

# **OREGON'S OFF SHORE ISLANDS**

**Marine Mammals**

**Kelp Beds**

**Marine Birds (April 9 – Mike Graybill)**



# Oregon Coast National Wildlife Refuge Complex



Oregon Islands and Three Arch Rocks NWRs support some of the most important seabird nesting colonies in the United States. Over a million seabirds, including murres, puffins,

cormorants, and storm-petrels nest here. Without these protected nesting areas, many seabird populations would be in jeopardy.

Nestucca Bay, Siletz Bay and Bandon Marsh NWRs provide vital feeding and resting habitat for shorebirds and waterfowl during their migrations. The protection and restoration of saltmarsh habitats in these refuges benefit the recovery of wild salmon, steelhead and cutthroat trout. Cape Meares NWR protects old-growth forest used by marbled murrelets, peregrine falcons, bald eagles, and songbirds.

The Oregon Coast Refuges are part of the National Wildlife Refuge System, a network of over 540 refuges set aside specifically for fish and wildlife. Managed by the U.S. Fish and Wildlife Service, the System is a living heritage, conserving fish, wildlife and their habitats for generations to come.



Over 1,850 rocks, reefs and islands  
Closed to human access



<http://www.fws.gov/oregoncoast/>

# **Oregon Islands National Wildlife Refuge**

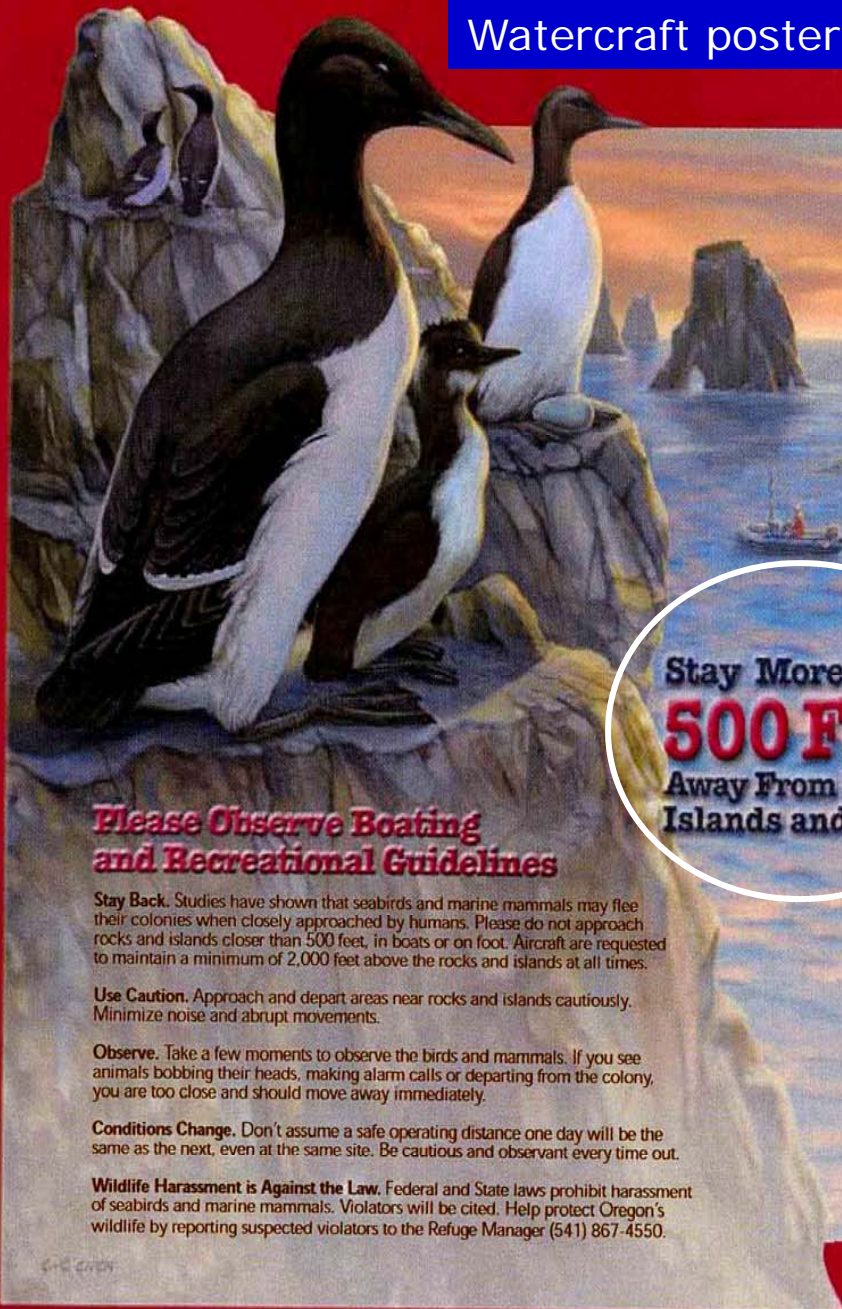
Haul – out sites for seals and sea lions

Nesting site for a million + seabirds

Intertidal resources

Terrestrial plants





## Help Protect Marine Wildlife

Seabirds and marine mammals are extremely sensitive to human disturbance. Because they view humans as predators, they will not tolerate close approach at any time. Disturbance often causes adults to flee their colonies, which can result in losses of eggs and young or complete colony abandonment.

Stay More Than  
**500 Feet**  
Away From Rocks,  
Islands and Cliffs

### Please Observe Boating and Recreational Guidelines

**Stay Back.** Studies have shown that seabirds and marine mammals may flee their colonies when closely approached by humans. Please do not approach rocks and islands closer than 500 feet, in boats or on foot. Aircraft are requested to maintain a minimum of 2,000 feet above the rocks and islands at all times.

**Use Caution.** Approach and depart areas near rocks and islands cautiously. Minimize noise and abrupt movements.

**Observe.** Take a few moments to observe the birds and mammals. If you see animals bobbing their heads, making alarm calls or departing from the colony, you are too close and should move away immediately.

**Conditions Change.** Don't assume a safe operating distance one day will be the same as the next, even at the same site. Be cautious and observant every time out.

**Wildlife Harassment is Against the Law.** Federal and State laws prohibit harassment of seabirds and marine mammals. Violators will be cited. Help protect Oregon's wildlife by reporting suspected violators to the Refuge Manager (541) 867-4550.



Seabirds and marine mammals are especially vulnerable to disturbance during the breeding season which extends from April through September.



The Oregon coast is home to over a million nesting seabirds and tens of thousands of seals and sea lions. They depend on coastal rocks, islands and steep mainland cliffs where they are protected from mammalian predators.

**Tenyo Maru Oil Spill**  
In July, 1991, the Japanese fishing vessel Tenyo Maru and the Chinese freighter Tui Hai collided in heavy fog northwest of Cape Flattery, Washington. The Tenyo Maru sank immediately, releasing 475,000 gallons of oil and fuel that killed thousands of seabirds. This education panel was funded by the Tenyo Maru Natural Resource Trustees as one of a number of restoration projects designed to educate the public and to restore natural resources, particularly migratory birds injured by the oil spill. The Trustees include the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, the Makah Indian Tribe and the State of Washington.

### Marine Wildlife Need Places Free from Disturbance

All rocks, reefs and islands along the Oregon coast are part of the Oregon Islands National Wildlife Refuge or Three Arch Rocks National Wildlife Refuge. Managed by the U.S. Fish and Wildlife Service, these refuges are closed to public access at all times.

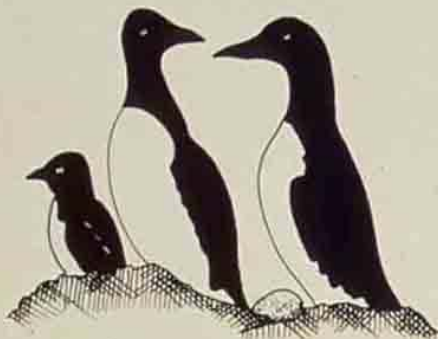
Most rocks and islands along the coasts of Washington and California are also closed to public access at all times. When visiting these states, please stay a safe distance away from rocks and islands to prevent disturbance to sensitive wildlife.



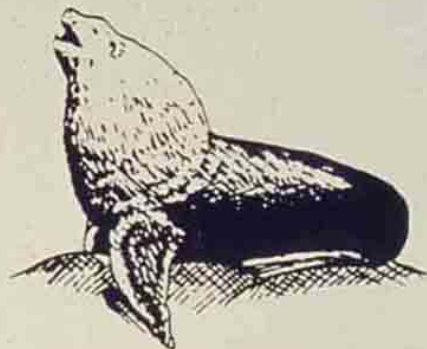


Seasonal closure marking with buoys in some areas

**ATTENTION BOATERS & ANGLERS**



## THREE ARCH ROCKS 500' SEASONAL CLOSURE MAY 1 - SEPT. 15

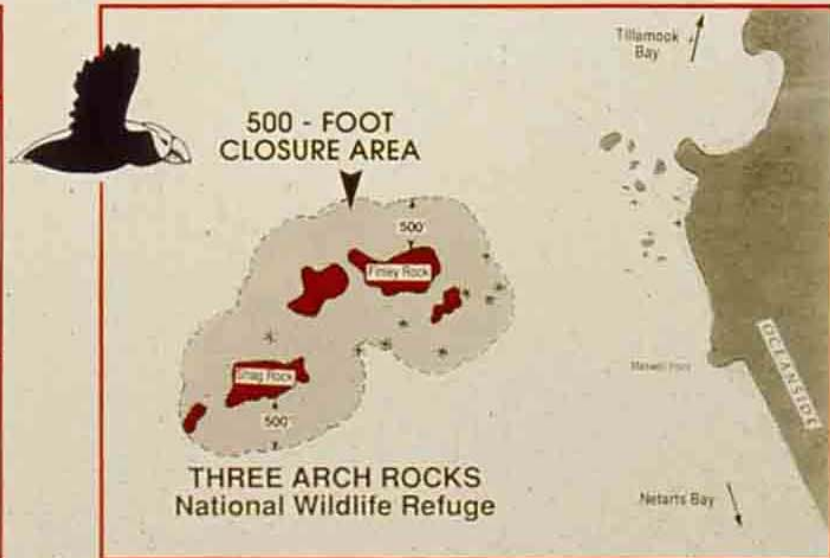


Boats and aircraft near Three Arch Rocks can cause nesting seabirds to flee, knocking eggs or chicks off the rocks. Sea lions may stampede, trampling and killing their pups. This seasonal closure prevents these disturbances from May 1 - Sept. 15.

**PLEASE COOPERATE WITH THIS CLOSURE TO HELP PROTECT MARINE WILDLIFE**

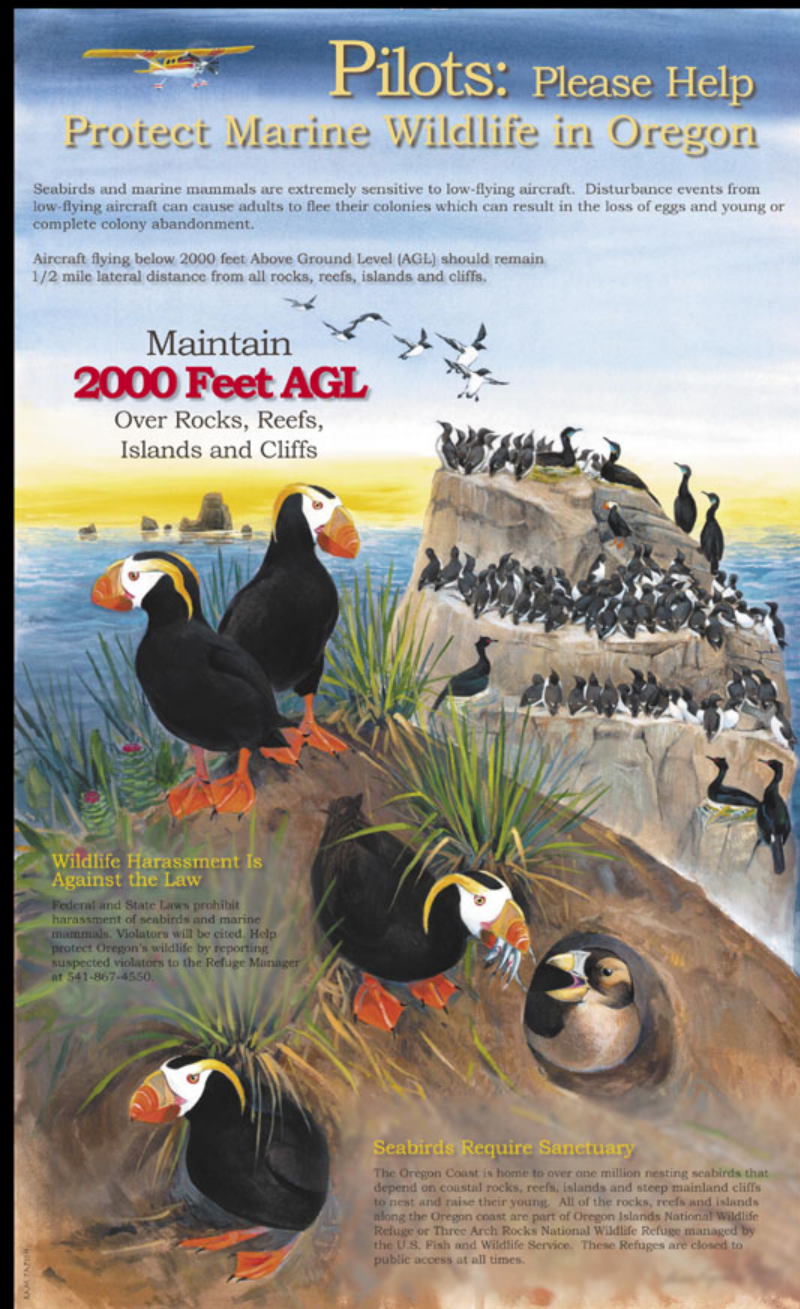
### AREA CLOSURE RULES (OAR 250-20-309)

1. No person shall operate a boat FOR ANY PURPOSE within 500 feet of the principal rocks at Three Arch Rocks National Wildlife Refuge during the period May 1 to September 15. VESSEL TRANSIT THROUGH THE CLOSED AREA, INCLUDING THE ARCHES OF THE ROCKS, IS PROHIBITED. Storm Rock, to the west of Shag Rock, is the westerly boundary of the seasonal closed area.
2. Persons operating boats near Three Arch Rocks National Wildlife Refuge should exercise caution to avoid any disturbance of nesting birds and marine mammals. Harassment of birds and marine wildlife is strictly prohibited under federal and state law.



**Aircraft** are requested to maintain 2000 feet above ground level.

Aircraft poster funded by the Tenyo Maru Oil Spill Trustees.



**Pilots: Please Help Protect Marine Wildlife in Oregon**

Seabirds and marine mammals are extremely sensitive to low-flying aircraft. Disturbance events from low-flying aircraft can cause adults to flee their colonies which can result in the loss of eggs and young or complete colony abandonment.

Aircraft flying below 2000 feet Above Ground Level (AGL) should remain 1/2 mile lateral distance from all rocks, reefs, islands and cliffs.

**Maintain 2000 Feet AGL**  
Over Rocks, Reefs, Islands and Cliffs

**Wildlife Harassment Is Against the Law**  
Federal and State Laws prohibit harassment of seabirds and marine mammals. Violators will be cited. Help protect Oregon's wildlife by reporting suspected violators to the Refuge Manager at 541-867-4550.

**Seabirds Require Sanctuary**  
The Oregon Coast is home to over one million nesting seabirds that depend on coastal rocks, reefs, islands and steep mainland cliffs to nest and raise their young. All of the rocks, reefs and islands along the Oregon coast are part of Oregon Islands National Wildlife Refuge or Three Arch Rocks National Wildlife Refuge managed by the U.S. Fish and Wildlife Service. These Refuges are closed to public access at all times.

© 2000, P. J. V. N. S.

**Tenyo Maru Oil Spill** In July 1991, the Japanese fishing vessel Tenyo Maru and the Chinese freighter Tin Tin collided in heavy fog northeast of Cape Henry, Washington. The Tenyo Maru sank immediately, releasing 475,000 gallons of oil and fuel (and 1000) thousands of seabirds. This environmental disaster was funded by the Tenyo Maru National Research Trustee as one of a number of restoration projects designed to educate the public and to restore natural resources, particularly migratory birds injured by the spill. The Trustees include the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Marine Inland, Tiller and the State of Washington.









