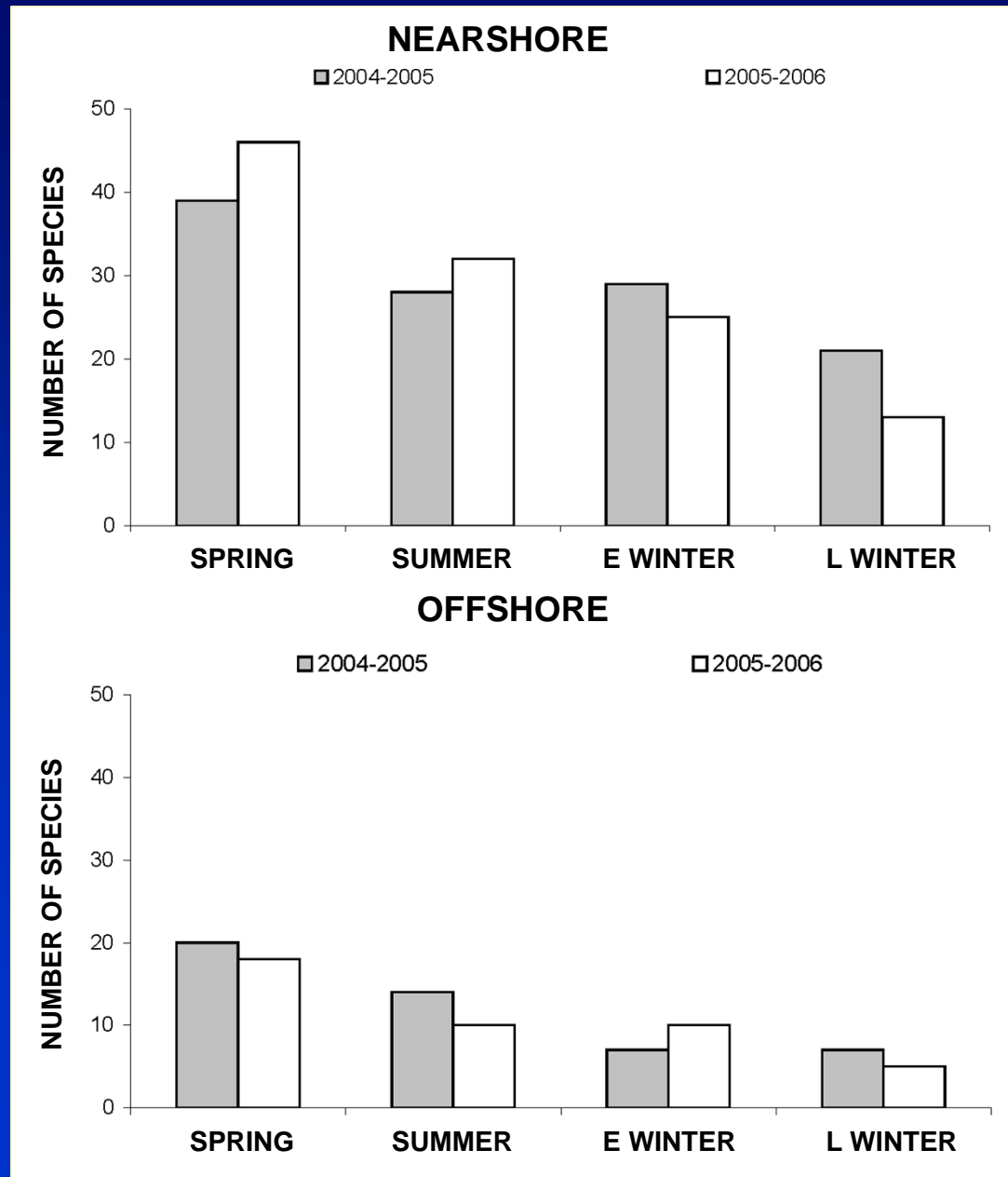
# Results

- 8 Boat-based surveys
- ~59,000 birds of at least 67 species
- 20 Fixed-wing surveys (1 partial, 1 w/data lost)
- ~72,000 birds of at least 31 species

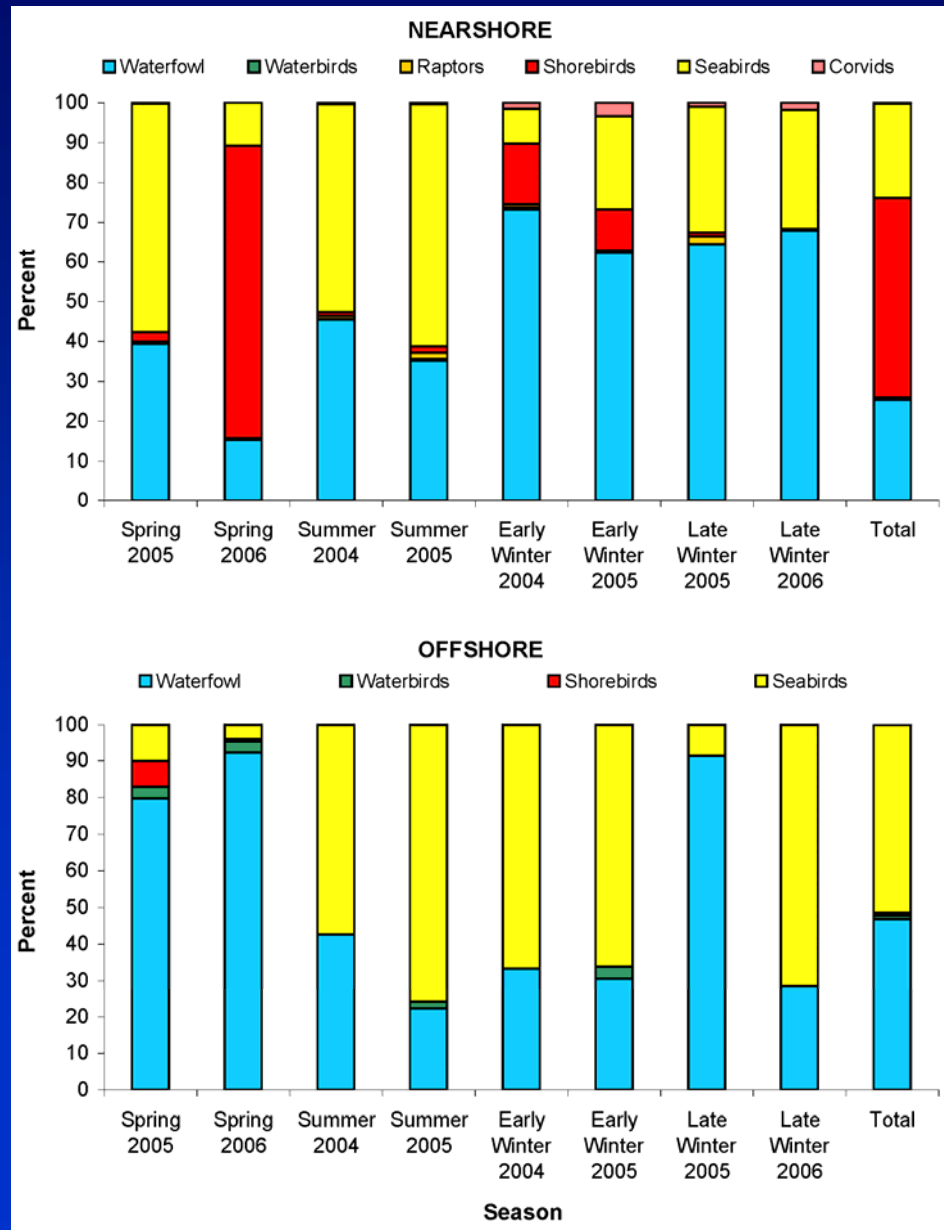
# Abundance (Boat)



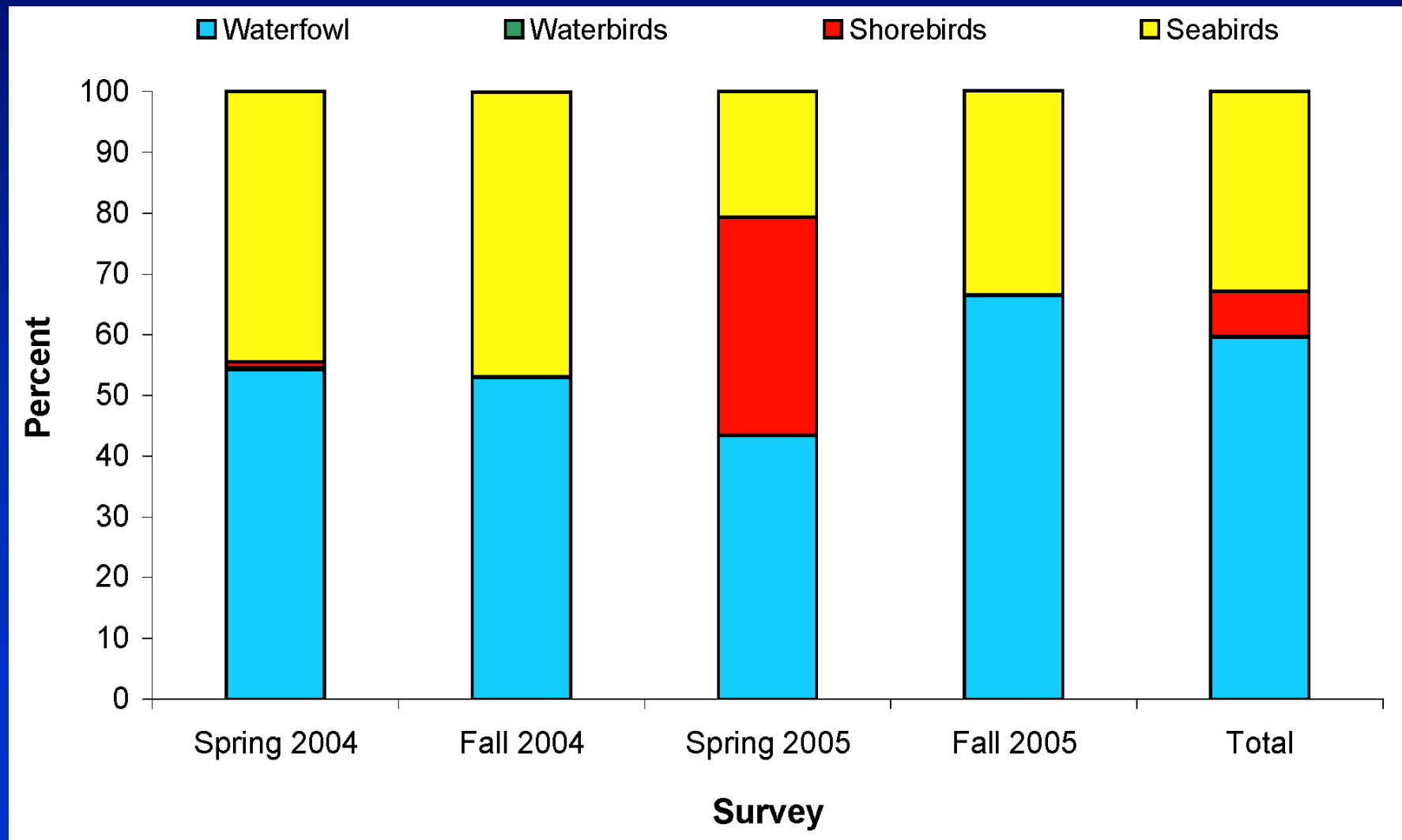
# Species Richness (Boat)



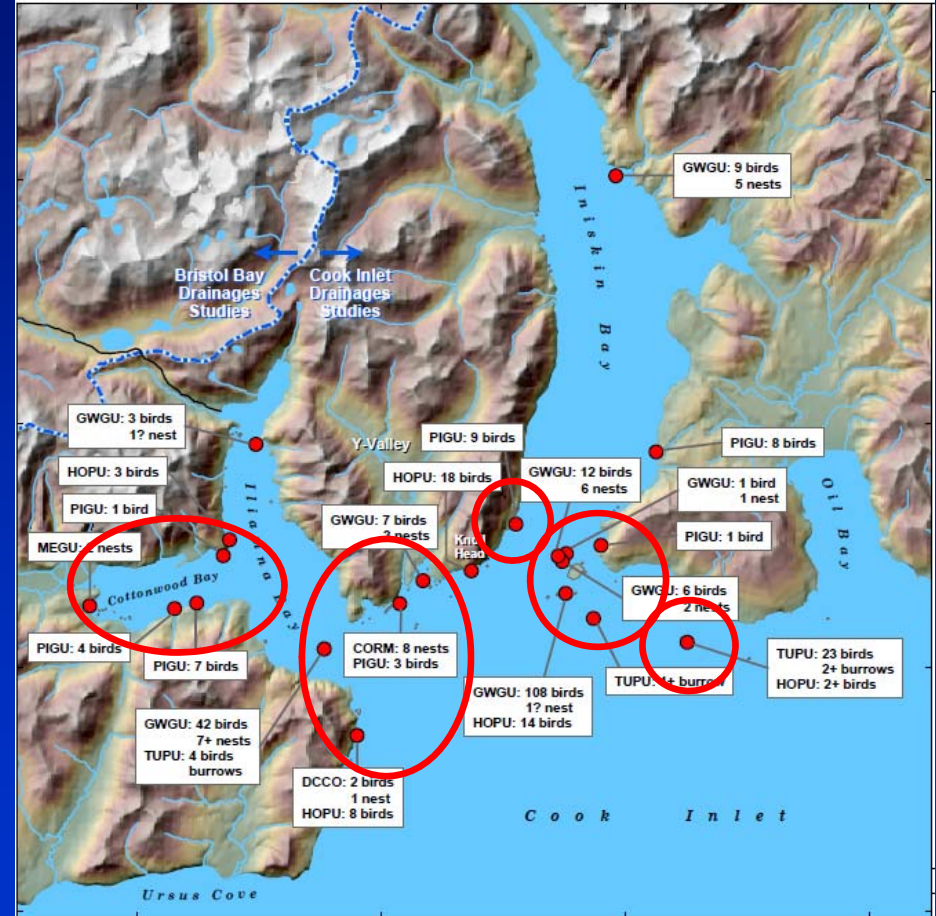
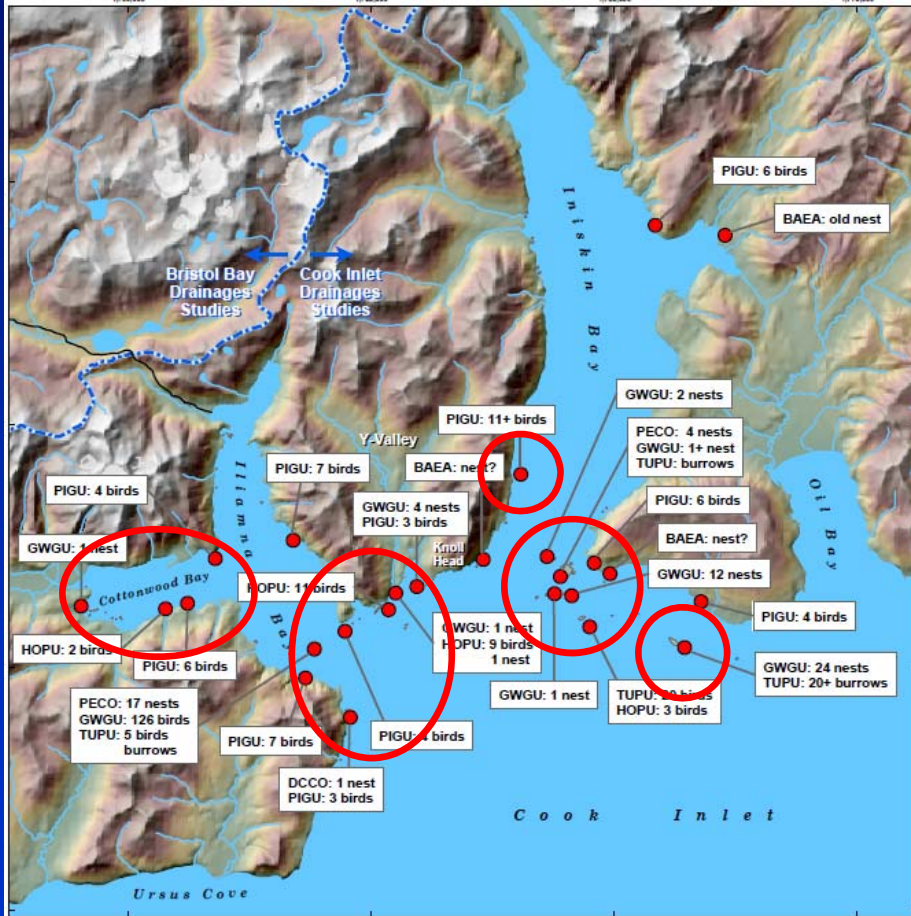
# Species-composition (Boat)



