

# **Local and Traditional Knowledge of the Nature and Extent of Interactions between Fishermen and Steller Sea Lions in the Gulf of Alaska and Bering Sea**

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# Project Collaboration

- **Collaborator:** Mike Turek, Alaska Department of Fish and Game, Division of Subsistence
- **Project title:** Steller Sea Lions (*Eumetopias jubatus*) in Alaska: Direct Mortality by Humans
- **Funding:** North Pacific Research Board
- **Poster:** presented a Mar. Sci. in AK Symposium

Steller Sea Lions (*Eumetopias jubatus*) in Alaska: Direct Mortality by Humans  
Mike Turek, Alaska Department of Fish and Game  
January 2007 Alaska Marine Science Symposium

**An Endangered Species: the Role of Direct Mortality to Steller Sea Lion Decline**



- Since the 1970s, the western population of Steller sea lions declined by more than 90%.
- In 1980, it became illegal to shoot Steller sea lions, but hunting still goes on in some areas.
- In 1981, domestic oil and gas drilling was placed on fishing vessels (22 ft in length).
- In 1982, the western stock was listed as "endangered" under the Endangered Species Act, though it appears to be recovering.

• Single shooting has declined, but what has been the contribution of direct mortality by shooting, overall, especially in areas of subsistence and harvest?

**Key Research Questions**

- What have been the patterns of shooting by subsistence?
- What have been the patterns of sea lion deaths in fishing gear?
- What is the contribution of direct mortality to sea lion decline?

- Study systematic subsistence shooting to get a primary estimate of increased mortality on the western distinct population segment of Steller sea lions.
- Study options to examine contemporary direct mortality by humans from shooting and fishing gear through key areas during 1970-2000.

**Research Methods**

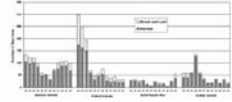
- Review of existing literature with information about direct mortality.
- Using the chondrichthyan method, identify knowledge gaps, experimental design and ethics with respect to the Gulf of Alaska, Eastern and Western Aleutians stock units.
- Conduct key informant interviews, using a standard interview guide (Table 1).
- Quantify focus on patterns of shooting and bycatch, in different geographic areas, industries and locations.
- Compile and review harvest and patterns of take in subsistence use by community in the study area.

**Direct Mortality from Regulated Commercial Harvests**

- Commercial harvests were allowed under state permits from 1962 to 1972 in the eastern Aleutian Islands and Gulf of Alaska.
- Other sea lion pups were shot on rookeries.
- Over 60,000 pups of both sexes were harvested primarily on three islands, Shumagin, Agulhas and Adak.
- Though a possible contribution existed between these harvests and account for the dramatic decline of the 1980s (Cliver and Larkin 1992).

**Direct Mortality from Subsistence Uses**

- Subsistence takes have ranged between 140 and 104 from 1962 to 1994 for all of Alaska, with notable declines around between 1982 and 1984, especially in the Pribilof Islands (see Turek et al., 2005).
- In 2004, the takes were split among four state regions - the Aleutian Islands, Pribilof Islands, the 14% of the total, comprised all of sea lions, the Trinity Strait (24 sea lions, or 21.7%), Kodiak Island (7 sea lions, or 7%) and the Pribilof Islands (24 sea lions, or 19.4%) (Cliver et al., 2005).
- Harvests in adults tend to be annual, with smaller "water" shooting than from pups in the winter and dead by humans (regard on shore).
- Shooting sea lions is a relatively organized collective activity in Alaska communities. About 90% of the hunters reported being about 90% of all sea lions (Cliver et al., 2005).



**Direct Mortality from Shooting**

- There has been little to no increase in the number of Steller sea lions killed by fishermen.
- A perfect survey of salmon trap operations in the Eastern and Alaska Peninsula areas indicated that 104 animals were killed in spring 1974 (Pace et al., 2002).
- In association with the Alutian Gilbert Library at the Copper River delta in 1975, 102 sea lions were shot and killed (Pace et al., 2002).
- Patterns of shooting by fishermen during the years 1970 to 1990 show no consistent pattern - shooting was opportunistic, generally not targeted on subsistence or harvests, did not target pups, did not have taking of males or females, juveniles or adults.
- Subsistence hunting is a common and widespread practice among fishermen until the early 1980s.

**Preliminary Conclusions**

- From 1962 - 2004, subsistence takes appear to have declined overall and account for less than 10% animals in any one year. Shooting sea lions is a relatively organized subsistence activity in Alaska communities. A consistent pattern of direct mortality by humans is apparent, but the contribution of direct mortality to the decline of Steller sea lions is unclear.
- Commercial harvests, but target pups on rookeries (up to 100% pups) in the central period 1970-1982. Commercial harvests are not considered a primary factor in the sea lion decline.
- Subsistence takes for commercial fisheries are not considered a primary factor in the sea lion decline.
- The preliminary conclusions corroborate other studies that direct mortality was not a primary factor in Steller sea lion decline in the late 20th century.

**Future Research**

- Further survey on the contribution of direct mortality to sea lion decline.
- Assess 100% Steller sea lion takes for subsistence and commercial purposes.
- Assess subsistence takes from 1982 to 1998.
- Assess subsistence shooting by commercial fishermen 1982 to 1998.
- Compare singletons and bycatch during the 1970-1975 period.
- Compare the pattern of subsistence shooting by commercial fishermen in Subarctic Alaska 1970-1990 to patterns of subsistence shooting by fishermen in the eastern Aleutian Islands and the Gulf of Alaska 1970-1990.

**References**

Cliver, J. L., and Larkin, P. A. 1992. The decline of Steller sea lions in the eastern Aleutian Islands and Gulf of Alaska. *Marine Mammal Science* 8: 1-10.

Pace, N. L., and Larkin, P. A. 2002. The decline of Steller sea lions in the eastern Aleutian Islands and Gulf of Alaska. *Marine Mammal Science* 18: 1-10.

Turek, M. J., and Larkin, P. A. 2005. The decline of Steller sea lions in the eastern Aleutian Islands and Gulf of Alaska. *Marine Mammal Science* 21: 1-10.