Important resting areas for pinnipeds

**Cannot pull hind flippers  
underneath body**



**Swim with hind  
flippers**

# **SEALS PHOCIDS**

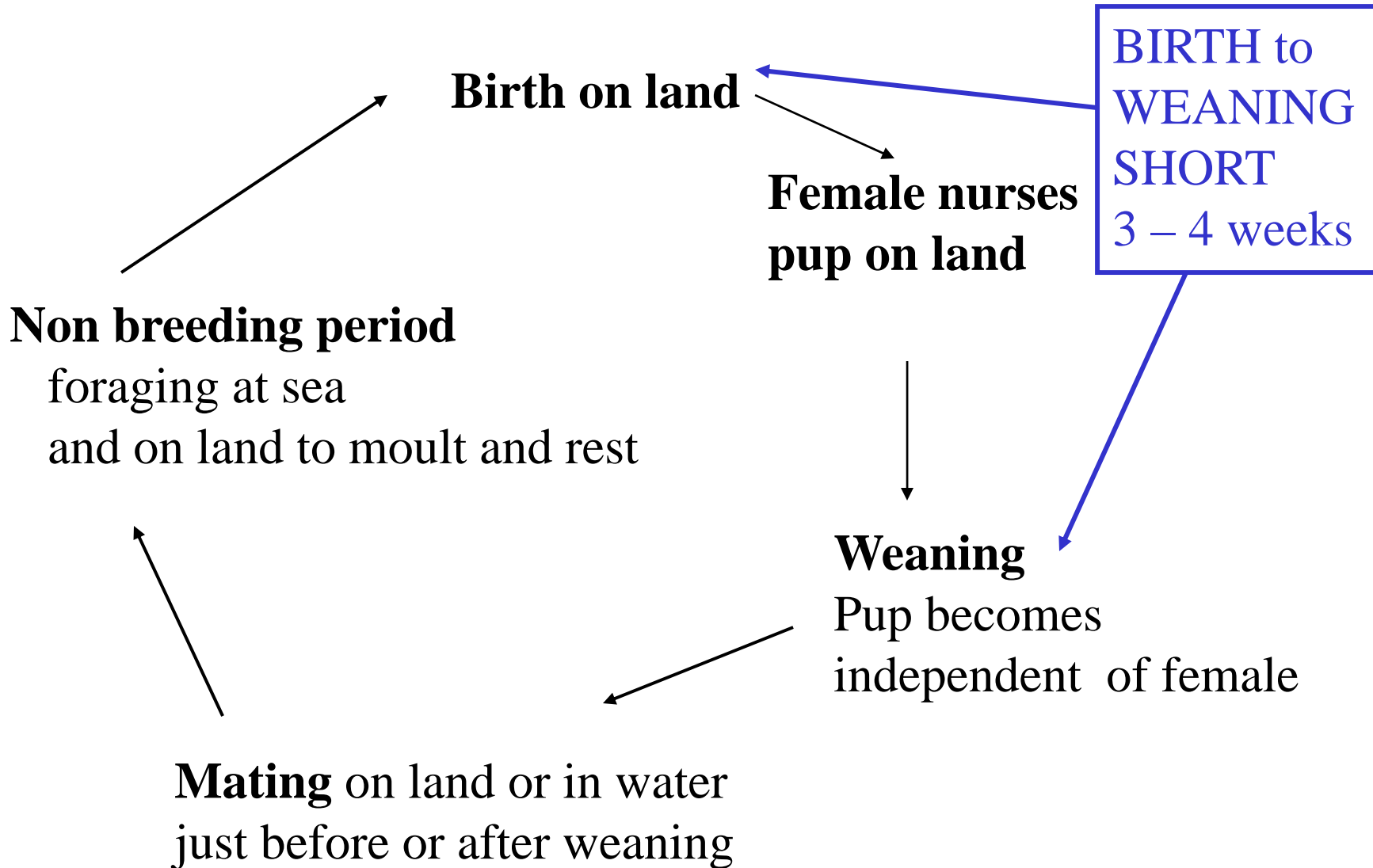
**Harbor seal**

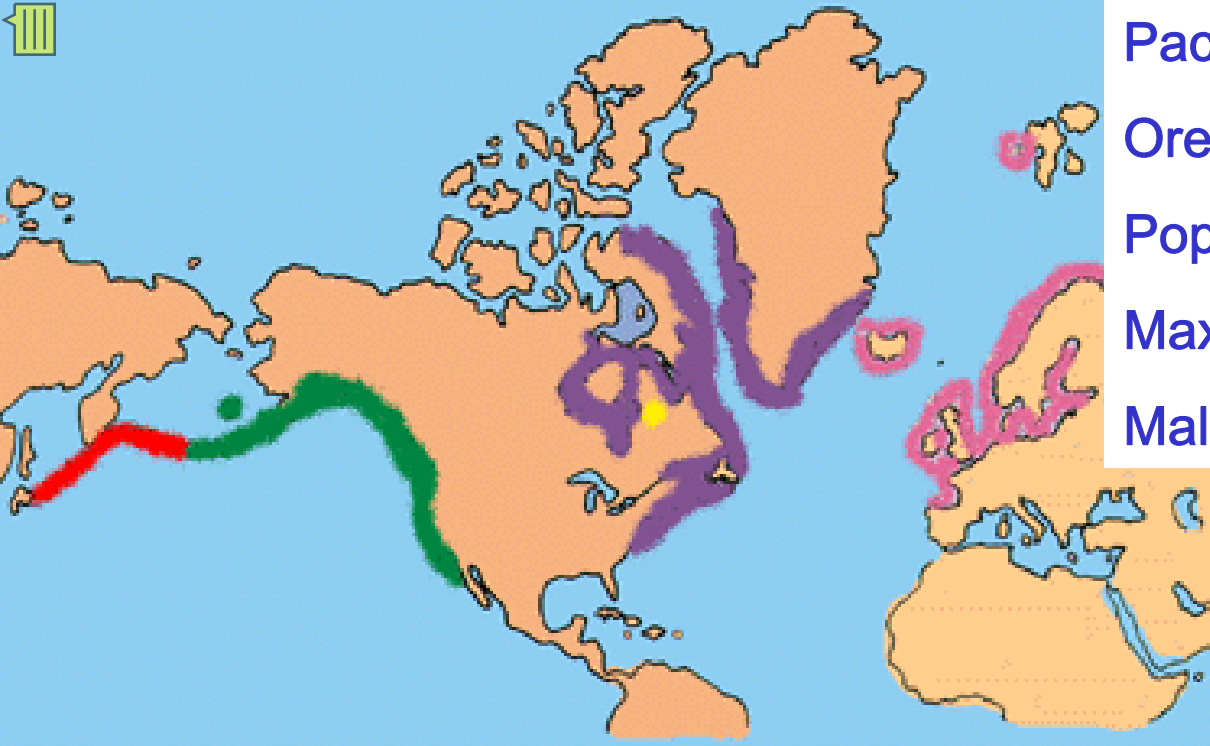
**Elephant Seal**

**No external  
ear flap**



# Annual Cycle of a Seal





Pacific population ~330,000

Oregon ~10,000

Population is stable

Max. age – 30 years

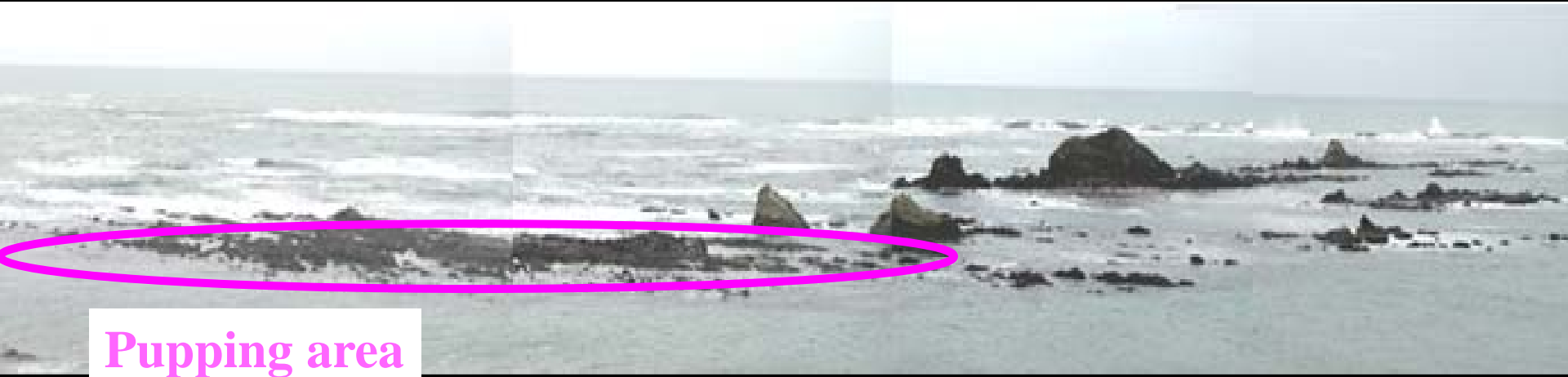
Males and females similar size



**Harbor Seal**



# North Cove Cape Arago Harbor Seal Haulout



Pupping area

Females give birth at 2-5 years of age and have one pup/year  
Pups born April and May

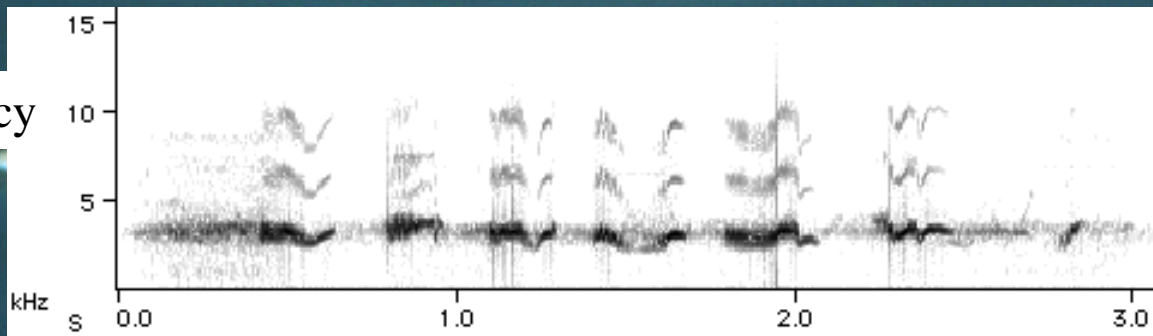
Pups nursed on land and in water  
Weaned after 3-4 weeks



**June and July Mate in the water**  
**Males defend underwater territories**

Sonogram recorded by a hydrophone

Frequency



Time seconds

**Sable Island**  
**Many males father the pups**





Table 2. Percent frequency of occurrence of prey found in 3,835 **harbor seal** scat collected and analyzed by ODFW. Percentages are not additive; only prey found in at least 5% of scat are included.

| Prey type                | Percent of scat containing prey |
|--------------------------|---------------------------------|
| ENGLISH SOLE             | 25.2                            |
| REX SOLE                 | 24.5                            |
| SANDDAB                  | 17.9                            |
| PACIFIC TOMCOD           | 17.1                            |
| PACIFIC SAND_LANCE       | 13.6                            |
| PACIFIC HERRING          | 12.7                            |
| UNIDENTIFIED FISH        | 12.2                            |
| DOVER SOLE               | 12.0                            |
| BUTTER SOLE              | 11.5                            |
| PACIFIC HAKE             | 10.7                            |
| PACIFIC STAGHORN SCULPIN | 10.0                            |
| FLATFISH NOT DAB         | 9.2                             |
| SLENDER SOLE             | 7.9                             |
| ROCKFISH                 | 7.5                             |
| FLATFISH ORDER           | 7.4                             |
| HERRING SHAD             | 7.2                             |
| OCTOPUS                  | 6.6                             |
| SCULPIN                  | 6.4                             |
| SMELT                    | 5.4                             |



A large colony of Northern Elephant Seals is gathered on a sandy beach. In the foreground, several seals are resting on the sand. In the middle ground, a large male seal with a prominent, wrinkled head is the central focus. To its right, a smaller female seal and a pup are visible. The background shows more seals scattered across the beach, with the ocean and some rocks visible in the distance. The scene is brightly lit, suggesting a sunny day.

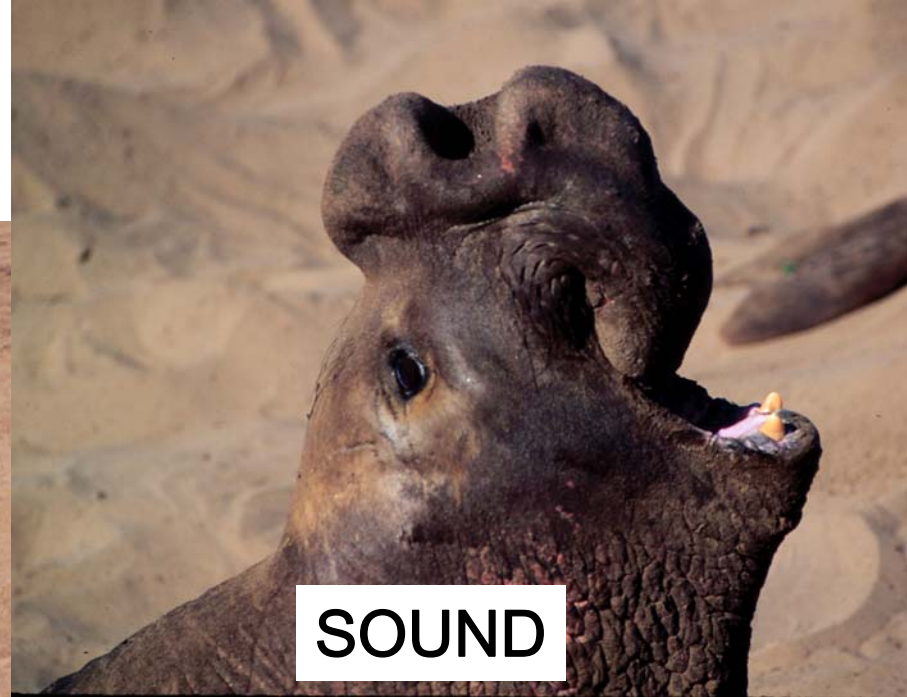
# Northern Elephant Seal

## 150,000

Males: 4.2m 2300kg

Females: 3m 900kg

**Males return in December**  
**Establish a dominance hierarchy**




**SOUND**

**SIZE AND PHYSICAL  
STRENGTH**



**Females return in late Dec/Jan  
Give birth to a single pup  
Nurse for ~4 weeks on land**





**Feb - March**  
**Male mates with female**  
**Female leaves**  
**Pup remains on beach**

## Shell Island E Seal Data

| YEAR | Max # adults Feb | # pups Mar 15  |
|------|------------------|----------------|
| 1993 | 12               | 0              |
| 1994 | 19               | 0              |
| 1995 | 26               | 0              |
| 1996 | 16               | 0              |
| 1997 | 20               | 7 (3 tagged)   |
| 1998 | 19               | 0              |
| 1999 | 19               | 0              |
| 2000 | 15               | 0              |
| 2001 | 21               | 0              |
| 2002 | 15               | 0              |
| 2003 | 19               | 0              |
| 2004 | 21               | 0              |
| 2005 | 25               | 4 (3 tagged)   |
| 2006 | 20               | 0              |
| 2007 | 17               | 1 (Horsfall)   |
| 2008 | 14               | 0              |
| 2009 | 16               | 13 (11 tagged) |
| 2010 | 16               | 0              |



# Elephant Seal Tags

| <b>Tag Color:</b> | <b>Rookery:</b>            |
|-------------------|----------------------------|
| <b>White</b>      | Piedras Blancas and Oregon |
| <b>Yellow</b>     | San Miguel Island          |
| <b>Red</b>        | San Nicholas Island        |
| <b>Green</b>      | Ano Nuevo                  |
| <b>Pink</b>       | Farallon Islands           |
| <b>Purple</b>     | Gorda                      |
| <b>Orange</b>     | Rehabilitated Animal       |



Oregon

Steller sea lion brands (R and Y brands with numbers on left flank)

California sea lion brand (C and U brands with numbers on rump),

Channel Islands California sea lions (numbers, no letters on left flank )

Puget Sound California sea lions brands (numbers, no letter on rump)

Send sightings of tagged and branded animals to: Bryan Wight ODFW - [bryan.e.wright@state.or.us](mailto:bryan.e.wright@state.or.us)

