

# Remote Video Monitoring of Steller Sea Lions

**Principal Investigator: John Maniscalco**  
**Co-Investigators: Pam Parker, Shannon Atkinson, Don Calkins, Karin Harris, Emily Teate, Craig Matkin, Rebecca Taylor**



Photo by Elizabeth Moundalexis



**Remote-control cameras  
Equipped with**

**\*Zoom**

**\*Pan/Tilt**

**\*Windshield**

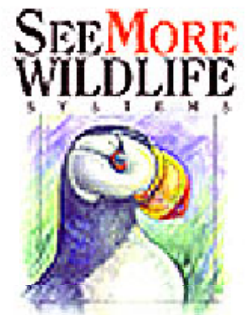
**washer/wipers**

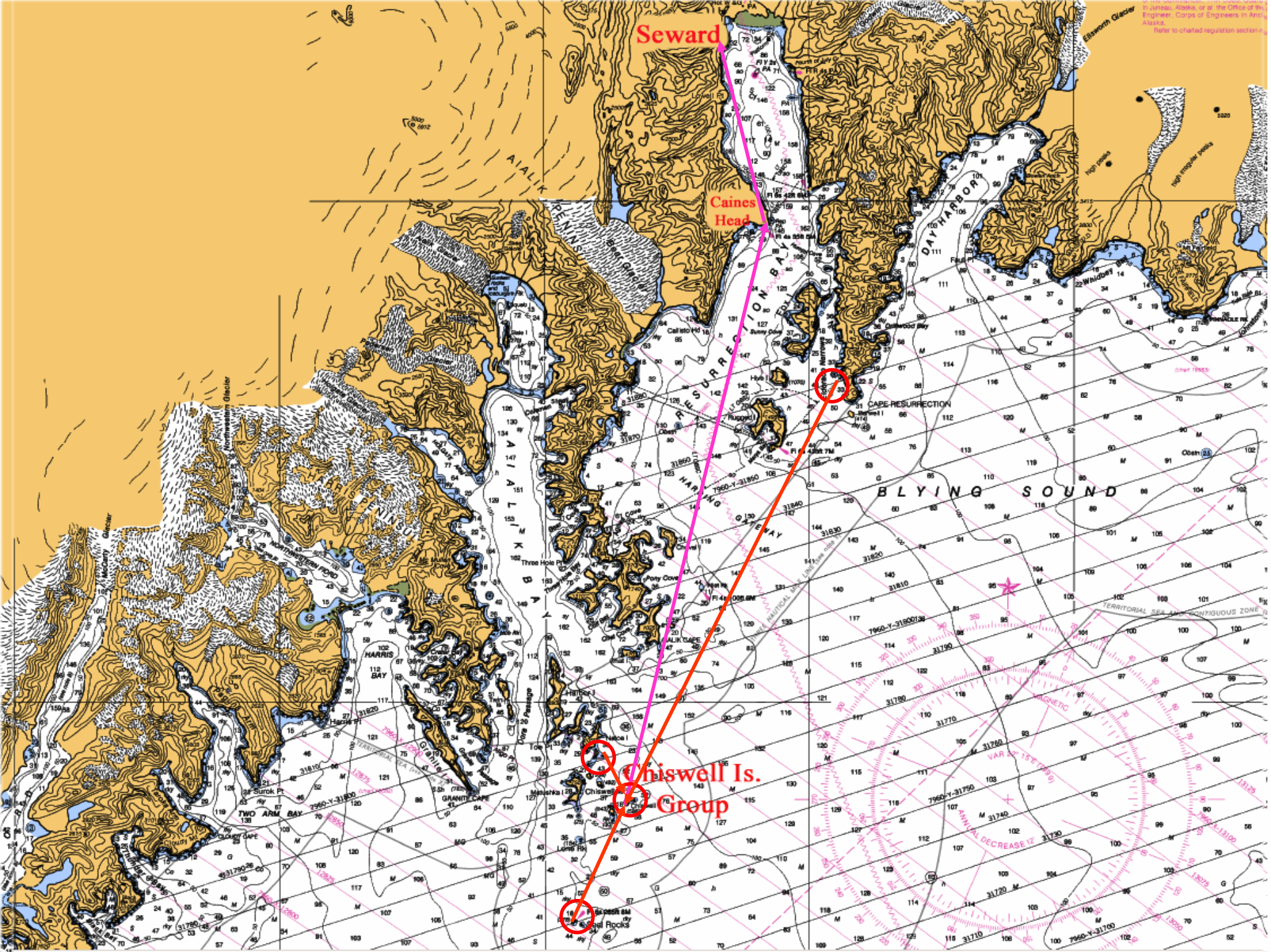
**SEE MORE  
WILDLIFE  
SYSTEMS**



# Control tower

- \* Microwave
- \* VHF antennas
- \* Solar panels
- \* Wind generators
- \* Anemometer
- \* Weather data logger





Seward

Caines Head

Chiswell Is. Group

BLYLING SOUND

CAPE RESURRECTION

© United States, Alaska, or of the Office of the Engineer, Corps of Engineers in Army Alaska.  
Refer to charted registration section 4.

# At The Alaska SeaLife Center



SWS Remote Control 1.0.9D  
File Options Window ViewPort Quality ViewPort Location (B3: 20 3 207 0 255 255 227 0 0)

Zoom

Wide

0  
1  
2  
3  
4  
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7  
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9  
10

Close-Up  
Zoom In Zoom Out  
Wipe Lens

Image Capture  
Snap Picture  
Back Capture Ready

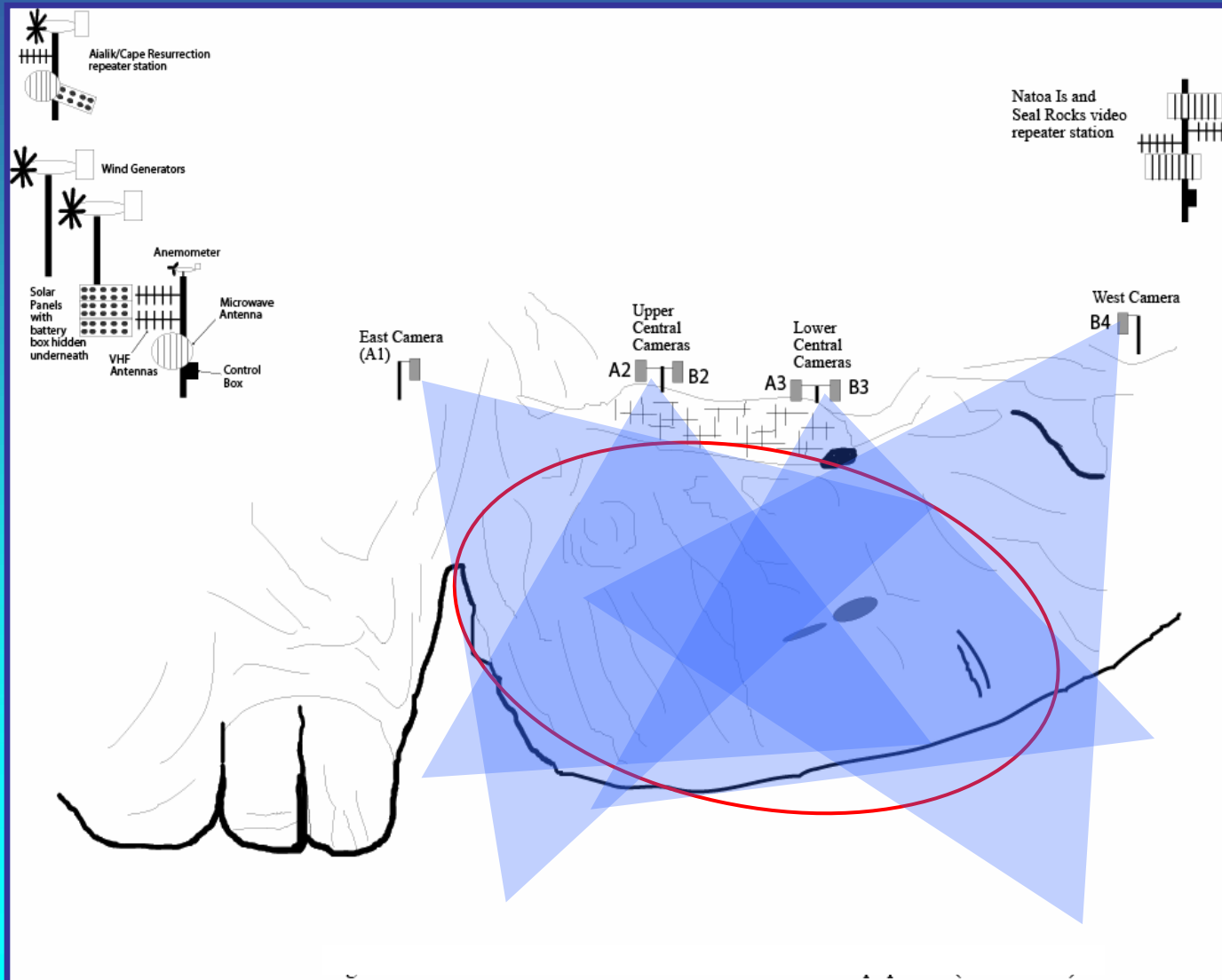
Up  
Down  
Left  
Right  
Stop

Camera Select  
A1-East  
A2  
A3  
B2  
B3  
B4-West  
Path B ON  
Path B OFF  
Grotto ON  
Grotto OFF  
Grotto Cam  
Seal ON  
Seal Lower 1  
Seal Lower 2  
Seal Upper  
Seal OFF  
Path A OFF  
Benji

