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A Review of Pinniped Predation on Salmonids

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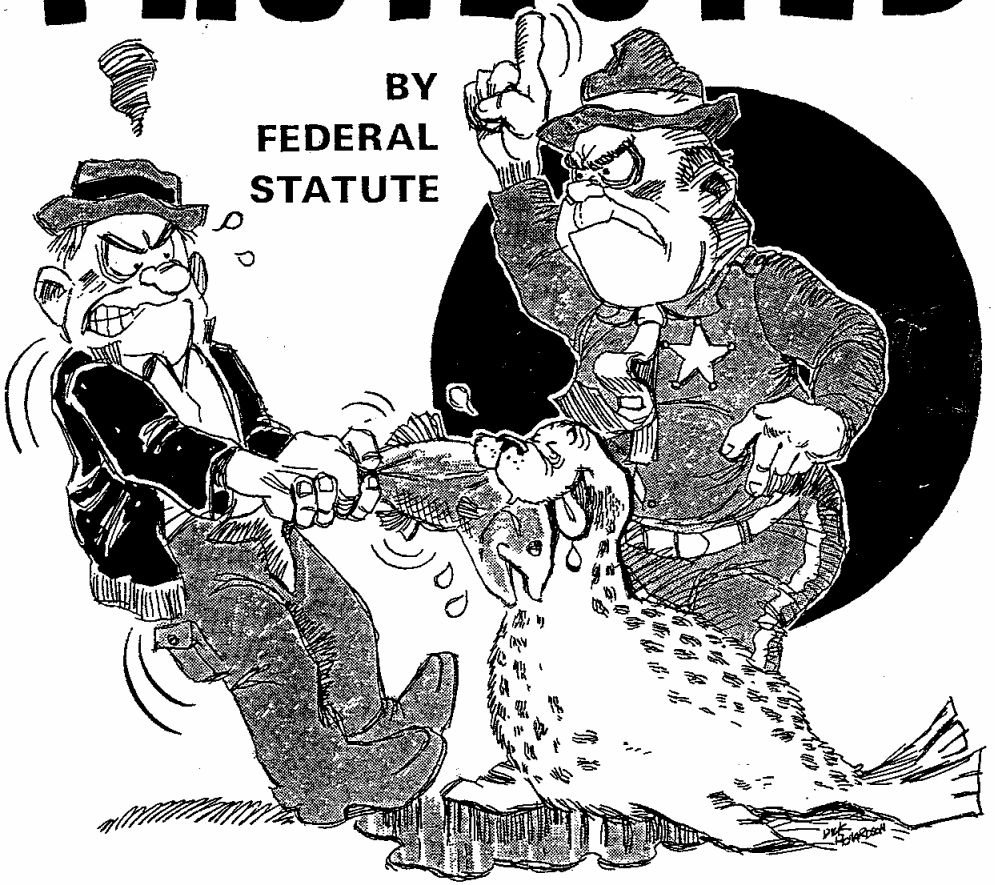
MARINE MAMMALS

ARE NOW

PROTECTED

BY
FEDERAL
STATUTE



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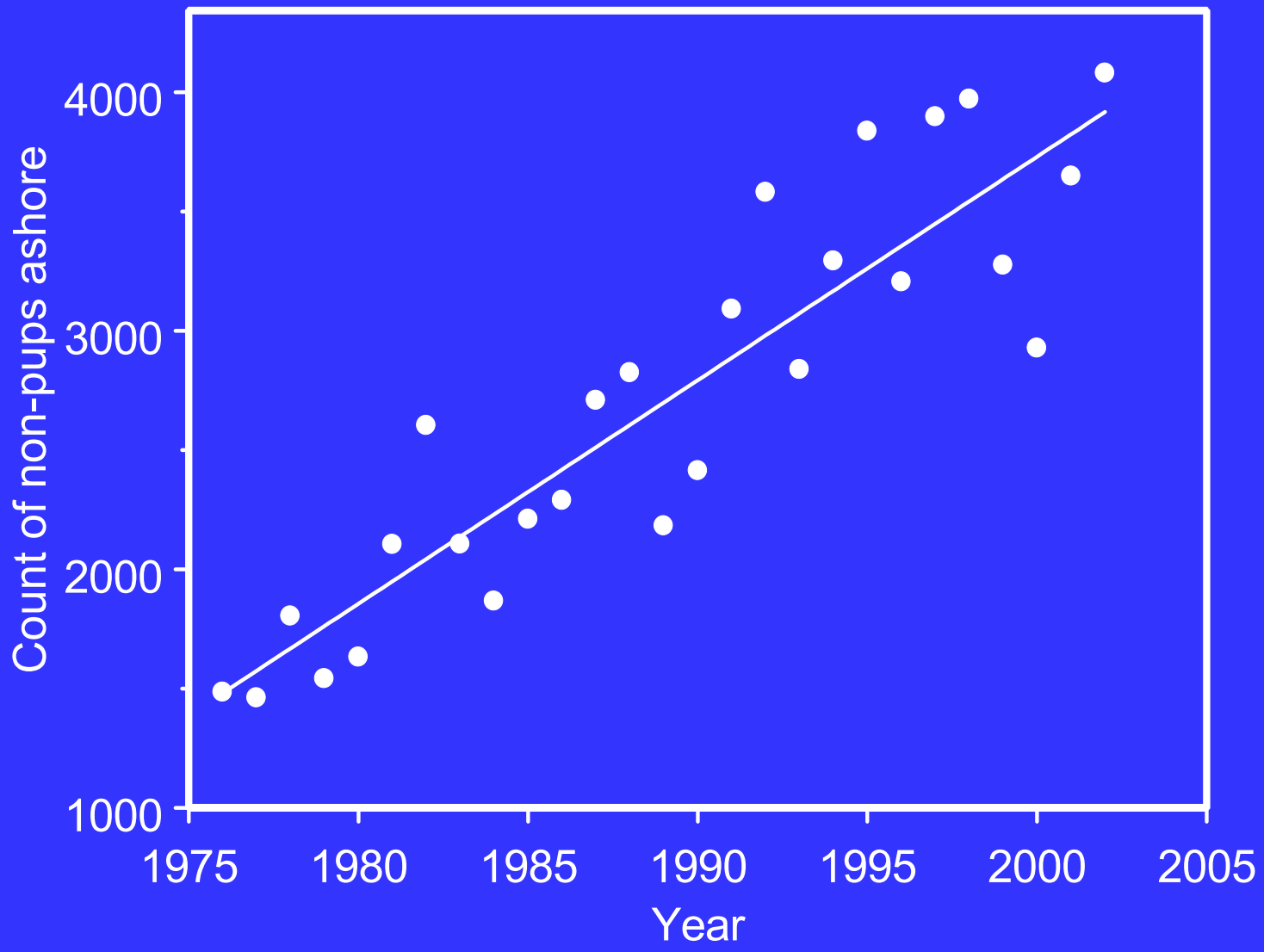
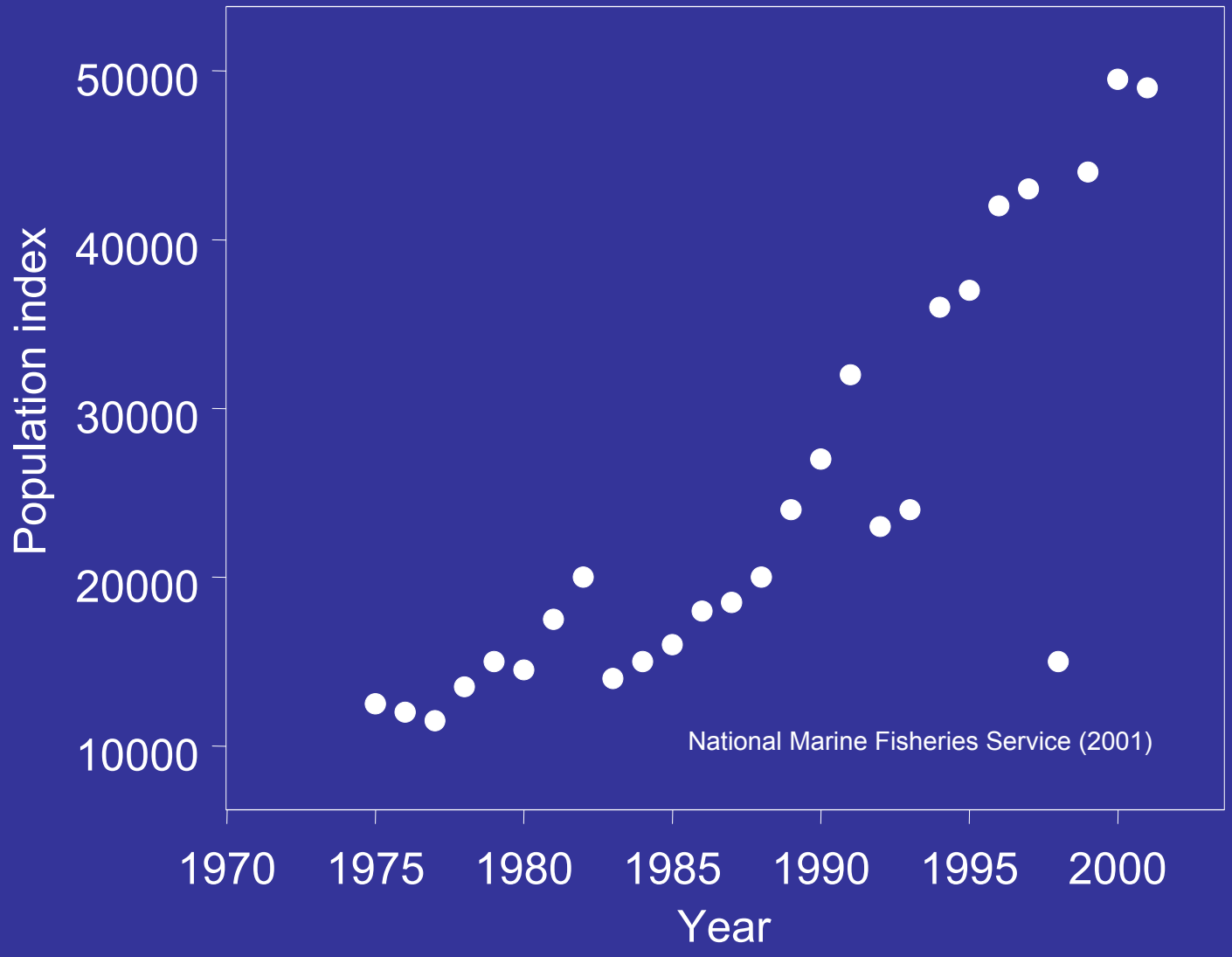
Oregon Game Commission (503) 229-5503