For branded animals need to have photographic evidence and location information

# 23R Oregon tagged Steller sea lion



Age 0, Rogue Reef, 6/28/01



Age 2, SE Alaska, 8/13/03



Age 4, SE Alaska, 7/11/05



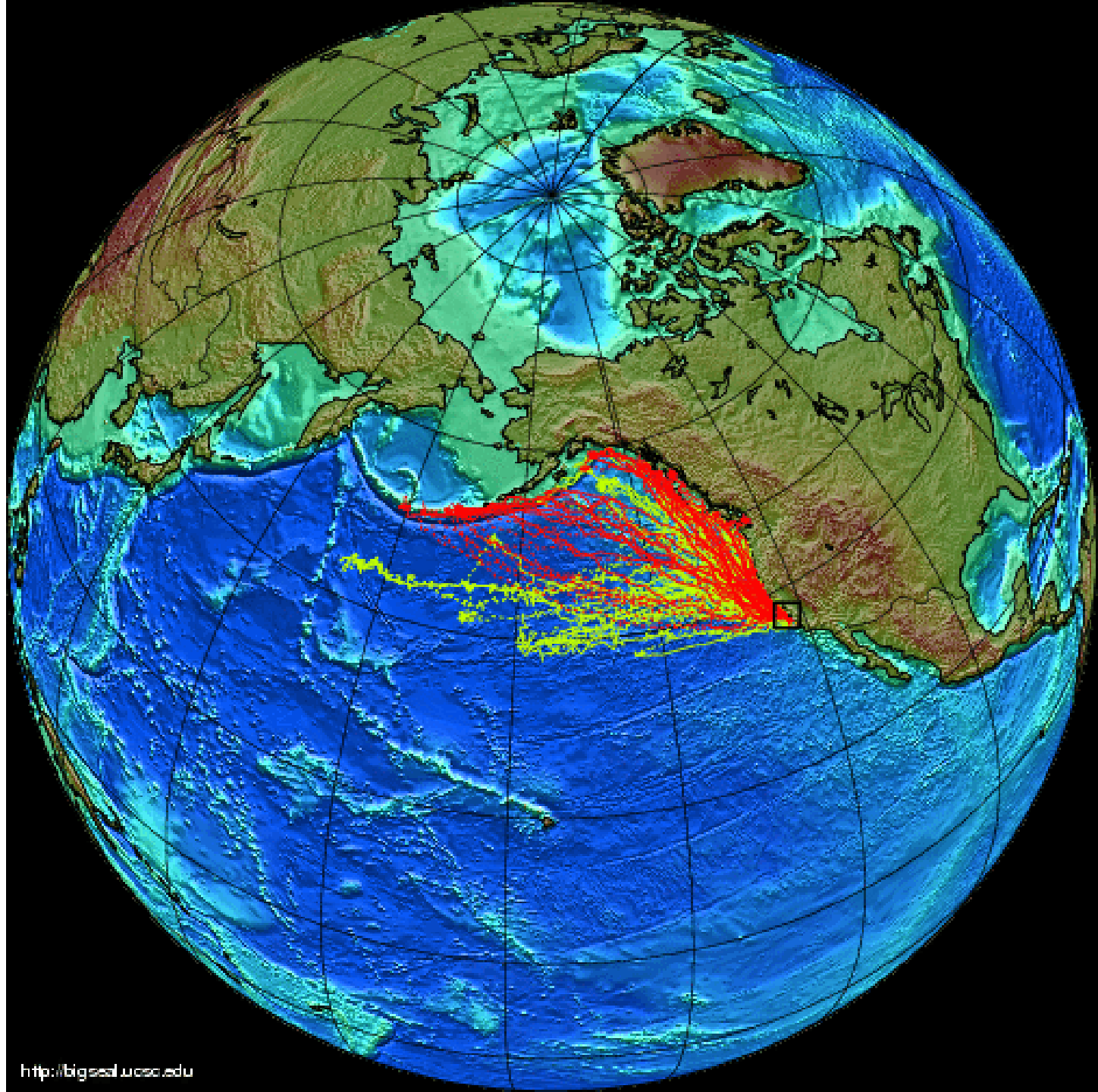
Age 3, SE Alaska, 7/19/04

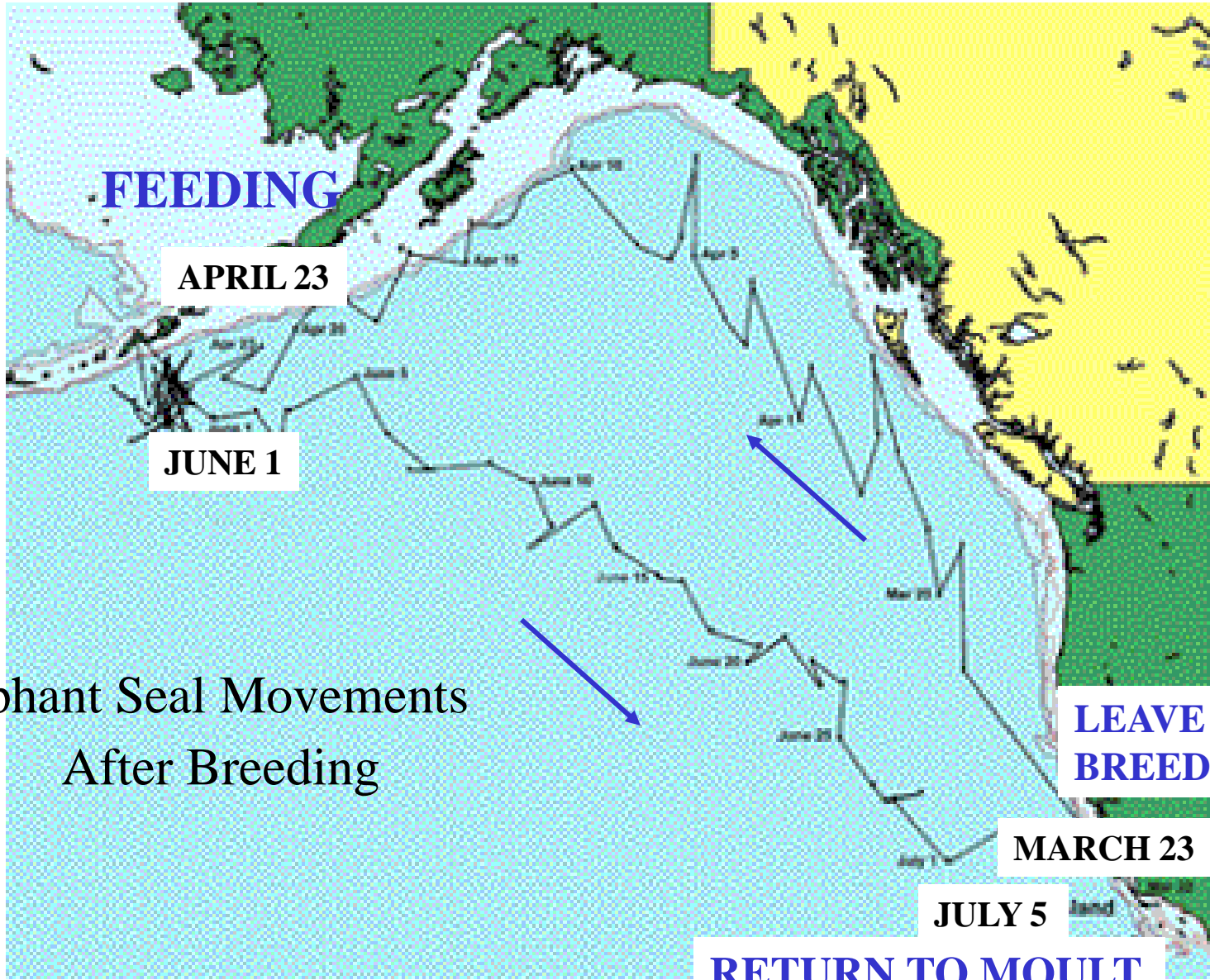
# C64 left rump - Oregon tagged California sea lion



# Satellite Tags and Time Depth Recorders







**FEEDING**

**APRIL 23**

**JUNE 1**

**LEAVE AFTER BREEDING**

**MARCH 23**

**JULY 5**

**RETURN TO MOULT**

Elephant Seal Movements  
After Breeding



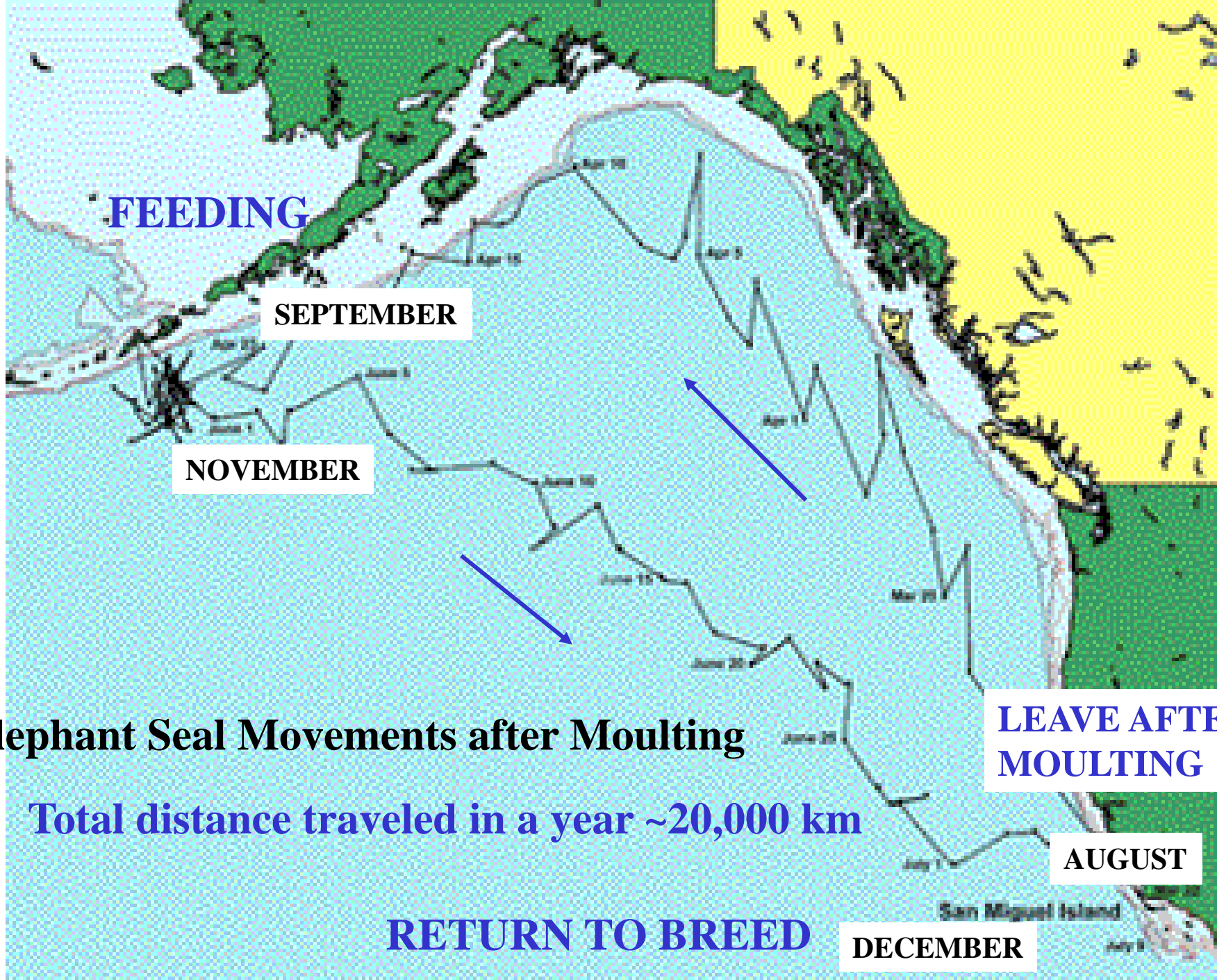
**3 – 4 weeks**



**Moulting  
Elephant  
Seal**







**FEEDING**

**SEPTEMBER**

**NOVEMBER**

**LEAVE AFTER MOULTING**

**AUGUST**

**DECEMBER**

**RETURN TO BREED**

# Elephant Seal Movements after Moulting

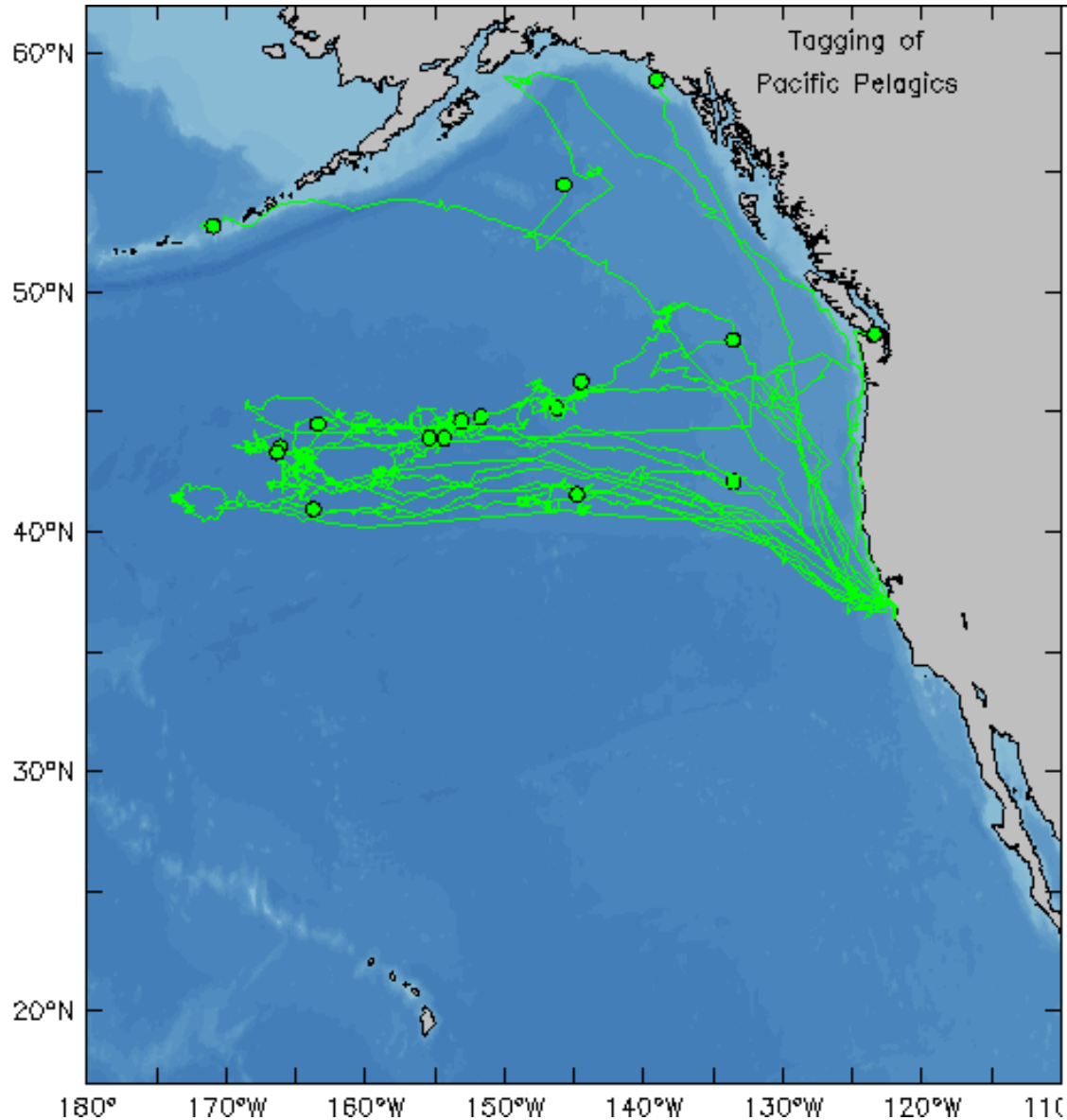
Total distance traveled in a year ~20,000 km