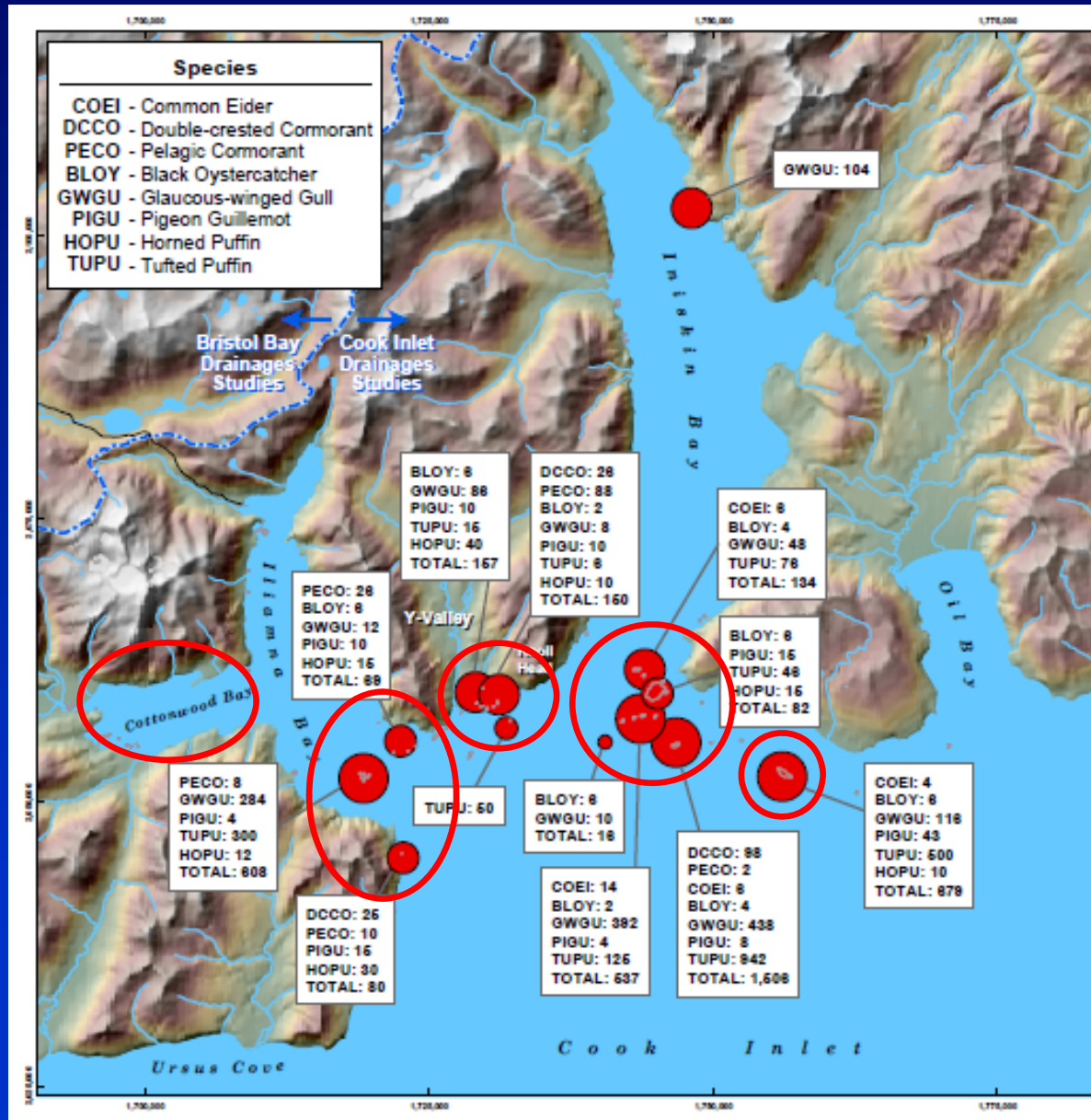
# Species-composition (Fixed-wing)



# Breeding Birds 2004-2005



# Breeding Birds 1976-1978



# Changes in Population Size

	Alaska Seabird	Total birds	
Species	Colony Catalog	June 2004	June 2005
<b>Double-crested Cormorant</b>	149	52	74
Pelagic Cormorant	134	117	130
<b>Common Eider</b>	30	8	13
Black Oystercatcher	42	23	41
<b>Glaucous-winged Gull</b>	1,498	843	1,030
<b>Pigeon Guillemot</b>	119	95	77
<b>Tufted Puffin</b>	2,060	49	84
<b>Horned Puffin</b>	140	32	51
<b>TOTAL</b>	<b>4,172</b>	<b>1,219</b>	<b>1,500</b>
Red-faced Cormorant	—	20	10
Mew Gull	—	25	74



# Birds—Helo (2006–2011)



# Helicopter -based Wildlife Surveys (2006- 2008)





# Results

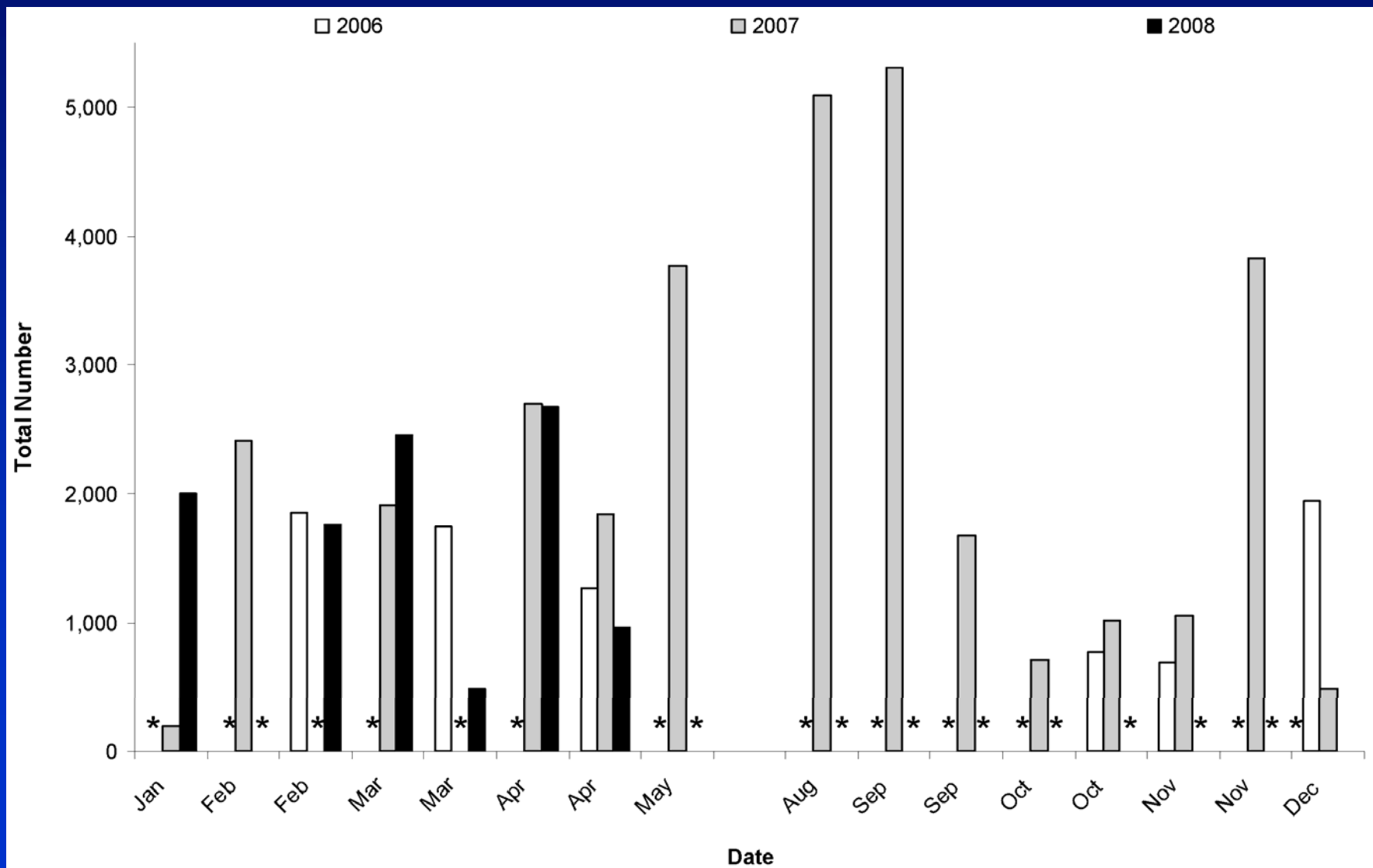
- 73 Helicopter-based survey periods (2006–2011)
- Surveyed all species 2006–2008, then emphasized Steller's Eiders 2009–2011
- ~67,400 birds (2006–2008)
- At least 36 species (2006–2008)
- Recorded Steller's Eiders every winter

# Abundance 2006–2008

- Substantial seasonal and interannual variation in total numbers of birds
- High in spring (matches results of boat-based and fixed-wing surveys)
- Highest in fall (matches results of fixed-wing surveys)
- Lowest in late fall and winter
- Interannual variation

# Abundance 2006–2008

## ILIAMNA–INISKIN

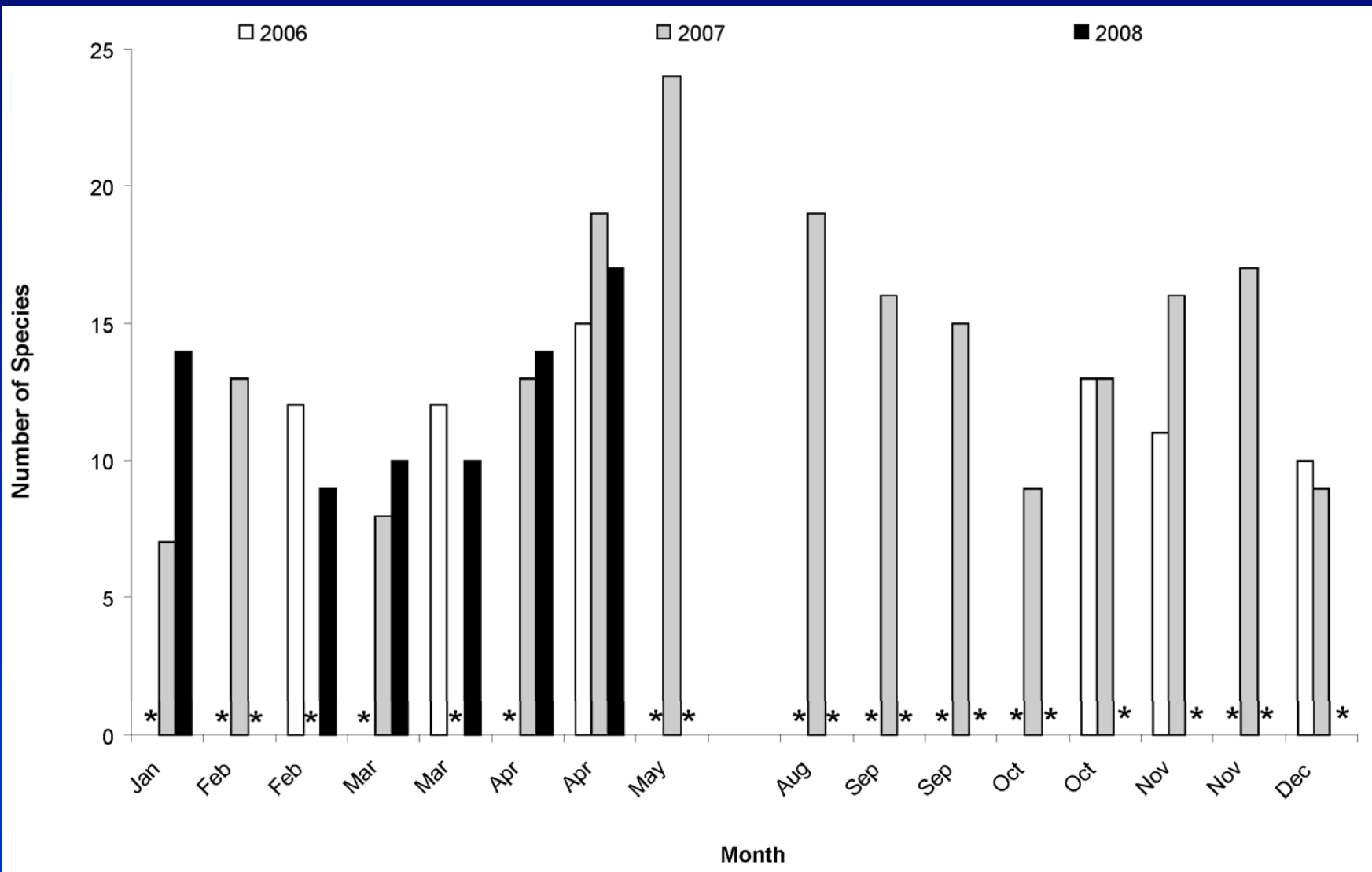


# Species–richness

- Substantial seasonal variation in richness
- Highest in spring and fall migrations (spring high matches results of boat-based surveys)
- Lowest in mid- to late winter (matches results of boat-based surveys)
- Not as many species as boat-based surveys, probably because of timing of surveys and limitations of sampling type
- Interannual variation

# Species-richness 2006–2008

## ILIAMNA-INISKIN



# Species-composition

- System is numerically dominated by waterfowl
- ~48,200 (71%) of ~67,400 total birds were waterfowl
- ~44,600 (93%) of all waterfowl were diving ducks
- Dominated numerically by scoters (~18,400), Long-tailed Ducks (~14,000), Steller's Eiders (~3,200), and Harlequin Ducks (~3,400)

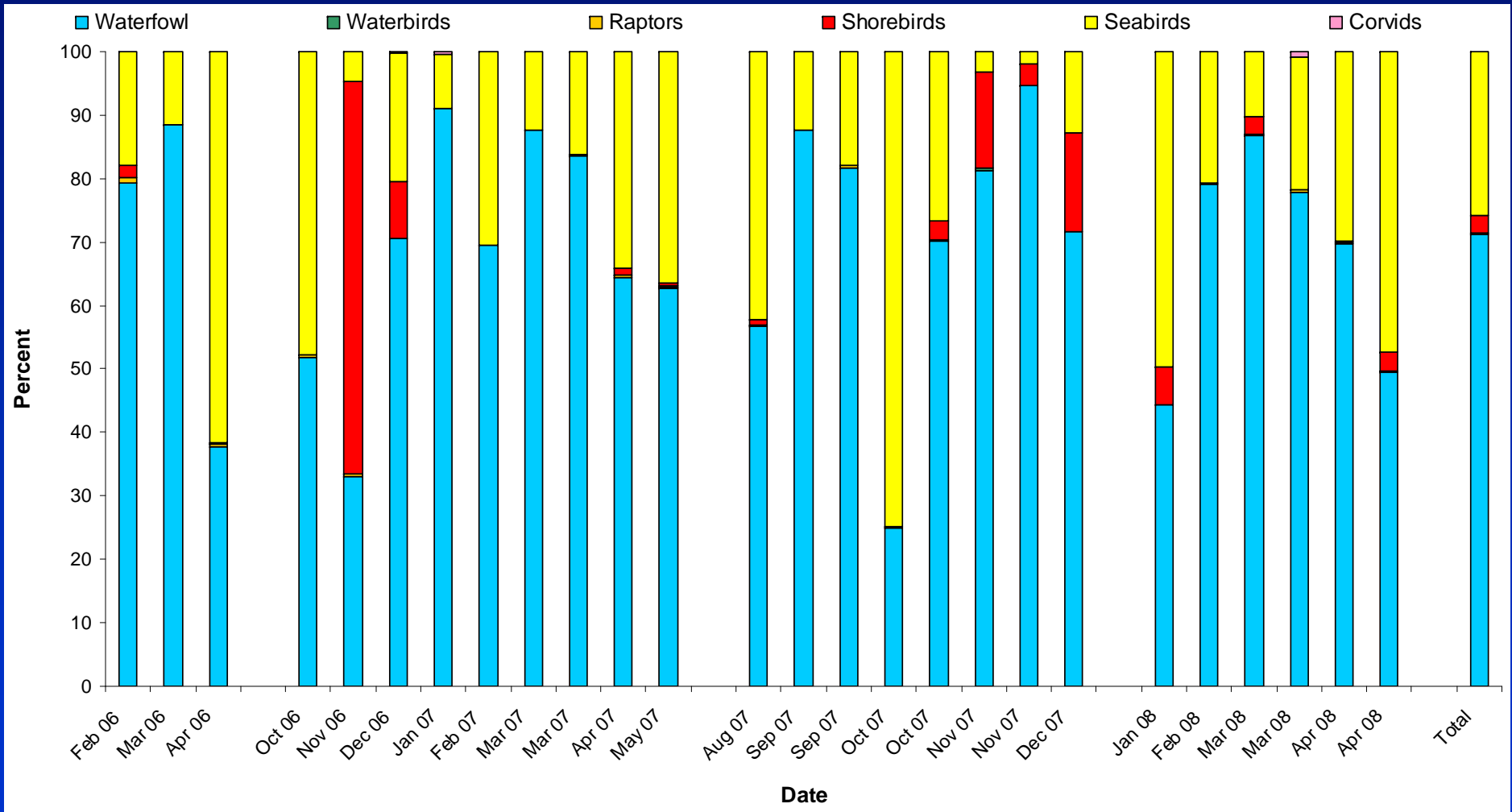
# Species–composition (cont'd.)