31 SEA GRANT
Oregon State University

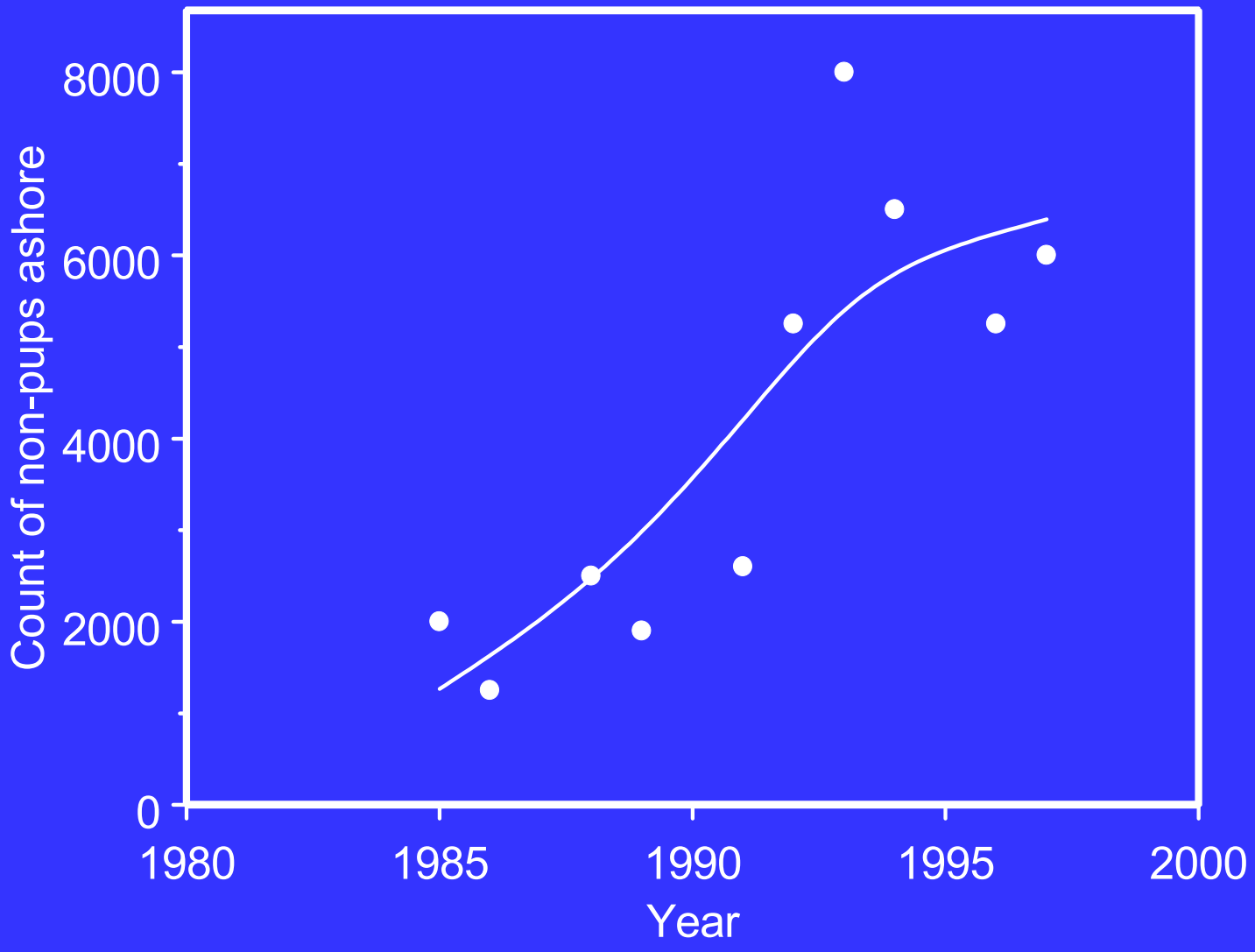
Steller Sea Lion Trend in OR



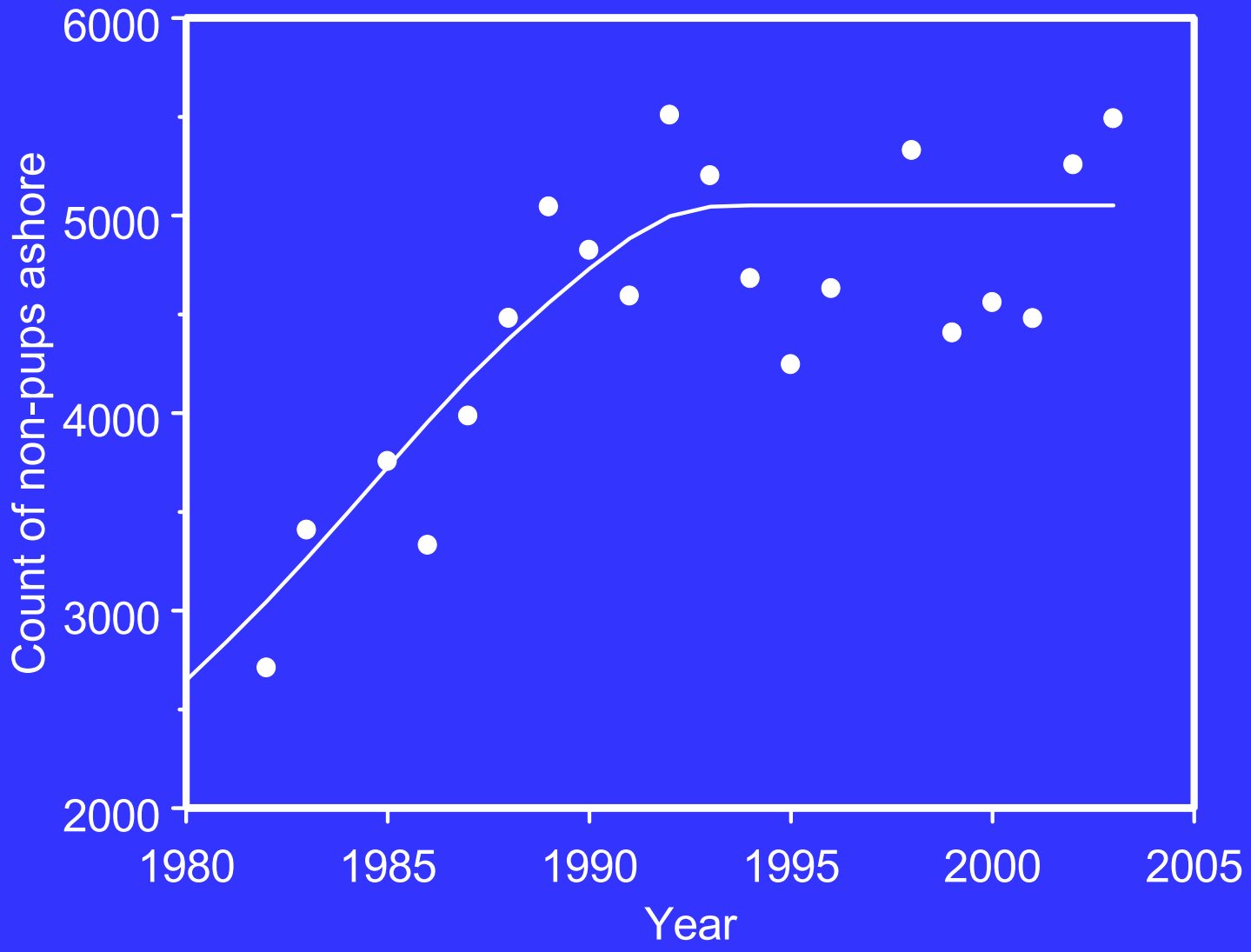
California Sea Lion Pups in U.S.: 1975-2001