Connection UP

SEE MORE WILDLIFE

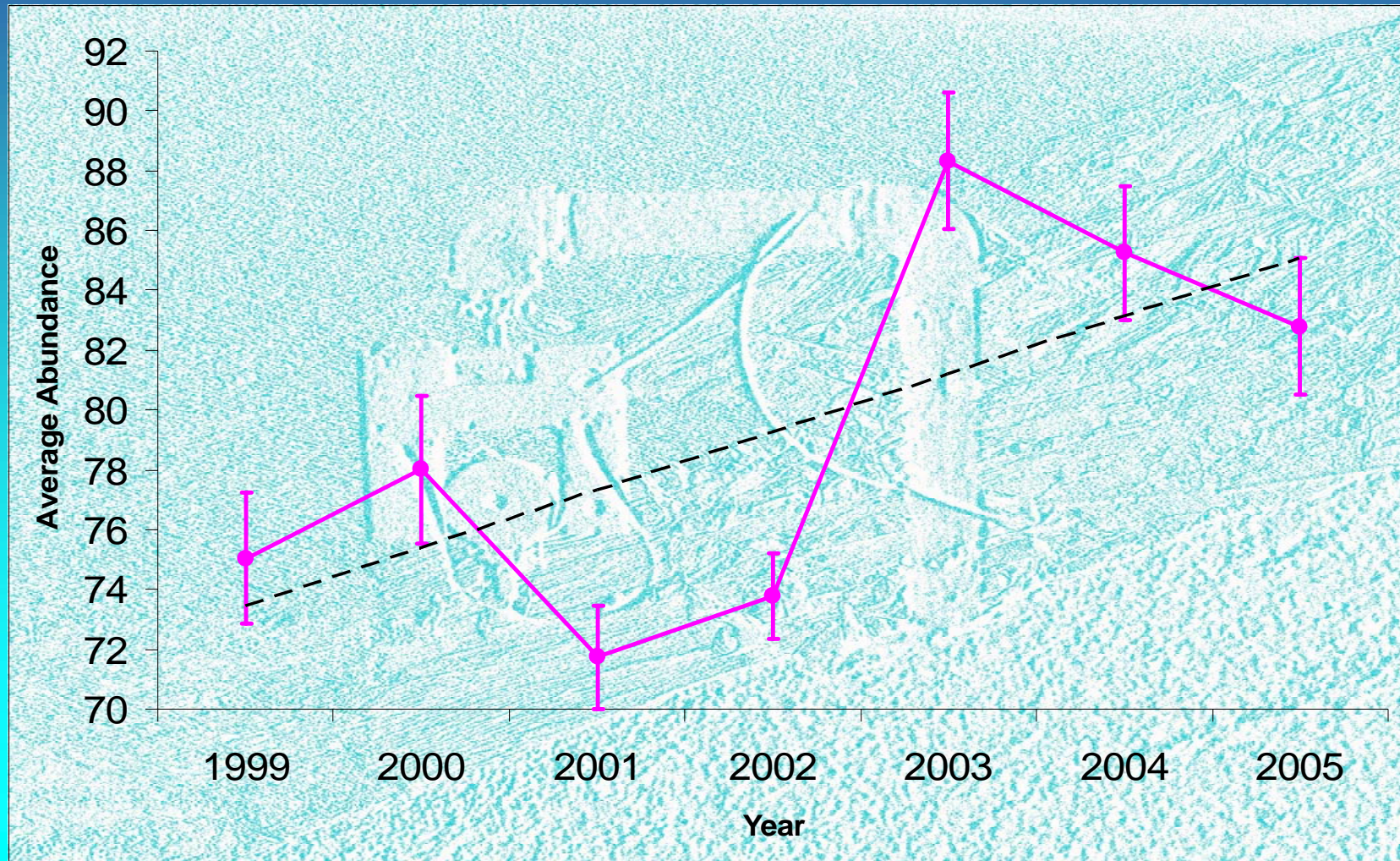
# Coverage of the Rookery



# Chiswell Island 1982 vs. 2002

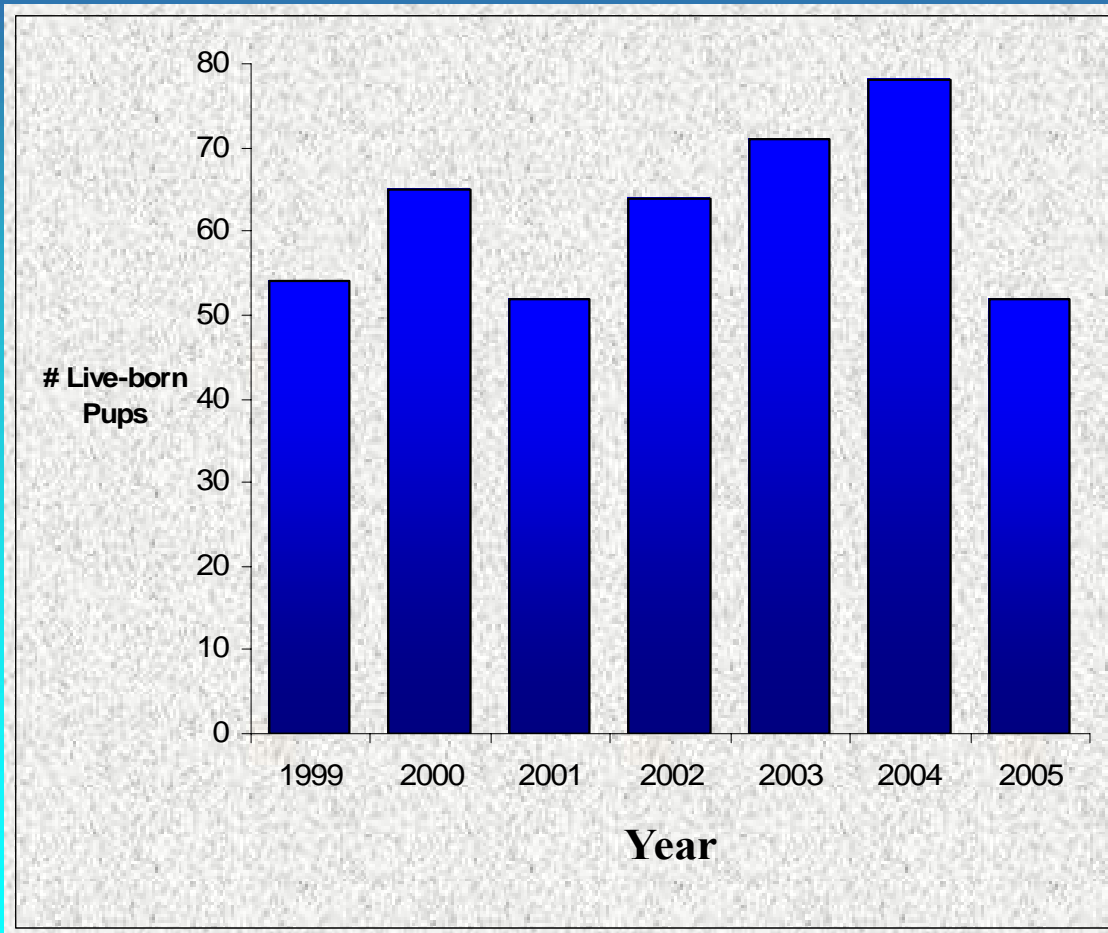


# Average summer abundance of age 1+ sea lions at Chiswell Island ( $\pm 1$ SE)





# Chiswell Island Pup Production 1999 - 2004



1999.....54  
2000.....65  
2001.....52  
2002.....64  
2003.....71  
2004.....78  
2005.....52

# Studies Being Accomplished

1. Maternal Investment
2. Characteristics of Parturition
3. Alloparental Care
4. Pupping Site Fidelity
5. Early Pup Mortality
6. Killer Whale Predation
7. Reproductive Performance of Females
8. Effects of Branding
9. Effects of Rookery Disturbance
10. Breeding Bull Dynamics
11. Occurrence of *Zalophus* in Alaska
12. Remote 3D Photogrammetry



## Future Studies

Population Estimates and Trends

Seasonal and Long-term  
Movements

Survivability

Synthesis of Studies

# Studies Being Accomplished

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# Maternal Investment Studies

- Identification of females



# Parturition

**Females give birth late May to July**



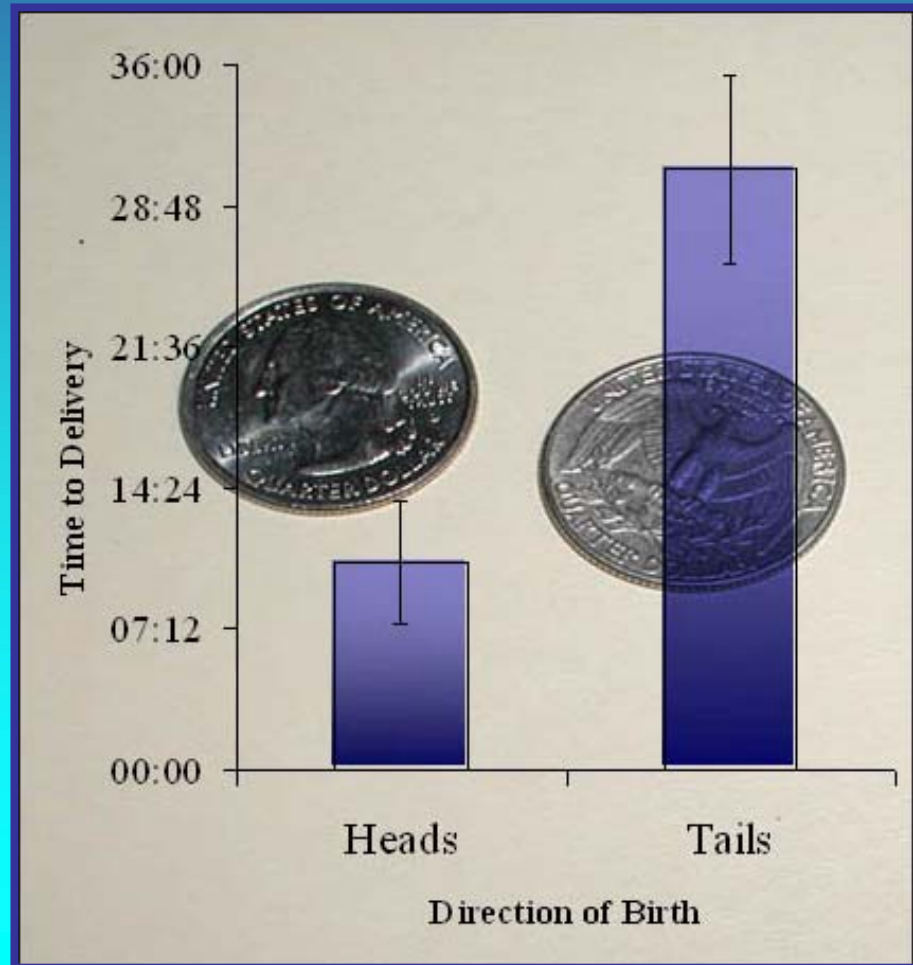
**~100 births recorded (VHS & DVD)**

# Parturition

2001-2003

**Heads = 27 females**

**Tails = 30 females**



# Maternal Care - Parturition

2001 = June 10

2002 = June 10

2003 = June 10

2004 = June 11



Individual females did differ significantly in their dates of parturition from year to year ( $n = 13$ ; RM ANOVA,  $P = 0.025$ ).