- Seabirds are second in abundance
- ~17,700 (26%) of ~67,400 total birds were seabirds
- ~16,700 (94%) of all seabirds were gulls
- Cormorants are the second-most-abundant seabird species group

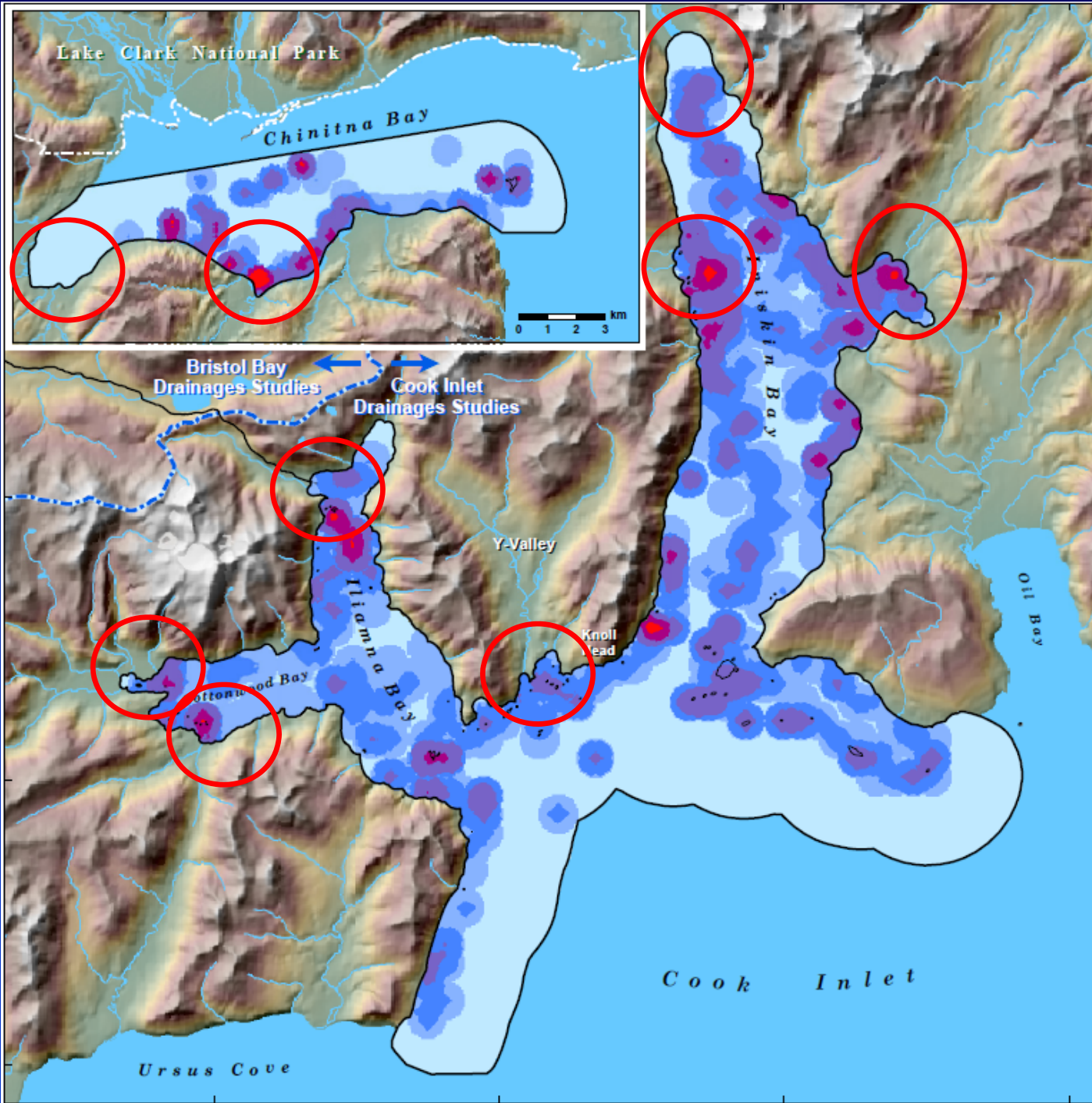
# Species–composition (cont'd.)

- Shorebirds (~2% of total) are under-represented
- Occur in large numbers in spring
- BUT occur in large numbers only during a very brief period (~1 week) in spring
- Timing of surveys not necessarily optimized for shorebird migration