**Acknowledgments**

The author would like to thank the following individuals for their assistance in the collection and analysis of data for this project: [List of names]

# Proposal Responsiveness, Funding and Timeline



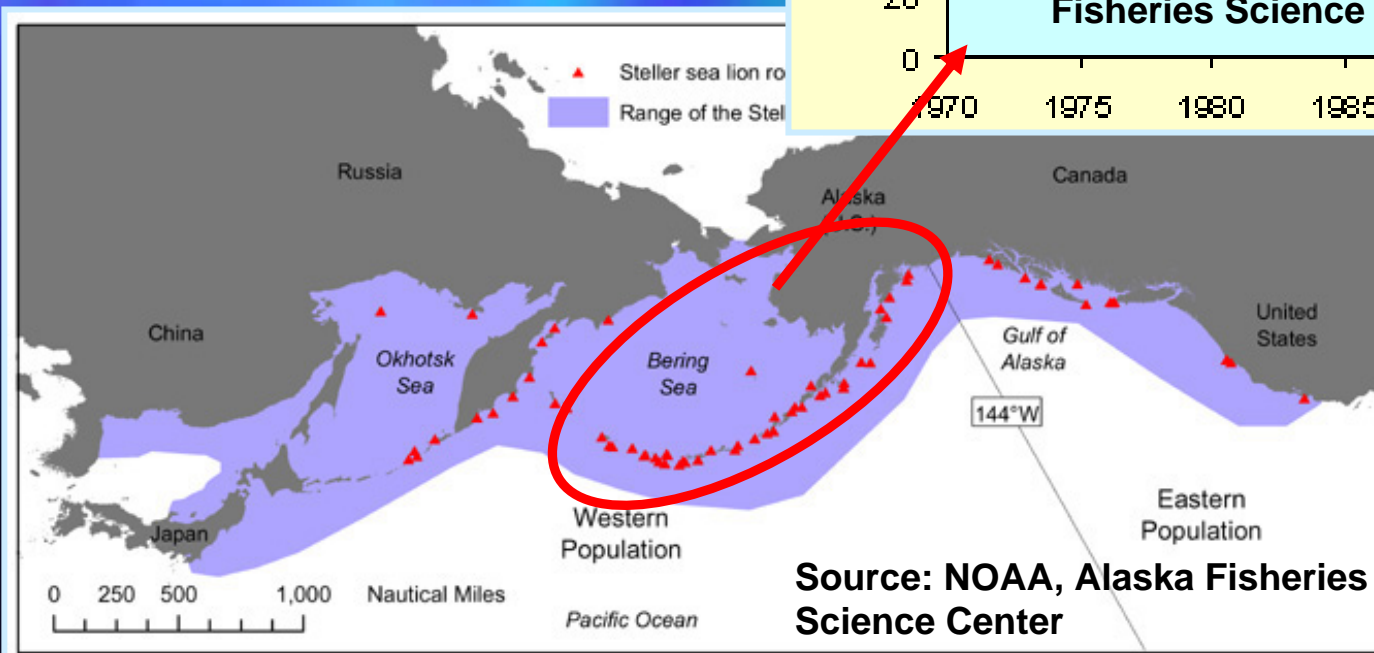
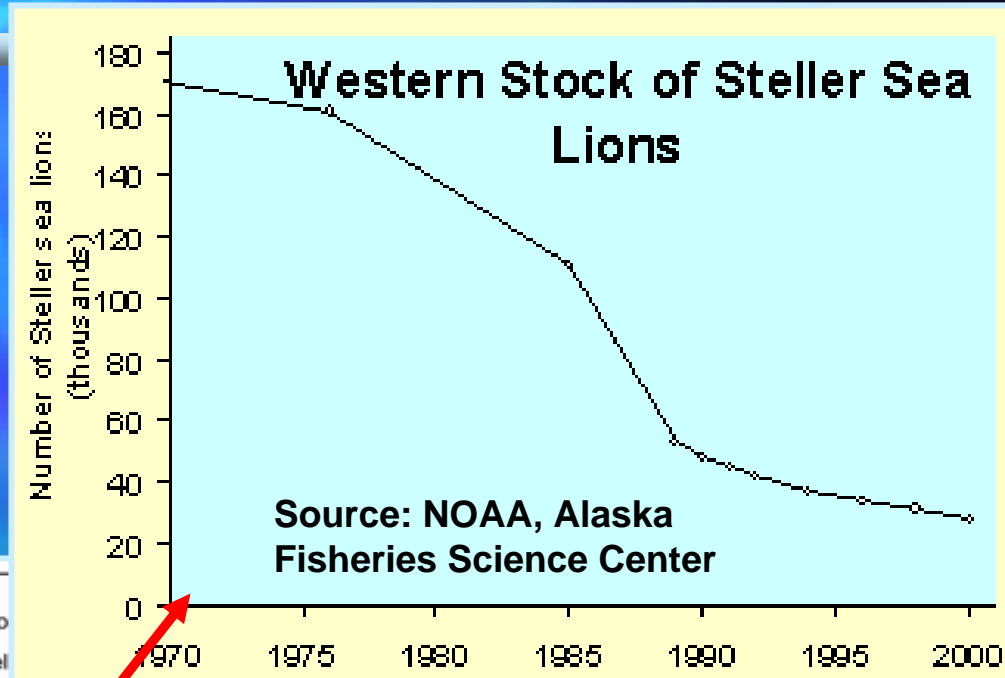
1) Response to research priority #6 in the PCCRC Request for Proposals in 2006:

*Assessments of regime changes and other factors affecting marine mammal populations of the Gulf of Alaska, Bering Sea and Aleutian Islands, based on traditional ecological knowledge of coastal community elders and commercial fishermen.*

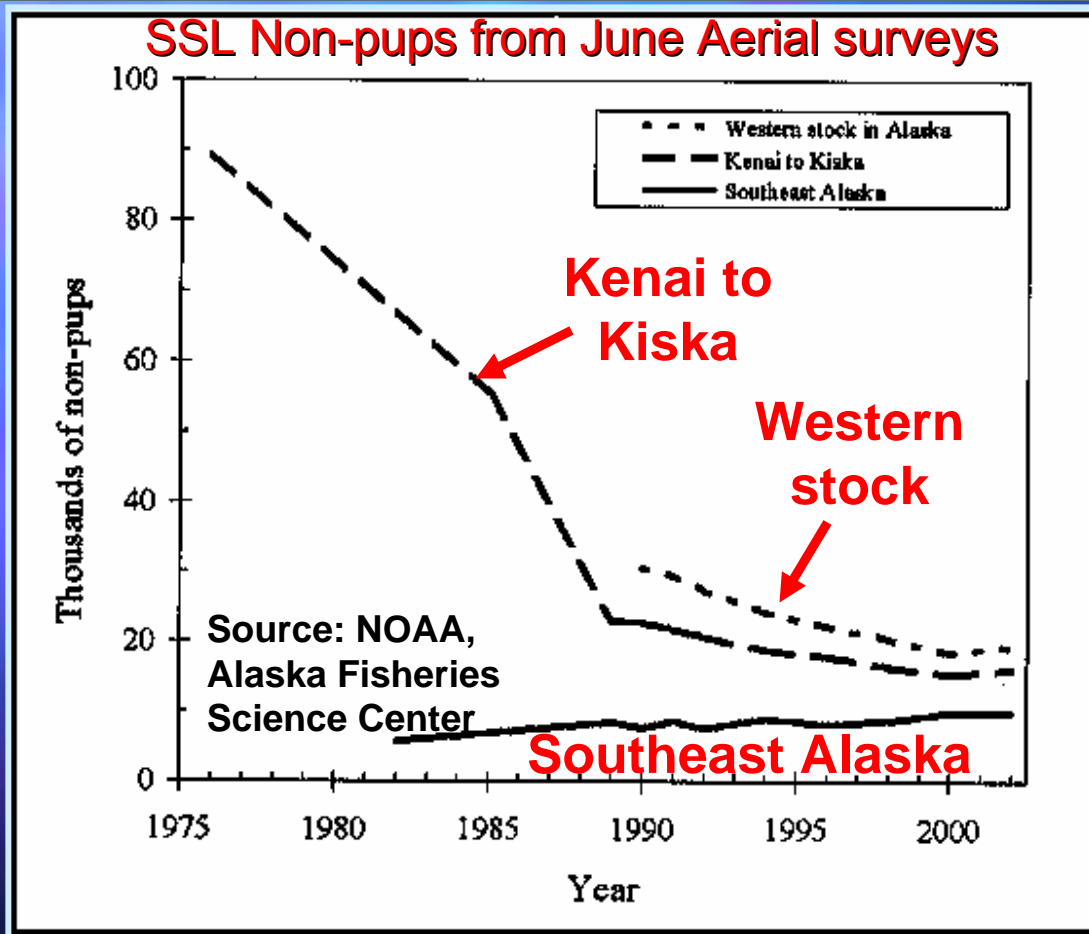
2) Funding of \$90,000 over 1 year (August 1, 2006 – August 1, 2007)