2001 = June 13

2002 = June 15

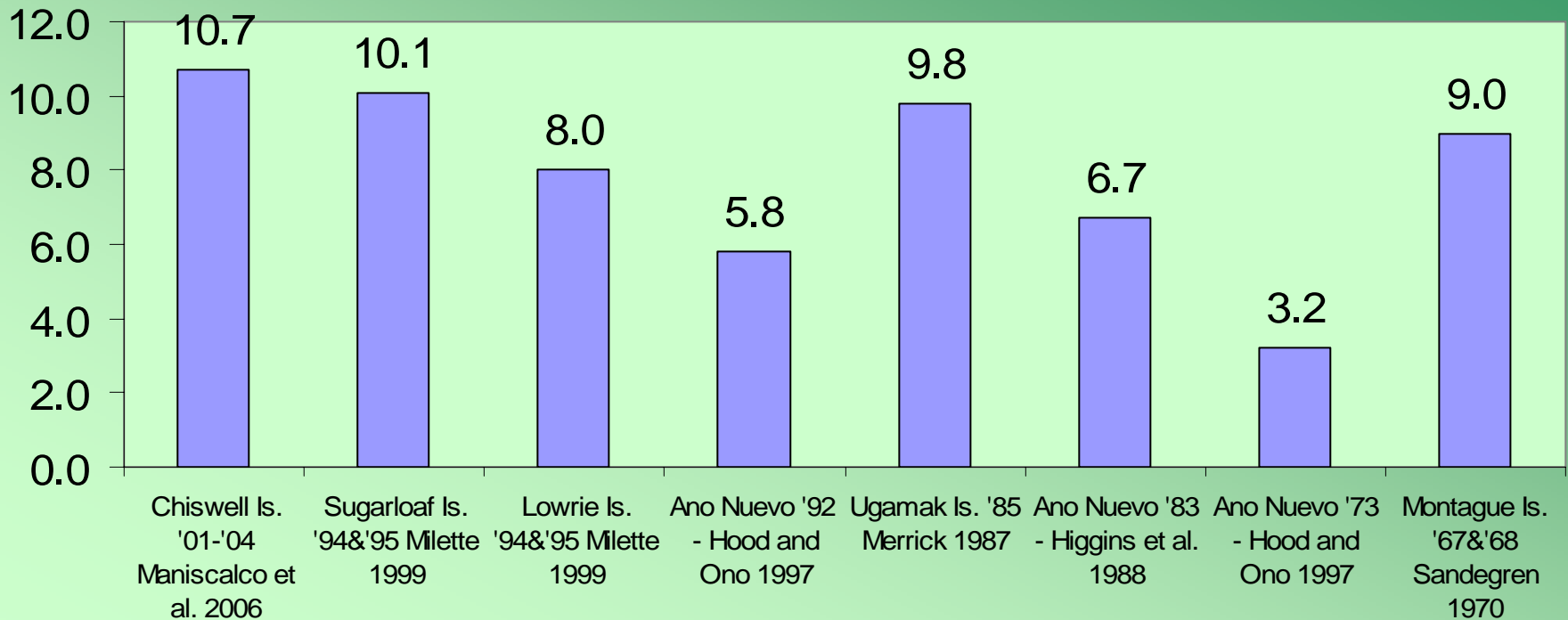
2003 = June 8

2004 = June 10



# Maternal Care – Perinatal Periods

## Average SSL Perinatal Periods

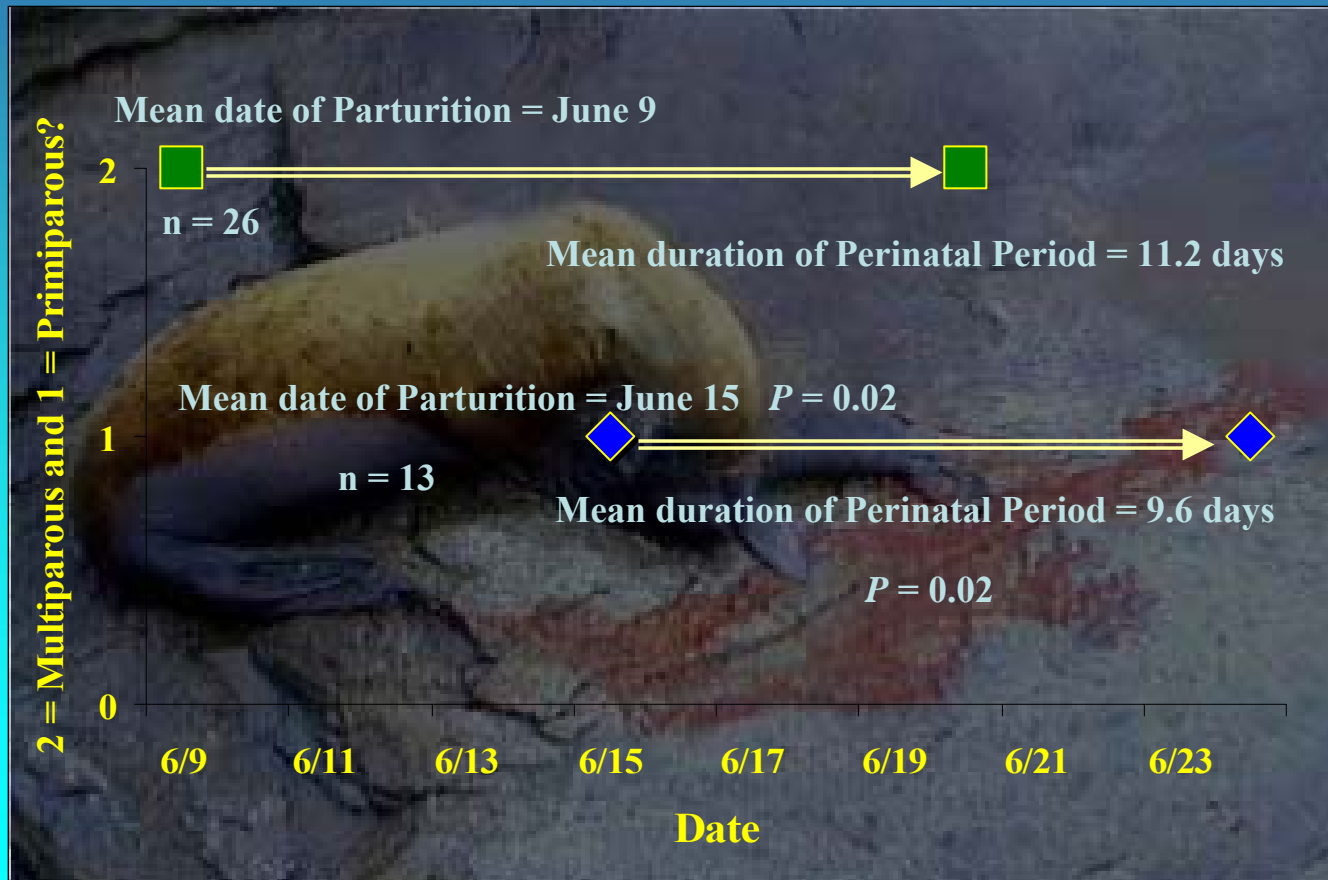




# Maternal Care

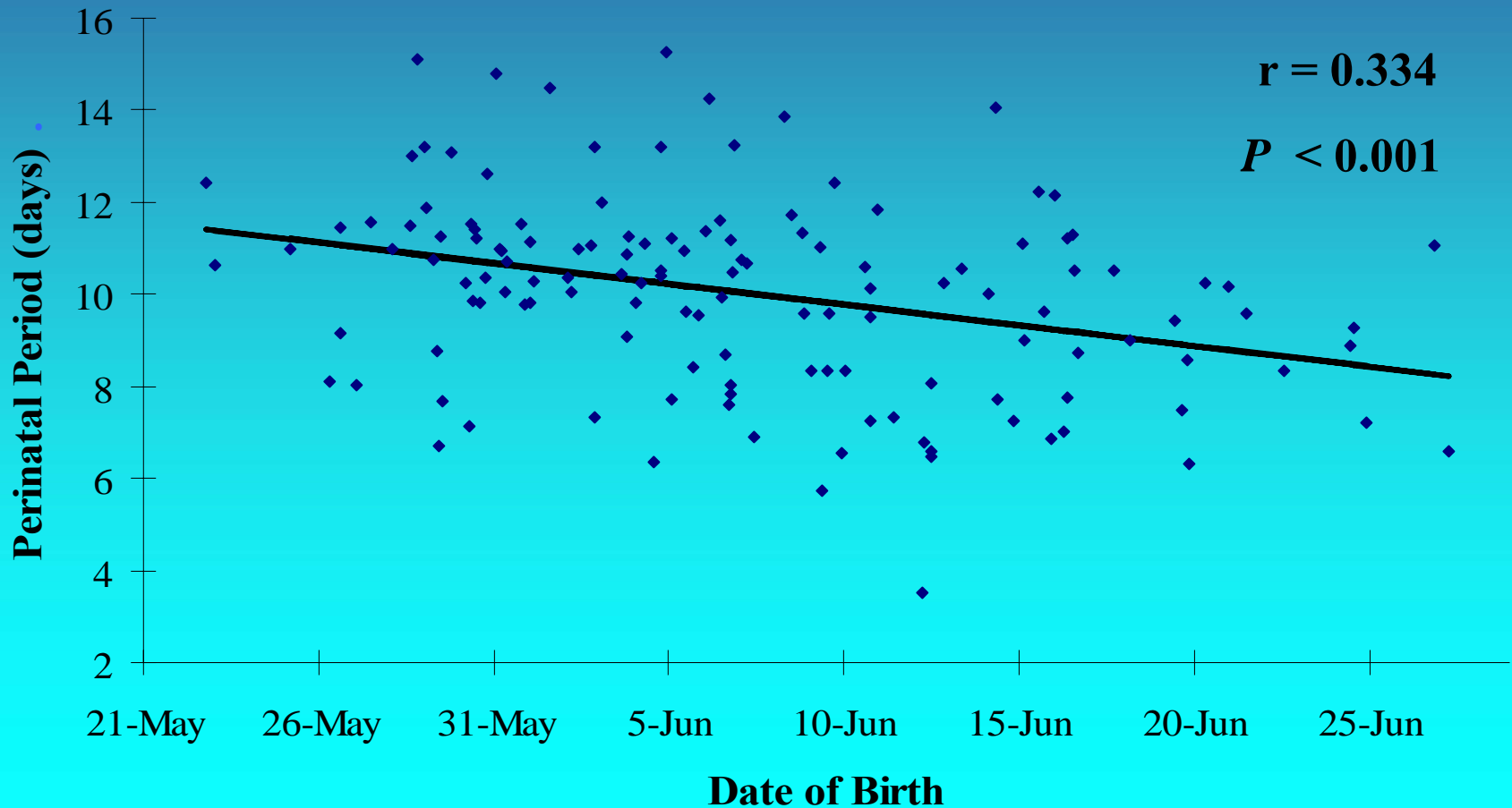
## Parturition and Perinatal Period

### Multiparous vs. Primiparous(?)

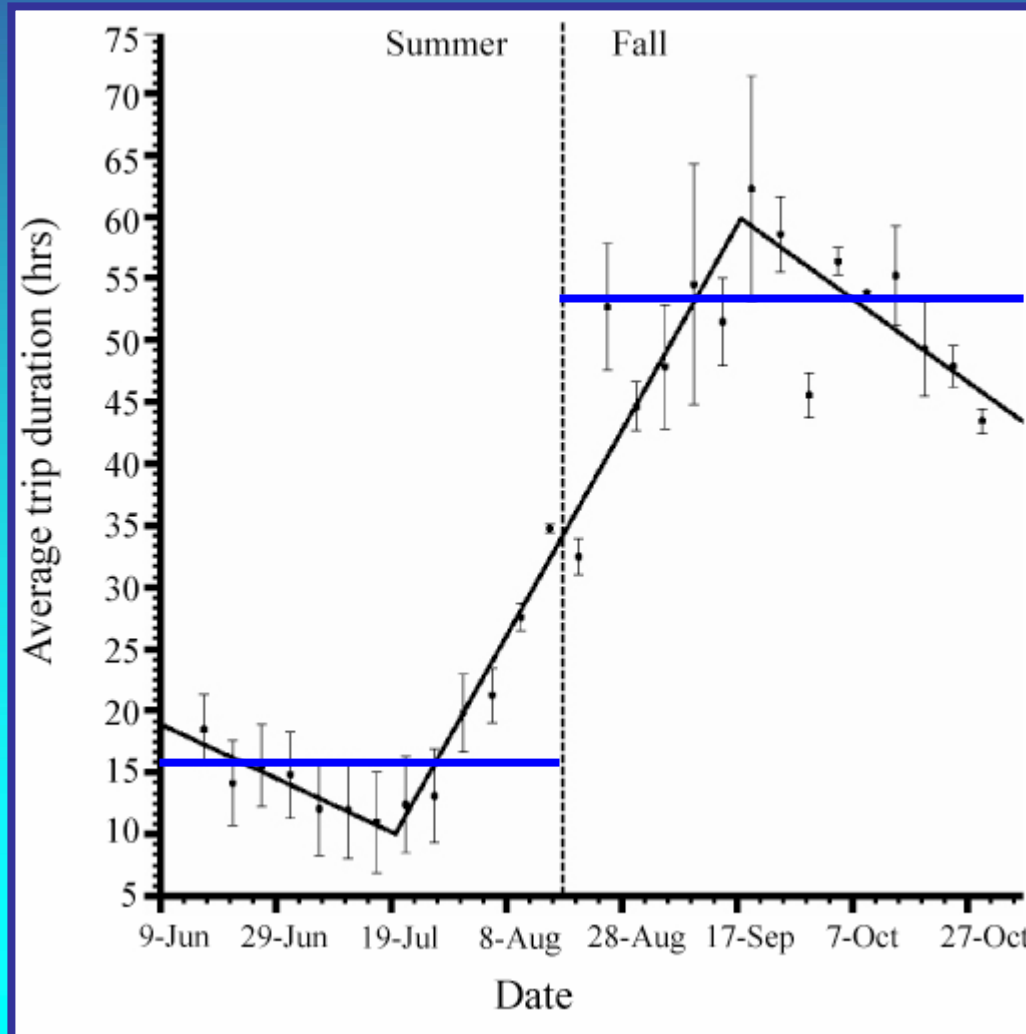


# Maternal Care

## Parturition and Perinatal Period



# Maternal Care – Foraging Trips



Summer  
mean = 16.5 hrs

Autumn  
mean = 55.7 hrs

# Parturition and Maternal Care



## Presentations

Maniscalco, J. M., S. Atkinson, A. M. Burdin, D. G. Calkins. 2003. Population dynamics, maternal investment, and early pup mortality in Steller sea lions at Chiswell Island. *Oral Presentation* at Marine Science in the Northeast Pacific, Jan 13-17. Anchorage, AK

Parker, P., J. Maniscalco, S. Atkinson, K. Harris, R. Baptista. 2003. Summer to autumn increases in maternal investment for individual Steller sea lions (*Eumetopias jubatus*) in the Northern Gulf of Alaska. *Poster Presentation* at 15<sup>th</sup> Biennial Conference on the Biology of Marine Mammals, Dec 14-19. Greensboro, NC

Maniscalco, J., S. Atkinson. 2003. Characteristics of parturition and neonatal behavior in Steller sea lions (*Eumetopias jubatus*). *Poster Presentation* at 15<sup>th</sup> Biennial Conference on the Biology of Marine Mammals, Dec 14-19. Greensboro, NC

# Parturition and Maternal Care



## Publications

Maniscalco, J. M., S. Atkinson, P. Armato. 2002. Early maternal care and pup survival in Steller sea lions: A remote video monitoring project in the northern Gulf of Alaska. *Arctic Research of the United States* 16:36-41.