California Sea Lion Trend in OR



Harbor Seal Trend in OR



Consumption Estimates

Oregon (NMFS, 1997)

- 5,300 MT fish by 50-3,700 Sea Lions
- 8,500 MT fish by 9,200 Harbor Seals

Published Consumption Estimates

Oregon (Harvey, 1987)

- Salmonids

  600 MT by 5,000 harbor seals

Strait of Georgia (Olesiuk, 1993)

- Salmonids

  400 MT by 16,000 harbor seals

Published Consumption Estimates

Rogue River, OR (Roffe & Mate, 1984)

- Spring Chinook

  0.4-0.7% by pinnipeds

- Summer Steelhead

  3.7-5.7% by pinnipeds

Lake Washington, WA (NMFS, 1994)

- Steelhead

  42-65% by CA sea lions

Working Group (1997-): Pinniped Predation on Salmonids

- National Marine Fisheries Service
- State Fish & Wildlife (WA, OR, CA)
- University of Washington
- Yurok Nation
- Humboldt State University
- Moss Landing Marine Labs

Working Group Estimates

Klamath River, CA (Yurok)

- Fall chinook; pinnipeds
  - 1997: 8.8% of run
  - 1998-99: ?

San Lorenzo River, CA (MLML)

- Winter steelhead; harbor seals
  - 2000: 6.3%-19.8% of run
  - 2001: 3.5%-16.6% of run

Working Group Estimates

Mad River, CA (HSU)

- Winter steelhead; harbor seals

  2001: 1.4% of run

Lake Ozette, WA (NMFS, Makah)

- Sockeye; pinnipeds

  1998-1999: ~negligible

Working Group Estimates

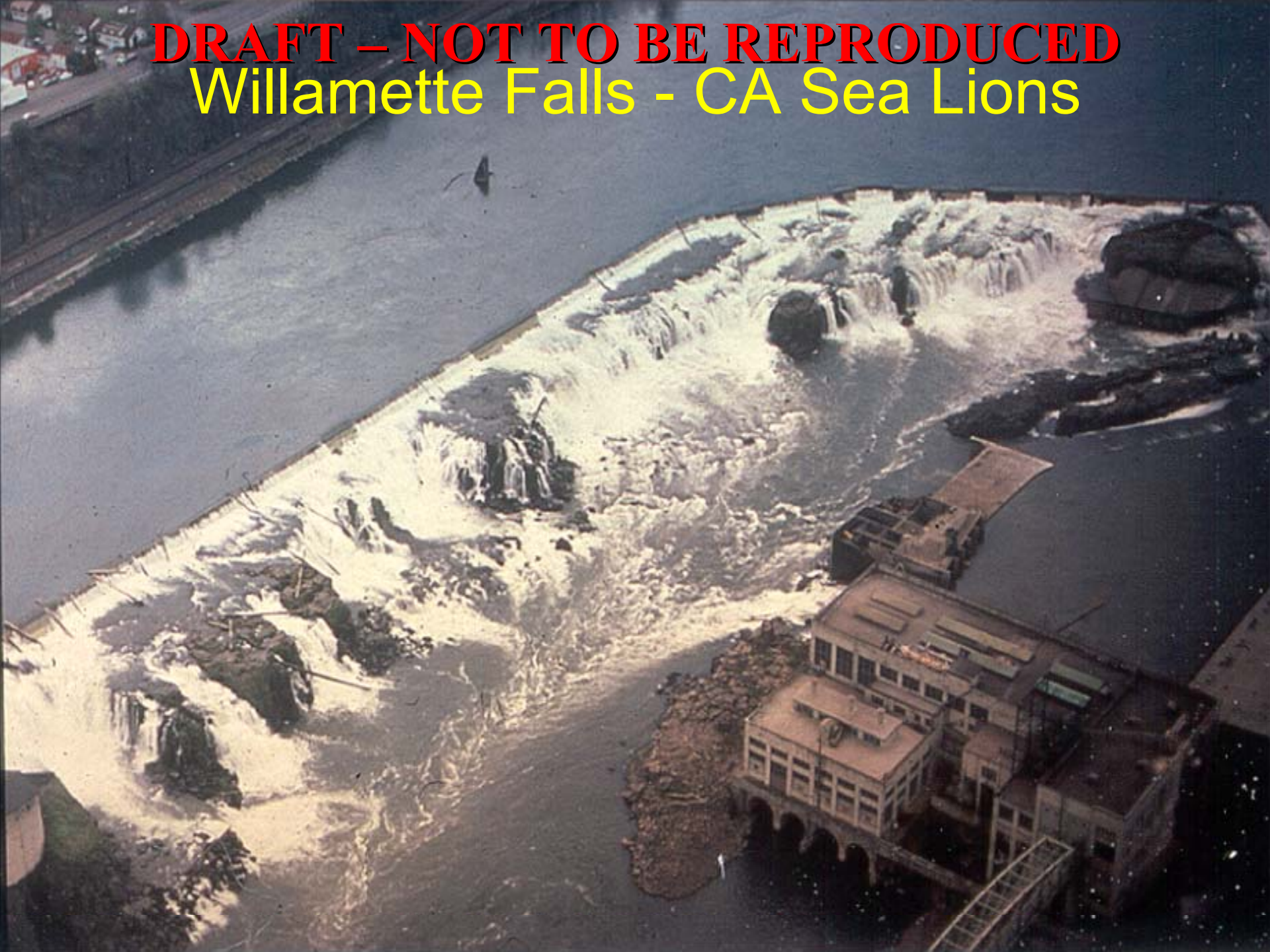
Hood Canal, WA (WDFW, UW)

- Summer chum; harbor seals
  1998-2000: 10%-20% of run
  2001-2003: pending

Bonneville Dam (ACOE)