# Decline of the Western Stock of Steller Sea Lions

- The western stock of SSLs declined >80% since the 1970s



# Sharpest Decline in late 1980s



- Western stock declined: 5.9%/yr (1975-1985), 15.6%/yr (1986-1990), and 5.2%/yr (1990s)
- Eastern stock increased: 1.8%/yr (since 1980s)

# Hypotheses about SSL Decline

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## Bottom-up hypotheses:

- 1) Fishery removals
- 2) Climate regime shift in the late 1970s
- 3) Non-lethal disease
- 4) Pollutants concentrated through food web

## Top-down hypotheses:

- 1) Predators
- 2) Incidental take of sea lions
- 3) Subsistence harvests
- 4) Shooting of sea lions
- 5) Pollution or disease has increased mortality

*One review ...*



**National Research Council. 2003. The Decline of the Steller Sea Lion in Alaskan Waters: Untangling Food Webs and Fishing Nets. National Academies Press, Washington, D.C. 204 p.**

# **NRC Conclusions for 1970s-1980s**

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## **1970s – 1980s**

- 5-yr period of rapid decline in late 1980s was broad, likely due to ecosystem-wide changes.
- Multiple factors likely contributed to widespread declines in the 1980s, including mortality associated with fishing

## **1990s – present**

- A combination of top-down mortality sources seem to pose the greatest threat:
  - Predation
  - Continued shooting
  - Incidental take by fishing
  - Subsistence harvest

# Reasons to Investigate Shootings

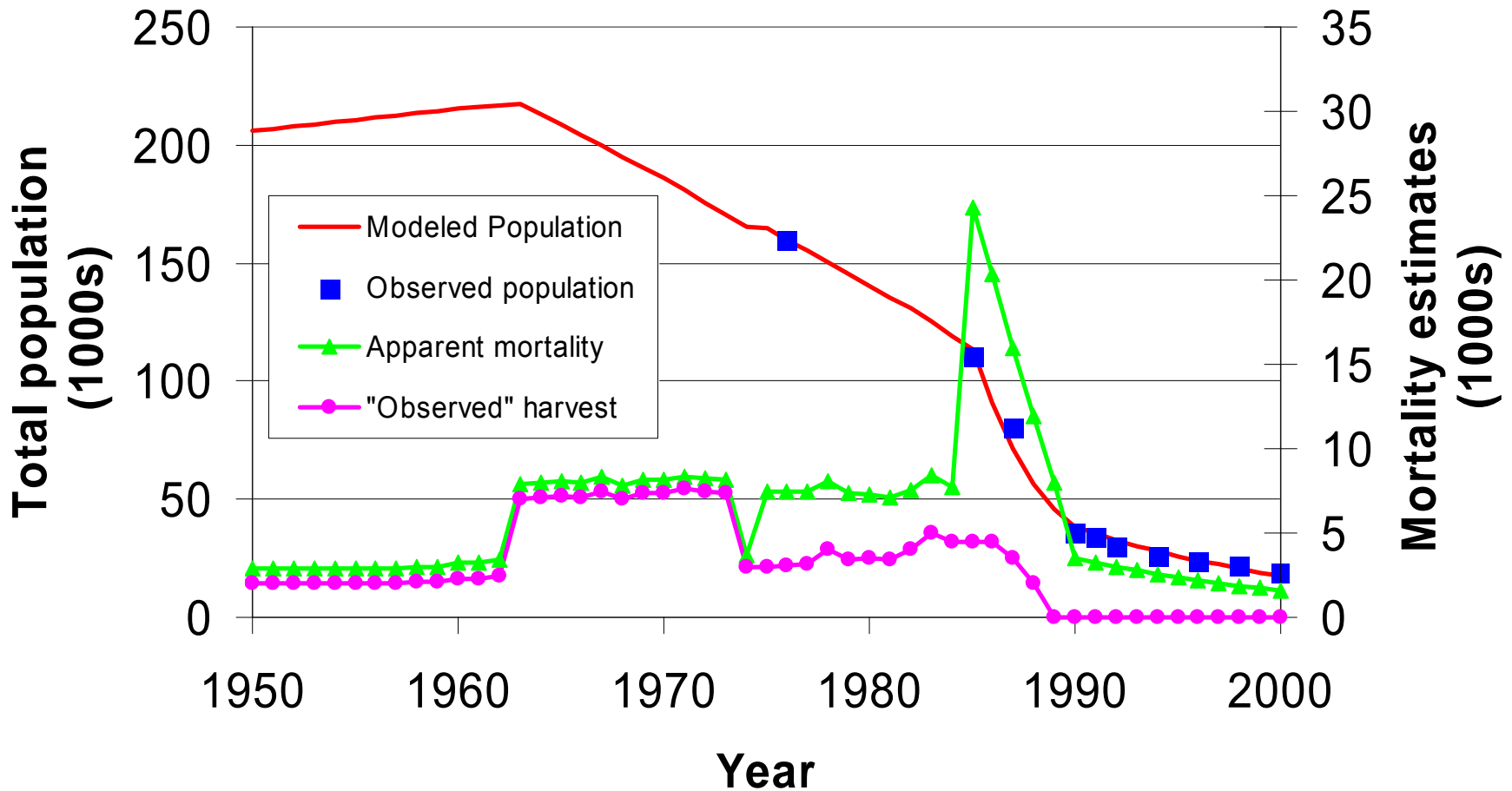
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- Preponderance of anecdotal and substantiated shooting in the past:
  - SSLs shot in 1940s by PBYs
  - Salmon trap operators killed 816 SSLs in spring 1954
  - Predator control program in 1950s-1960s (all pups shot on Amatuli Island on 2 occasions)
  - Experimental harvest of 45,178 SSL pups (1963-1972)
  - Shooting became illegal in 1990