Maniscalco, J. M., P. Parker, S. Atkinson. 2006. Interseasonal and interannual measures of maternal care among individual Steller sea lions (*Eumetopias jubatus*). *Journal of Mammalogy* 87:304-311.

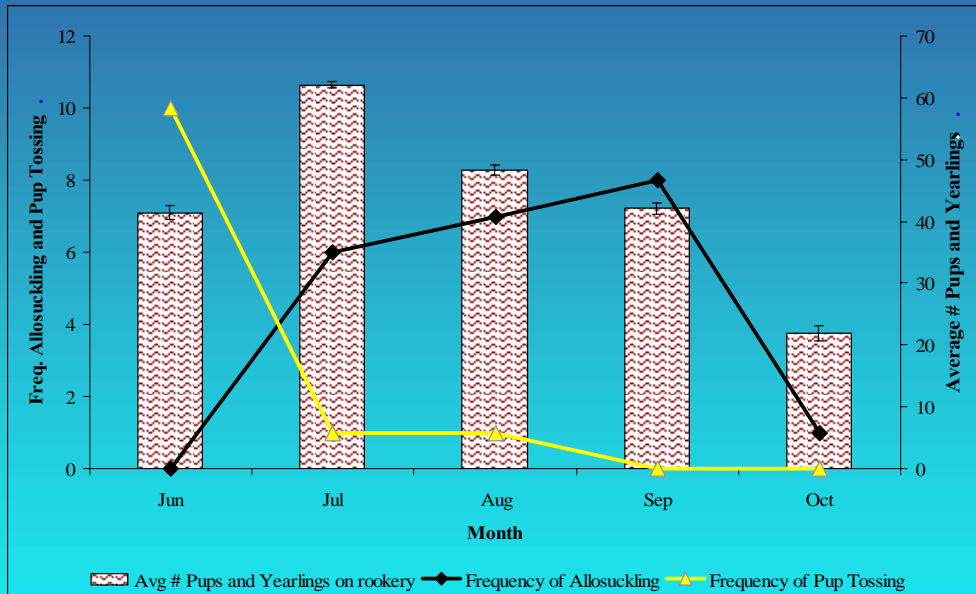
**See Also:** Synopsis of Research on Steller Sea Lions – Chapter 32

# Studies Being Accomplished

1. Maternal Investment
2. Characteristics of Parturition
- 3. Alloparental Care**
4. Pupping Site Fidelity
5. Early Pup Mortality
6. Killer Whale Predation
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# Alloparental Care



**23 cases of allosuckling observed over the years 2001-2004**

	Primiparous (n = 6)	Multiparous (n = 6)
Vocals/min	0.06	1.73
Allosuckling Duration (min)	5.85	0.38

**Also: One case of adoption**

# Alloparental Care



## Presentation and Publication

Maniscalco, J. M., K. Harris. 2005. Observations of alloparental care in Steller sea lions. *Poster Presentation* at Animal Behavior Society, 42<sup>nd</sup> Annual Meeting. Aug 6-10, Snowbird, UT

Maniscalco, J. M., K. R. Harris, S. Atkinson, P. Parker. *In Press*. Alloparenting in Steller sea lions (*Eumetopias jubatus*): Correlations with misdirected care and other observations. *Journal of Ethology*.

**See Also:** Synopsis of Research on Steller Sea Lions – Chapter 29

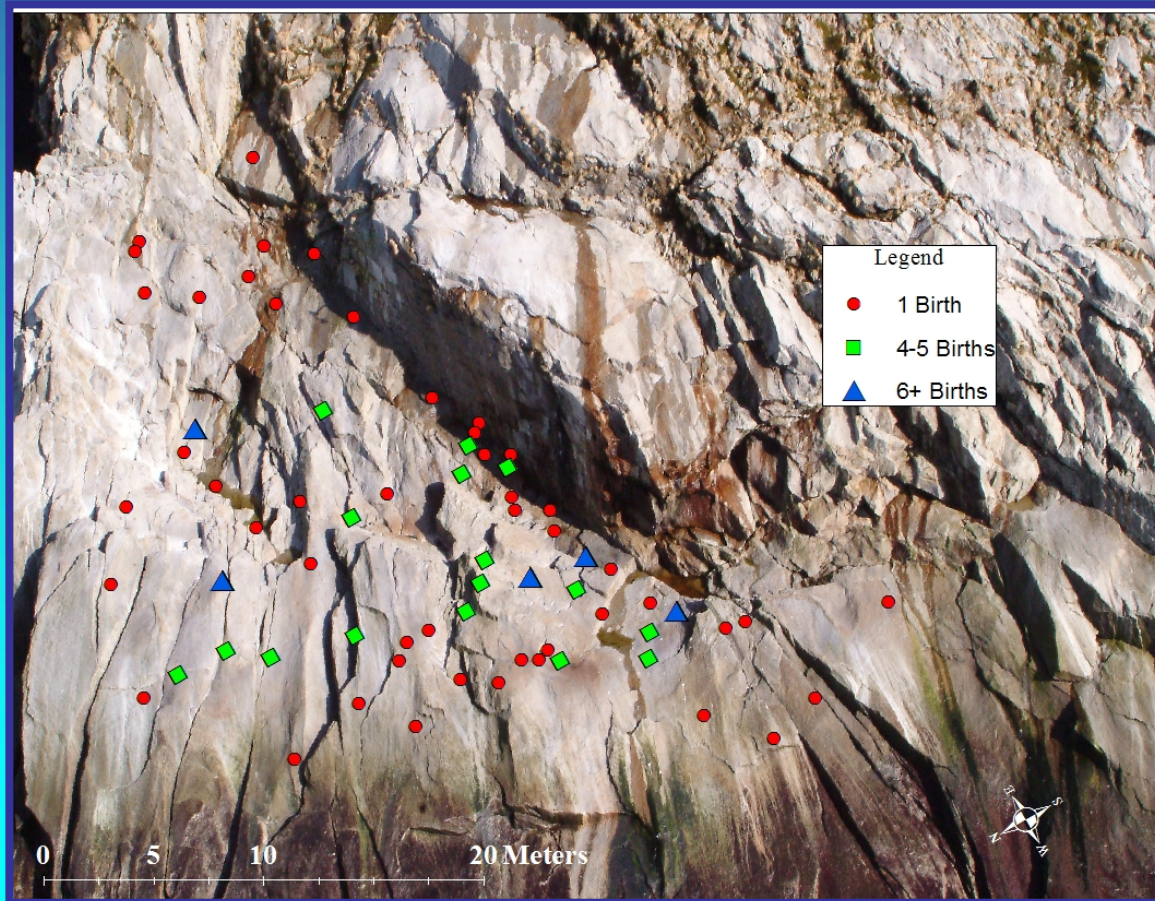


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# Pupping Site Fidelity



# Pupping Site Fidelity

## Presentations and Publications

Parker, P. J. M. Maniscalco, J. Harvey, S. Atkinson. 2005. Pupping site fidelity among individual Steller sea lions (*Eumetopias jubatus*) in the northern Gulf of Alaska. *Oral Presentation* at upcoming 16<sup>th</sup> Biennial Conference on the Biology of Marine Mammals, Dec 12-16, San Diego, CA