San Miguel Island

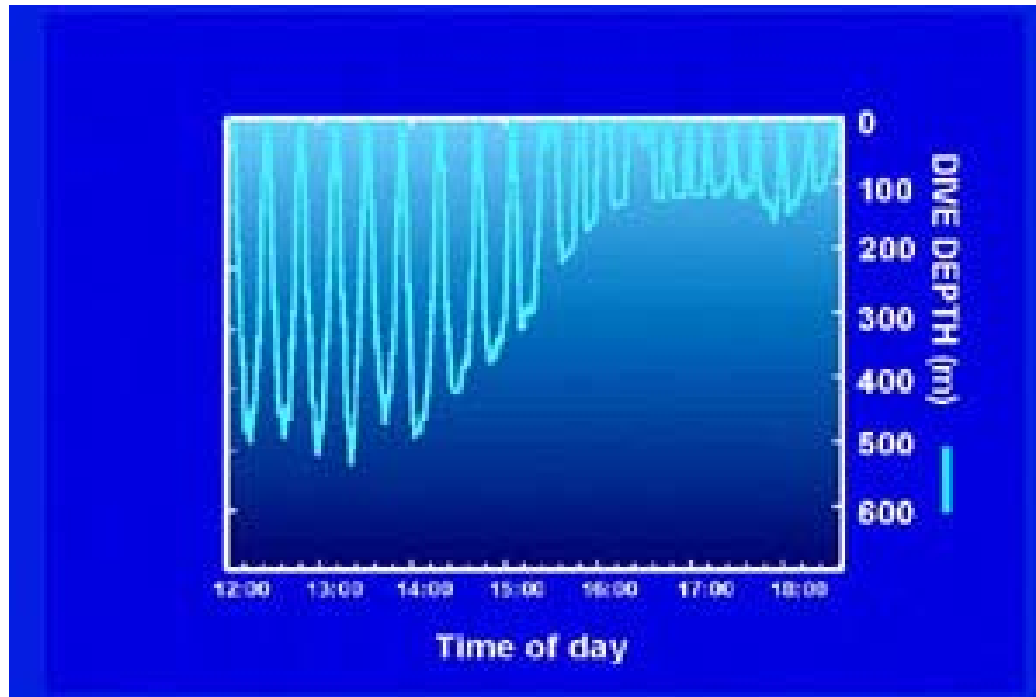
# TOPPS - TAGGING OF PACIFIC PELAGICS

<http://www.toppcensus.org/>

Elephant  
Seals  
Oct 2008



# Dive Statistics



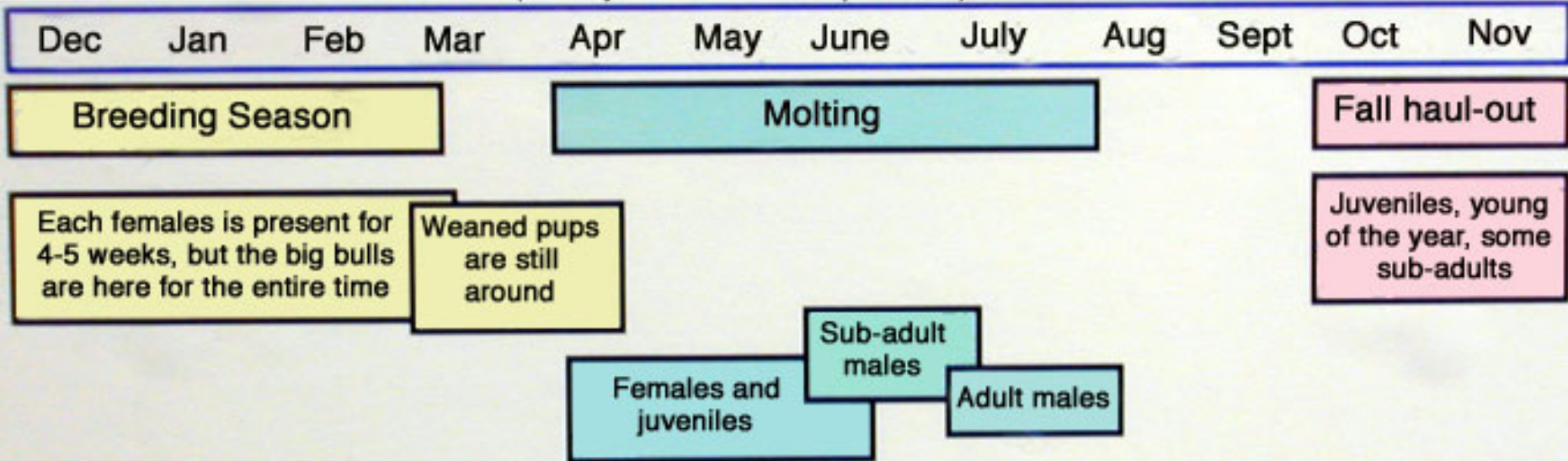
Average dive depth = 450m  
Average dive length = 24 mins  
Average surface interval = 2 mins  
% time submerged = 90%

Maximum dive depth = 1600m  
Maximum dive length = 90 mins

# Annual Cycle of Northern Elephant Seal

## When are the Elephant Seals here?

(courtesy of Friends of the Elephant Seal)



# SEA LIONS OTARIIDS



External ear flap

Walk with all four legs



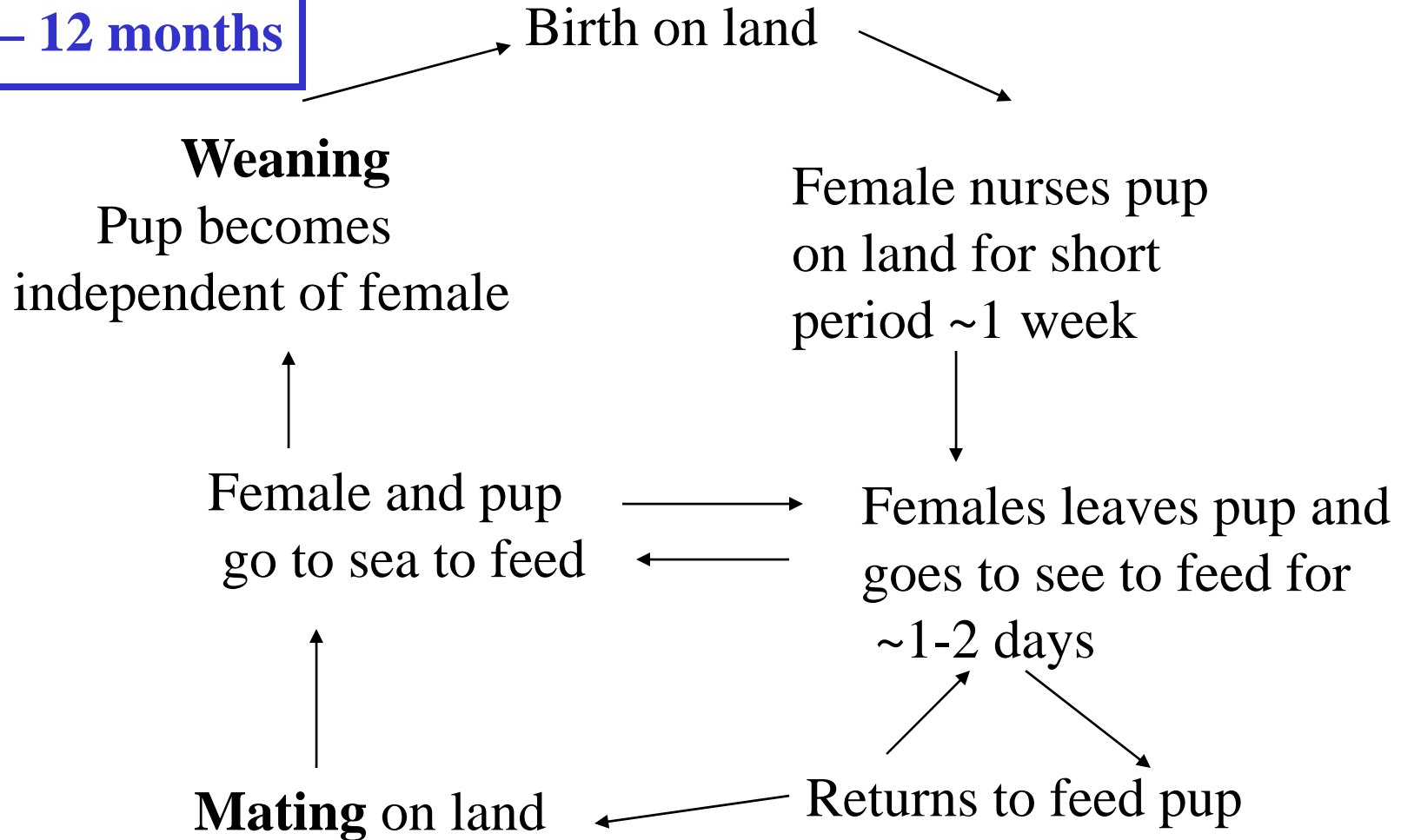
Swim with fore flippers



**Strong sexual dimorphism**

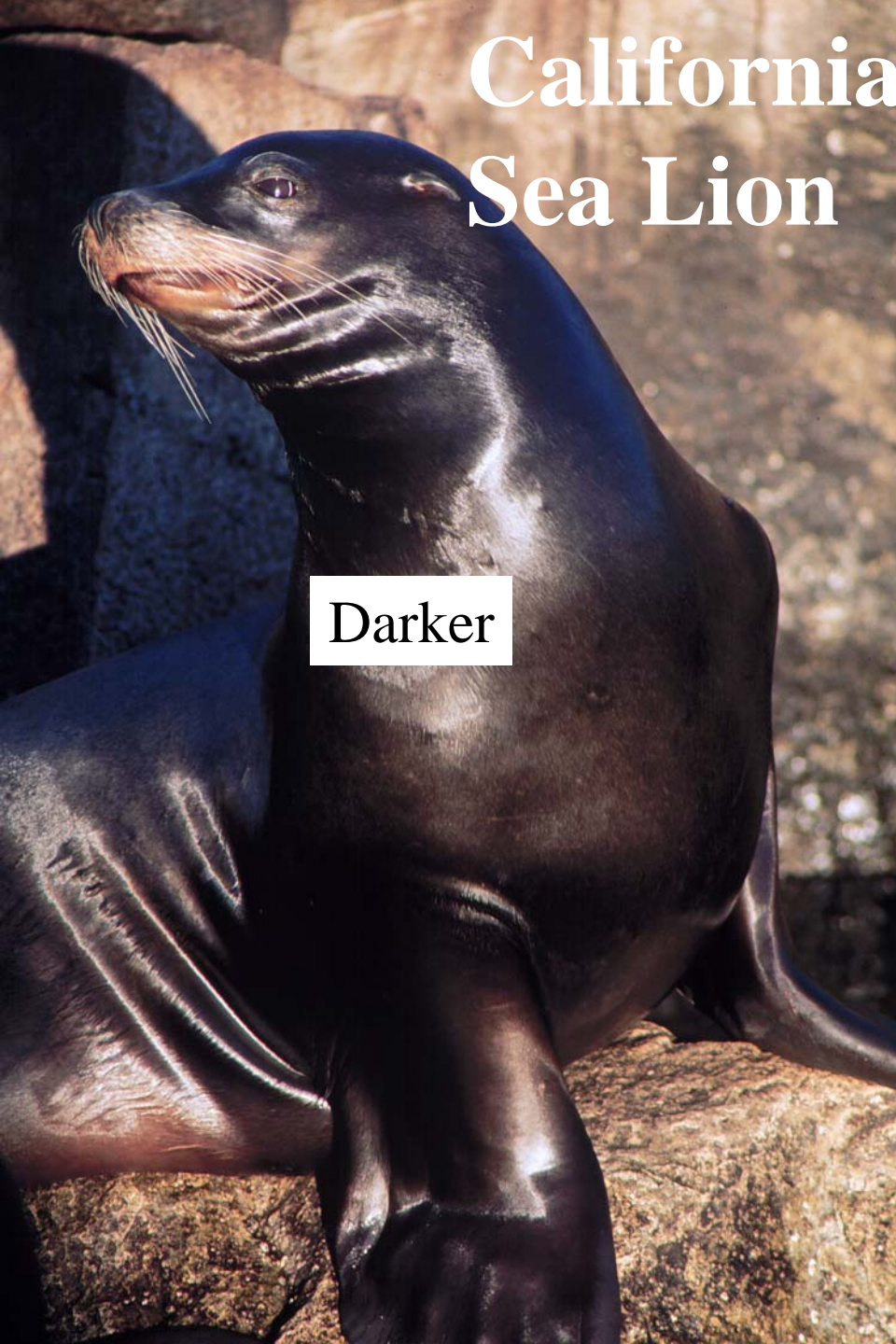
**BIRTH to  
WEANING  
LONG  
4 – 12 months**