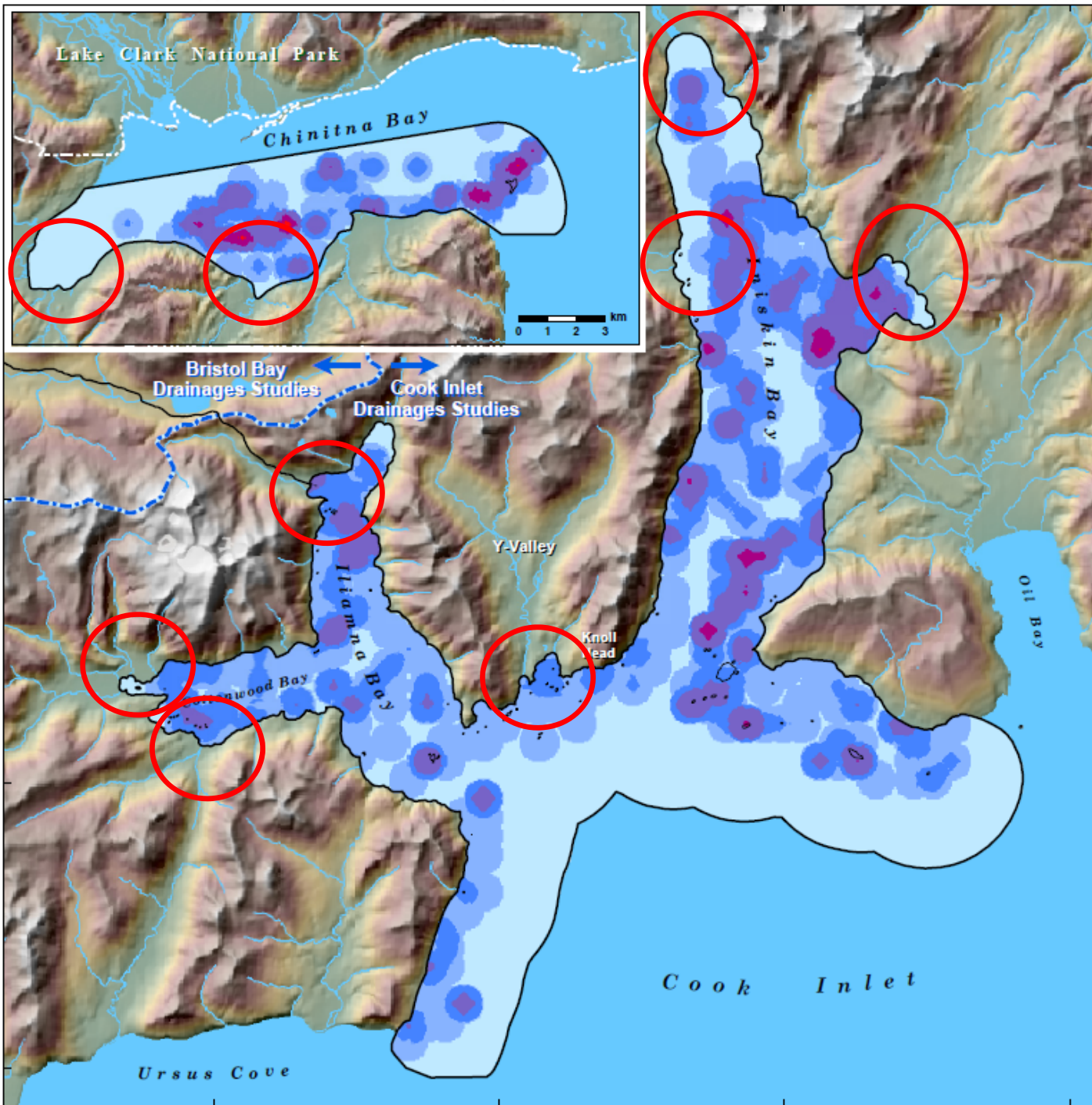
# Species-composition ILIAMNA-INISKIN



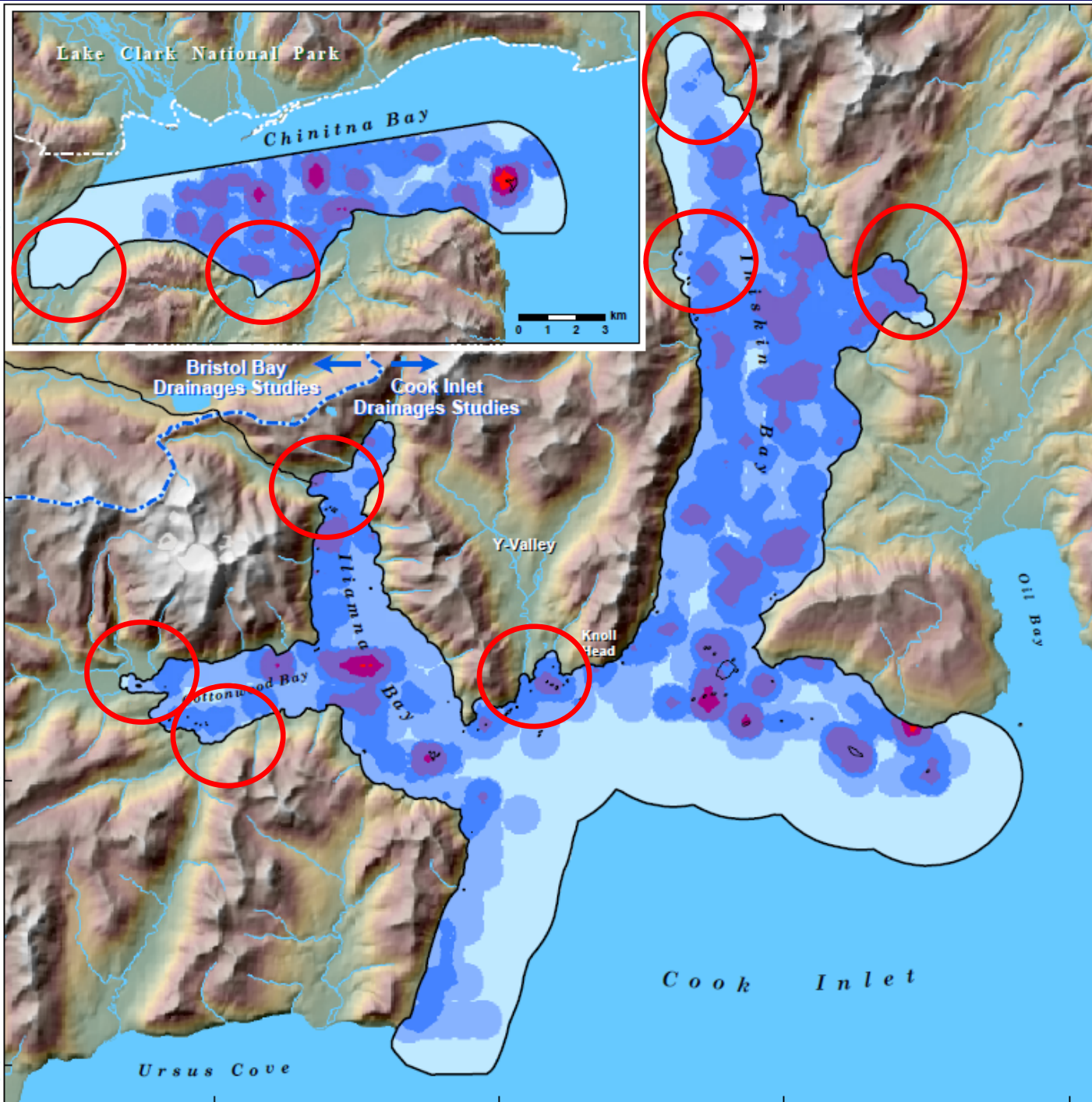
# Birds Aug–Oct 2006–2008



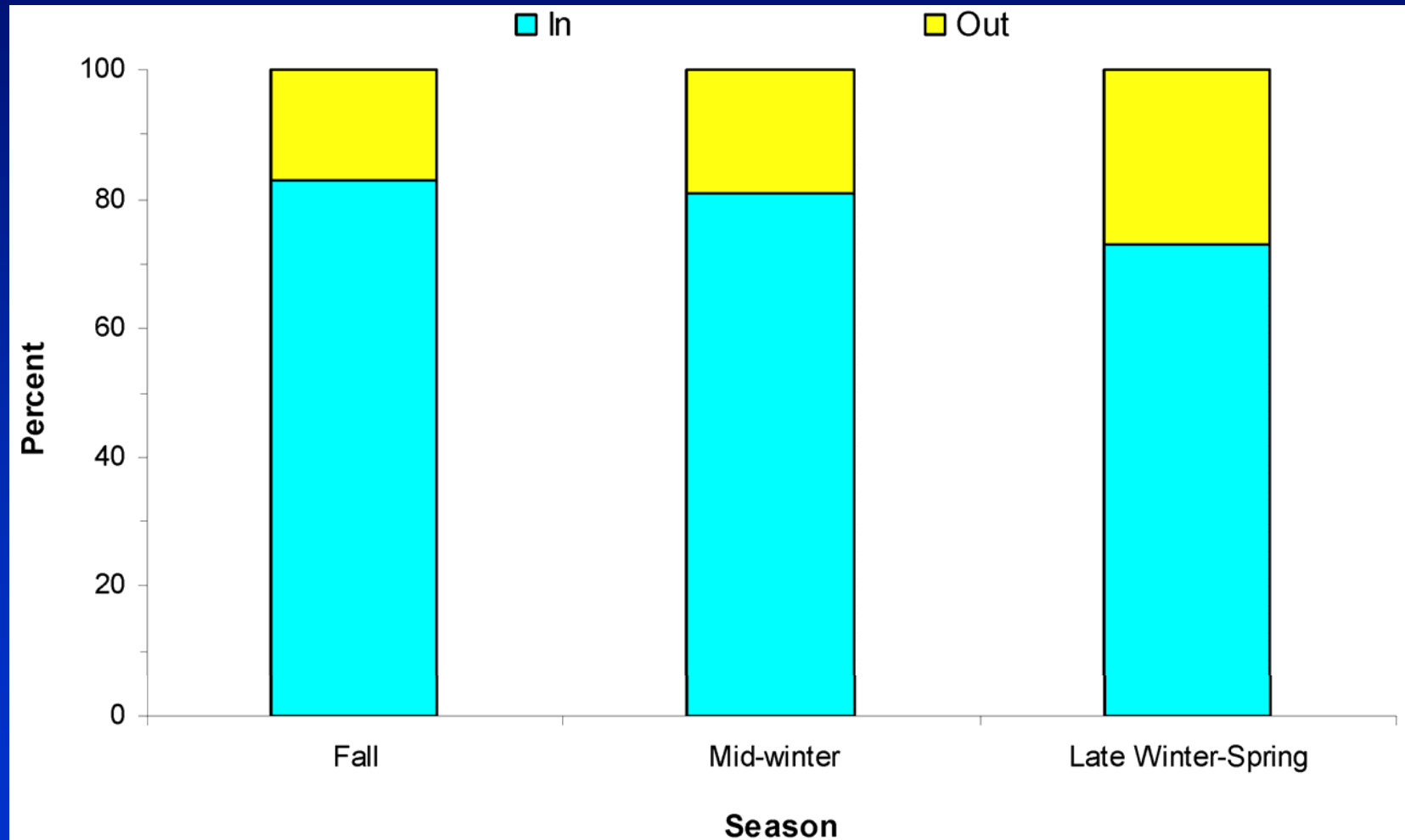
# Birds Nov–Feb 2006–2008



# Birds Mar–May 2006–2008



# General Location of Birds (2006–2008)



Most wintering birds occur within bays

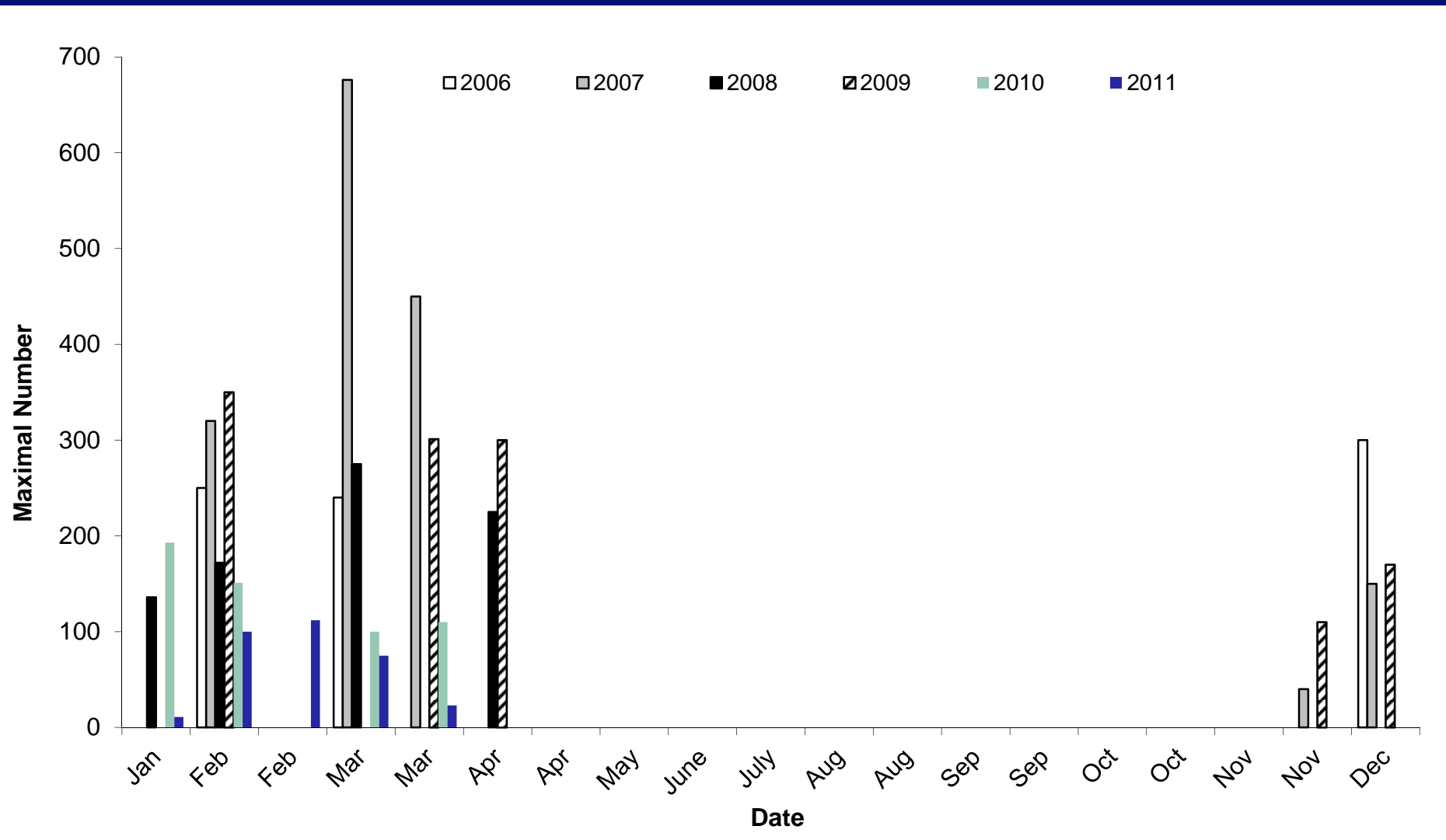
# Steller's Eider



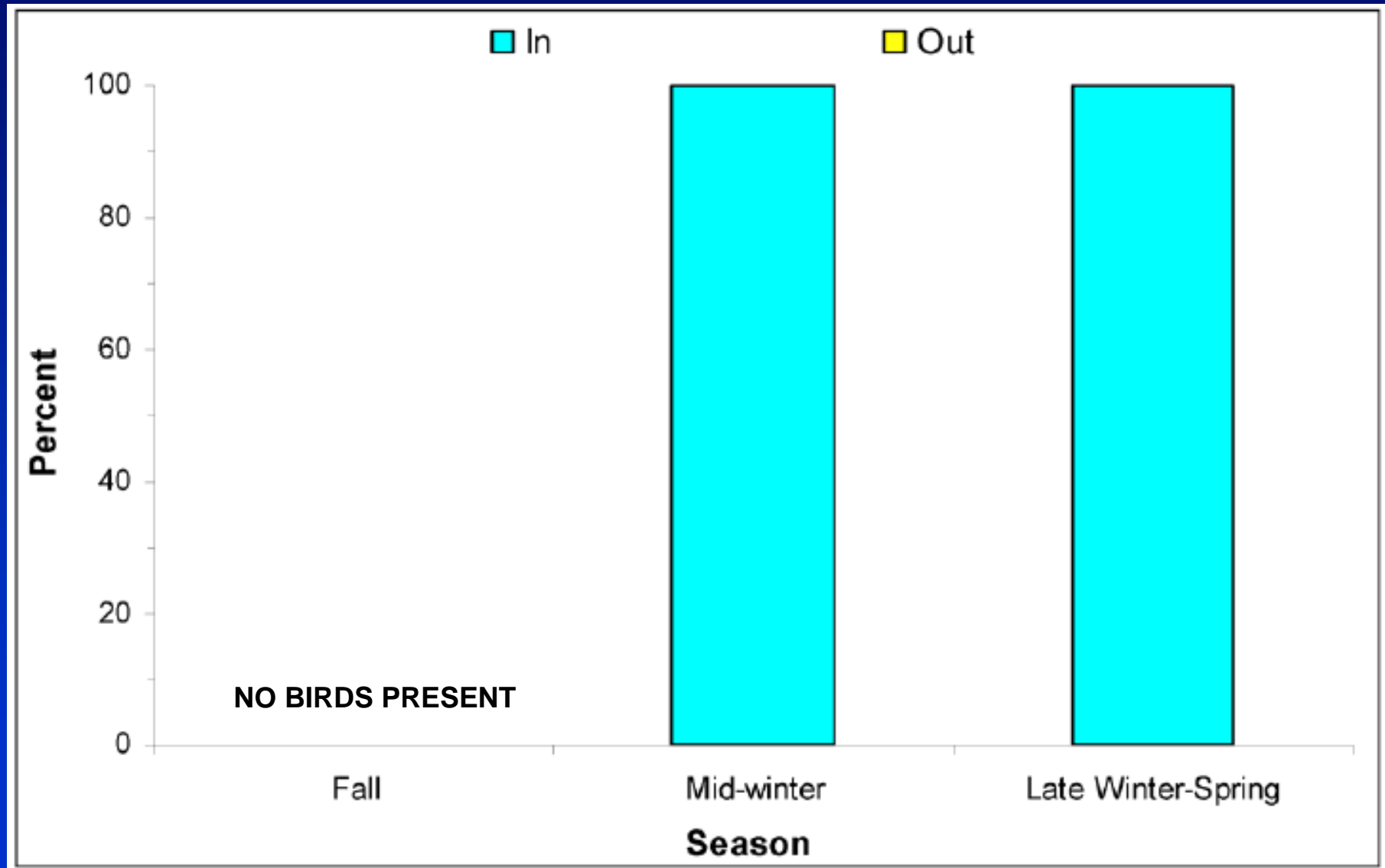
# Steller's Eider

- Seen only late Nov (sometimes Oct) to early Apr
- Primarily in centers of bays, especially Iniskin
- Also seen in Iliamna Bay in recent years
- Total ~5,350 counted (2006–2011)
- 23–675 birds seen on an individual survey
- Often segregate in single-species flocks

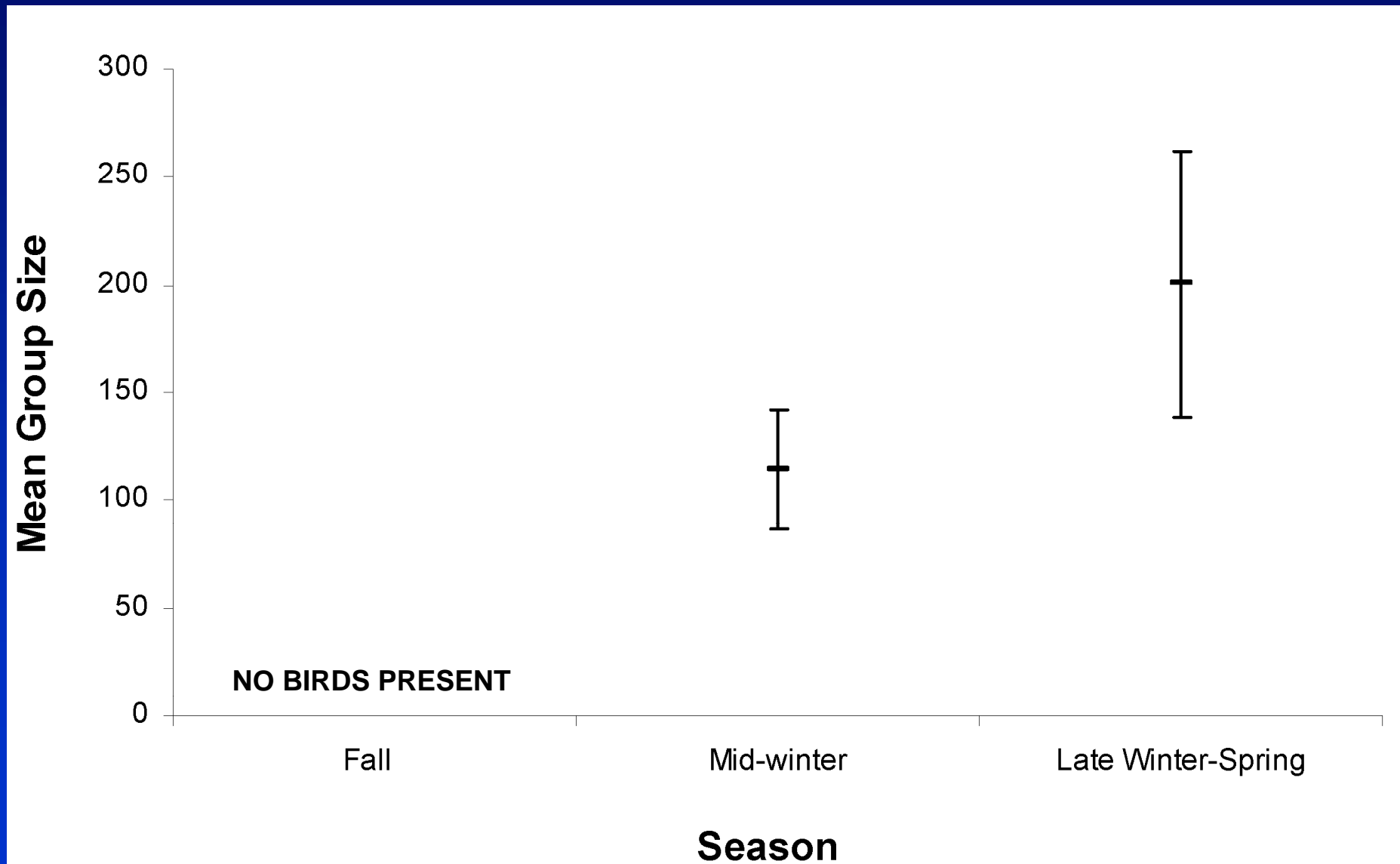
# Steller's Eider (2006–2011)



# General Location of Steller's Eiders



# Steller's Eider Group Size (2006–2008)

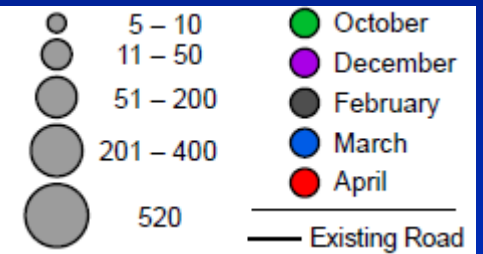
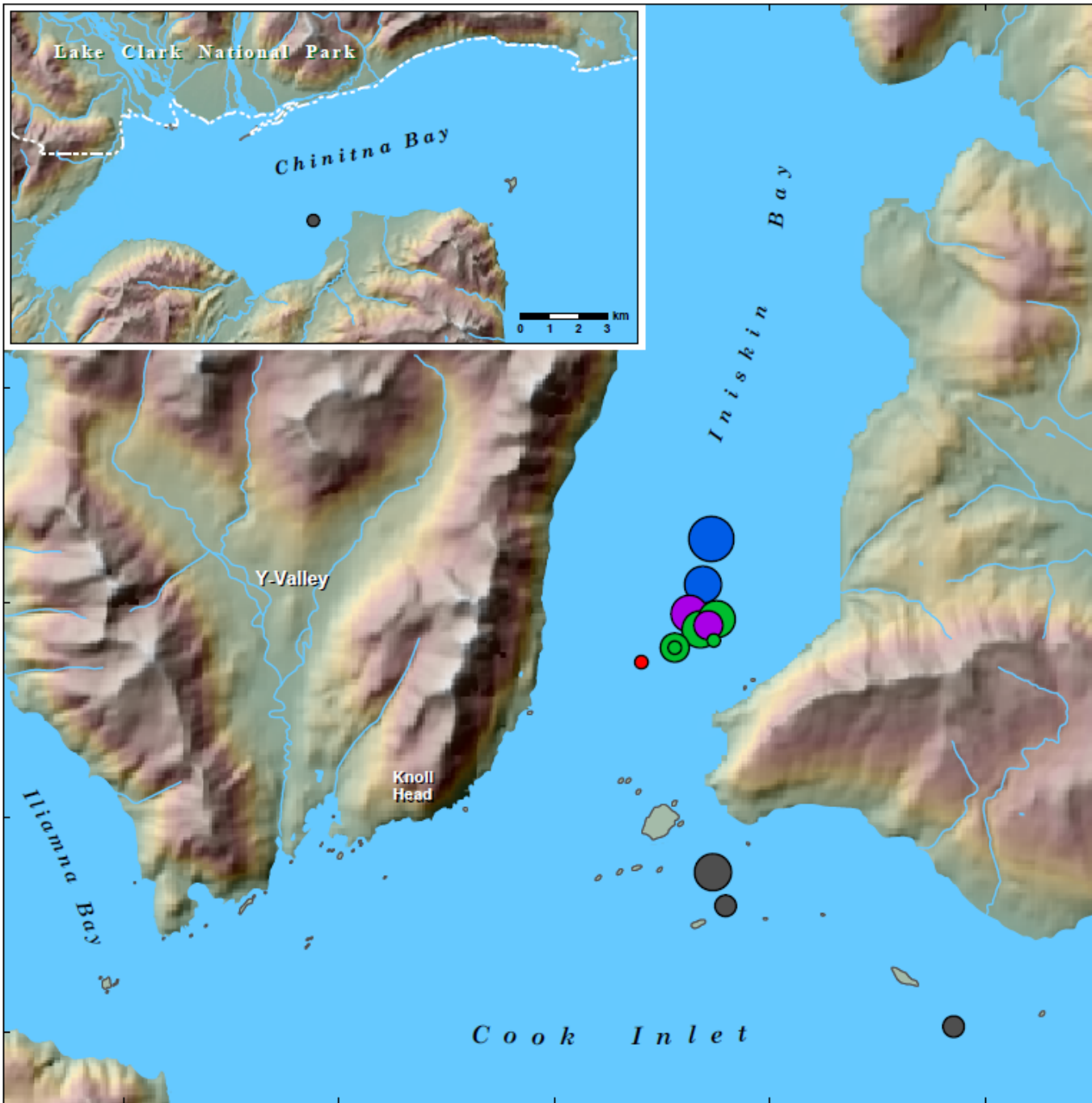


# Steller's Eider (All data) 2004–2011



Number of Individuals		Month
	1 – 50	January
	51 – 150	February
	151 – 250	March
	251 – 450	April
	451 – 675	November
	675	December