Parker, P. 2006. Master of Science Thesis, San Jose State University, CA

\*Further publication TBD

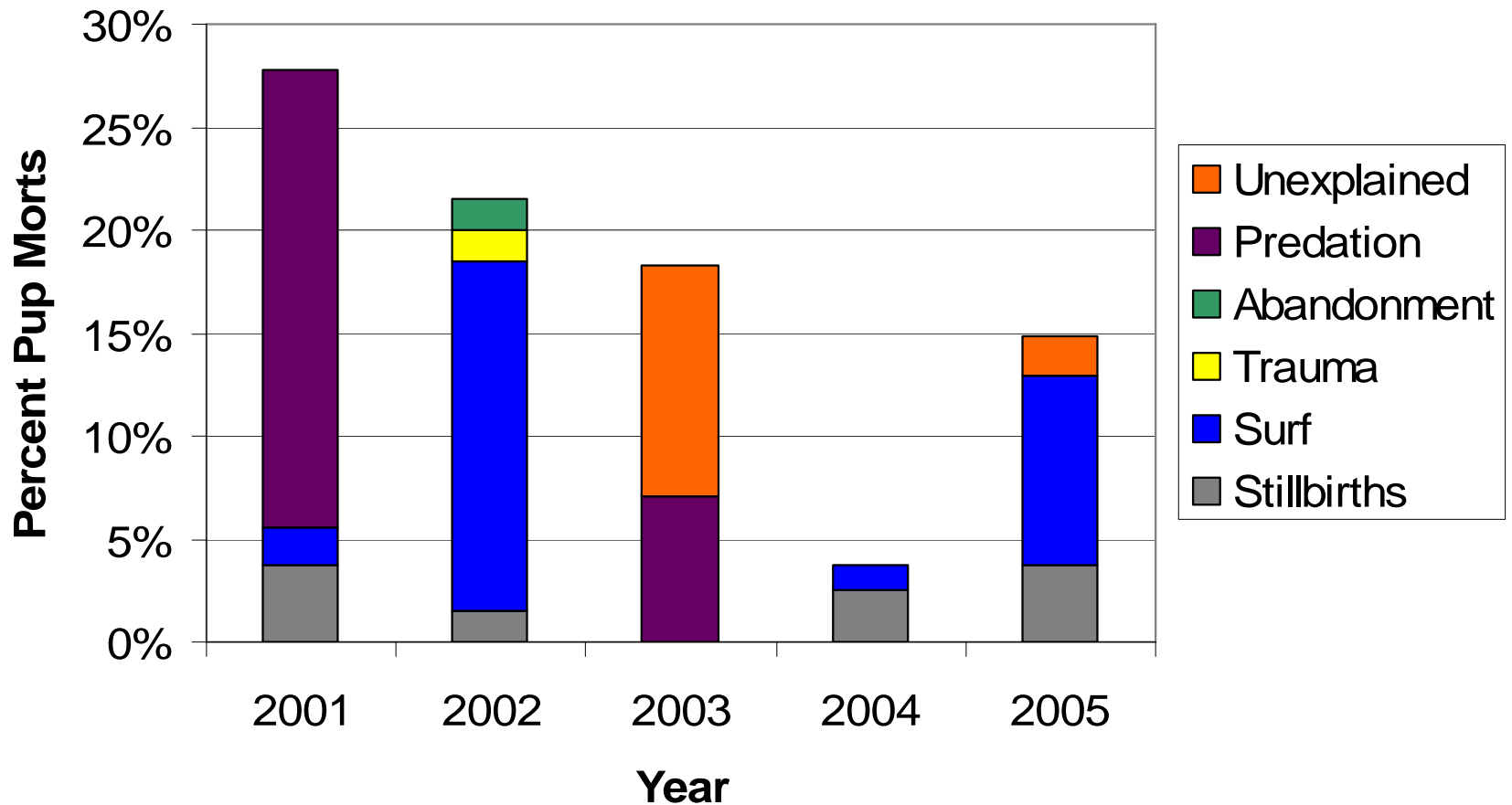
**See Also:** Synopsis of Research on Steller Sea Lions – Chapter 33

# Studies Being Accomplished

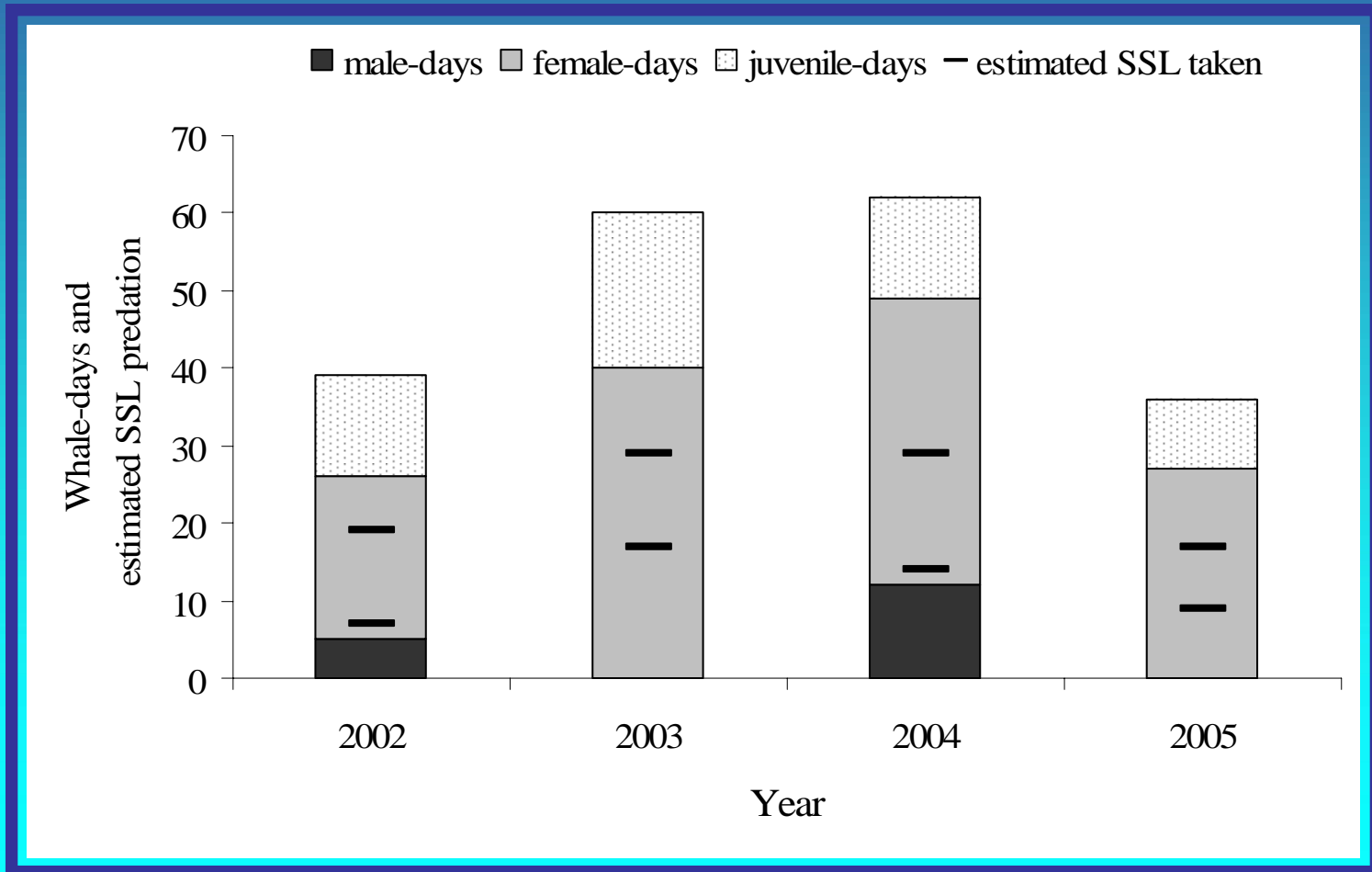
1. Maternal Investment
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# Pup Mortalities



# Killer Whale Presence and Estimated Predation in KF



# Pup Mortalities and Predation

## Presentations and Publications



- Maniscalco, J. M., S. Atkinson. 2004. Causes of early pup mortality at a Steller sea lion (*Eumetopias jubatus*) rookery in the northern Gulf of Alaska. *Poster Presentation* at Marine Science in Alaska Symposium, Jan 12-14, Anchorage, AK
- Matkin, C. O., J. Maniscalco, D. Maldini, E. Saulitis, L. Mazzuca. 2005. Specialists or generalists? Population-specific variation in the foraging ecology of transient killer whales in Alaska. *Poster Presentation* at upcoming 16th Biennial Conference on the Biology of Marine Mammals, Dec 12-16, San Diego, CA
- Maniscalco, J. M., C. O. Matkin, D. Maldini, S. Atkinson, D. G. Calkins. *In Review*. Assessing killer whale predation on Steller sea lions from field observations in Kenai Fjords, Alaska. *Marine Mammal Science*

**See Also:** Synopsis of Research on Steller Sea Lions – Chapter 22

# Studies Being Accomplished

1. Maternal Investment
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# Calculating Reproductive Rates

## Methods

- Identification of females
- Establish presence with intent to breed



Brook hauling out in 2002



Brook with pup in 2003

# Calculating Reproductive Rates

## Methods

- Identification of females
- Establish presence with intent to breed
- What to do with females gone missing?



What happened to Marti?

# Calculating Reproductive Rates

## Methods

- Identification of females
- Establish presence with intent to breed
- What to do with females gone missing?
- Are some females too young?