- Adult salmonids, CA sea lions
  2002-2004: 0.3 - 2.0% of passage

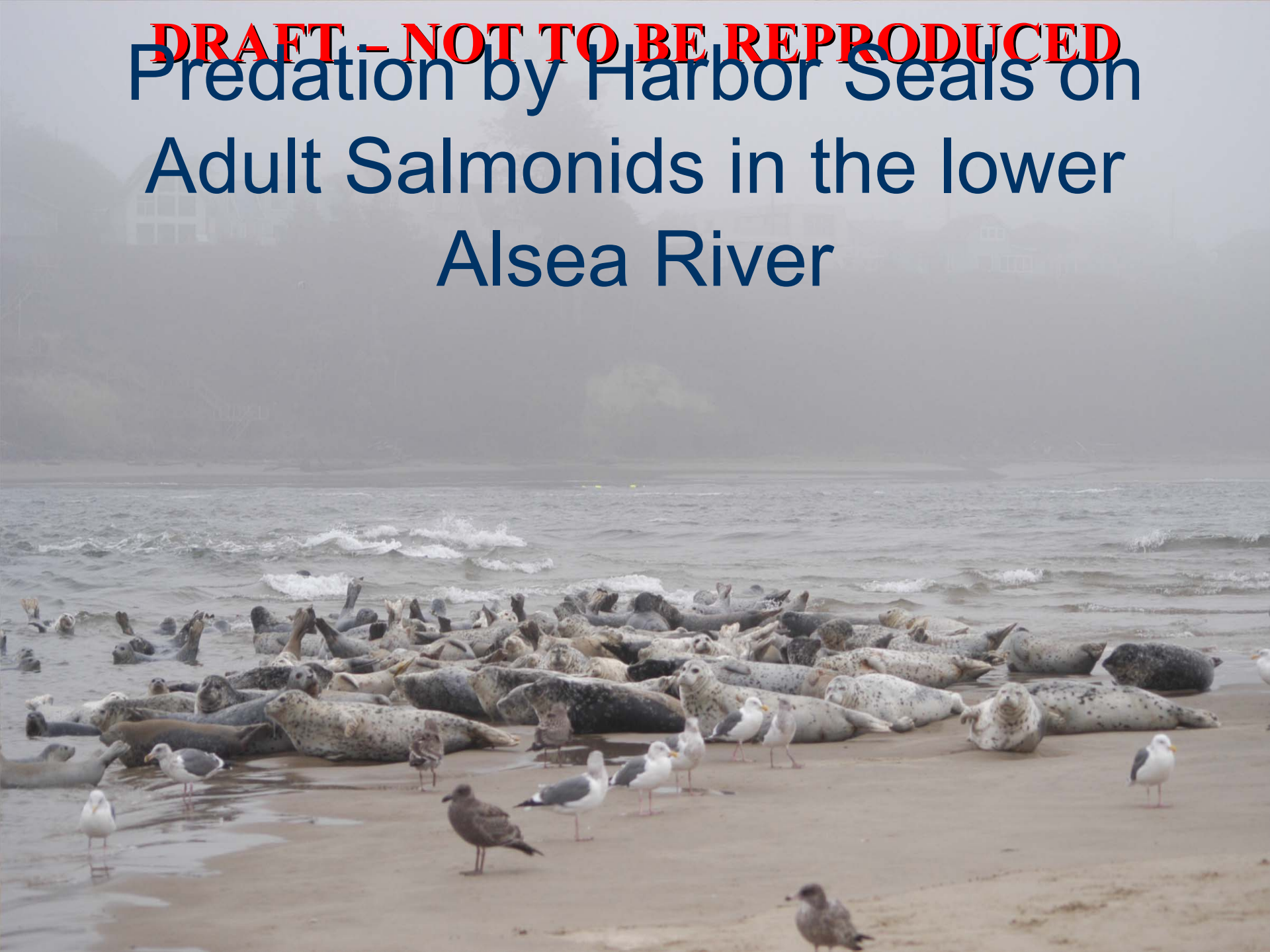
Willamette Falls - CA Sea Lions



Willamette Falls - CA Sea Lions

	Proportion of escapement consumed	
Year	Winter steelhead	Spring chinook
1996	0.055	0.008
1997	0.015	0.005
1998	0.035	0.002
1999	0.030	0.004
2000	0.037	0.005
2001	0.003	0.001
2002	0.003	0.002

Predation by Harbor Seals on Adult Salmonids in the lower Alsea River



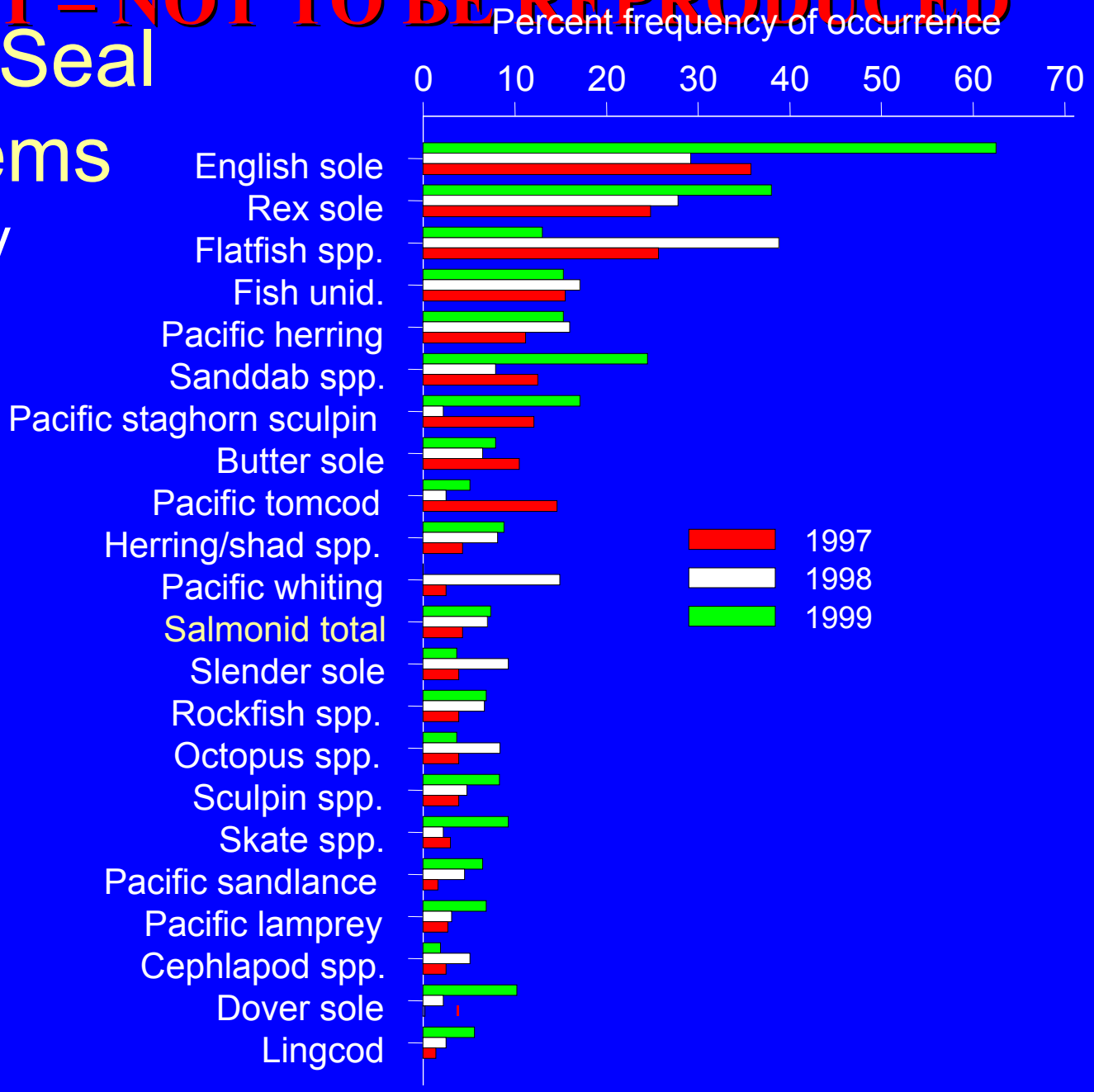
Alsea River - Harbor Seal Scat Collection

- Fall 1997-2002; some year-around collecting
- 3,424 scat collected and processed
- Characterize diet
- Genetic ID of salmonids (OSU)

Harbor Seal Prey Items

Alsea Bay

Fall



Alsea River - Harbor Seal Scat Collection

- Seal diet consisted of over 30 prey items
- Flatfish spp. occurred most frequently (e.g., English sole, Dover sole, Rex sole)
- Salmonids occurred in 4.3%-9.4% of annual fall collections
- Genetic analysis of scat w/ salmonid remains:
  - 39% exclusively coho
  - 46% exclusively chinook
  - 15% mixed coho-chinook (+1 steelhead or cutthroat)
  - Multiple individuals occurred in some scat