# Annual Cycle of a Sea Lion

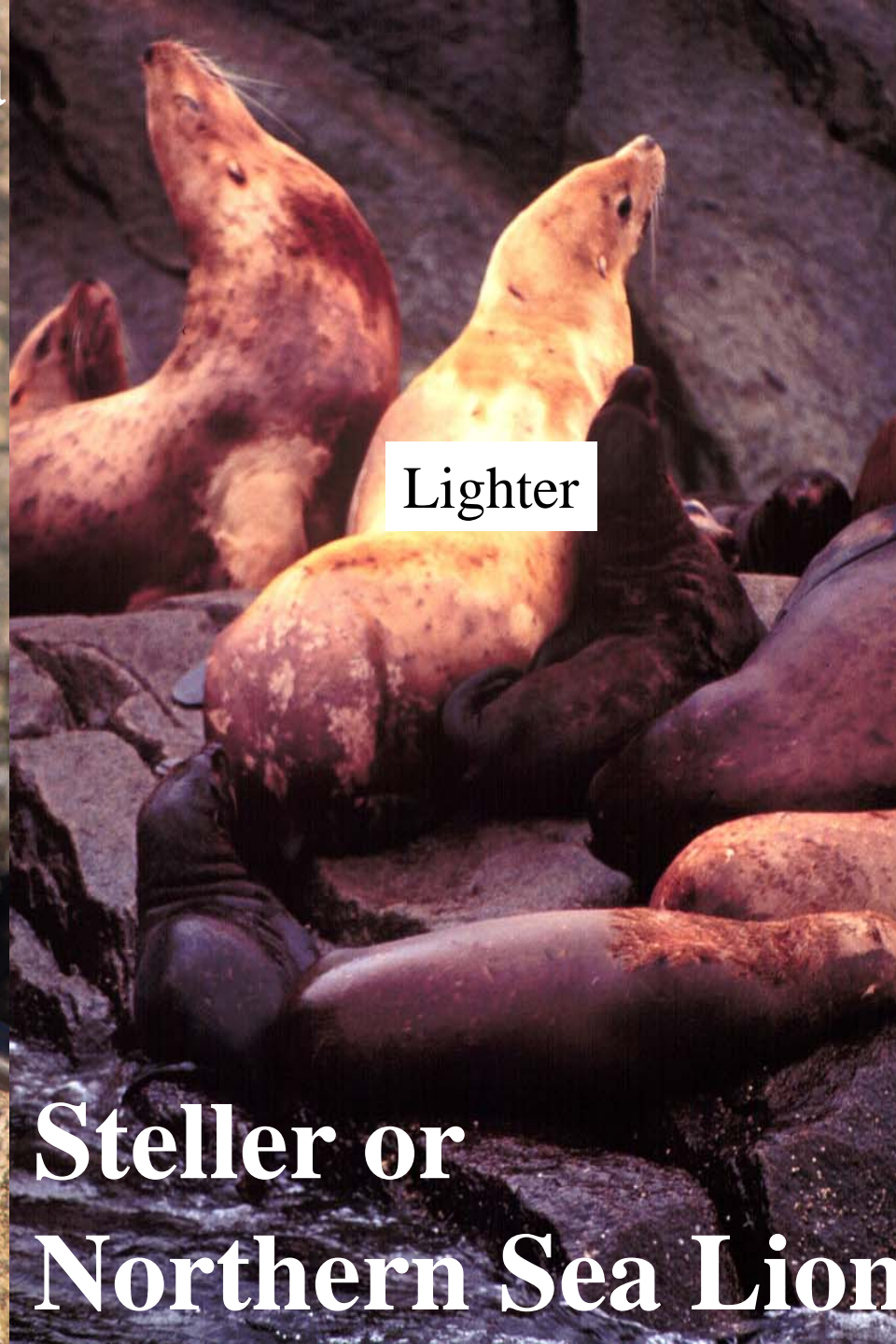


# California Sea Lion

Darker



Lighter



# Steller or Northern Sea Lion



# Differences in adult males

Shape of head

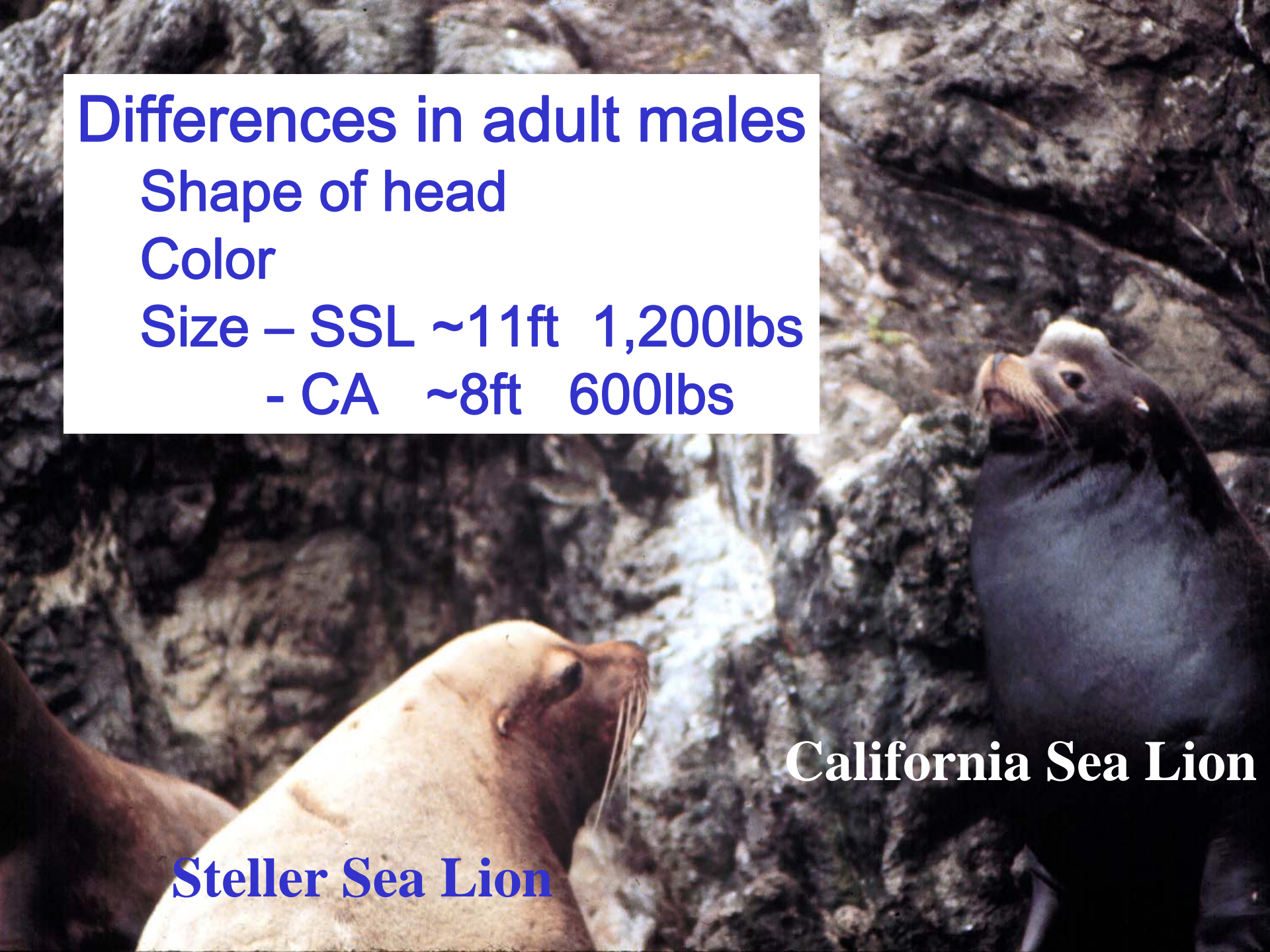
Color

Size – SSL ~11ft 1,200lbs

- CA ~8ft 600lbs

**Steller Sea Lion**

**California Sea Lion**



**Both species at Simpson Reef year round**

**Neither breed there**

**Steller – females and males**

**California – males only (a few females probably)**



**FEMALE - 8 ft, 770lbs**

**1<sup>st</sup> pup – 4 years**

**Females and juveniles stay all year in Pacific NW**

**Live to ~30 years**

**MALE - 11ft, 2400 lbs**

**Males breed 8 – 10 years**

**Mature males disperse north after breeding**

**Live to ~20 years**



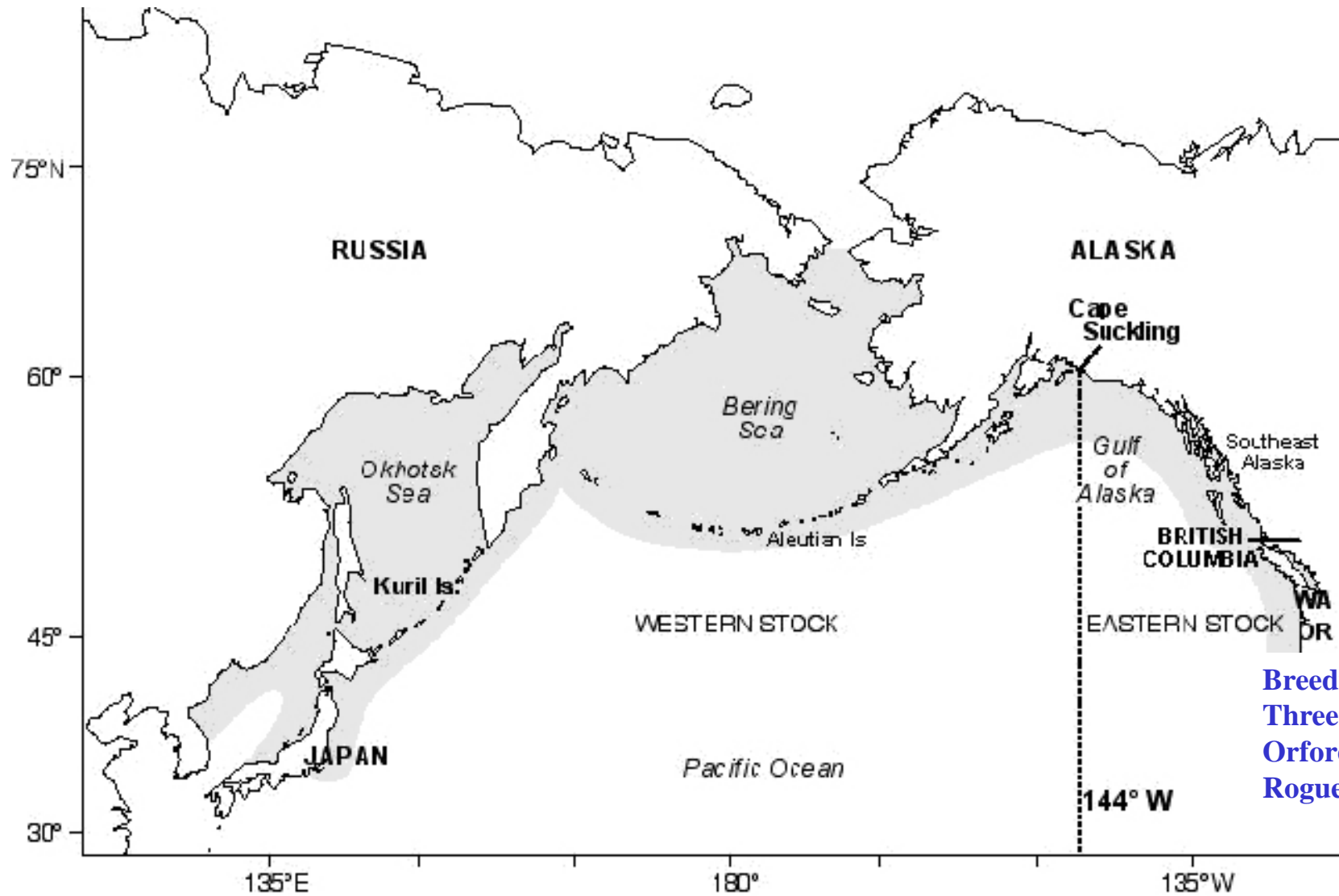
**STELLER SEA LION**



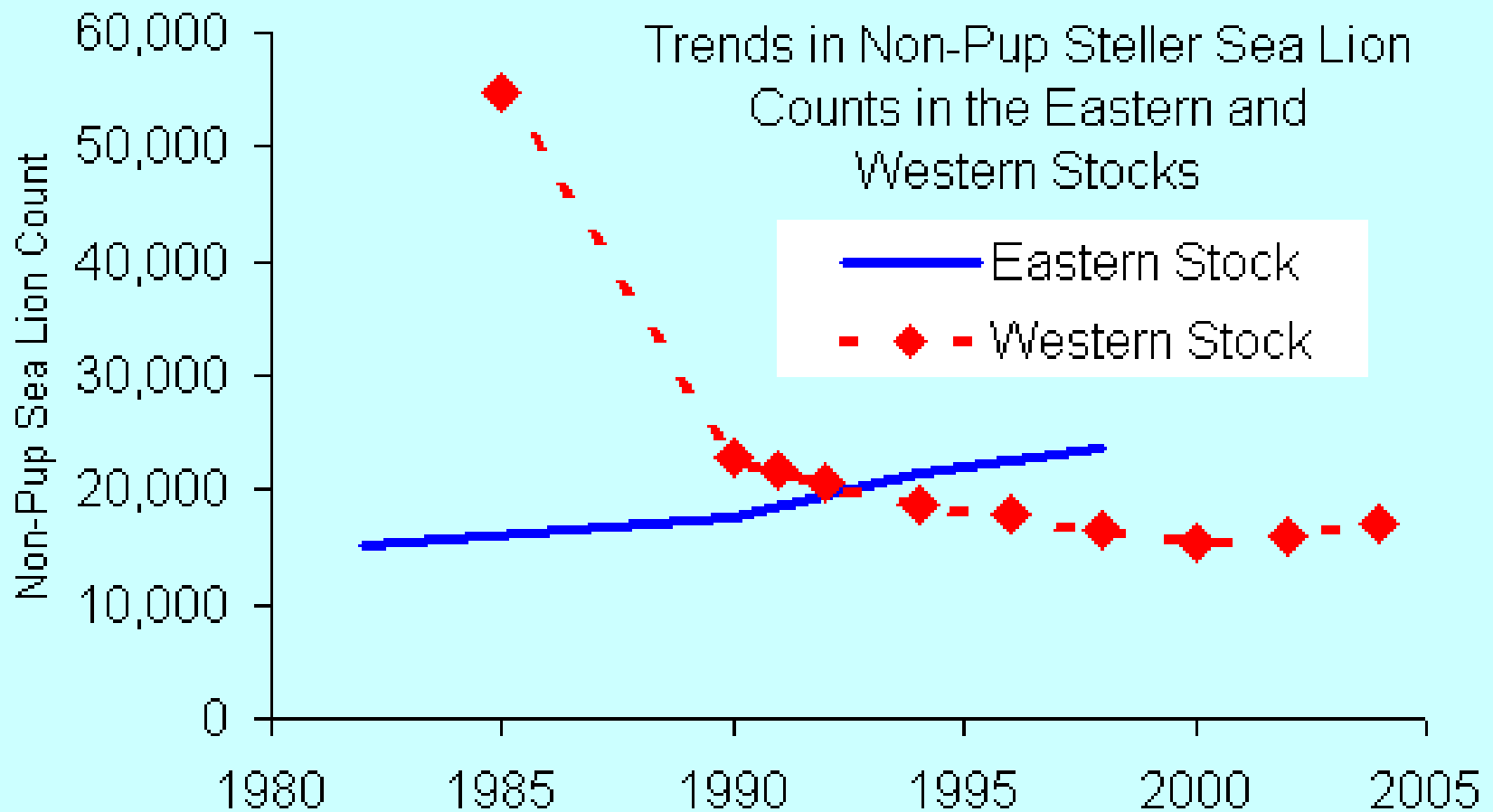
- Pups born mid-May - July weighing 50lbs
- Mothers nurse for 1-2 weeks before returning to sea.
- Pups are weaned between the 1- 3 years

# Immature Steller sea lions





Breeding in Oregon  
Three Arch Rocks  
Orford Reef  
Rogue River Reef



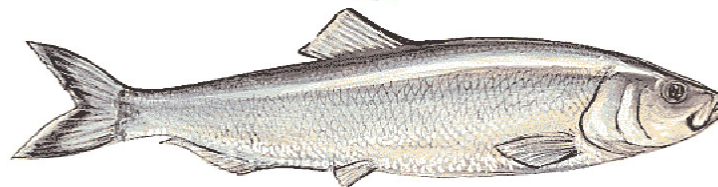
**Oregon population is growing = 6,000 animals**

**Population growth ~ 3% year**

- **Rogue Reef ~1,000 pups**
- **Orford reef ~200 pups**

Percent frequency of occurrence of prey found in 1,313 **Steller sea lion** scat collected and analyzed by ODFW. Percentages are not additive; only prey found in at least 5% of scat are included.

| Prey type          | Percent of scat containing prey |
|--------------------|---------------------------------|
| PACIFIC HAKE       | 78.2                            |
| SKATES             | 23.4                            |
| HERRING SHAD       | 18.0                            |
| ADULT SALMONID     | 16.4                            |
| UNIDENTIFIED FISH  | 11.6                            |
| LAMPREY            | 11.2                            |
| NORTHERN ANCHOVY   | 11.2                            |
| PACIFIC HERRING    | 10.4                            |
| ROCKFISH           | 10.2                            |
| PACIFIC LAMPREY    | 10.2                            |
| SALMONID           | 9.9                             |
| PACIFIC SAND LANCE | 9.2                             |
| PACIFIC SARDINE    | 8.5                             |
| PACIFIC STAGHORN   |                                 |
| SCULPIN            | 7.5                             |
| ADULT ROCKFISH     | 7.2                             |
| SMELT              | 7.0                             |
| THREESPINE         |                                 |
| STICKLEBACK        | 6.4                             |
| CEPHALOPOD         | 5.9                             |
| JACK MACKEREL      | 5.4                             |





# California Sea Lion



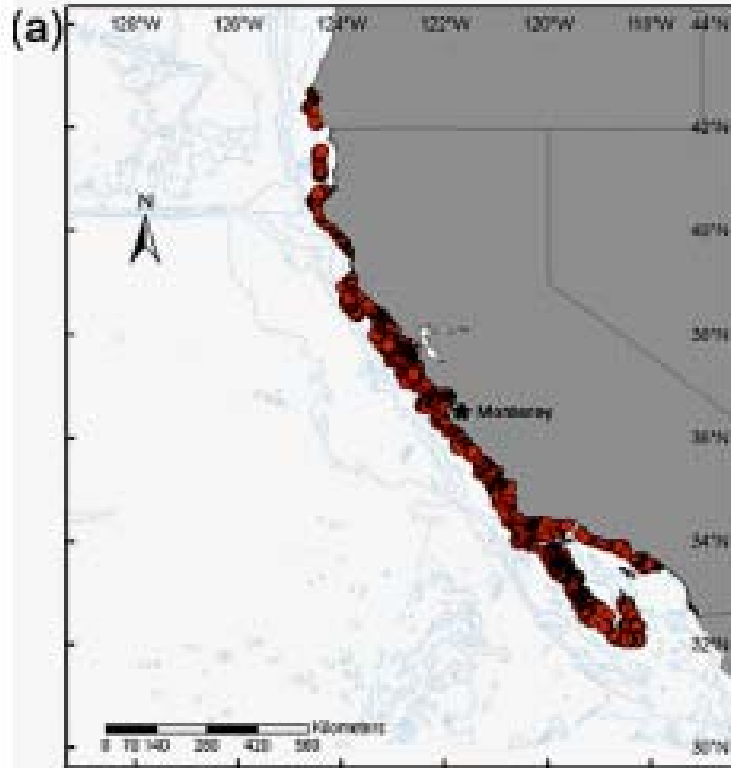


# California Sea Lion Distribution

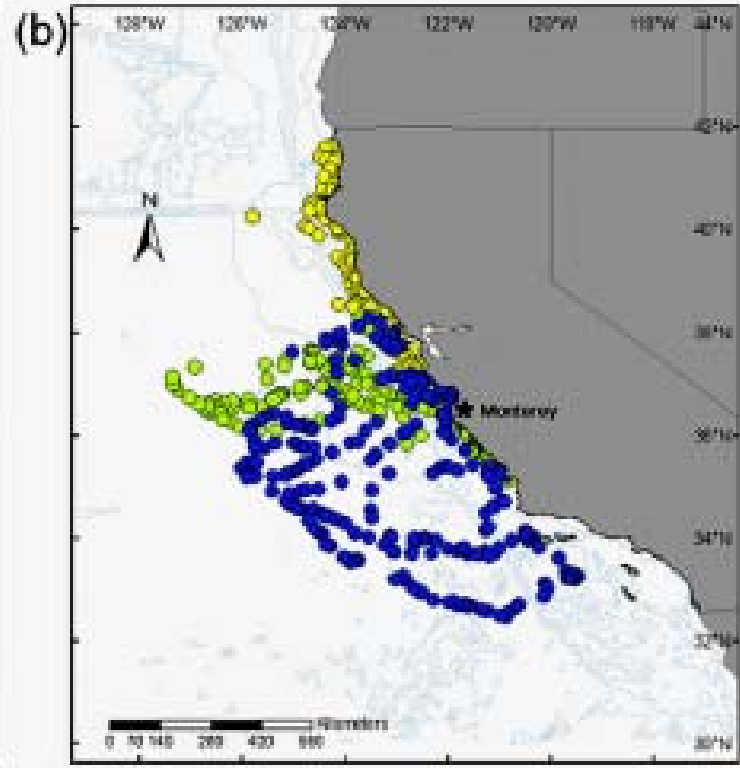
Total: 200,000  
To OR in fall  
- ~10,000

Vast majority are males





2003-2004  
N=22



2004-2005  
N=3

California sea lion movements from Monterey

## 2009 south of Heceta Head



Columbia River

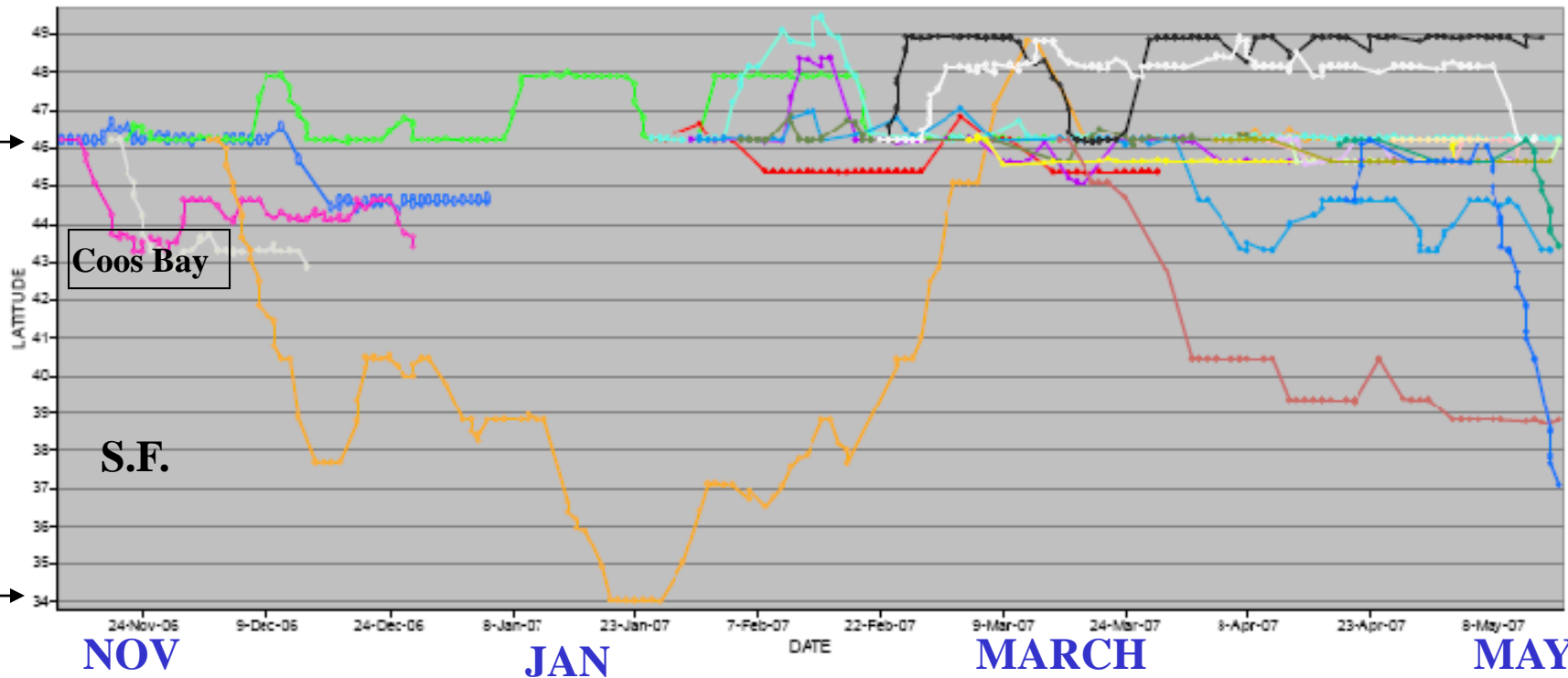


Fig.2. Latitudinal movements of PTT-tagged California sea lions captured in the Columbia River, Oregon, 2006-2007.