# Clues from Population Models

Steller Sea Lion, Western Population

**York (2002) Model**



# Clues from Population Models

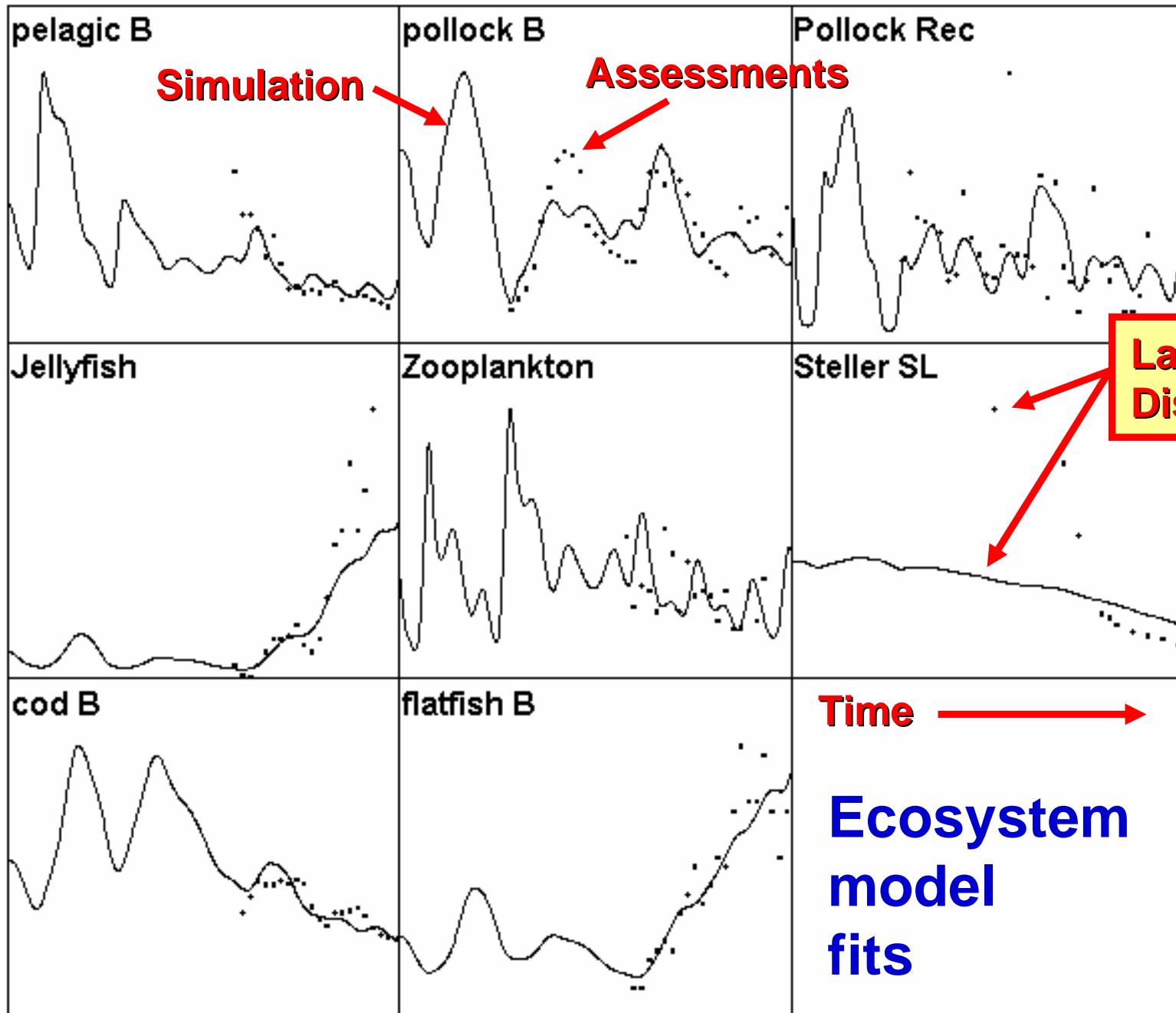
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- Unexplained mortality peaked at 20,000-25,000 animals per year in mid 1980s
- The losses are too large to have only involved pups and yearlings

# Clues from Ecosystem Models

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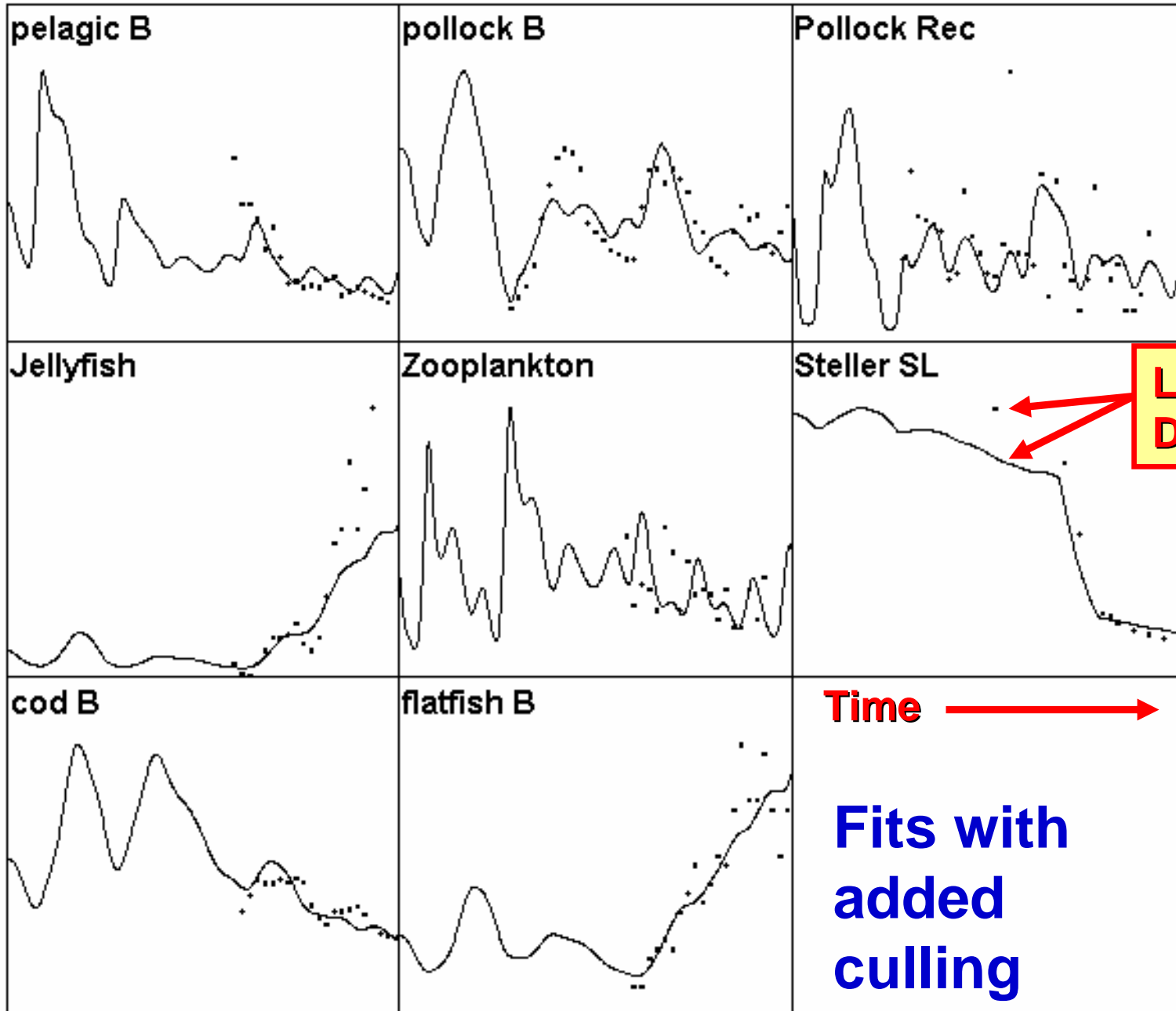
- Anomalies from model predictions for most species best explained by climate regime shifts, not fishing
- However, no parameter combination involving only trophic relationships and fishing can match the steep SSL decline
- Scenarios assuming more SSL culling improves fit to SSL observations in 1980s