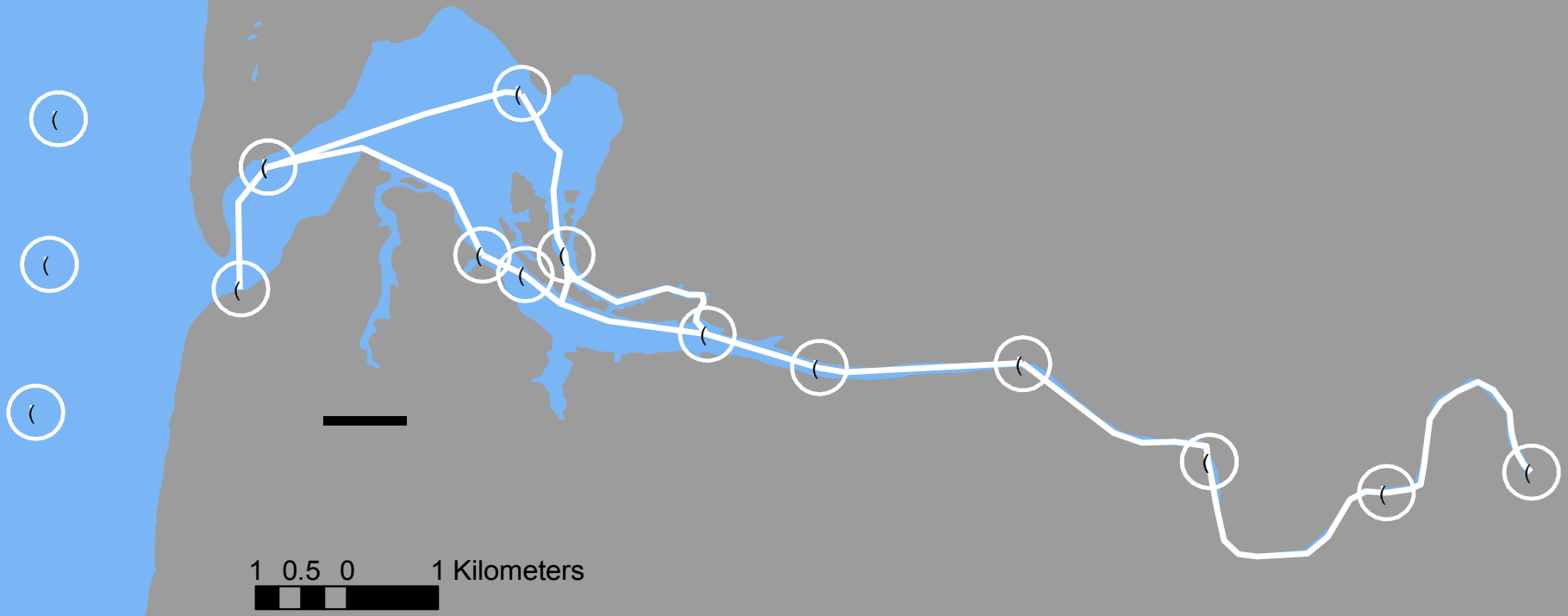
Alsea River - Harbor Seal Movements

- 2000
- Radio transmitters
- Between-estuary movements

- 2002
- Acoustic transmitters
- Within-estuary movements

Receiver Locations

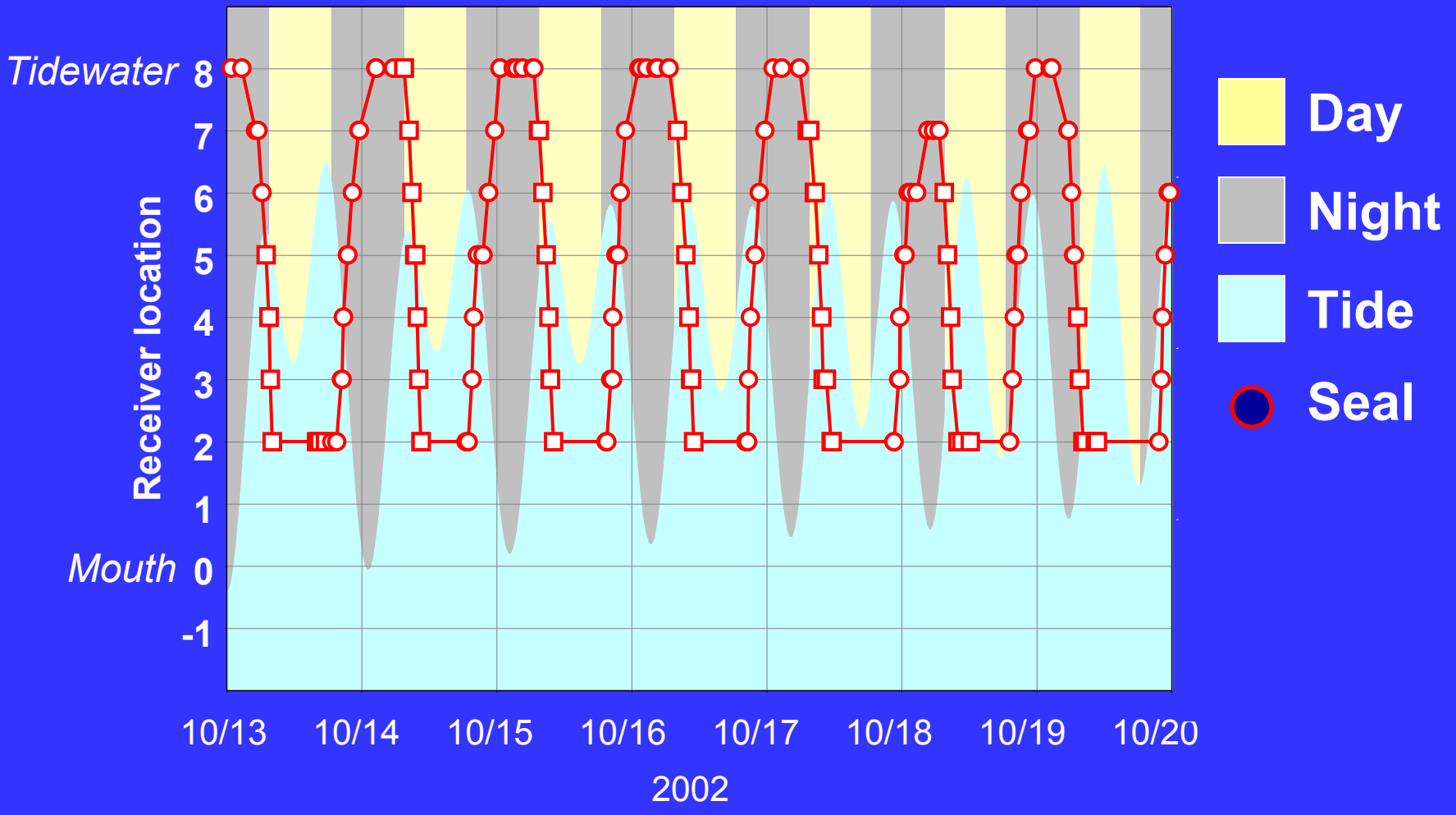
- 15 receivers
- Range: 300 m

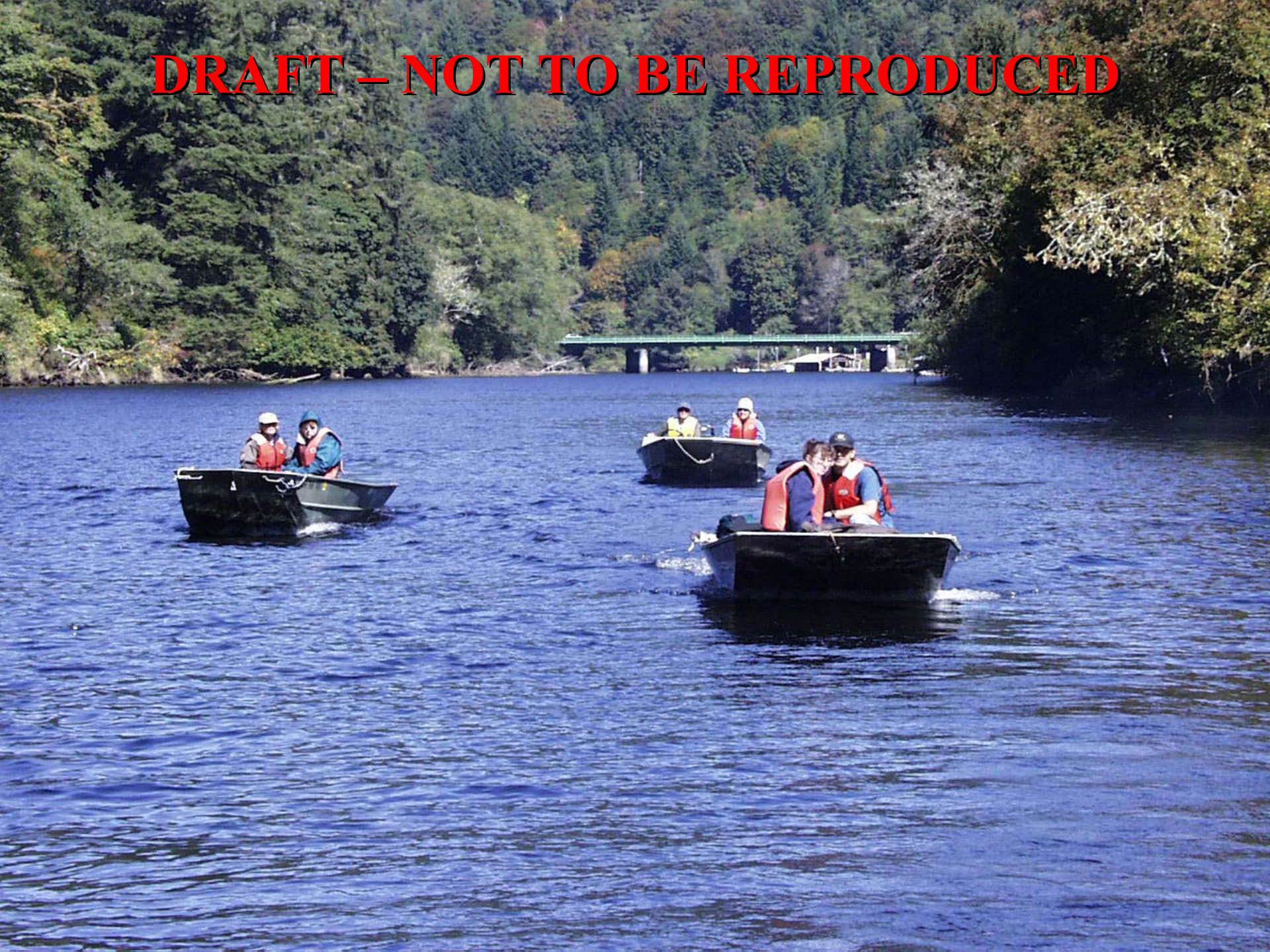


Results: Movements

- Captured and marked 59 seals
- General movement patterns:
  - Ocean seals
  - Bay seals
  - River seals
- 593 river trips totaling 5067 hours
  - 7 seals accounted for 94% of hours
  - 73% of hours occurred at night