Channel Islands

Astoria – S CA in 2.5 days

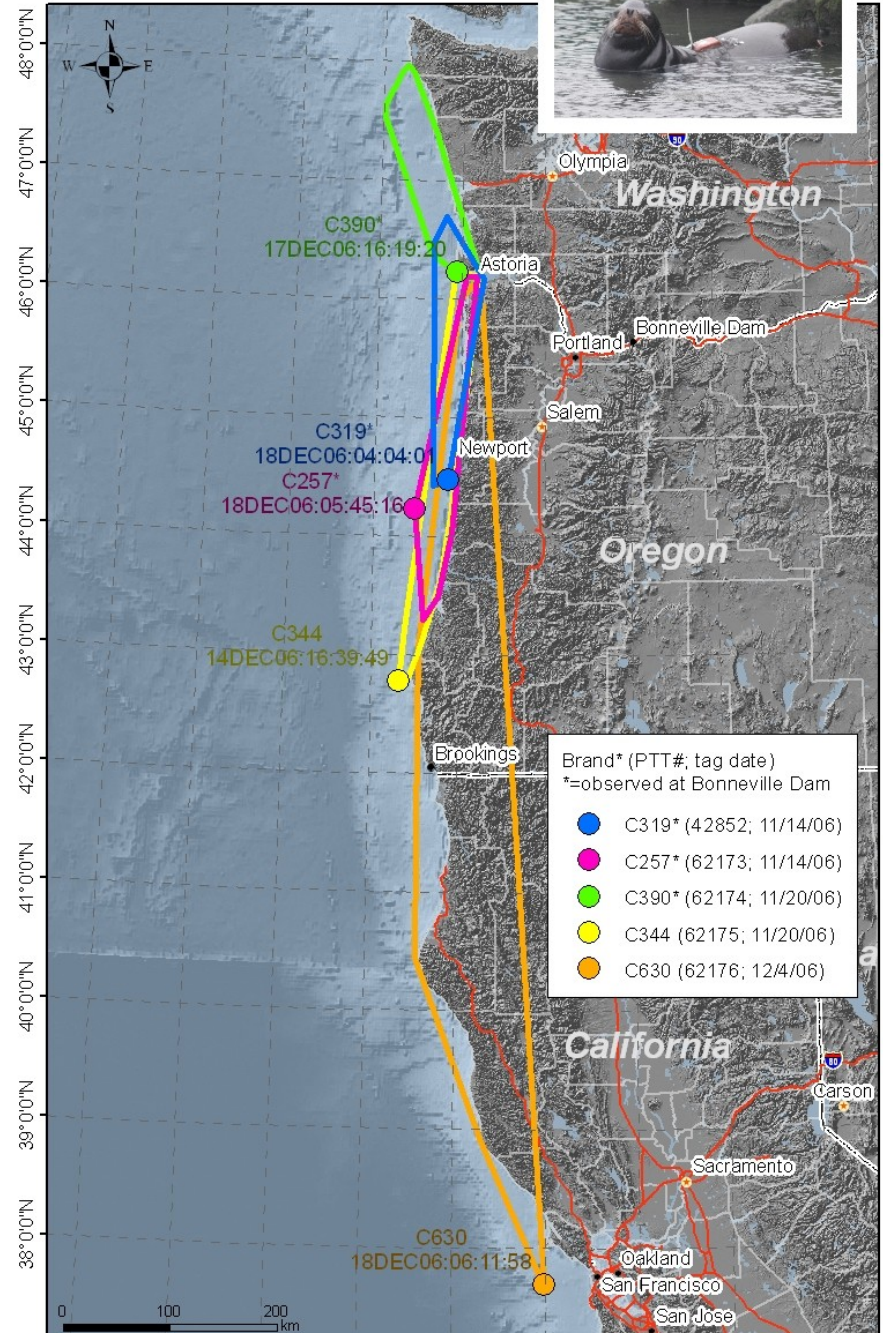


# Foraging ecology and movements of Columbia River CA sea lions

Last standard fix; minimum convex "home range"  
(ARGOS satellite location classes >= 1)



75 – 100 animals

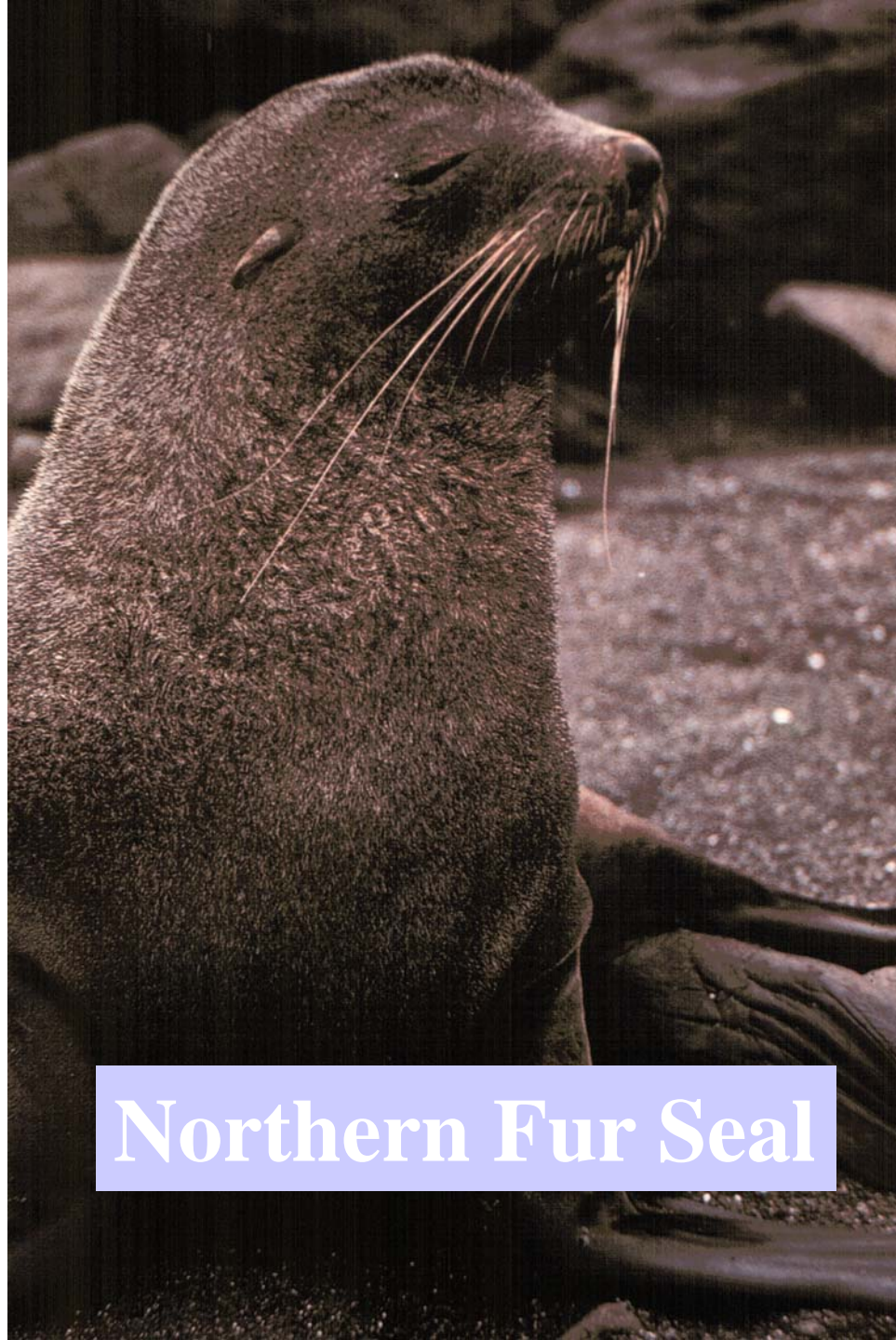




## Leptospirosis – a bacterial disease that infects pinnipeds

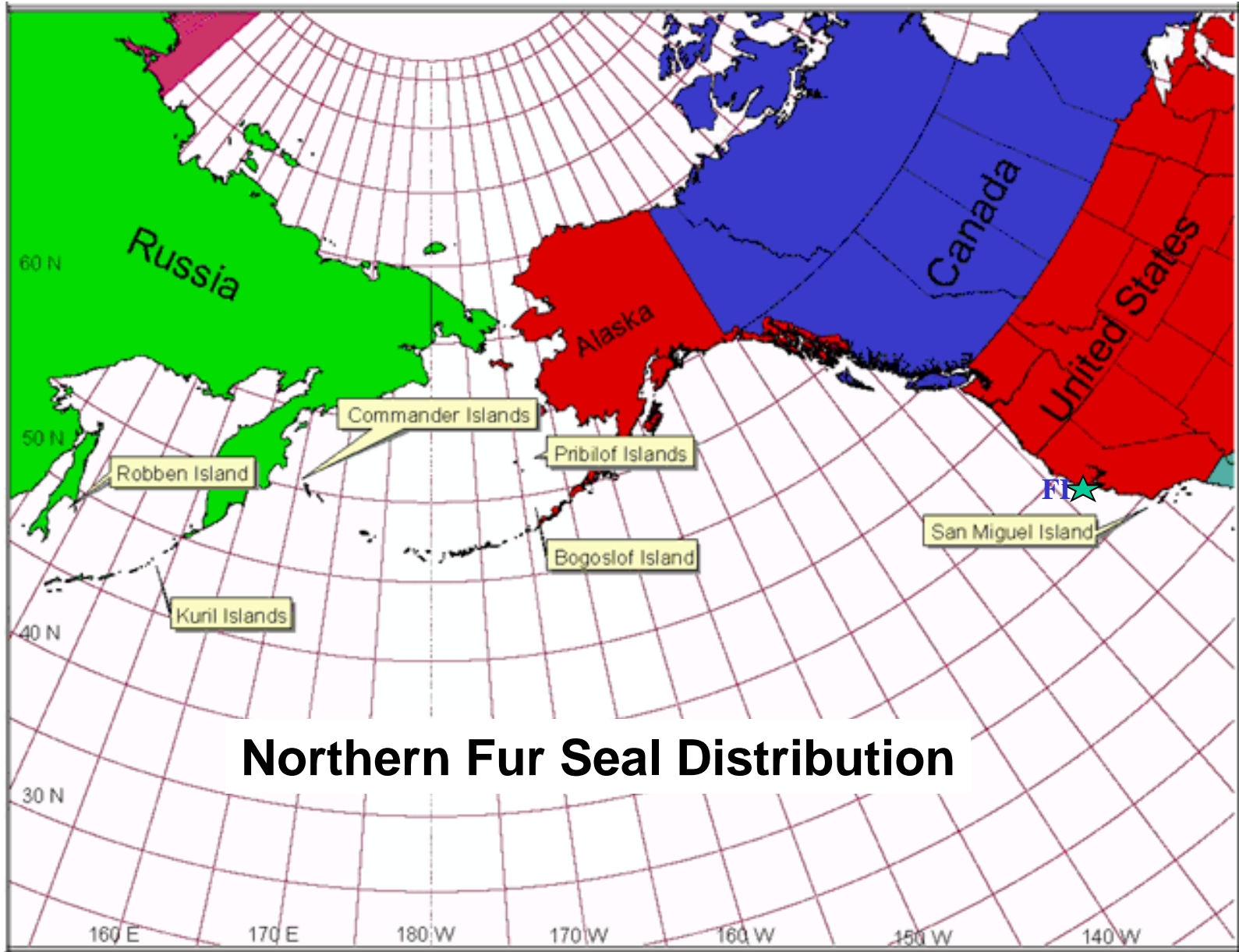


Affects kidney function – thus a reluctance to use their hind flippers



Northern Fur Seal





## Northern Fur Seal Distribution

# How Much Fish do Oregon Pinnipeds Eat?

|                      |                        |
|----------------------|------------------------|
| <b>Harbor seals</b>  | <b>~5lbs/day</b>       |
| <b>Steller SL</b>    | <b>~35- 44 lbs/day</b> |
| <b>California SL</b> | <b>~11-36 lbs/day</b>  |

**Total /Year - estimated at 45,000-70,000 tons**

**2008 Oregon Commercial Fish Catch – 77,908 tons**

Pinniped consumption estimates from Robin Brown, ODFW  
Commercial catch statistics from Michelle Grooms, ODFW

# MARINE MAMMAL PROTECTION ACT



The MMPA established a moratorium on the **taking** of marine mammals in U.S. waters.

It defines “**take**” to mean “to hunt harass, capture, or kill” any marine mammal or attempt to do so.

To report a stranded animal:

1-800-452-7888 (Oregon State Police)

or **541-270-6830**

OSU Marine Mammal Stranding Hotline

Info on the OR MM stranding network:

<http://mmi.oregonstate.edu/ommsn>



# KELP BEDS





**Bull whip kelp**

*Nereocystis luetkeana*



# Giant Kelp

*Macrocystis pyrifera*



**A single  
species  
world  
wide**



Photo from the Seaweeds of Alaska [www.seaweedsokalaska.com](http://www.seaweedsokalaska.com)