**Large Discrepancy**

**Time** →

**Ecosystem model fits**



**Less  
Discrepancy**

**Time** →

**Fits with  
added  
culling**

## Project Objectives

- Collect local and traditional knowledge of fishermen about historical changes in the marine ecosystem
- Collect information about historical (pre-1990) interactions with Steller sea lions, including shooting

## Study Methods

- Interview fishermen with knowledge of 1970s and 1980s from Seattle, Kodiak, Sand Point and King Cove
- Interviews follow semi-directive method, in which interviewers explore several topics but do not rigid sequence of pre-set questions.

# Considerations for Study Participants

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- Study maintains full confidentiality at all times
  - Informed consent form
  - Interview form
- Only interested in pre-1990s (legal activity)
- No direct questions asked; answers can be given in “third person”
- Seek representation from various gear groups: pot, longline, trawl, seine, setnet
- Draft report provided in advance to those interested

# Special Acknowledgments

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## Seattle

- Paul MacGregor, Karl Haflinger, John Gruver

## Kodiak

- Jeff Stephan, Al Burch, Julie Bonney

## King Cove/Sand Point

- Beth Stewart

# Project Progress

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- Interview and consent forms developed
- Institutional Review Board (IRB) training completed
- IRB protocol application filed and approved
- Interviews conducted and completed:
  - Seattle (Nov. 16-17, 2006)
  - Kodiak (Nov. 27 - Dec. 1, 2006)
  - King Cove/Sand Point (Dec. 11-15, 2006)
  - Phone (Dec. 18-19, 2006)

# Media Coverage

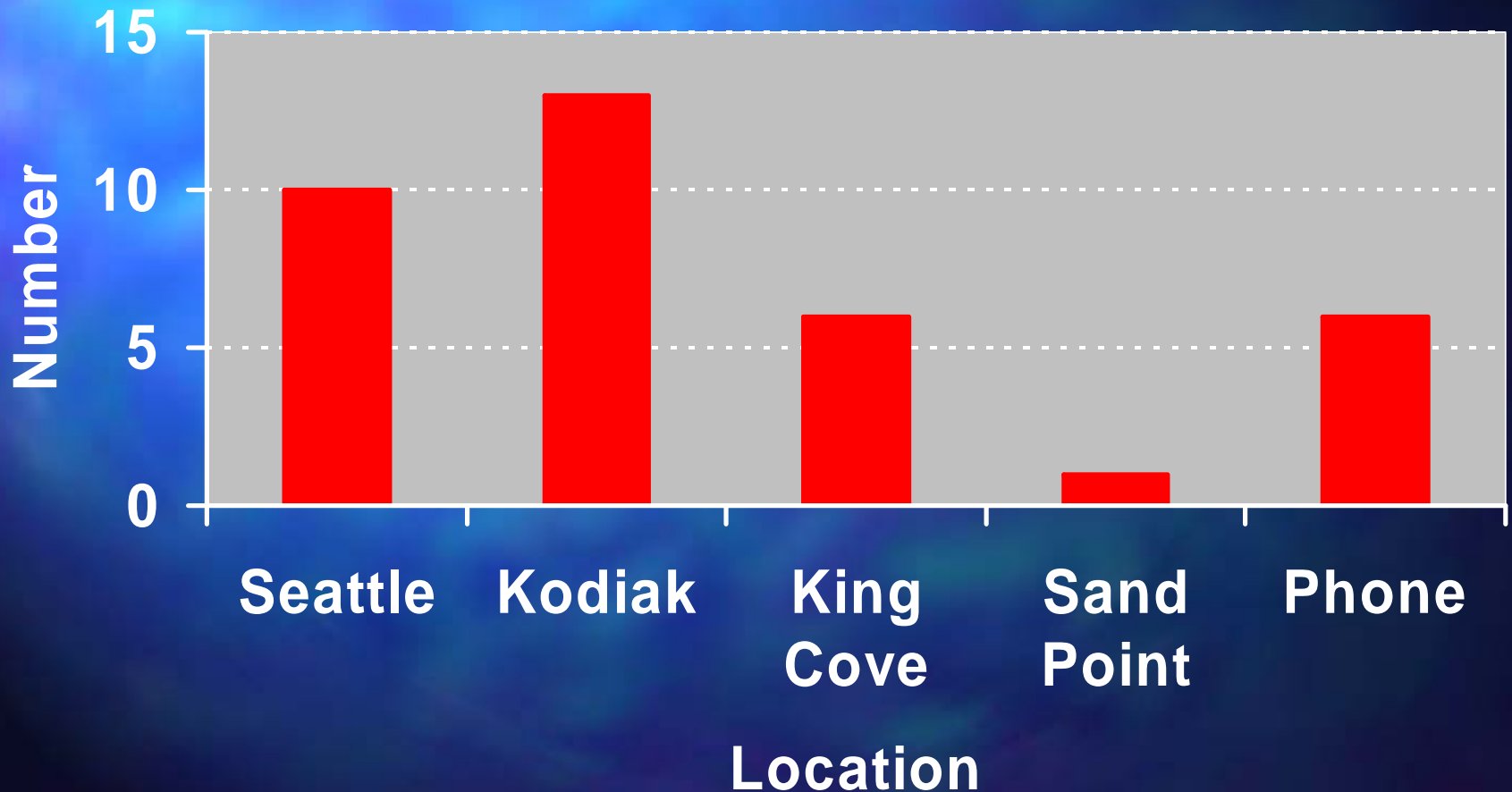
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- Interview by Laine Welch aired on Fish Radio during week of Oct. 30, 2006.
- Interview by Jay Barrett aired on the Fisheries Report and Alaska News Nightly during week of Nov. 27, 2006.
- Front page article published in Kodiak Daily Mirror during week of Nov. 27, 2006.
- Front page article published in Anchorage Daily News on December 7, 2006.