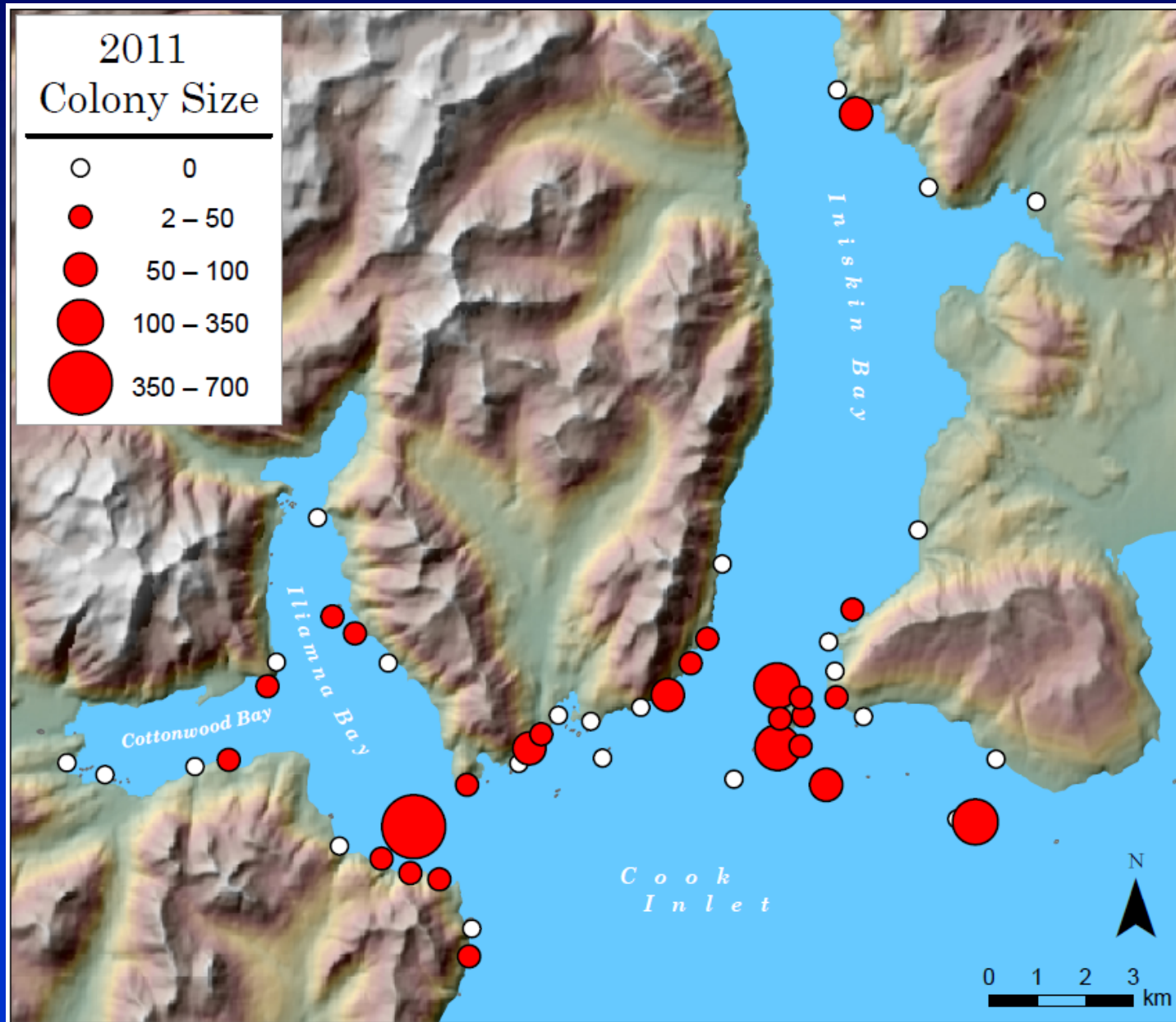
# Steller's Eider (Bill Larned, USFWS, data) 2004–2005



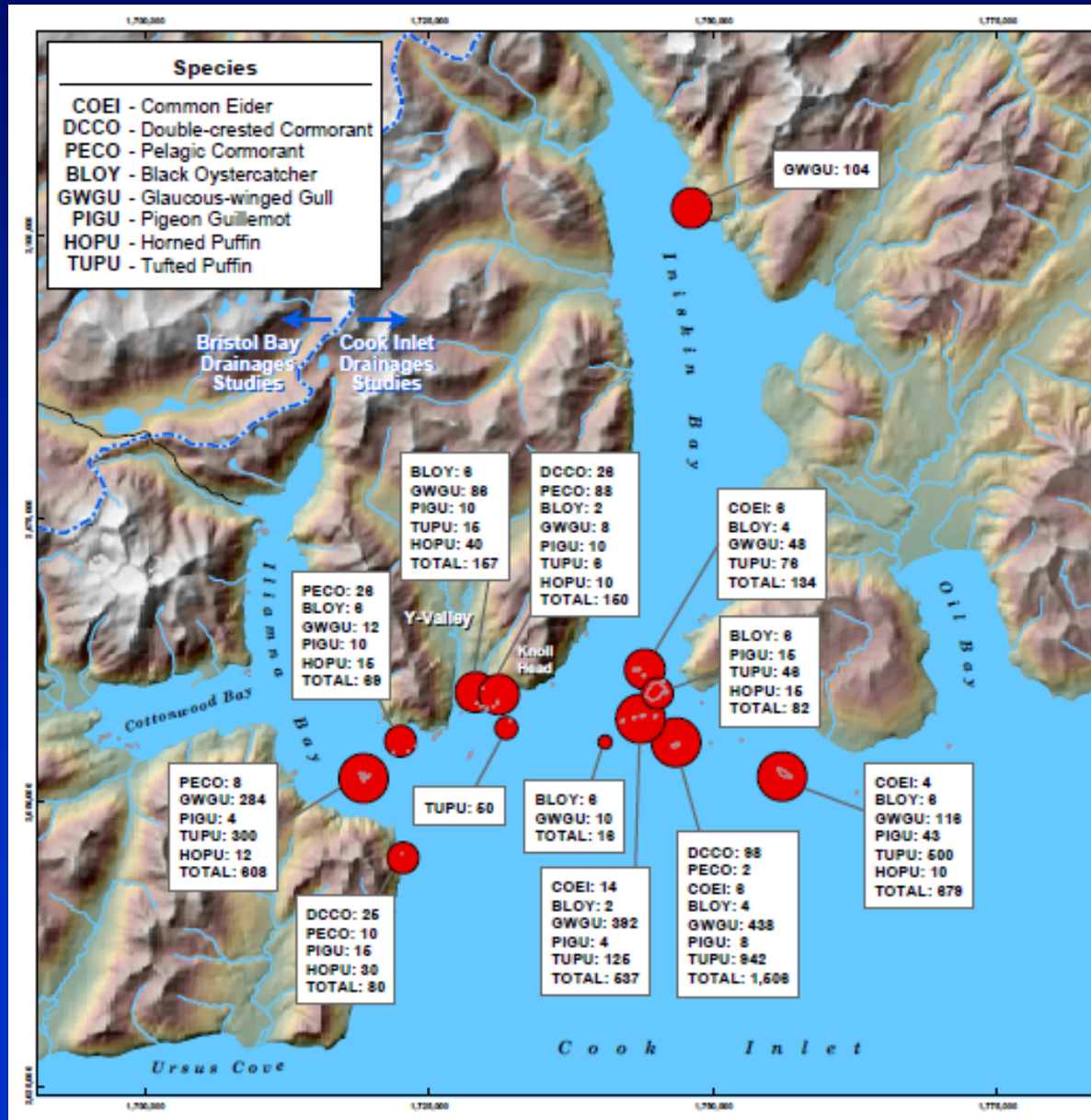
# Breeding Birds (2011)



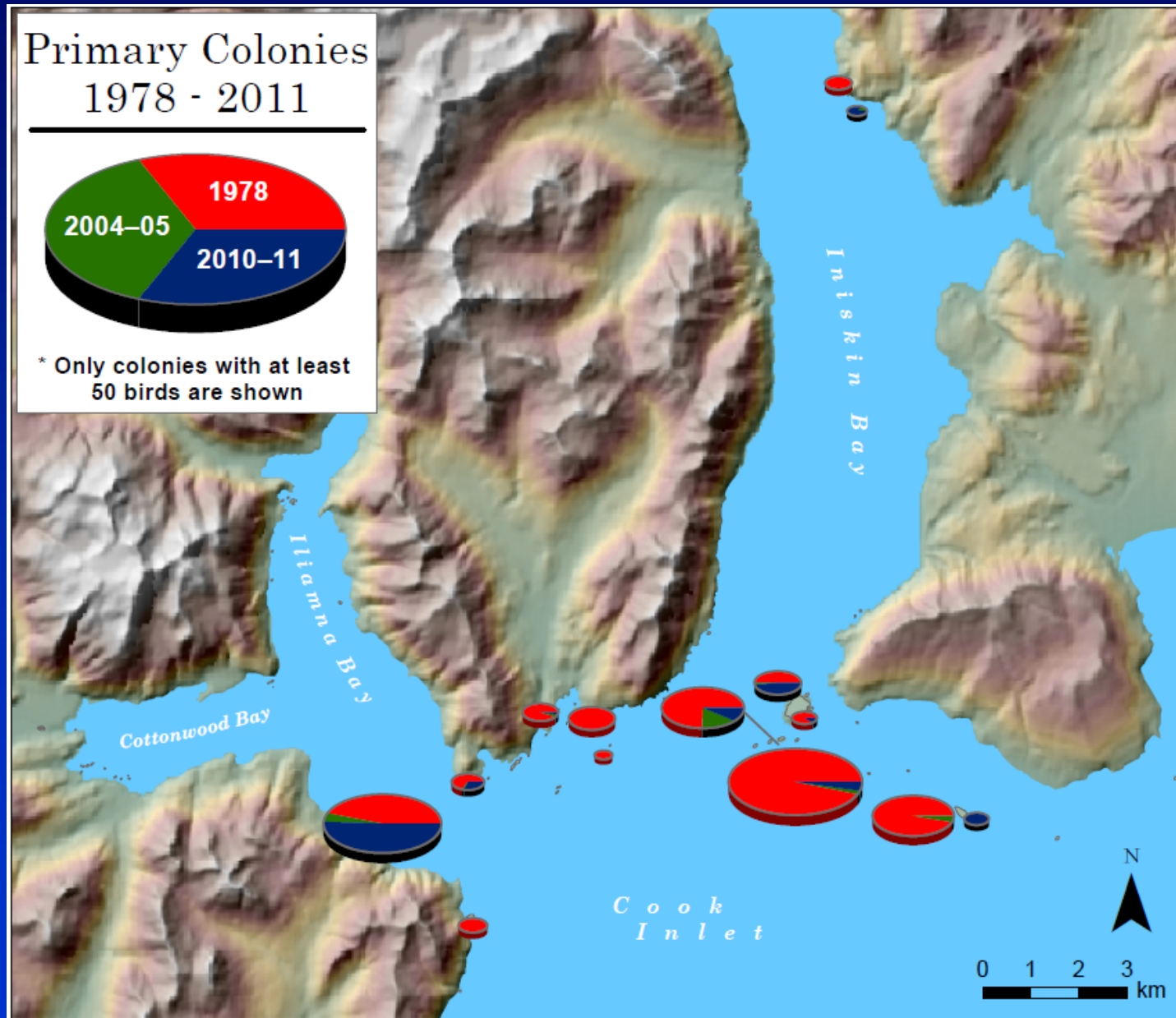
# Breeding Birds 2011 (Colony Size)



# Breeding Birds 1976-1978



# Breeding Birds 2011 (Colony Changes)



# Changes in Population Size

Species	AK Seabird Colony Catalog	Maximal total birds	
	1976-1978	2004–2005	2011
<b>Double-crested Cormorant</b>	149	74 (2)	31 (18)
<b>Pelagic Cormorant</b>	134	130 (21)	71 (66)
<b>Common Eider</b>	30	13 (0)	30 (30)
<b>Black Oystercatcher</b>	42	41 (41)	60 (49)
<b>Glaucous-winged Gull</b>	1498	1030 (198)	1307 (1301)
<b>Pigeon Guillemot</b>	119	95 (61)	96 (93)
<b>Tufted Puffin</b>	2060	84 (27)	128 (128)
<b>Horned Puffin</b>	140	51 (45)	57 (51)
<b>TOTAL</b>	<b>4172</b>	<b>1518 (295)</b>	<b>1780 (1736)</b>
<b>Red-faced Cormorant</b>	–	20	4 (4)
<b>Mew Gull</b>	–	74	2 (1)

# Summary (Birds)

- At least 72 marine-oriented bird species occur or probably occur within the area (all survey types, years)
- Seasonal pattern of species-richness (highest in spring and fall migration, lowest in mid- to late winter)
- Species-composition dominated numerically by waterfowl and seabirds, with substantial numbers of shorebirds in spring and sometimes in winter (Rock Sandpipers)

# Summary (Birds)

- Large numbers of waterfowl migrate through the area (>8,600 at times on fixed-wing surveys—late Aug–early Sept 2005)
- Less than 750 threatened Steller's Eiders winter here
- No Kittlitz's Murrelets seen, but habitat is appropriate for the species
- Several seaduck species molting and wintering (Scoters, Long-tailed Ducks, Harlequin Ducks)

# Summary (Birds)

- 19 species of conservation concern recorded
- Helicopter-based surveys show use of the area by Steller's Eiders and substantial concentrations of wintering birds
- Appears to have been a decline in populations of breeding birds, especially of puffins, since mid-1970s

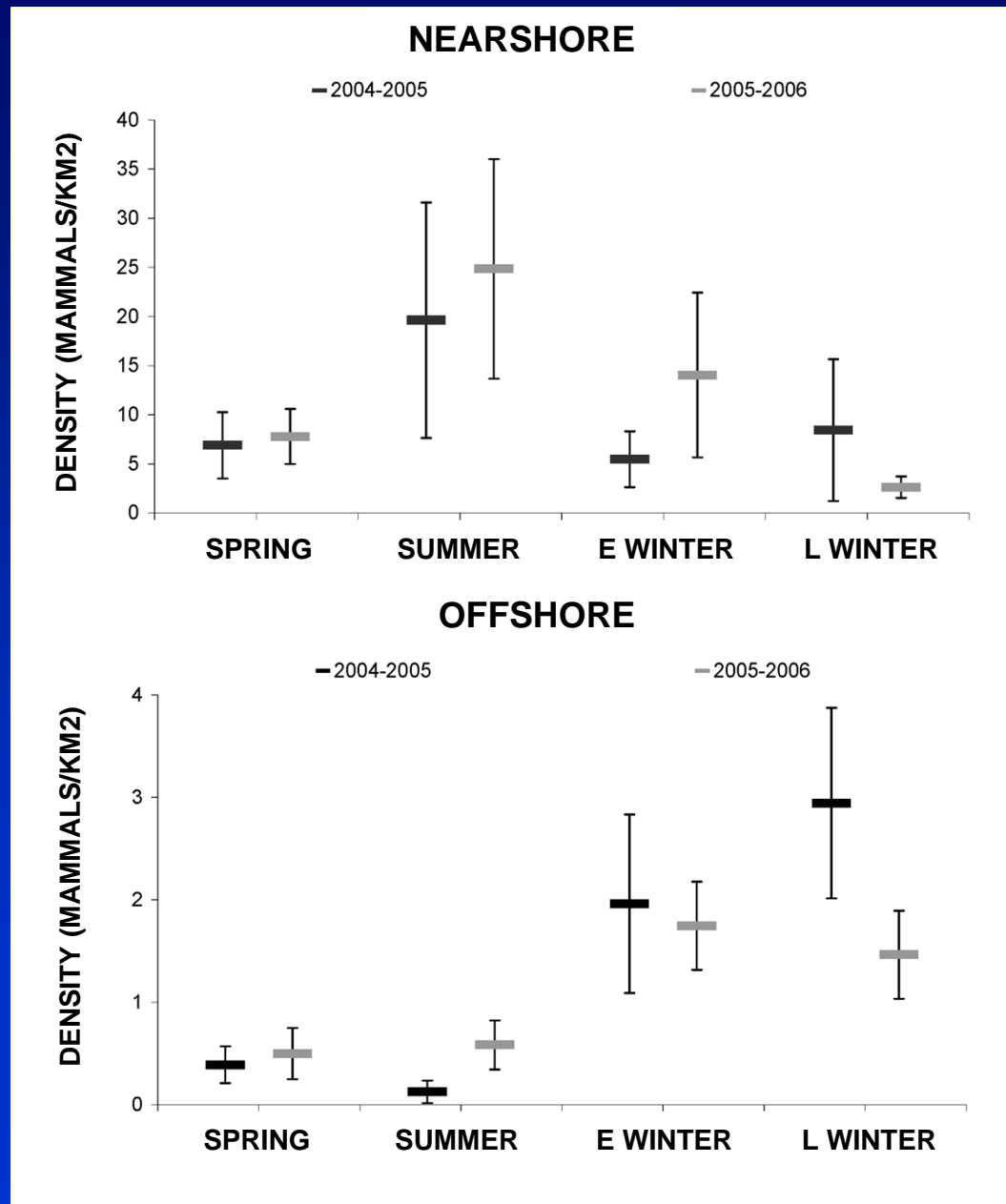
# Mammals (2004-2008)