Alsea River - Harbor Seal Movements

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Observation Locations

- 63 sites (19 km)
- 300 m L x ≤150 m W
- 60 min period

2002 Results: Observations

- 759.5 hours of daytime observation
- 17 confirmed salmonid predation events observed
- Majority of events occurred in river (vs. bay)
- 77.5 hours of nighttime observation
- Confirmed nocturnal salmonid predation

Alsea River – Coho Predation Fall '02

- Estimated total salmonid consumption: 1,160 adult salmonids

  (95% CI: 500-1,820)

Alsea River – Coho Predation Fall '02

- Qualifiers:
  - 84-day period (1 SEP – 23 NOV 2002)
  - 18.9 km of Alsea River (mouth - ~tidewater)
  - Daylight only (½ h after sunrise – ½ h before sunset)
  - Not species-specific (coho and chinook)

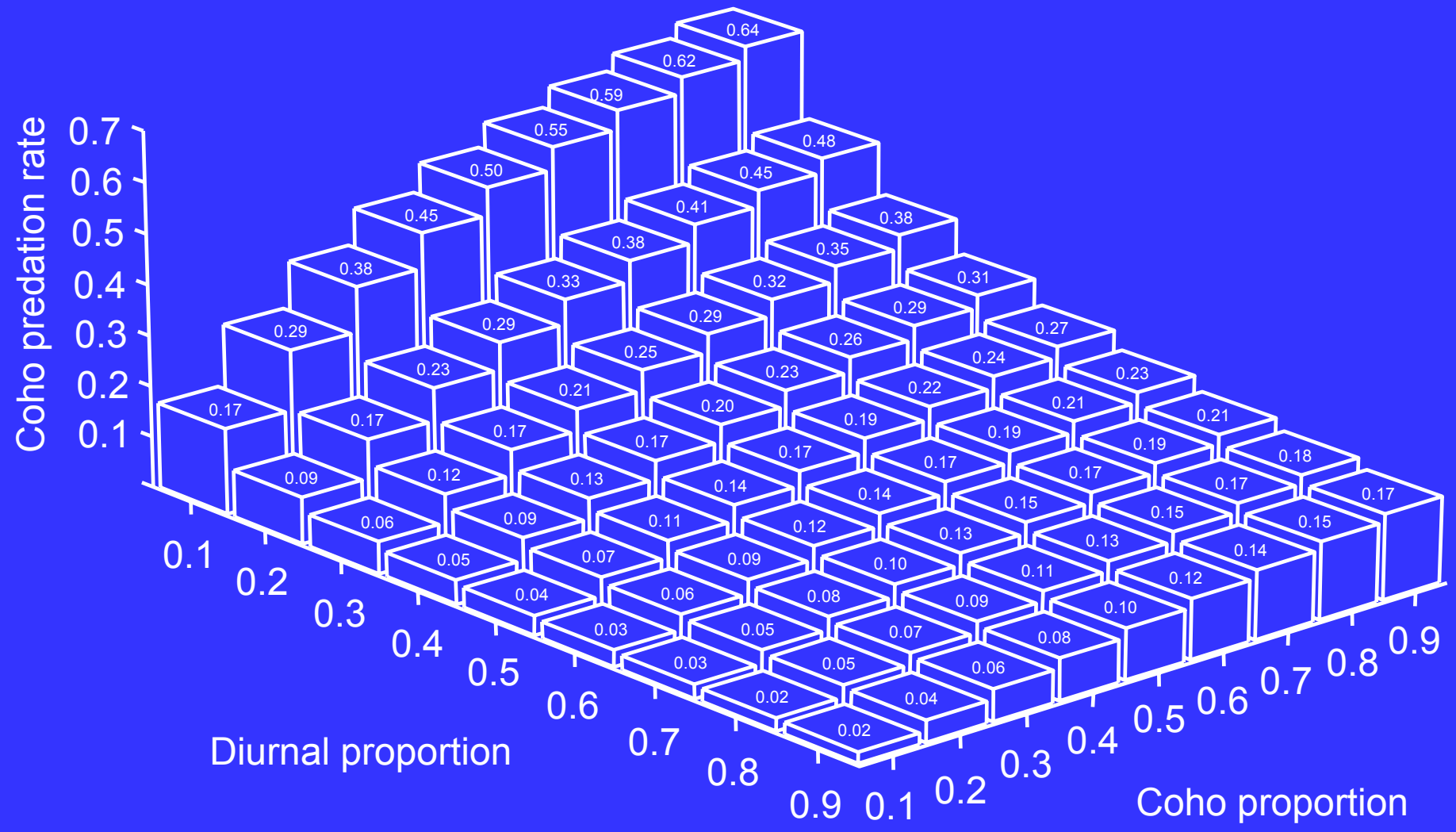
Alsea River – Coho Predation Fall '02

- Estimated coho abundance: 5,767 spawners (95% CI: 2,220 – 9,314)

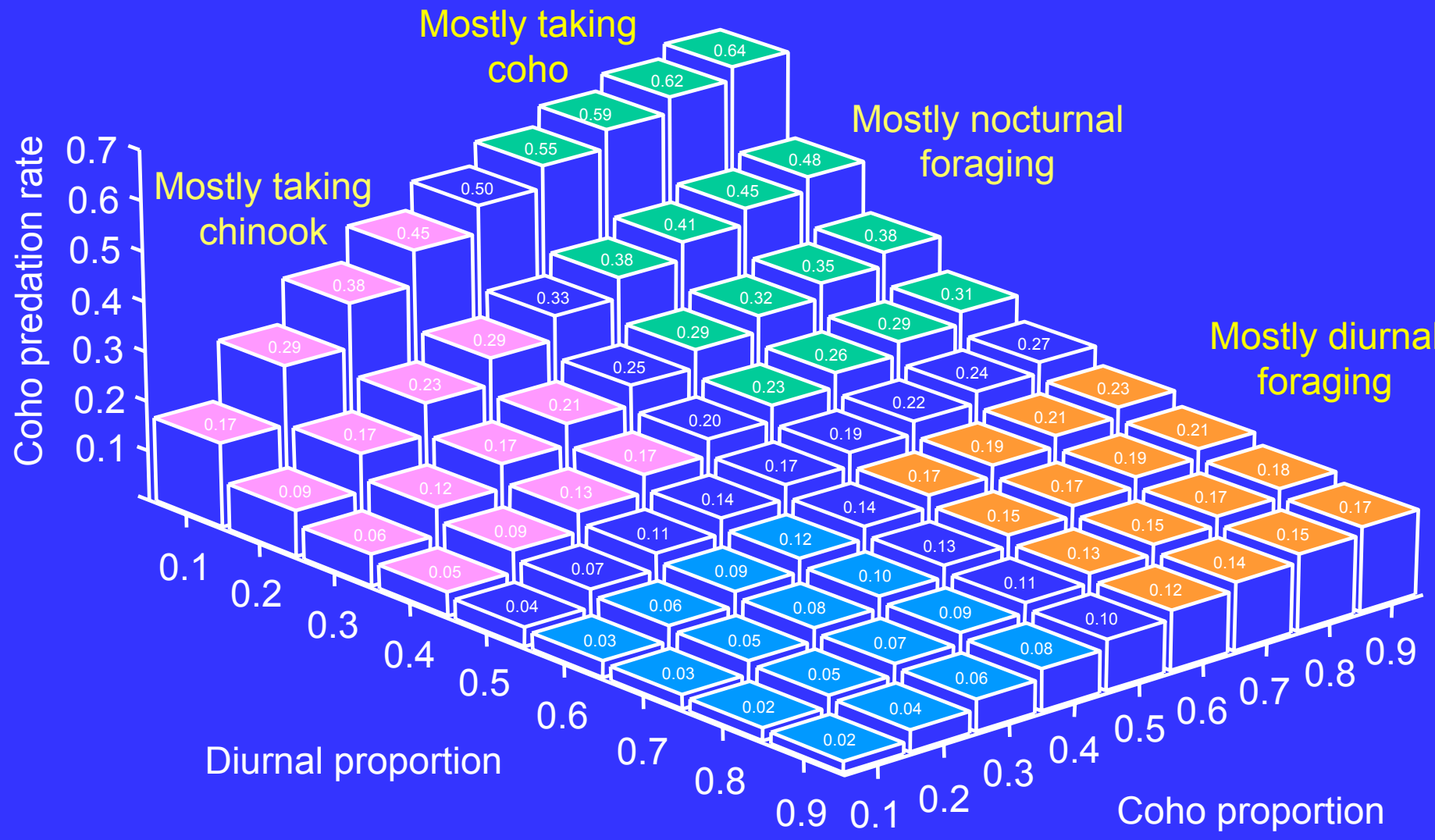
- Estimated total salmonid consumption: 1,160 adult salmonids