# Results

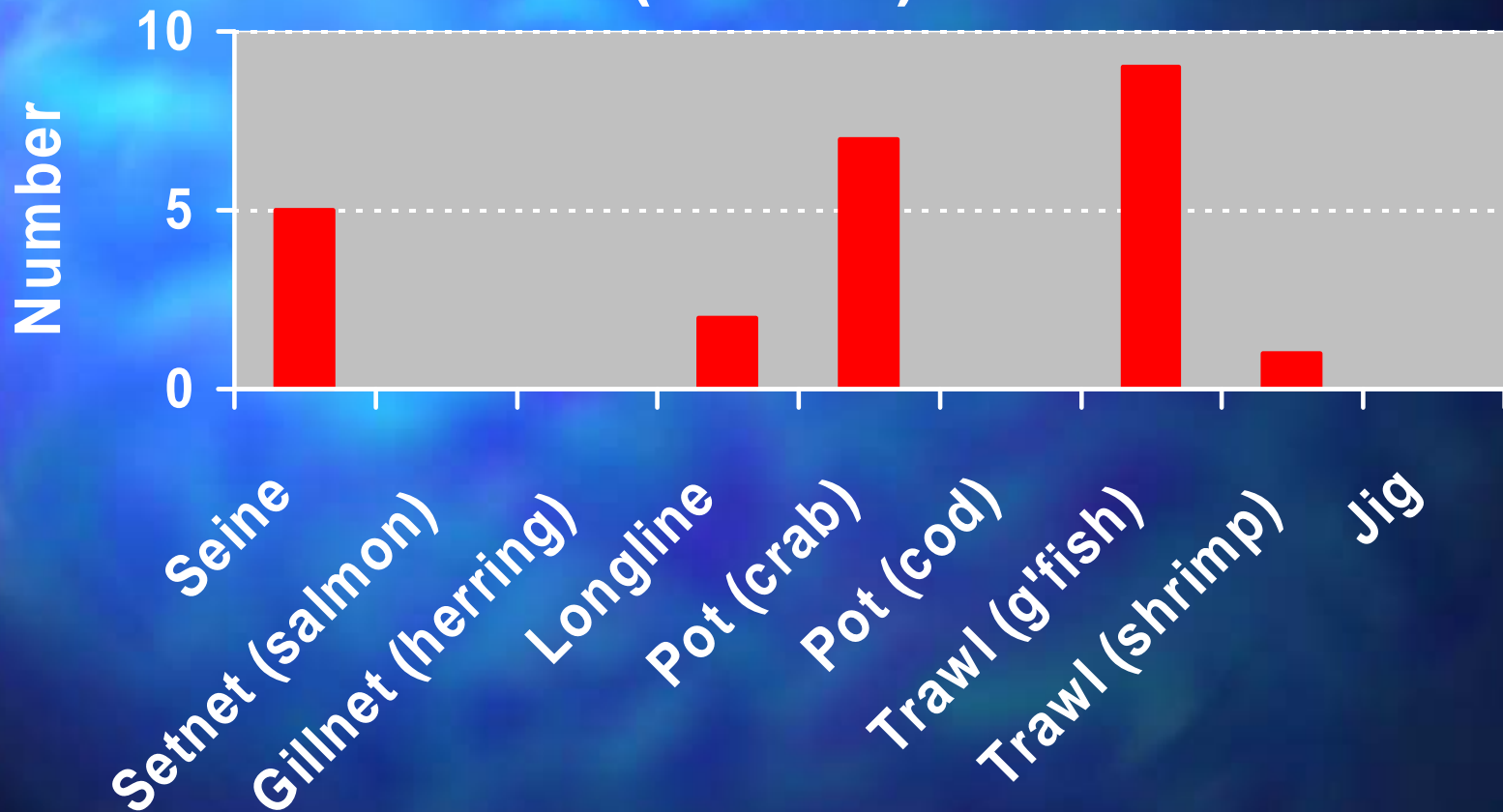
- 36 interviews conducted

## Number of Interviews by Area



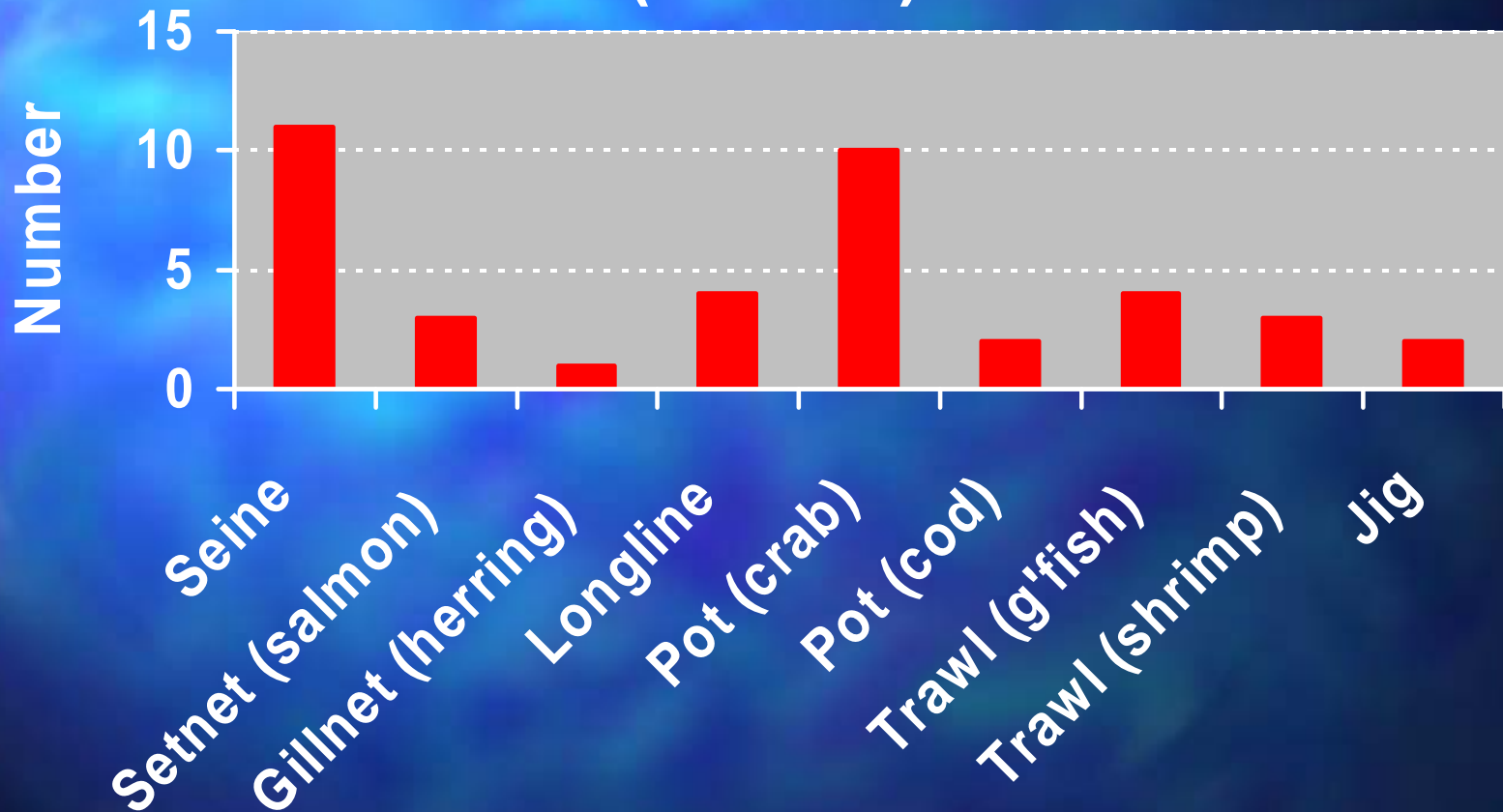
# Results

## Number of Interviews by Gear (Seattle)



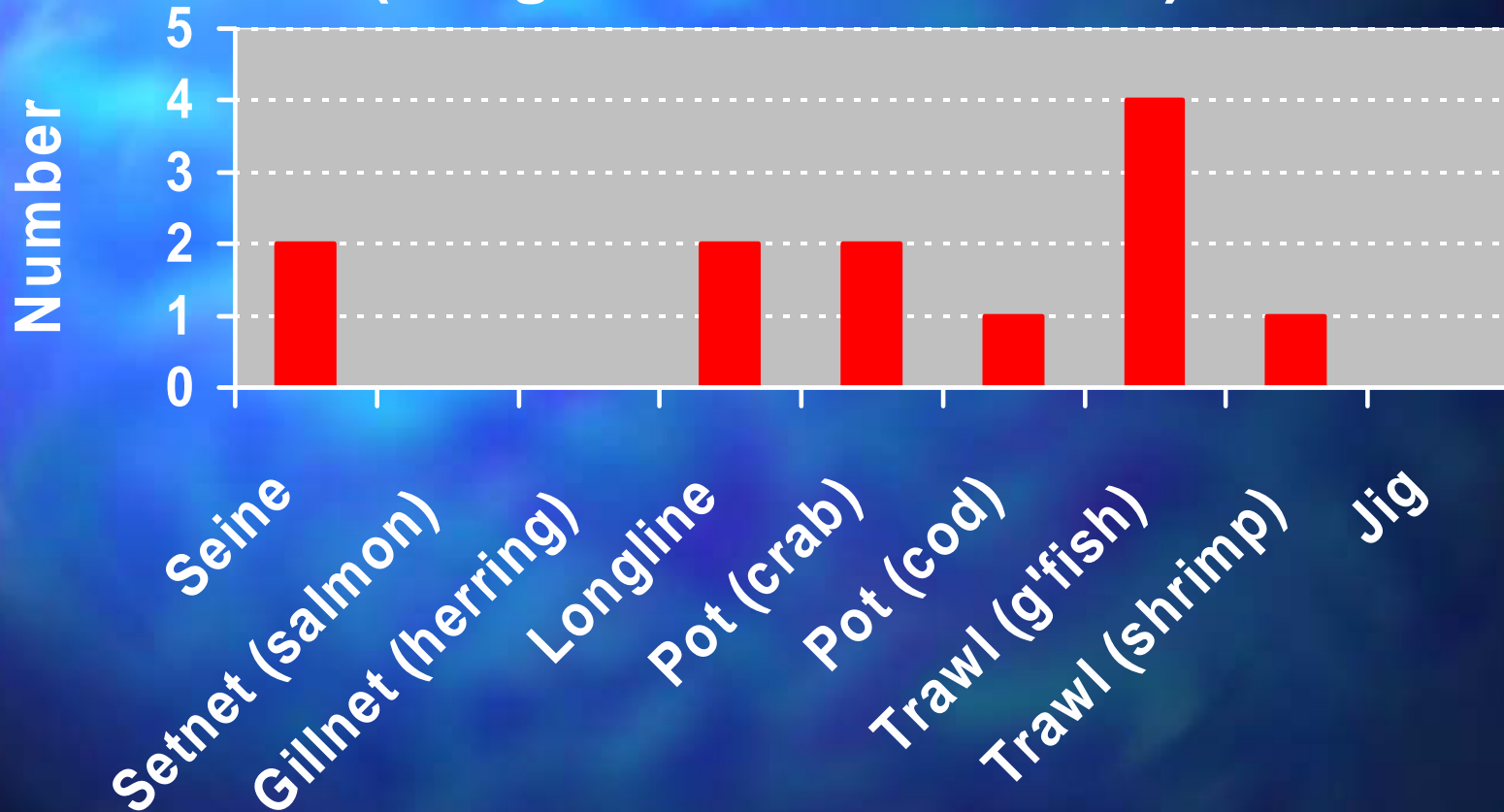
# Results

## Number of Interviews by Gear (Kodiak)



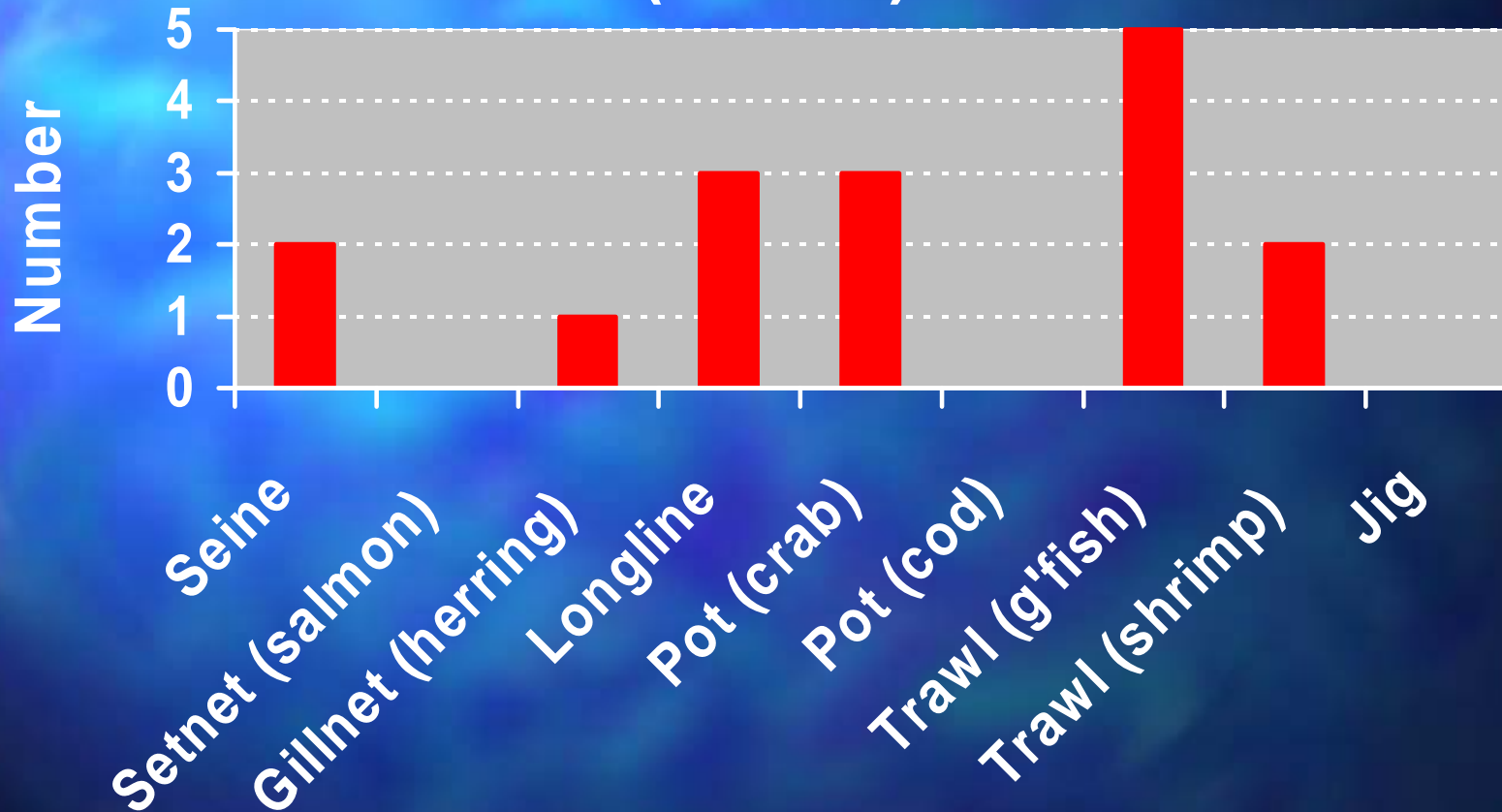
# Results

## Number of Interviews by Gear (King Cove/Sand Point)



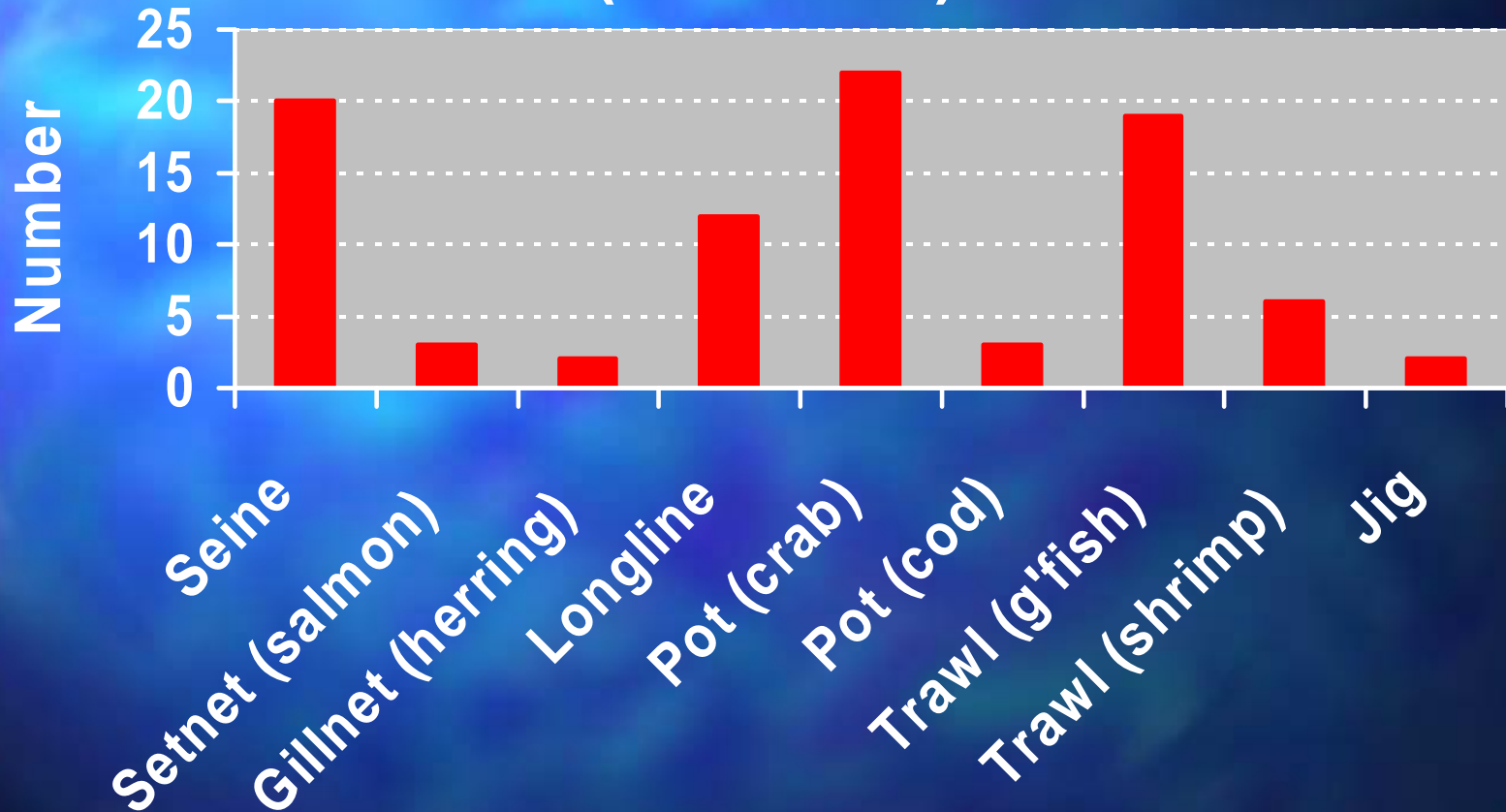
# Results

## Number of Interviews by Gear (Phone)



# Results

## Number of Interviews by Gear (All Areas)



# General Impressions (SSLs)

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- Highest rates of bycatch (and shooting) during fishing occurred during joint-venture trawl fishery for pollock in Shelikof Strait in mid 1980s. Aggressive SSL behaviors.