**Rita first identified 2003  
but did not pup**



**Rita returned in 2004 and  
still did not produce a pup**

$$R_i = \frac{\sum F_{bi}}{\left( \sum F_{bi} + \sum F_{oi} + \frac{1}{2} \left( \sum F_{yi} + \sum F_{xi} \right) \right)}$$

$R_i$  = Reproductive rate in year i

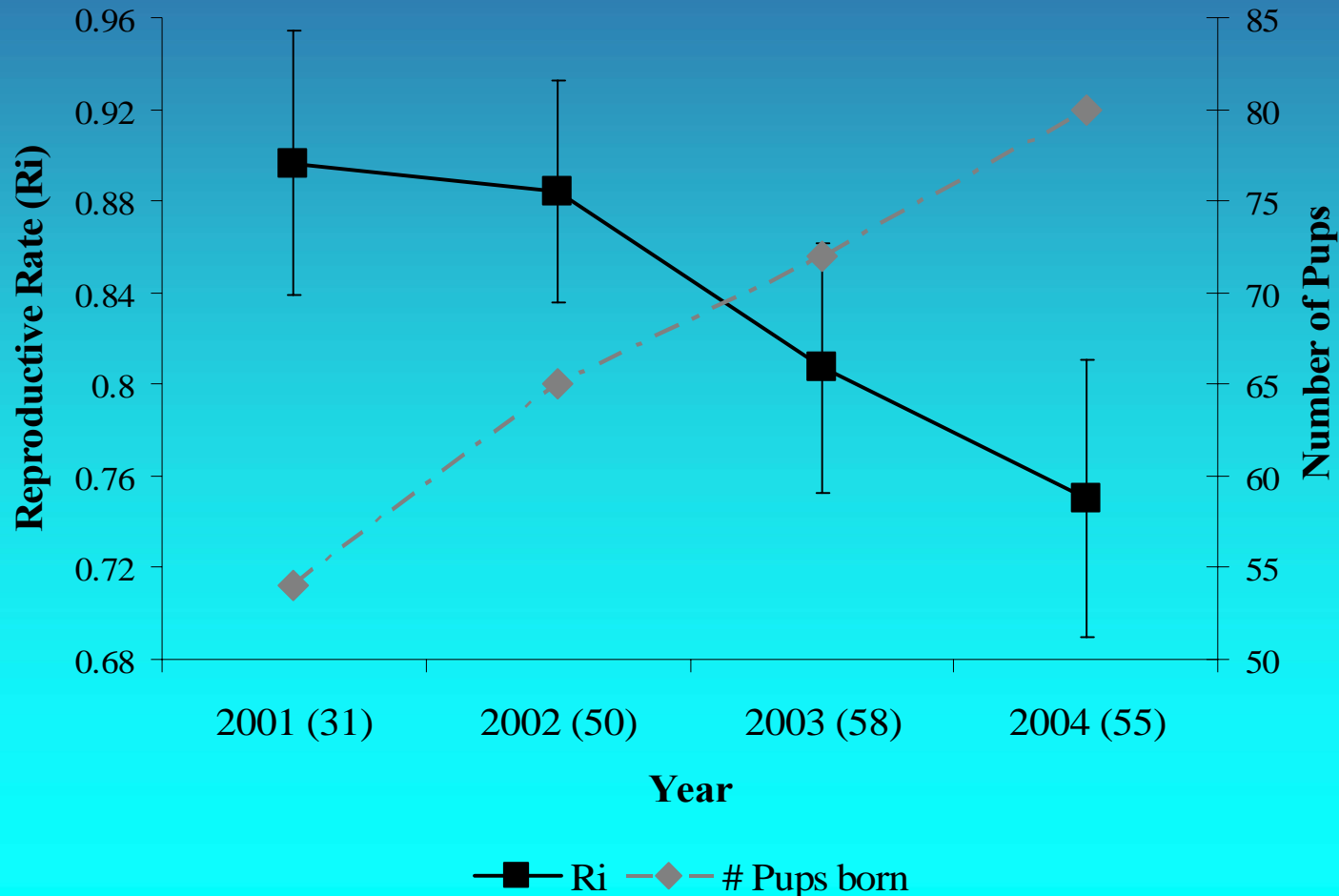
$F_{bi}$  = Females observed and have given birth in year i

$F_{oi}$  = Females observed and have not to have given birth in year i

$F_{yi}$  = Females that may be too young to give birth in year i

$F_{xi}$  = Females who are missing and may be dead or taking a year off

'01-'04 combined  $R_i = 82.5\%$  (+/- 2.8%)  
n = 61 Female SSLs whose status was known for  $\geq 2$  yrs



# Reproductive Rates

based on observed copulations and births

Year	Copulation-based Rate	Standard Rate
2002 (n=9)	88%	89%
2003 (n=23)	80%	87%
2004 (n=22)	76%	75%

# Are female SSLs more likely to pup after taking a year off or losing their previous pup?

<u>Year i + 1</u>	<u>Year i</u>		<u>Total pups lived+died</u>	<u>No pup</u>
	<u>Lived</u>	<u>Died</u>		
Pup	63 (79%)	15 (60%)	78 (74%)	11 (46%)
No pup	7 (9%)	4 (16%)	11 (10%)	8 (33%)
Not present	10 (12%)	6 (24%)	16 (15%)	5 (21%)

# Does loss of a pup affect timing of birth the following season?

**Average Pupping Date  
following a loss = June 7**

**Average Pupping Date  
after no loss = June 11**

***Paired T = 2.06***

***P = 0.035, n = 10***



# Reproductive Performance

## Presentations and Publications



Maniscalco, J. M., R. Taylor, D. G. Calkins, S. Atkinson. 2005. Reproductive performance in Steller sea lions at Chiswell Island, Gulf of Alaska. *Poster Presentation at Marine Science in Alaska Symposium, Jan 24-26, Anchorage, AK*

Maniscalco, J. M., R. Taylor, D. G. Calkins, S. Atkinson, P. Parker. *In Prep.* Reproductive performance in Steller sea lions (*Eumetopias jubatus*) at a small Alaskan rookery. Journal TBD.

**See Also:** Synopsis of Research on Steller Sea Lions – Chapter 30

# Studies Being Accomplished

1. Maternal Investment
2. Characteristics of Parturition
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4. Pupping Site Fidelity
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# Effects of Branding

June 30, 2005

Branded 26 pups (E33 – E58)

Tagged 13 pups (1251 – 1263)

Bled 30 pups (10 pre- & 10 post-brand & 10 tagged)

Morphs for 39 pups

Genetic samples from 39 pups



# Effects of Branding

## Presentations and Publications

Data are currently being analyzed

Additional branding and tagging in 2006

Report by end of 2006?

Future publications and presentations TBD



# Studies Being Accomplished

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# Effects of Rookery Disturbance

**7 years of intermittent disturbance**

**7 years of videotape before and after disturbance events**

**7 years of daily census counts**

**What are the short-term effects?**

**What are the long-term effects?**

**Must consider:** Intensity of disturbance, weather conditions, presence of orcas, time of season, number SSLs present, other things?



# Studies Being Accomplished

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# Breeding Bull Dynamics

Mean no. bulls holding territory during peak breeding season (6/15 to 7/5) = 10

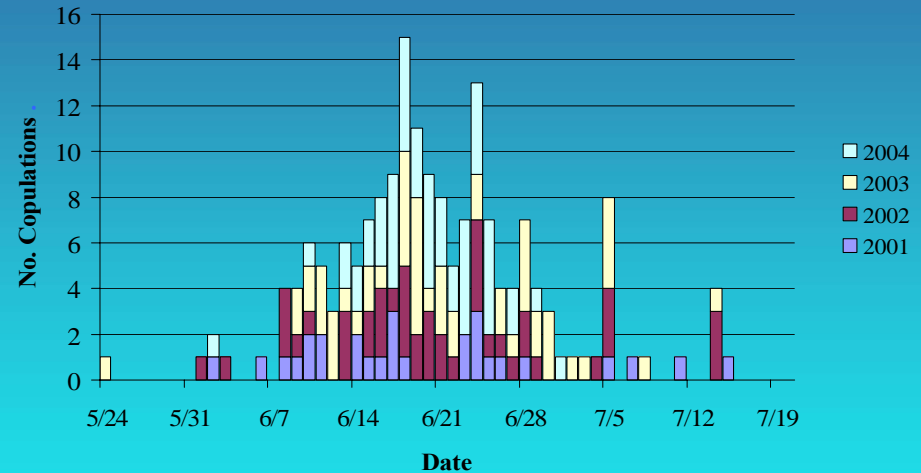
Mean no. days holding territory per season = 42

Mean no. years holding a territory = 3

Mean no. observed copulations per territory holder = 4

(actual no. copulations is probably greater because not all were observed)

\*Data based on bulls that hold a territory for at least one week with females present





# Breeding Bull Dynamics



## Presentations and Publications

Teate, E., P. Parker, J. M. Maniscalco, K. Harris. 2005. Tenure and reproductive success in Steller sea lion (*Eumetopias jubatus*) males at Chiswell Island, Gulf of Alaska. *Poster Presentation* at upcoming 16th Biennial Conference on the Biology of Marine Mammals, Dec 12-16, San Diego, CA

Future presentations and publications TBD.

# Acknowledgments

Many thanks to the hard work of several interns and technicians. Daniel Zatz and Co. (SWS) kept the remote control system operational at all costs. Field observations and transportation were also provided by Kenai Fjords Tours and Renown Charters and Tours. We also thank Mike Pendergast, Chip Arnold, Kristen Sieminski and Daniel Hilliard for providing invaluable tech support, and Daniel Hennen for statistical advice.

*The Chiswell Island group is part of the U.S. Fish & Wildlife Service Alaska Maritime National Wildlife Refuge. The placement of equipment and research conducted on refuge land was done under a special use permit issued by the U.S. Fish & Wildlife Service and under NMFS permits No. 782-1532-00 & 881-1668-00 issued under the authority of the Marine Mammal Protection Act and the Endangered Species Act.*