**Sea Palm**  
*Postelsia palmata*



# Kelp = Brown Algae



**pneumatocyst**

**blade**

**stipe**

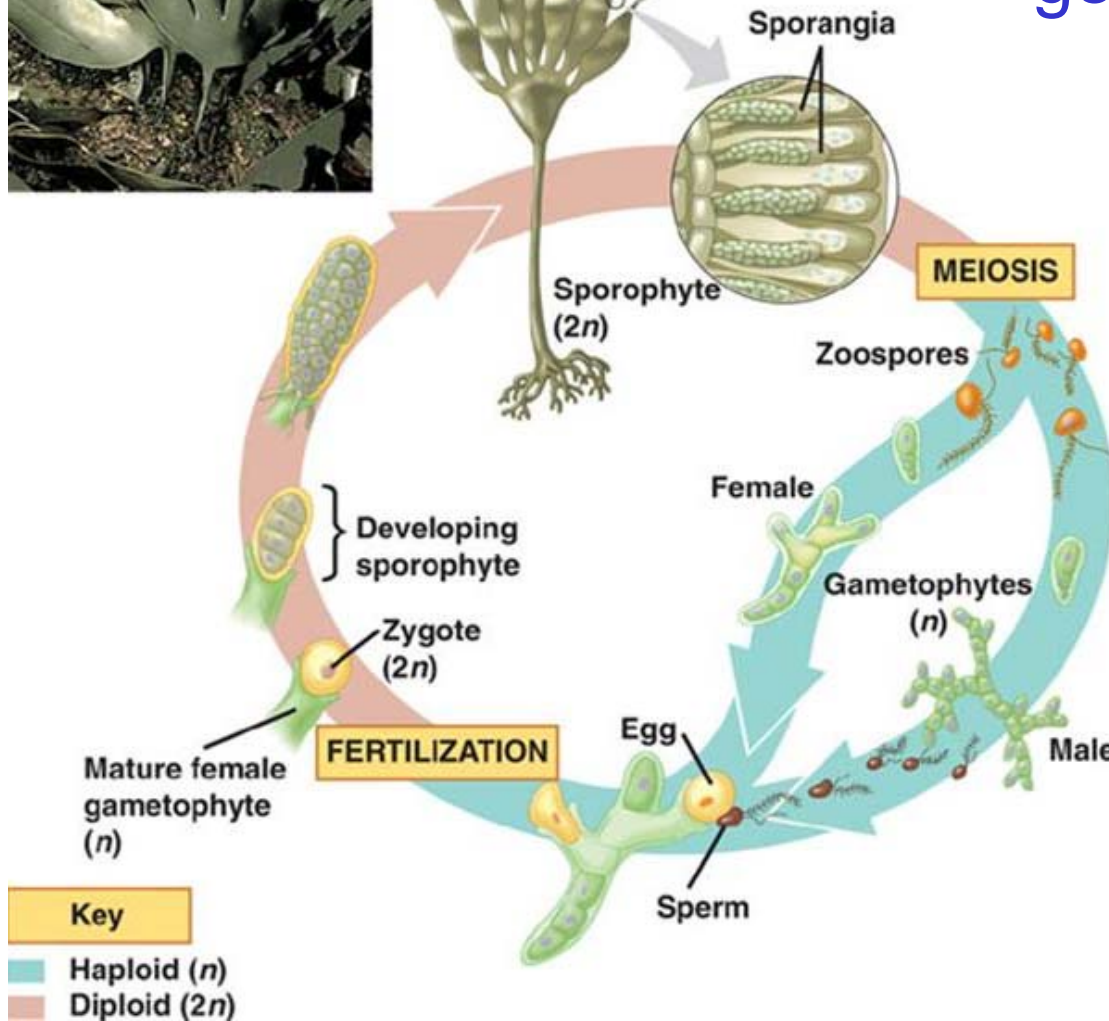


**holdfast**



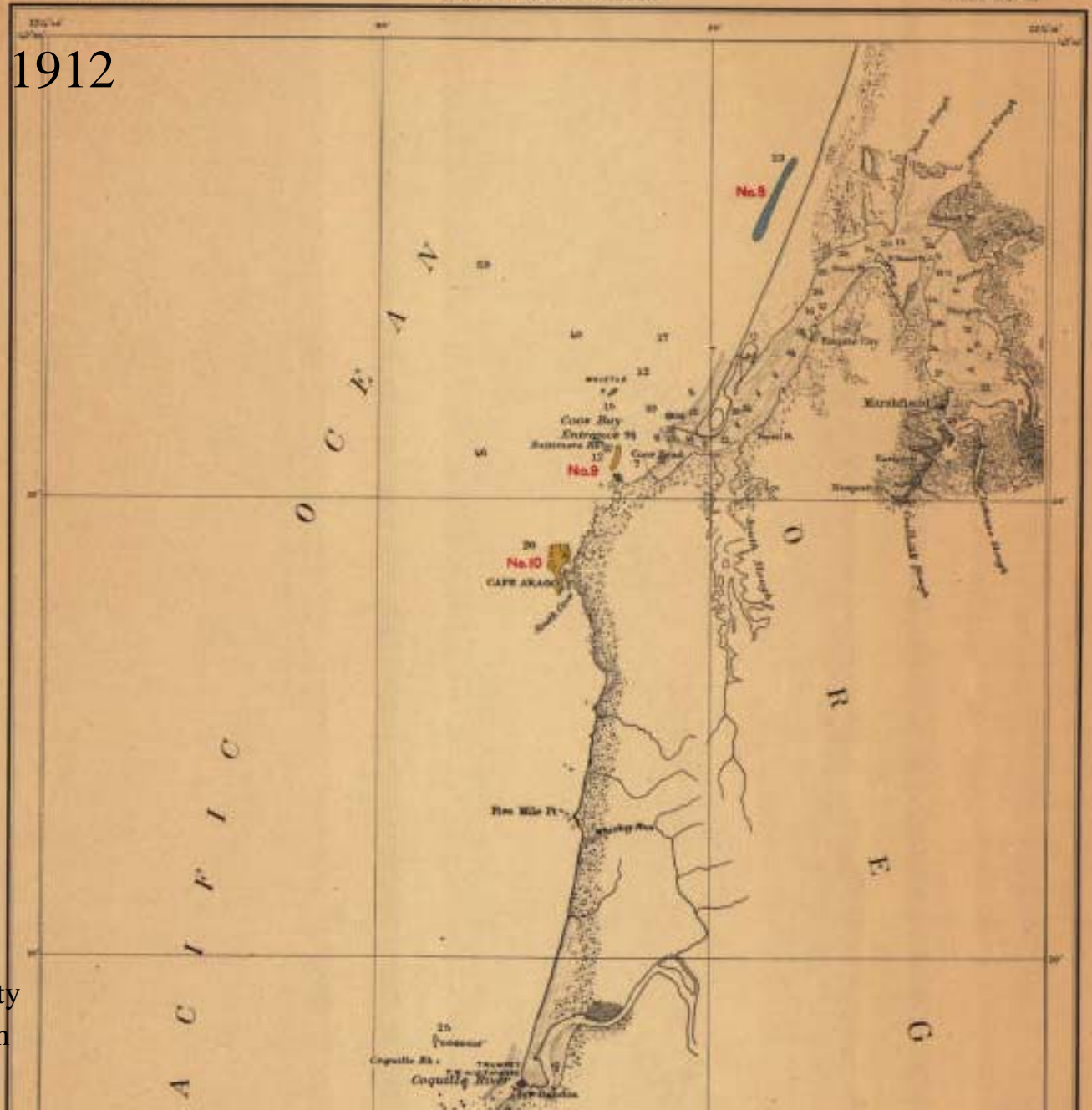
# Kelp

## Alternation of generations

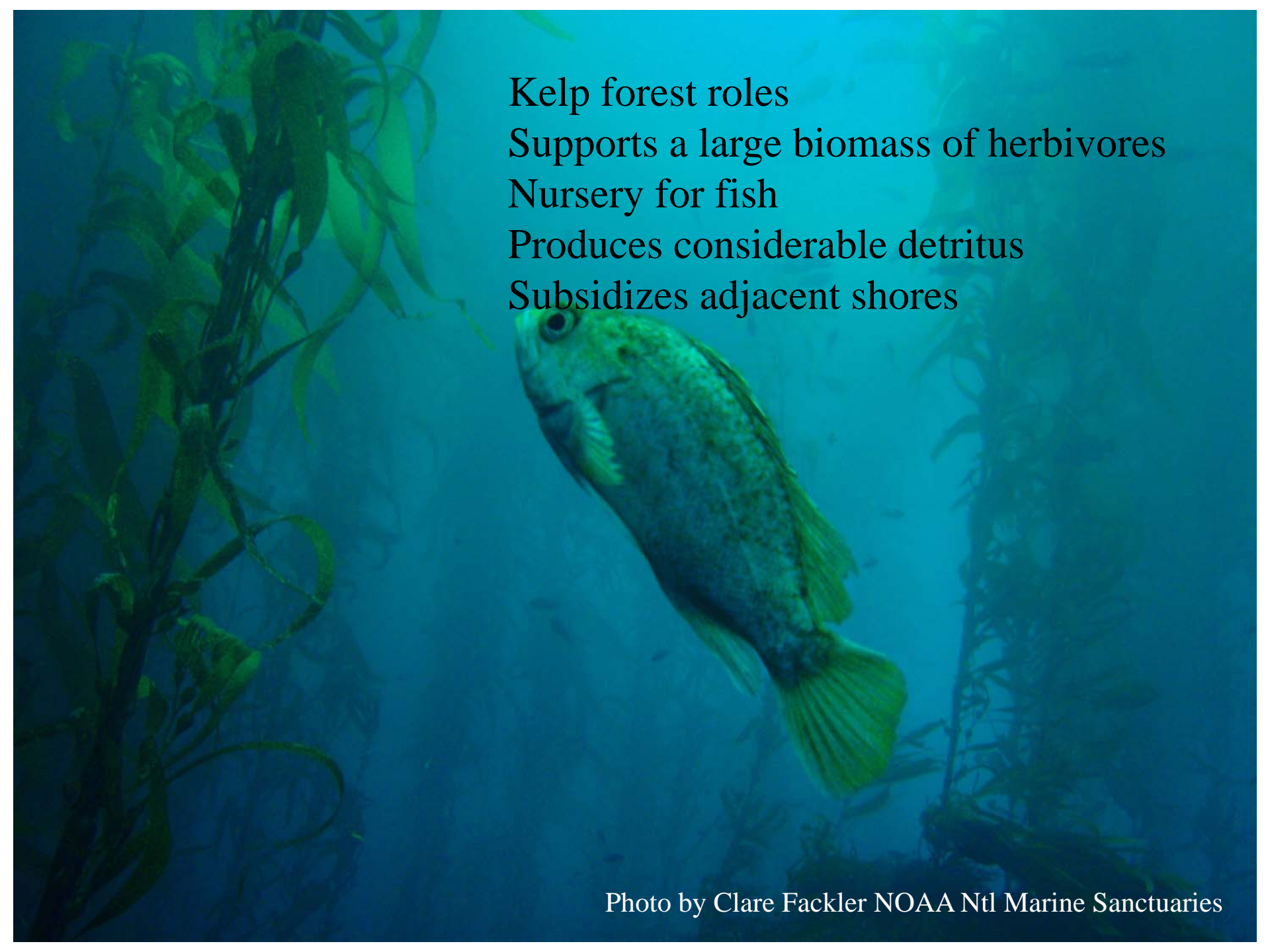


very small

Map of kelp from 1912  
study of fertilizer  
resources



Courtesy of Oregon State University  
Libraries' Scanned Maps Collection



Kelp forest roles  
Supports a large biomass of herbivores  
Nursery for fish  
Produces considerable detritus  
Subsidizes adjacent shores

Photo by Clare Fackler NOAA Ntl Marine Sanctuaries



**SEA OTTER**

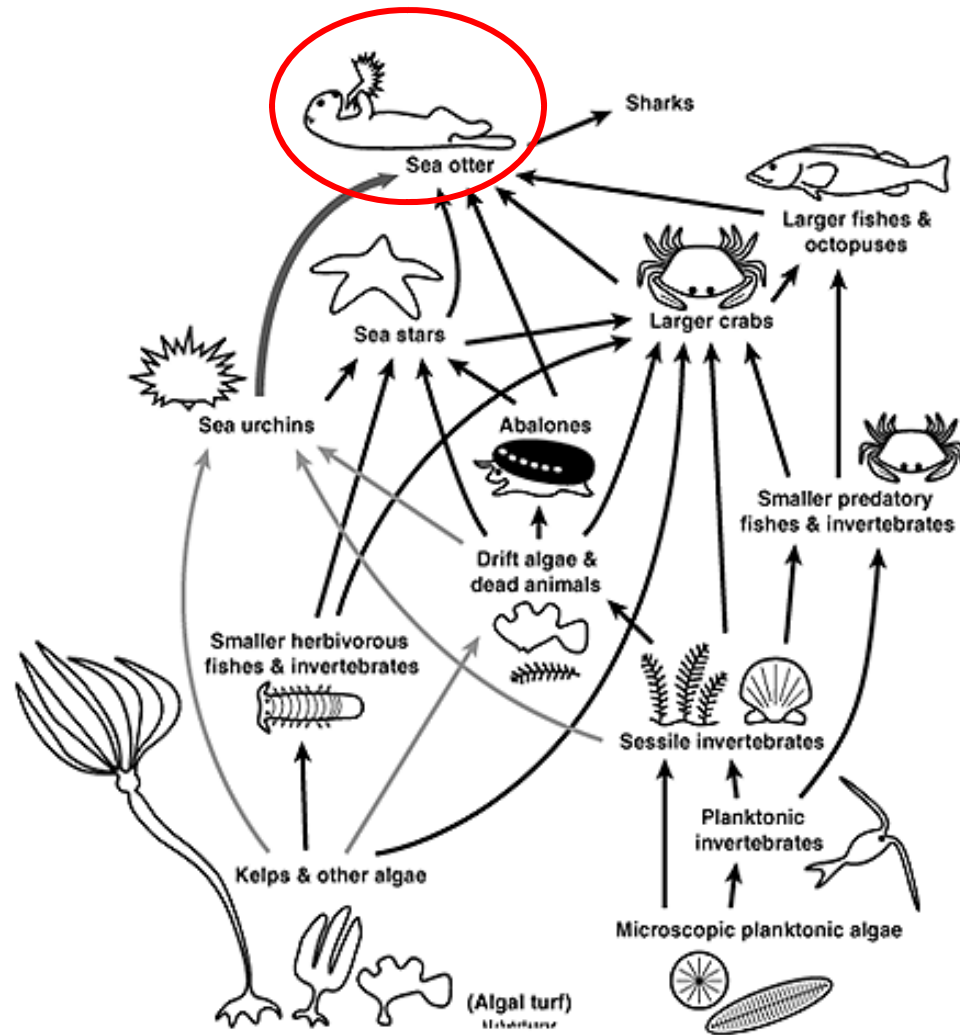


Hunted 1700's – 1911



<http://www.ecotrust.org/nativeprograms/elakha.html>





## With Otters

Kelp is abundant

Invertebrates are present but none dominate

Habitat is complex for fish

Without Otters  
Kelp is less abundant  
Urchins dominate  
invertebrates  
Habitat is not as complex

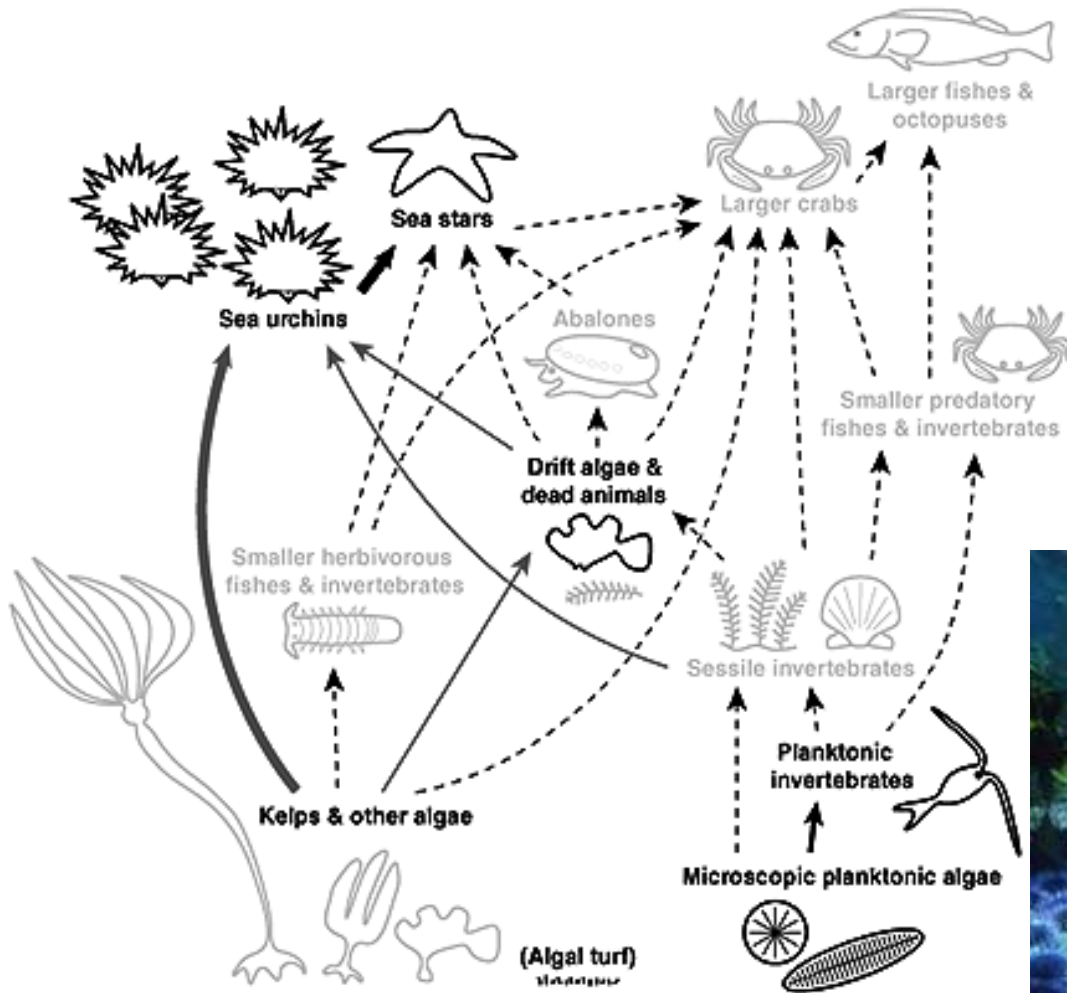
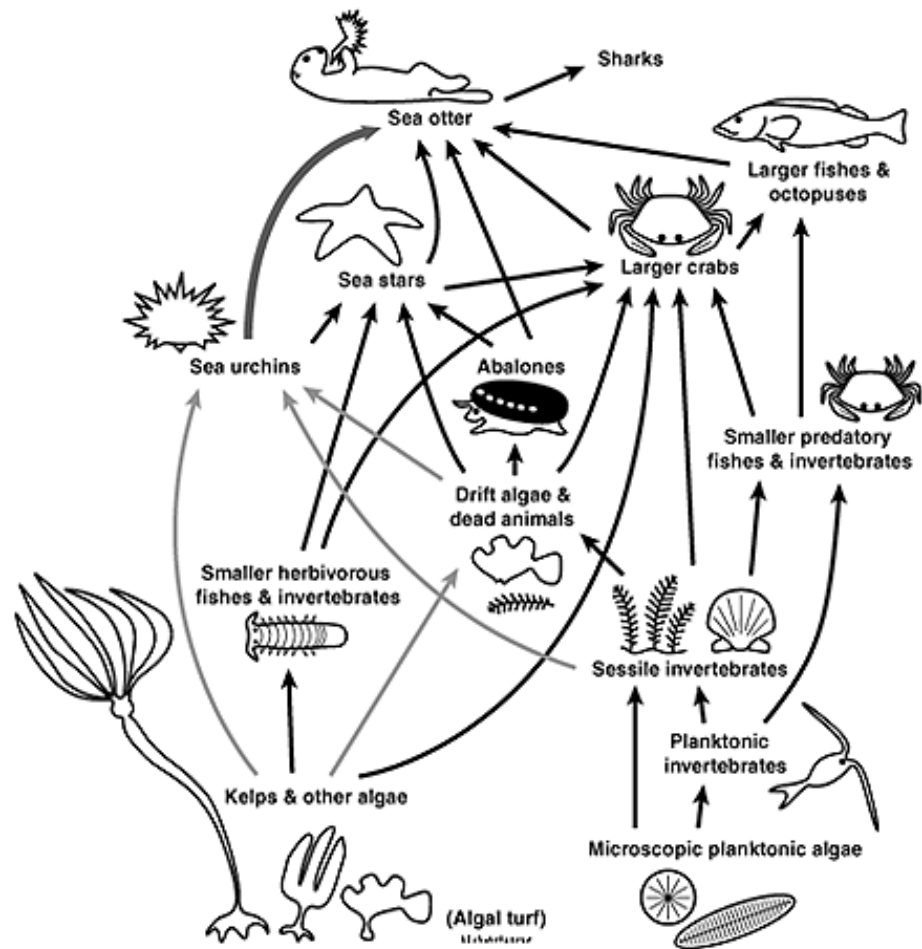