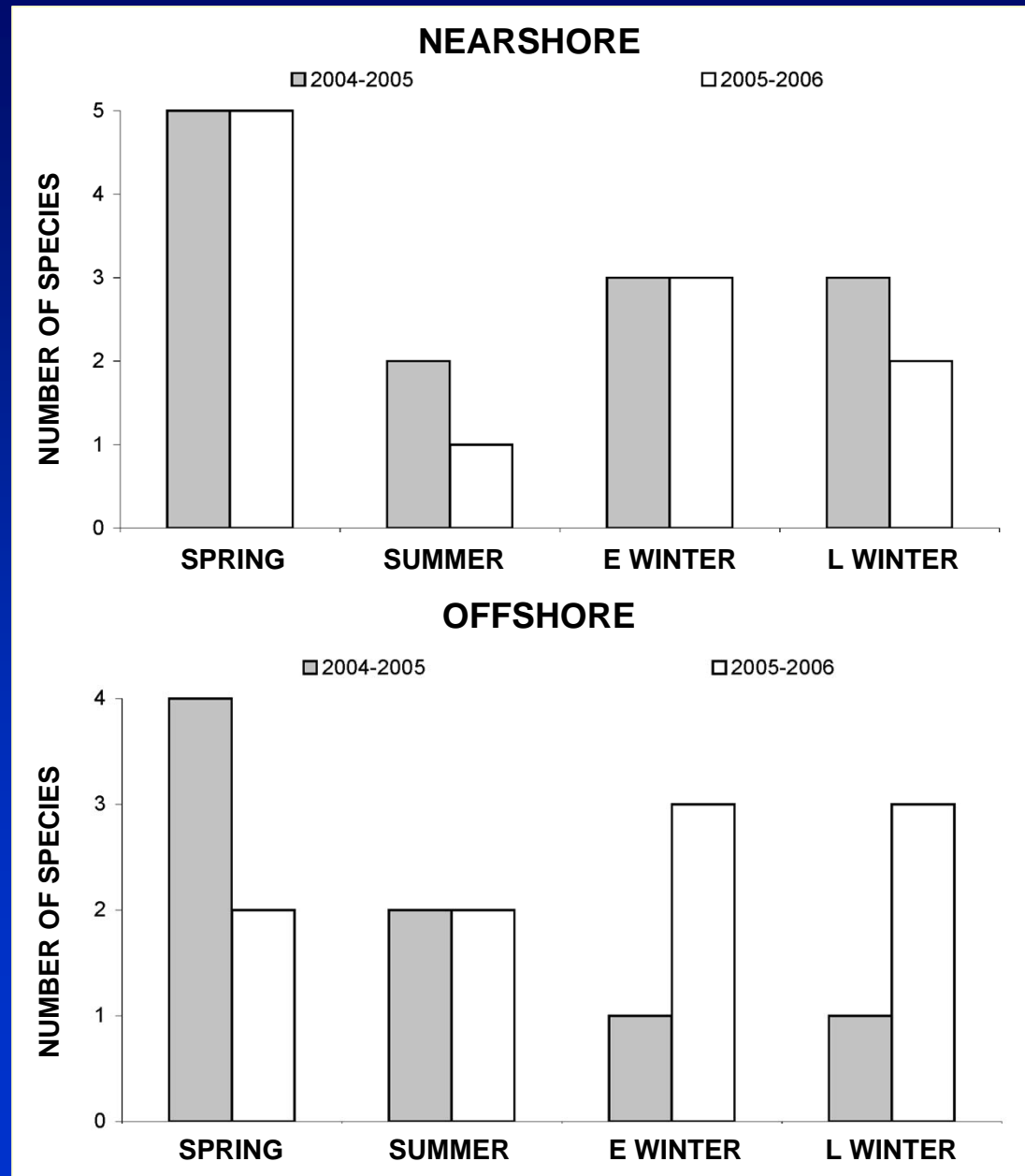
# Results

- 8 Boat-based surveys (2004–2006)
- ~2,400 mammals of at least 5 species
- 73 Helicopter-based surveys (2006–2011)
- ~40,250 mammals of at least 7 species
- 43 Fixed-wing surveys of Harbor Seals (2005, 2007–2008)

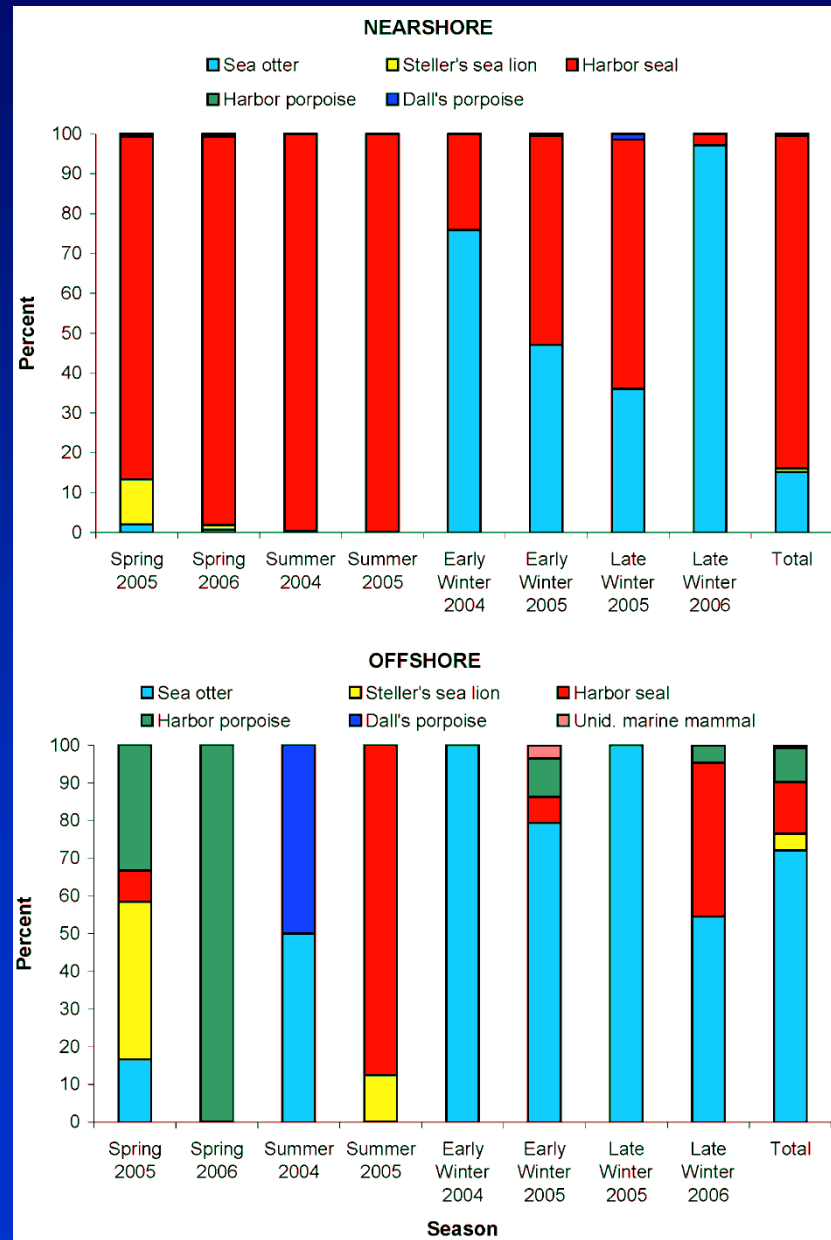
# Abundance (Boat)



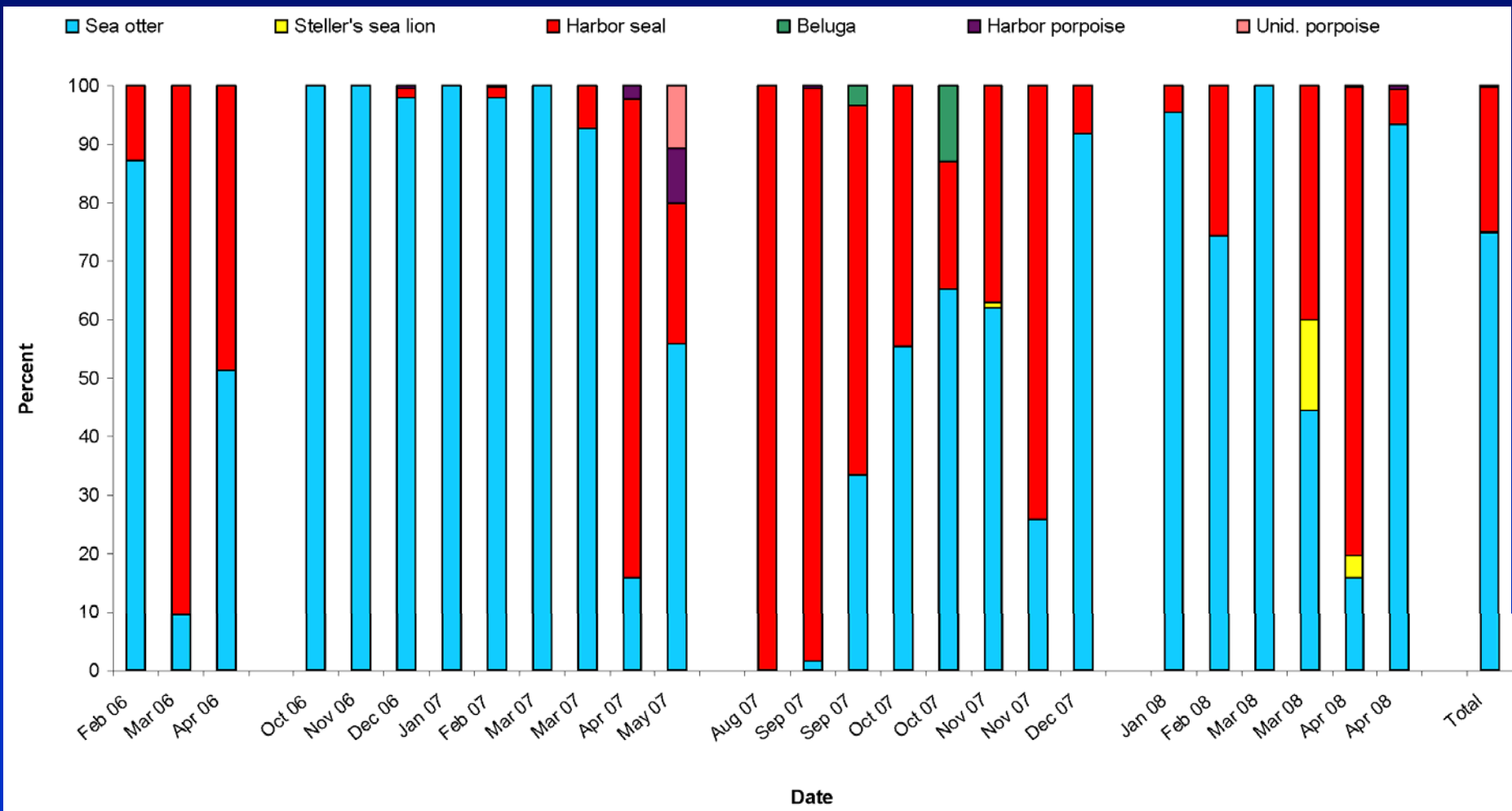
# Species Richness (Boat)



# Species-composition (Boat)



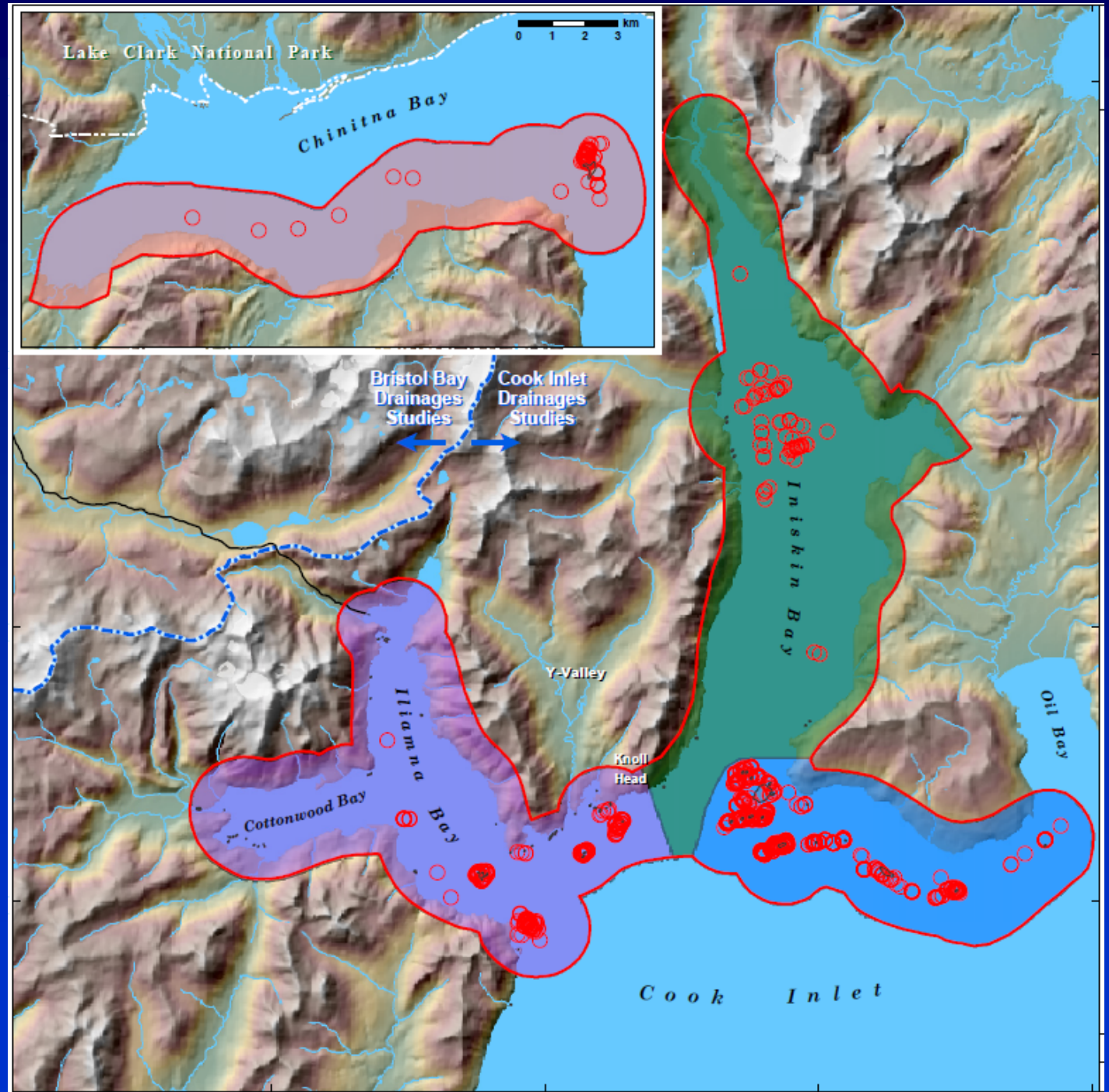
# Species-composition (Helo)