# Overview of Marine Mammal Predation by Killer Whales in Alaska



Summarized by

Craig Matkin

Eva Saulitis



ASLC  
NPMRC



# Acknowledgements



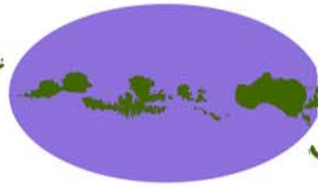
**Alaska SeaLife Center**

*w i n d o w s   t o   t h e   s e a*

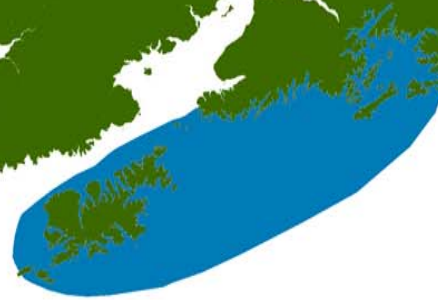


NORTH PACIFIC  
UNIVERSITIES  
MARINE  
MAMMAL  
RESEARCH  
CONSORTIUM

*Bering Sea*



Eastern  
Aleutians



Northern Gulf of Alaska



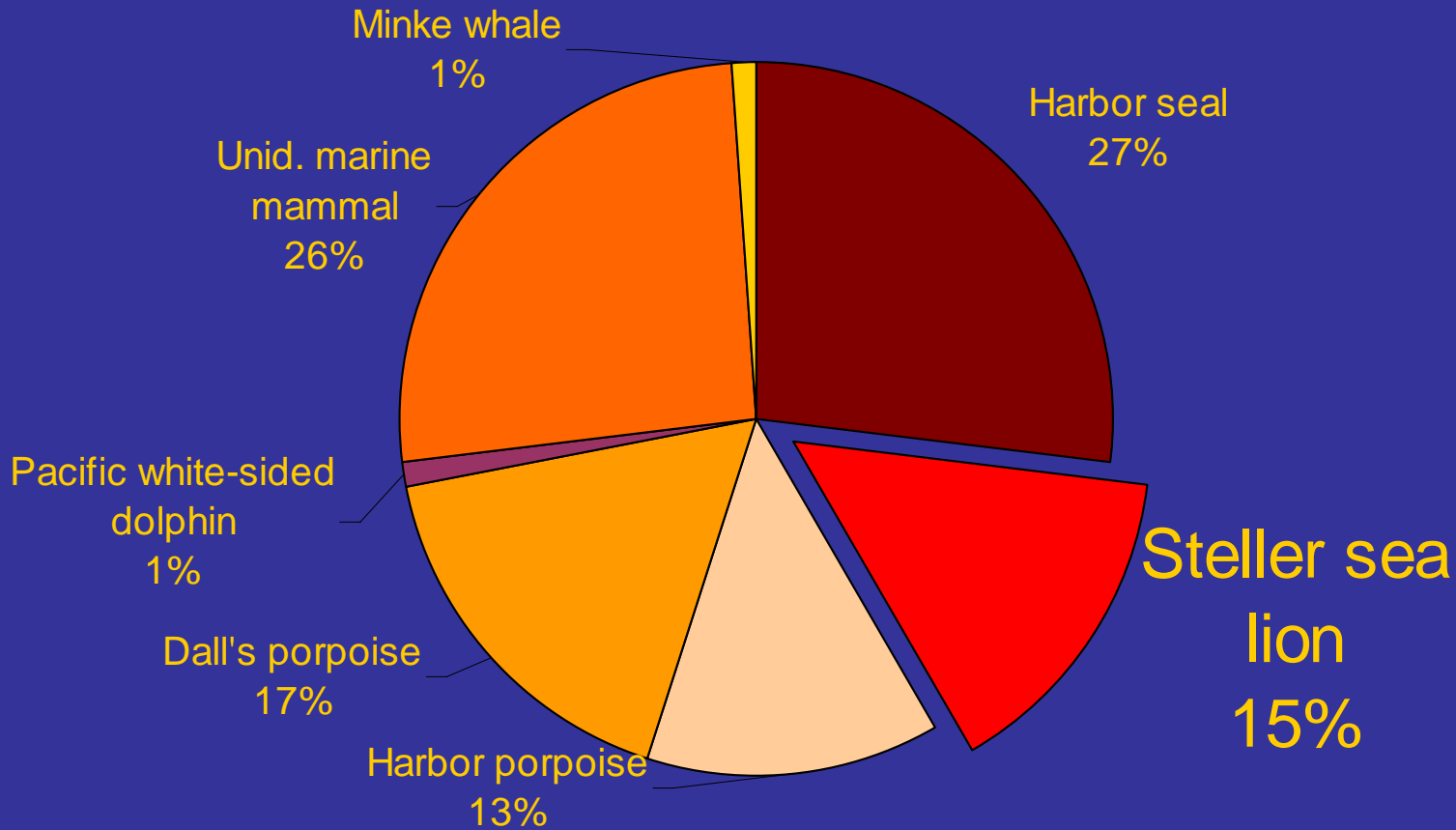
Southeastern Alaska

**Work presented is from observational  
studies in three areas in Alaska**

British Columbia

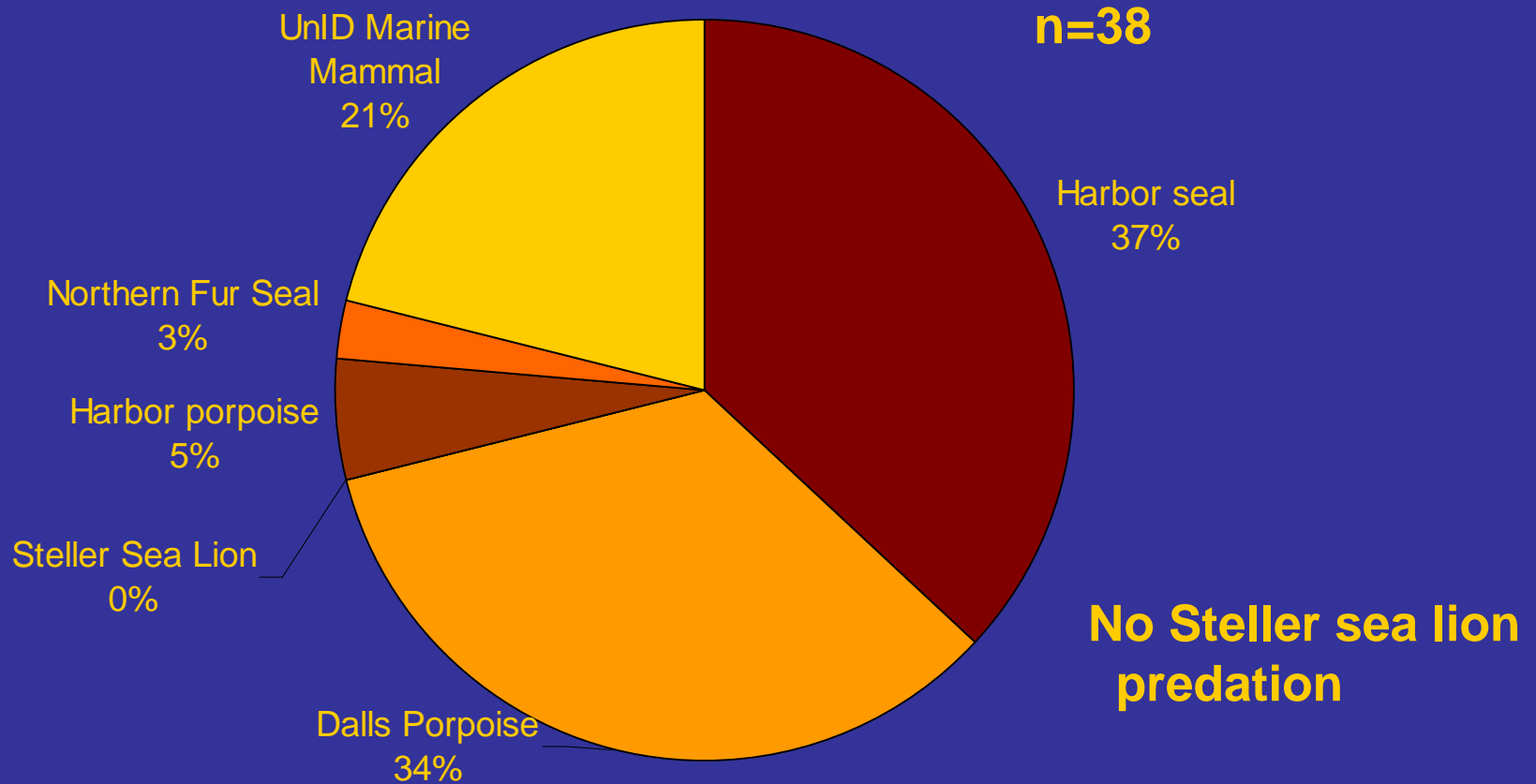
# Kills by West Coast Transient Killer Whales in Southeastern Alaska 1984-2003

n = 90



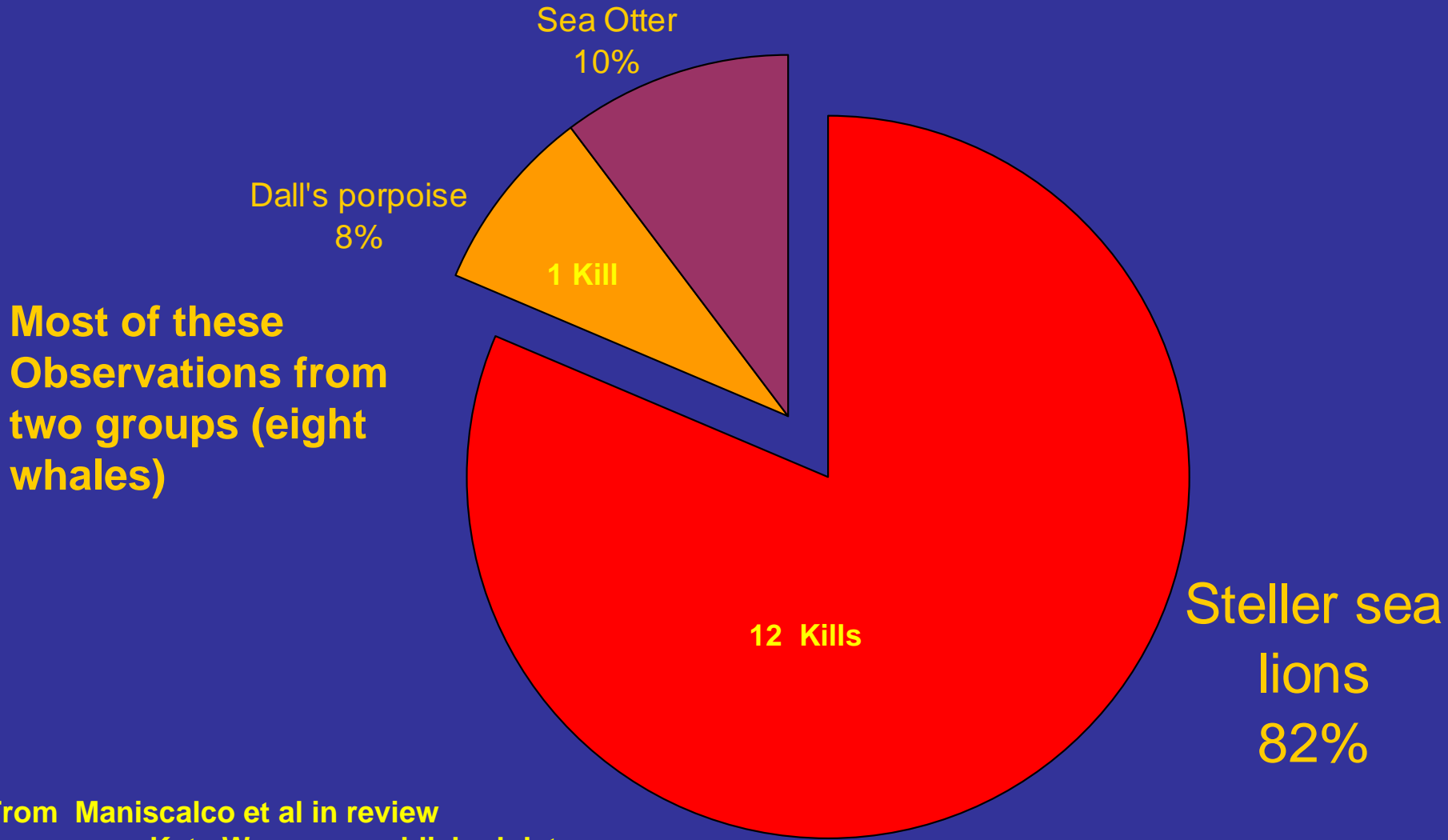
From: Straley, Matkin, Deeke, in prep  
(does not include observer network data)  
and  
Dahlheim, White, and Ellifrit, in prep