  (95% CI: 500-1,820)

Alsea River – Coho Predation Fall '02



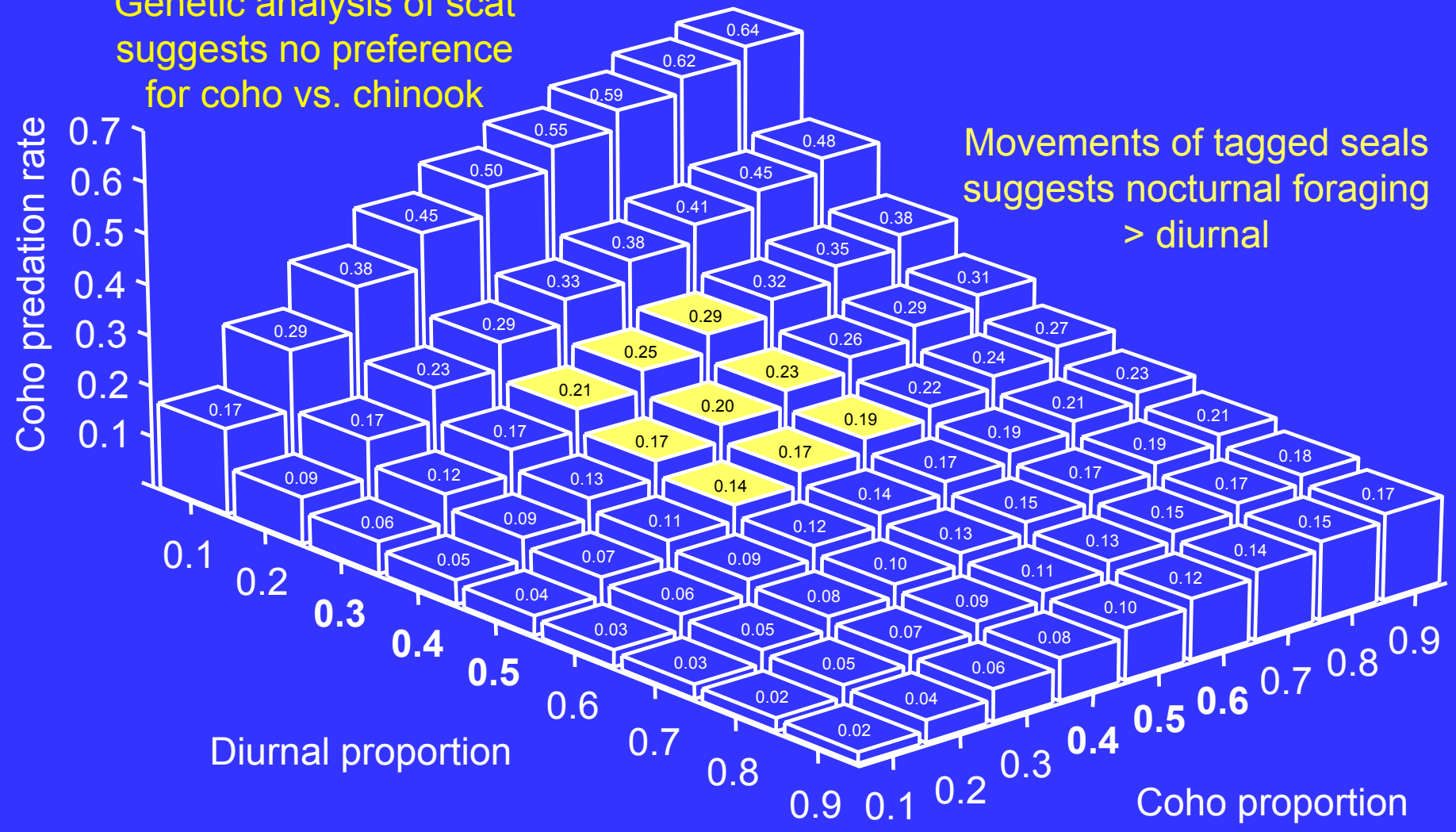
Alsea River – Coho Predation Fall '02



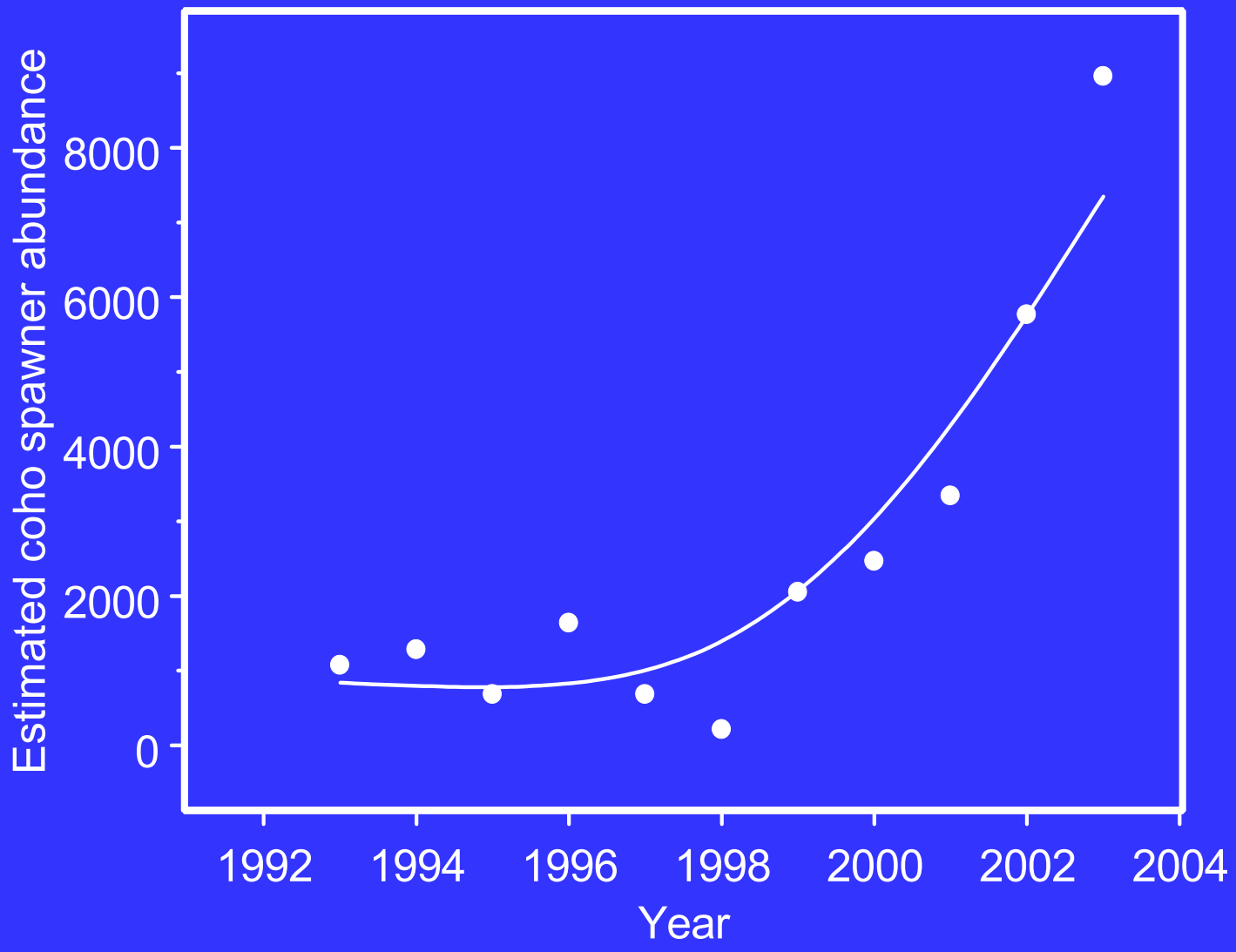
Alsea River – Coho Predation Fall '02

Genetic analysis of scat suggests no preference for coho vs. chinook

Movements of tagged seals suggests nocturnal foraging > diurnal



Alsea Coho Spawner Trend



Problem Animal Hypothesis

Willamette Falls

Willamette Falls

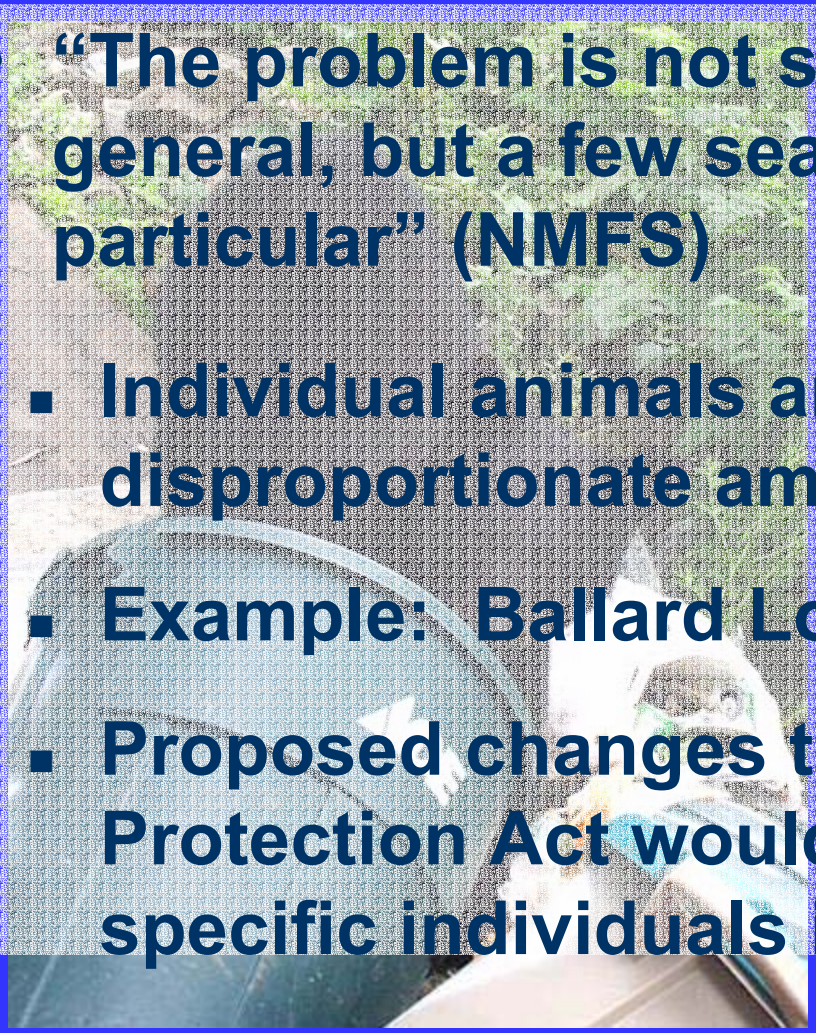
- April 23, 1999: Adult male CA sea lion branded in Astoria, OR
  - May 4-11, 1999: Responsible for 13% of observed predation at falls in 1999
  - June-July, 1999: San Miguel Island, CA
  - August 25, 1999: Cape Arago, OR
  - February 2-29, 2000: Responsible for 8.5% of observed predation at falls in 2000

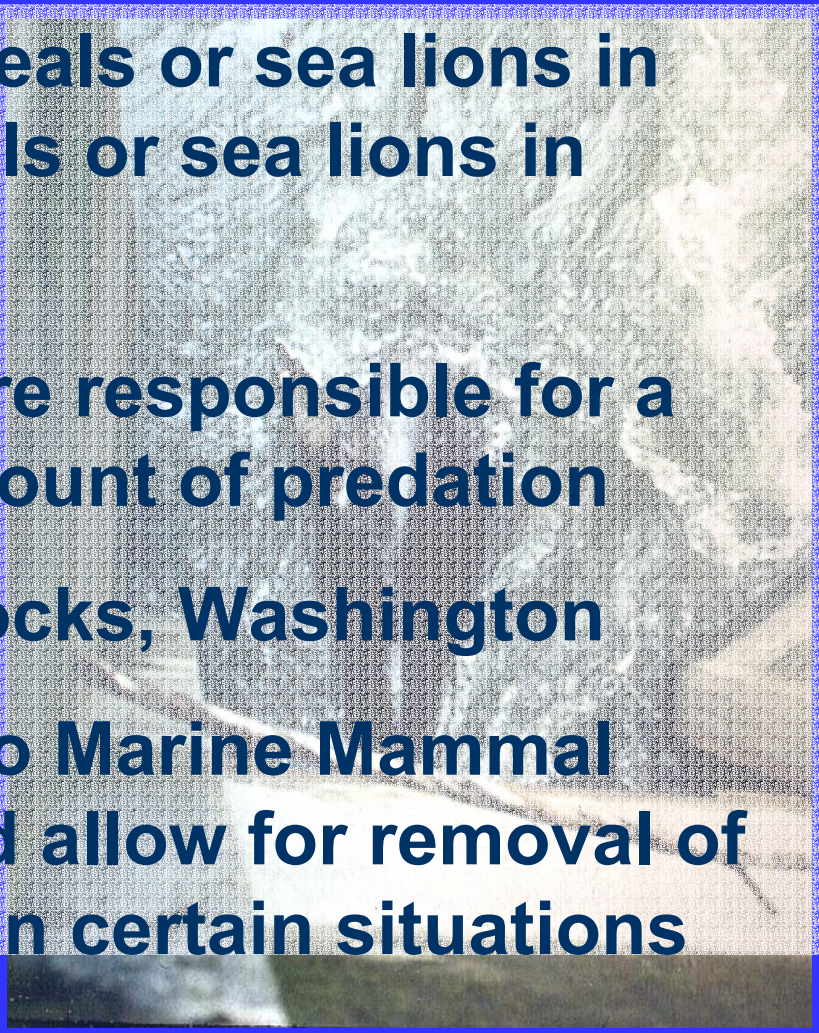
Alsea River

Alsea River

- Adult female harbor seal: tagged August 30, 2000
  - Responsible for 10-16% of all observed predation
    - September 17 – October 3, 2000
    - All predations occurred at mouth of Drift Creek (major spawning tributary)

Problem Animal Hypothesis





- "The problem is not seals or sea lions in general, but a few seals or sea lions in particular" (NMFS)
  - Individual animals are responsible for a disproportionate amount of predation
  - Example: Ballard Locks, Washington
  - Proposed changes to Marine Mammal Protection Act would allow for removal of specific individuals in certain situations

Summary

- Pinnipeds eat lots of fish; frequently salmonids
- Species and site specific information is limited, but is increasing with new work
- Results to date show highly variable impacts