- Salmon setnets have 2<sup>nd</sup> highest rates of adverse interactions with SSLs.
- “Pill boxes” at some setnet sites.
- Pre-season, sport, and “bad weather day” shooting of SSLs reported.
- SSLs shot by some crabbers for bait and in response to punctured buoys historically.

# General Impressions (SSLs)

- Bycatch, gear damage, and shooting appear to have been low in the following fisheries:
  - Trawl (current)
  - Longline
  - Seine
  - Herring gillnet
  - Cod pot
  - Crab pot (current)



Photo: NOAA, Alaska  
Fishery Science Center

# General Impressions (Ecosystem)

- Increase in cod at end of crab/shrimp fishery.
- Most fishermen report increases in sharks.
- Some report increases in whales, especially orcas and sperm whales.
- Increased incidences of orcas/sperm whales predating longline gear.
- Observations of orcas eating SSLs are rare at sea, except in Kodiak harbor.
- No reports of orcas eating sea otters.



Photo: Betty Sederquist  
<http://www.sederquist.com>

# Remaining Work

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- Analyze and summarize interview results
- Prepare draft report (by spring 2007)
- Provide draft to interested study participants for feedback
- Publish project completion report (by August 2007)
- Prepare jointly authored journal manuscript with ADF&G
- Consider future research