# Marine Mammal Kills by AT1 Transient Killer Whales in Prince William Sound/Kenai Fjords 1984-2004



From Saulitis et al 2000  
Matkin unpublished data

# Marine Mammal Harassment and Kills by Gulf of Alaska Transients 1997-2004 n= 48



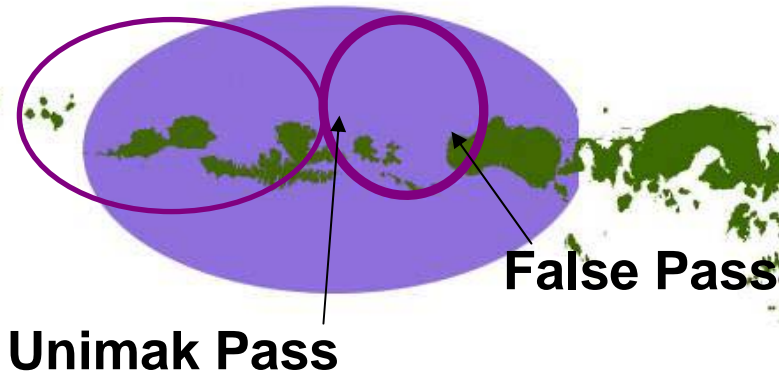
From Maniscalco et al in review  
Kate Wynne unpublished data



# Spring work: East of Unimak Pass Summer work: West of Unimak Pass

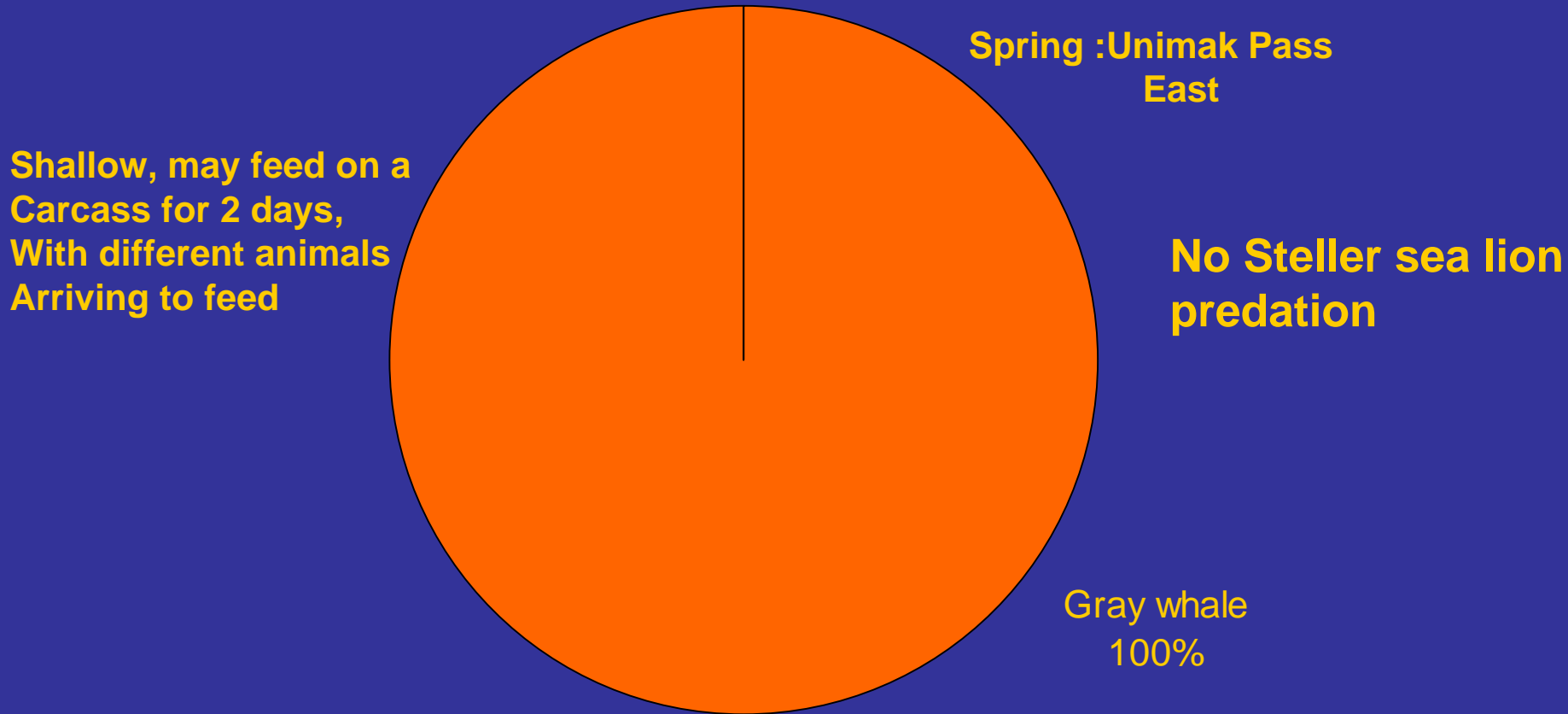
*Bering Sea*

**Eastern**  
**Aleutians**



*Northern Gulf of Alaska*

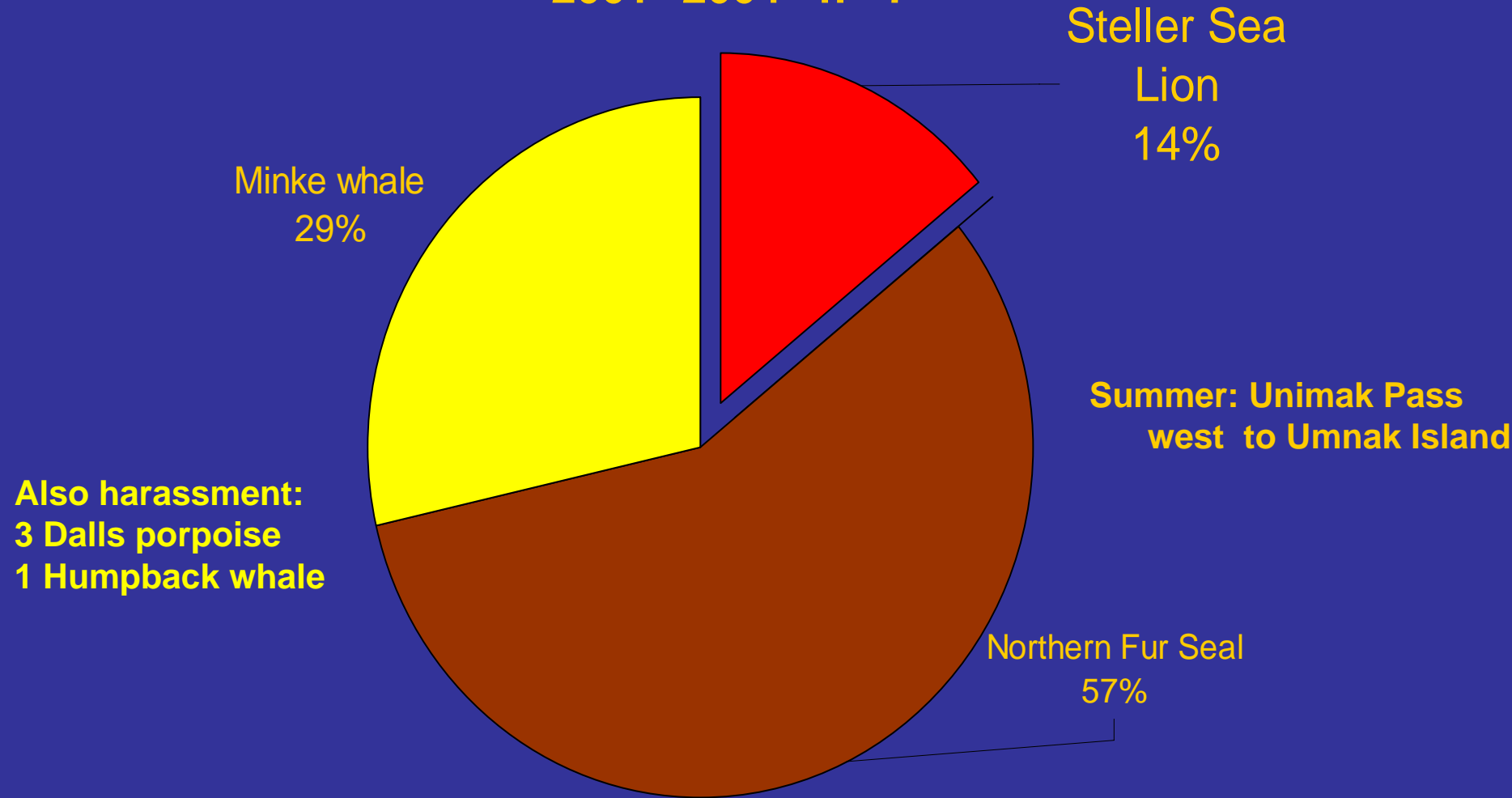
**Marine Mammal Kills by Transient Whales  
in the Eastern Aleutians Spring  
2002--2004 n=18**



From Barrett-Lennard and Matkin in prep

# Marine Mammal Kills by Transient Whales in the Eastern Aleutians Summer

2001--2004 n= 7



From Matkin et al in press

# Predation Summary

- In Southeast Alaska harbor seals most frequent prey, followed by Dalls and harbor porpoises, Steller sea lions
- Unique AT1 population in Kenai Fjords/Prince William Sound specialize in harbor seals and Dalls porpoises with no SSL predation. Dalls porpoise increase in diet with harbor seal decline? Recent sea otter predation from one stomach.
- Some GOA transients (Prince William Sound through Kodiak) appear to be seasonal SSL specialists in the PWS/KF/Kodiak region, but very few (8) that we regularly encounter. Habits unknown out of nearshore study areas. Mixed stomach contents
- Eastern Aleutian transients focus on grey whales during spring migration (May/June) primarily northern fur seals in summer w/ minke whales and SSL and possibly Dalls porpoise.
- Data is limited in eastern Aleutians and lacking in central and western Aleutians

# Bias in Observations of Predation

- Bias against observation of predation on some species (harbor seal and harbor porpoise predation are difficult to observe)
- Bias due to work in particular locations
- Bias toward inshore vs. offshore areas
- Bias toward spring/summer/fall vs winter season

# Conclusions from Predation Data

- **Killer whales consume a wide variety of pinniped and cetacean prey from Southeast Alaska to Eastern Aleutians in spring summer and fall observations.**
- **Except for 2 particular groups in Kenai Fjords/Kodiak no good evidence that killer whale populations specialize on a single pinniped prey in the regions studied**
- **Large cetaceans primarily limited to gray whales (calves) and minke whales despite abundance of fin and humpbacks. Sea otters not important in the areas/times we have observed.**
- **Predation varies by area and by season. Pinnipeds and small cetaceans are important in most areas during the spring/summer/fall months.**
- **Steller sea lions have not been indicated as a primary prey in most areas, except for two groups of whales in Kenai Fjords/Kodiak.**