- Predation on healthy stocks is generally not a significant concern (opinions vary)
- Unabated predation on depressed stocks at restrictions in passage can be important
- New, directed management actions (individual animals) may be warranted in certain cases

Avian Predation

- Believed to be a minor factor in decline of coastal salmonid populations
- Opportunistic feeders concentrate on mass hatchery releases
- May have lesser impacts on wild smolts
- Decreases in quality of riverine/estuarine habitats increase predation success
- Columbia River (Terns), Coastal Bays (Cormorants) studies (OCFWRU)

Predation as a Factor for Decline

- **NMFS and Oregon Plan (1997)**
- **Oregon Plan Assessment (2004)**
  - **Relative to the effects of fishing, habitat degradation, and hatchery practices, predation is not believed to be a major factor contributing to the overall decline of coho**

Predation as a Factor for Decline

- **NMFS and Oregon Plan (1997)**
- **Oregon Plan Assessment (2004)**
  - **Unabated predation by locally abundant predators on depressed fish stocks at restrictions in passage may be important for salmon recovery**

Predation as a Factor for Decline

- **NMFS and Oregon Plan (1997)**
- **Oregon Plan Assessment (2004)**
  - **Learned behaviors by individual predators can be significant in some cases**
  - **New, directed management actions (individual pinnipeds) may be warranted in certain cases**

Acknowledgements

- National Marine Fisheries Service
- National Marine Mammal Laboratory
- West Coast Pinniped Predation Working Group Members
- ODFW Fish Division Biologists (Rick Boatner - Willamette Falls, Bob Buckman - Alsea River)
- ODFW Predation Studies Field Staff