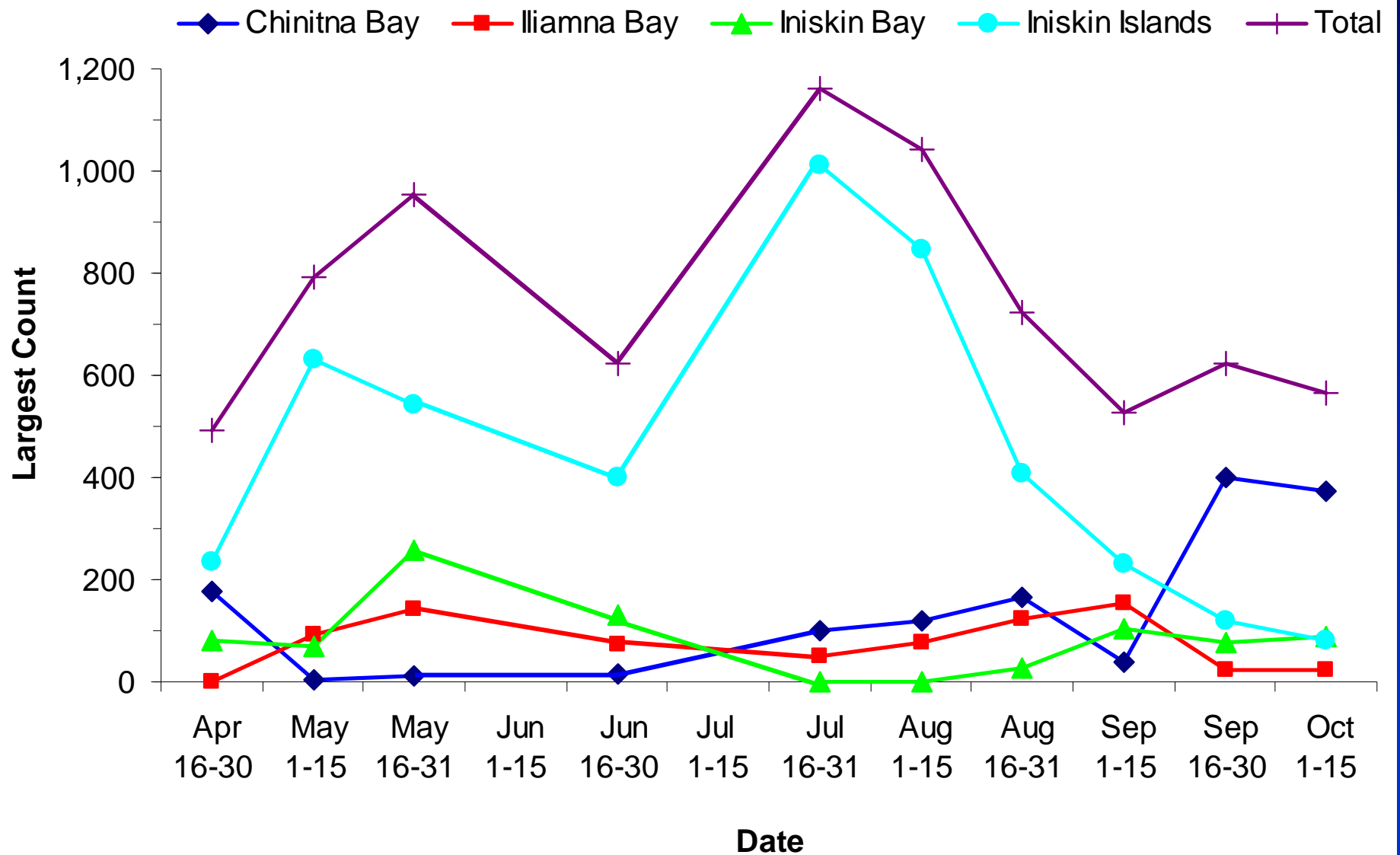
# Harbor Seal



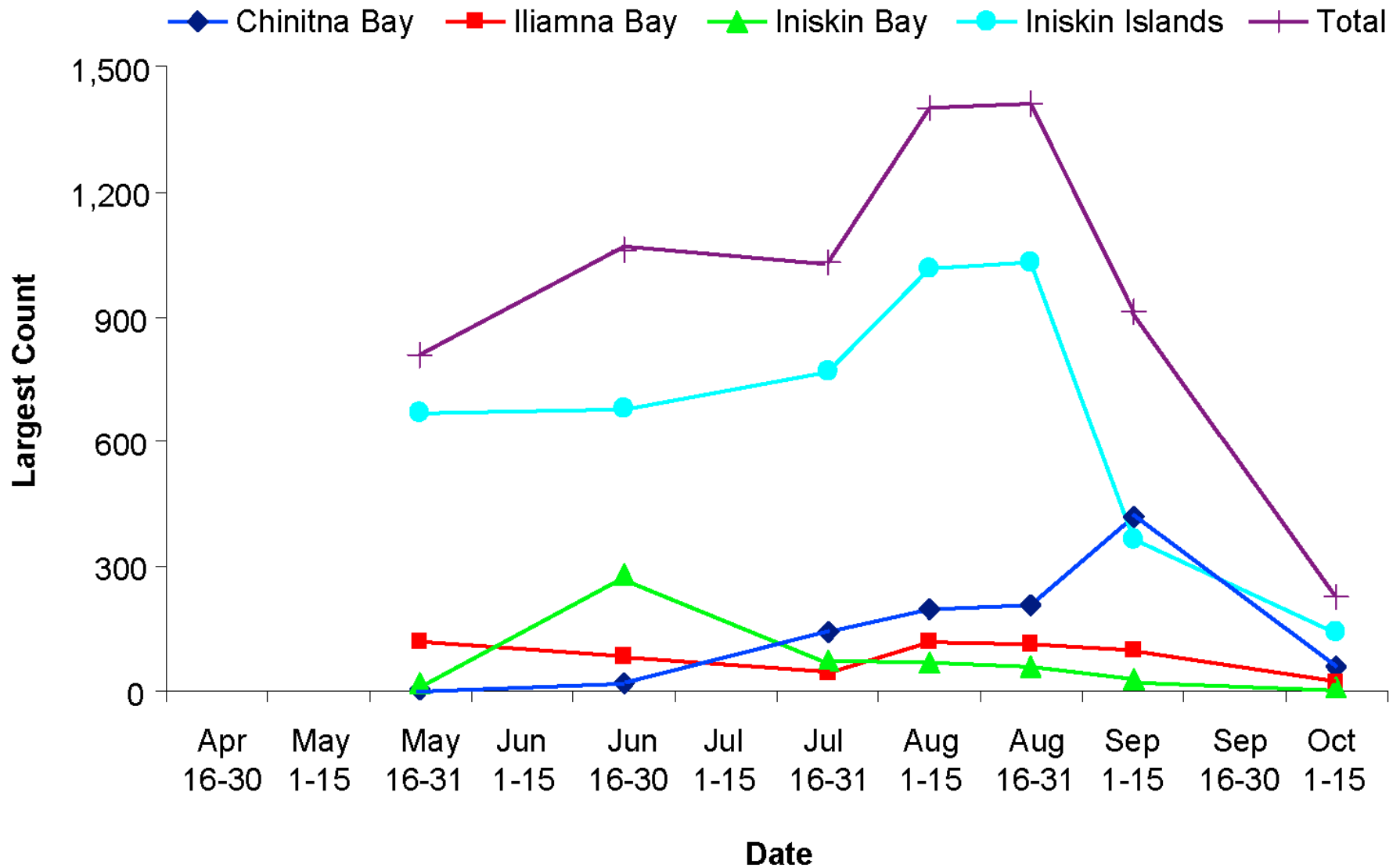
Fixed-wing  
Harbor  
Seal  
Surveys  
(2005,  
2007-  
2008)



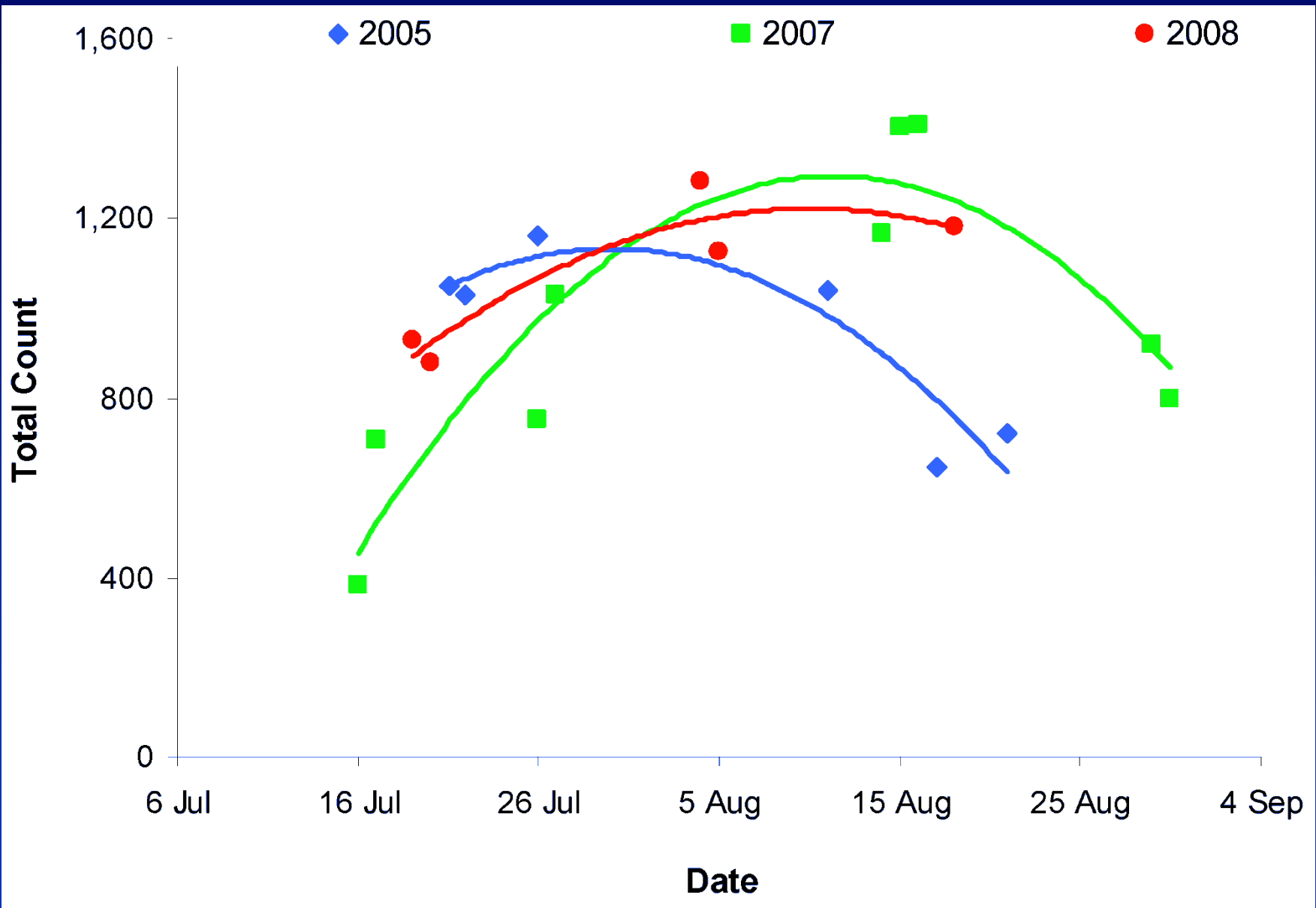
# Harbor Seals (2005)



# Harbor Seals (2007)



# Harbor Seals (Raw Counts)



# Harbor Seals (Peak Numbers)

- Highest adjusted counts 26 Jul 2006, 16 Aug 2007, 4 Aug 2008 (20-day window)
- Peak observed count 1,410 seals on 16 Aug 2007
- Corrected count for Julian Date, Time from Midday, then for number of seals not hauled out
- Estimated peak of 1,841 seals in the area (95% CI: 1,652–2,029)

# Mammals—Helo (2006–2011)



# Results

- 73 Helicopter-based survey periods (2006–2011)
- ~15,500 Sea Otters
- ~14,500 Harbor Seals
- 90 Steller's Sea Lions
- 68 Harbor Porpoises
- 1 Dall's Porpoise
- 1 Killer Whale
- 4 Belugas (+ 23 off-survey)

# Results

- Overall community dominated numerically by Sea Otters in winter—but highly seasonal
- Harbor Porpoises occasionally seen, especially in spring (similar to boat-based surveys)
- Harbor Seals seen throughout area all year, but not focus of helicopter-based sampling
- Belugas seen primarily in 2007—in both Chinitna and Iliamna bays; 1 record of 2 animals in Iliamna Bay, Oct 2008

# Species Richness & Composition

- Only 1–2 species recorded on any survey, so no plots of richness or composition
- Primarily Sea Otters and Harbor Seals
- A few Steller's Sea Lions, Harbor Porpoises, and Belugas, and single Dall's Porpoises and Killer Whales

# Sea Otter



# Sea Otter

- Present all year (i.e., resident as a species), although most individuals are migratory
- Present primarily in fall and winter, especially Nov–Apr (northernmost extent of Kamishak Bay population)
- Distributed throughout entire area, but especially common near Iniskin Islands
- Movements related to bad weather and sea ice?

# Highly Seasonal Environment!

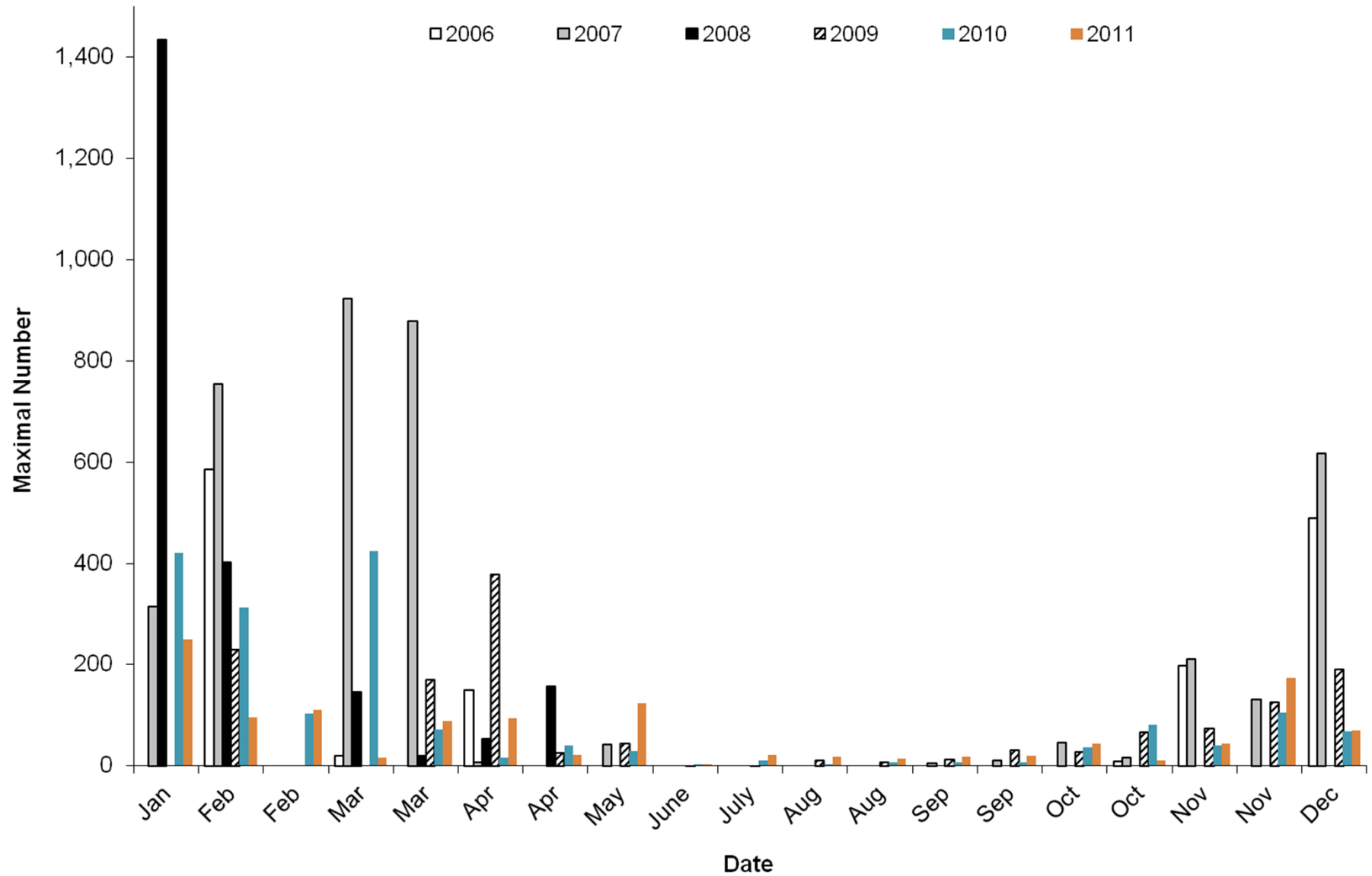


February, April 2006

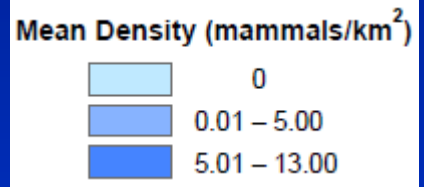
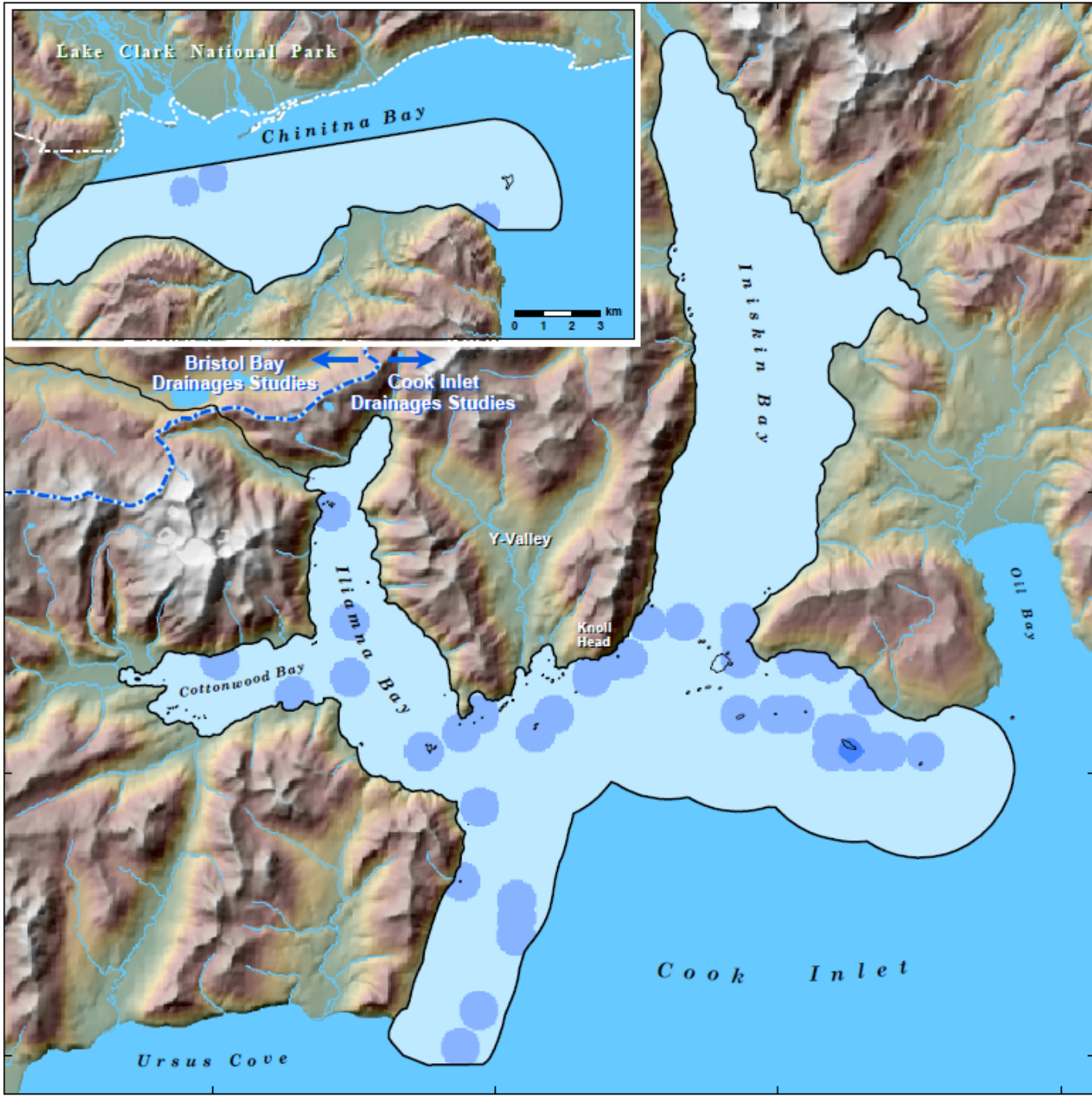


March 2006

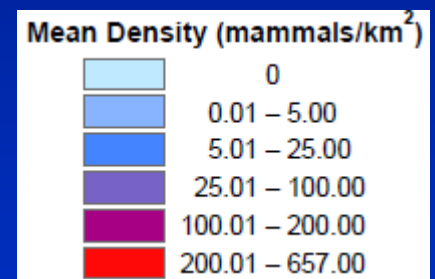
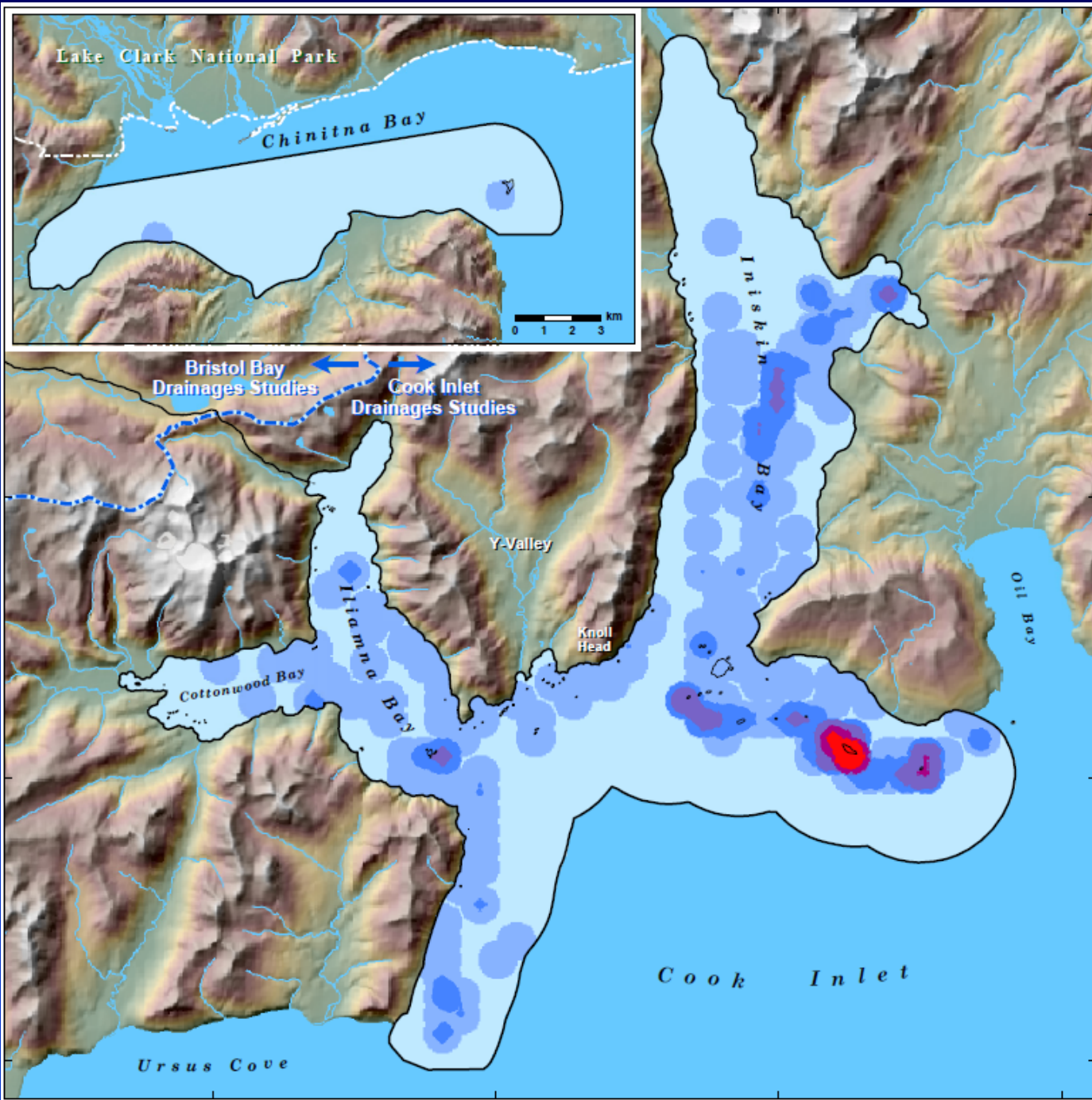
# Sea Otter (2006–2011)



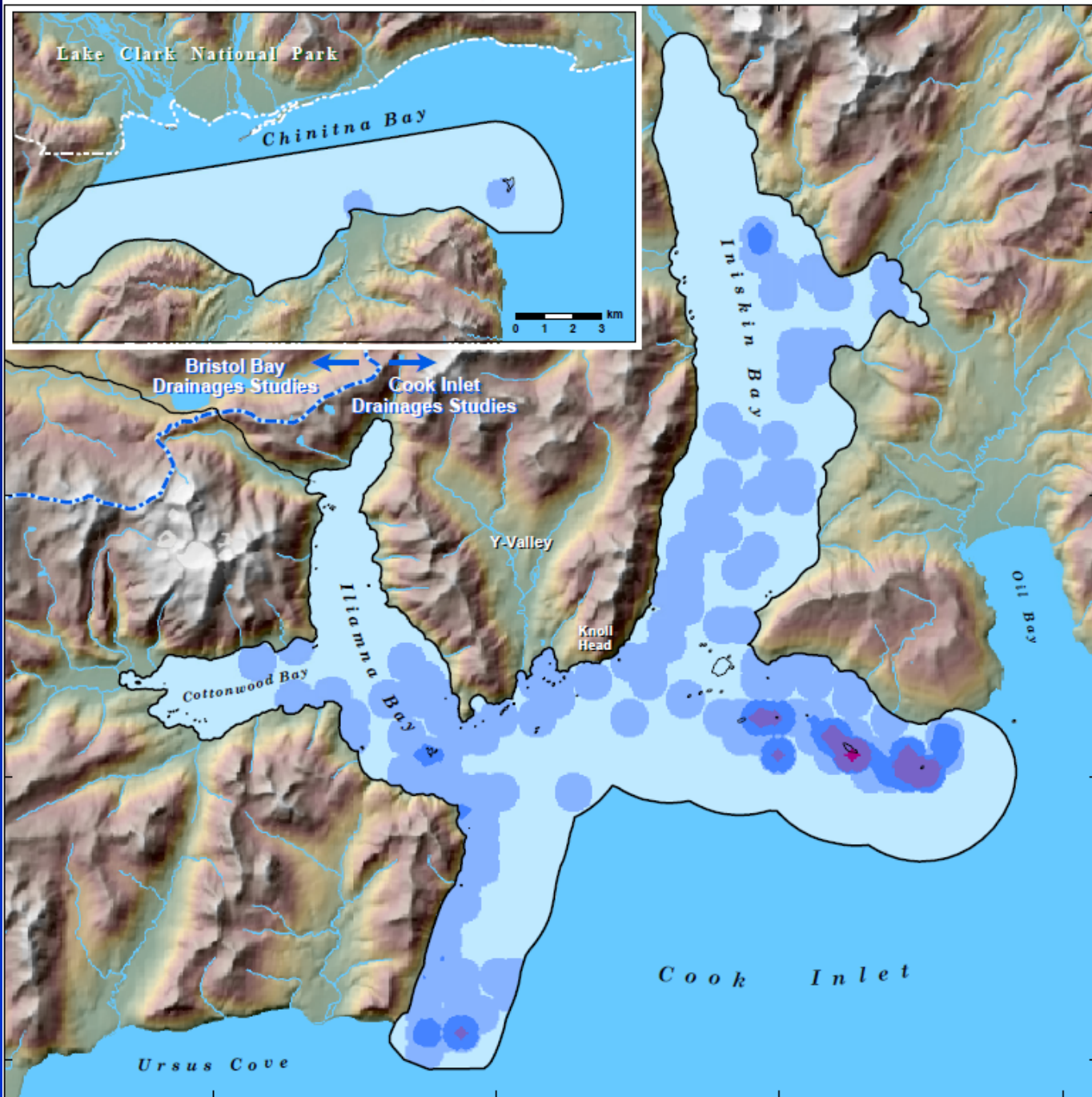
# Sea Otter Distribution Aug–Oct 2006–2008



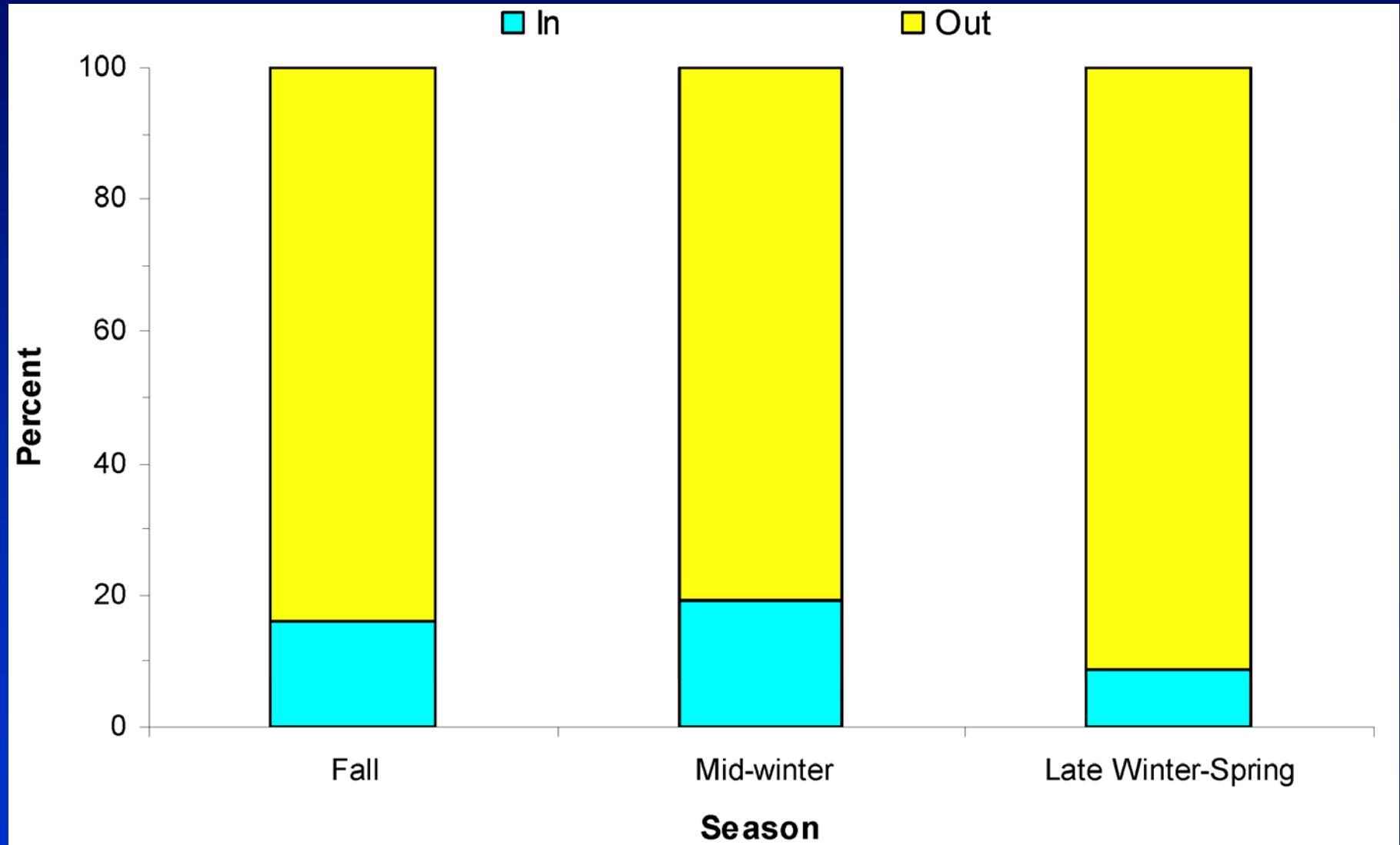
# Sea Otter Distribution Nov–Feb 2006–2008



# Sea Otter Distribution Mar–May 2006–2008



# Sea Otter Locations (2006–2008)



Most otters occur outside of bays

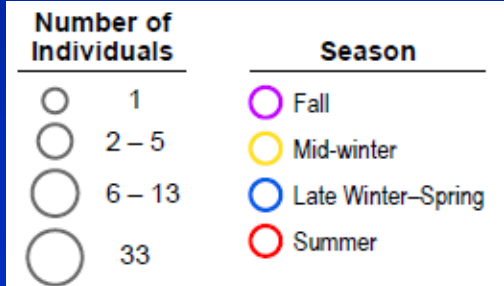
# Steller's Sea Lion



# Steller's Sea Lion

- Total 90 recorded on helicopter surveys (2006–2011)
- Seen primarily on eastern end of Iniskin Islands
- Concentrate in area during the spring (following schools of forage fishes?)

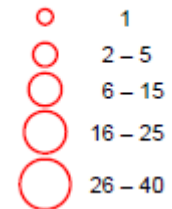
# Steller's Sea Lion Distribution (Boat & Helicopter) 2004-2011



# Steller's Sea Lion (Ted Otis, ADF&G) 1978-2002



## Number of Individuals



# Harbor Seal



Not surveyed consistently by helicopter— want to avoid chance of disturbance

An aerial photograph showing two belugas swimming in a wide river. The water is a murky, brownish-green color with small ripples. The belugas are white, and their dorsal fins are visible above the water. One is in the lower center, and the other is further up and to the right. The word "Beluga" is written in yellow text at the bottom center of the image.

Beluga

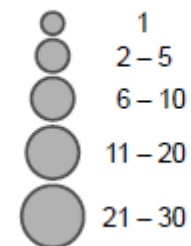
# Beluga

- Previous records in the area, but none during our surveys until fall 2007
- First seen in Chinitna Bay by ADFG personnel in mid-Sep 2007 (25–30, including ~10 calves)
- Also in Iniskin Bay mid-Sep 2007 (~12)
- Seen by us in Chinitna Bay (7+) and Iliamna Bay (1 cow/calf) in late Sep 2007
- Seen by us in Chinitna Bay mid-Oct (14) and in Iliamna Bay in late Oct 2007 (3+, included calf)
- J. Houghton saw 2 in Iliamna Bay, Oct 2008

# Beluga 2004–2008 (All but one record in 2007)

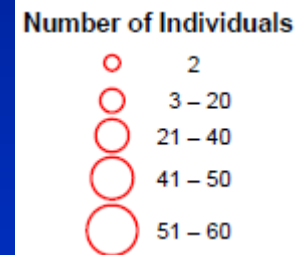


## Number of Individuals



Month	
●	September
●	October

# Beluga (Ted Otis, ADF&G) 1978–2002



# Summary (Mammals)

- Nine marine mammal species occur within the area
- Seasonal pattern of species-richness (highest in spring, lowest in late winter—boat surveys)
- Species-composition dominated by Harbor Seals (spring–summer) and Sea Otters (fall–winter)
- 5 Species are of conservation concern (Sea Otter, Steller's Sea Lion, Gray Whale, Beluga, Harbor Seal)

# Summary (Mammals)

- Steller's Sea Lions occur primarily in spring and early summer (but some winter records)
- Cetaceans rare overall (single records of Minke Whale, Gray Whale, Killer Whale)
- Belugas occurred primarily in fall 2007 (1 record fall 2008); otherwise are absent
- Estimated maximum of ~1,840 seals in this area in 2007 (~36% of all seals in western Cook Inlet)

**QUESTIONS?  
OR JUST TIME FOR LUNCH?**