Photo by Annie Crawley

**A. With sea otters, kelp forest food web**



**B. Without sea otters, urchin barren food web**

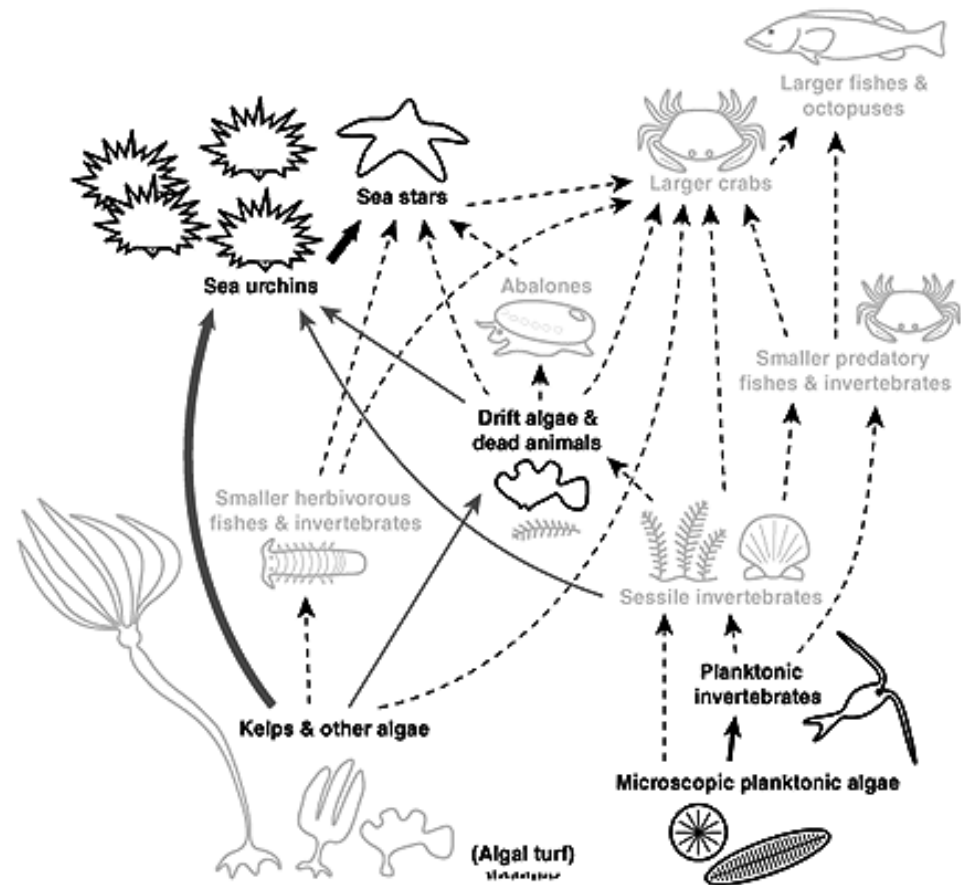
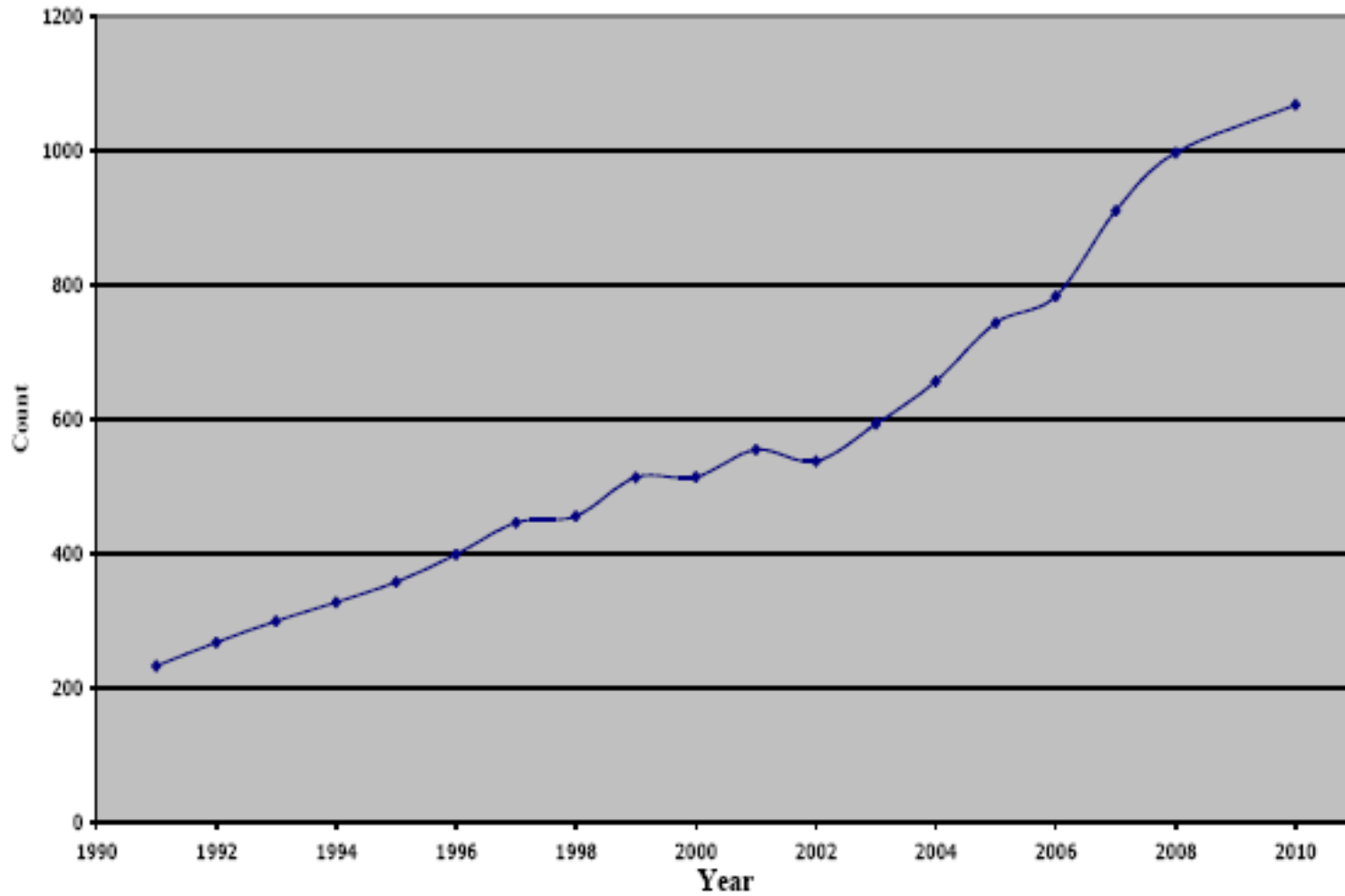




Figure 1. Growth of Washington sea otter population, showing 3-yr running average of counts, 1989-2010.



Washington population    2005 – 814 animals    2010 - 1073



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Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)



**THE GRAY WHALE**  
***Eschrichtius robustus***

T.W.Rutledge

**Average Adult Length:**

**Females – 46ft Males – 42ft**

**Adult Weight: ~50 tons**

**Puberty ~8 yrs**

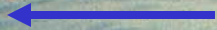
**Stop growing ~40 yrs**

**Max Age ?? 80 yrs**

No dorsal fin

Barnacles and scars from  
barnacle attachment

Head



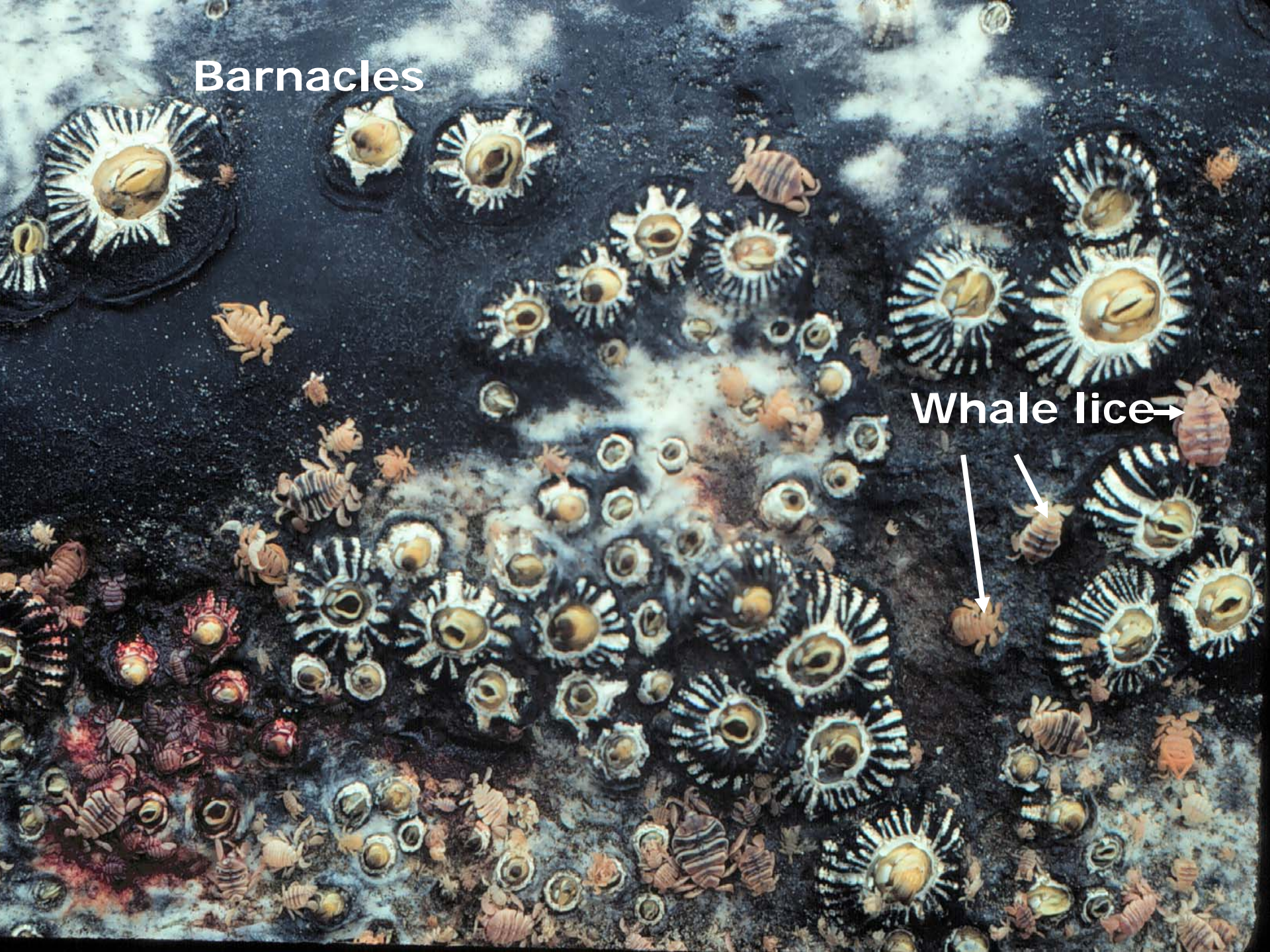
Hump Series of "knuckles"



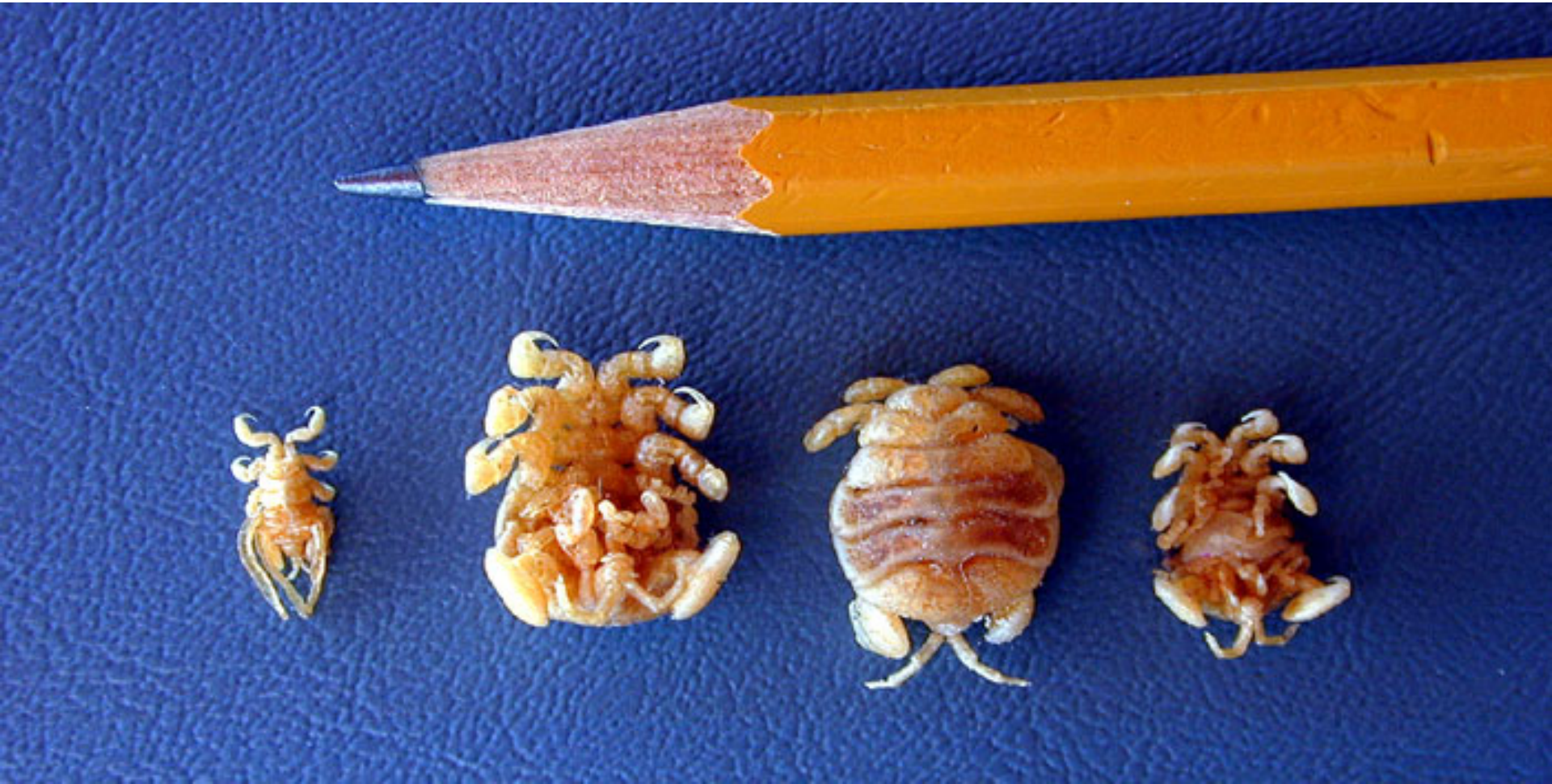


Barnacles

Whale lice →



# 3 different types of lice



Feed on dead skin

# Gray Whale Surface Behaviors

Blows



At the surface

Preparing for a dive



Flukes up



**spyhop**



# Low bushy blow

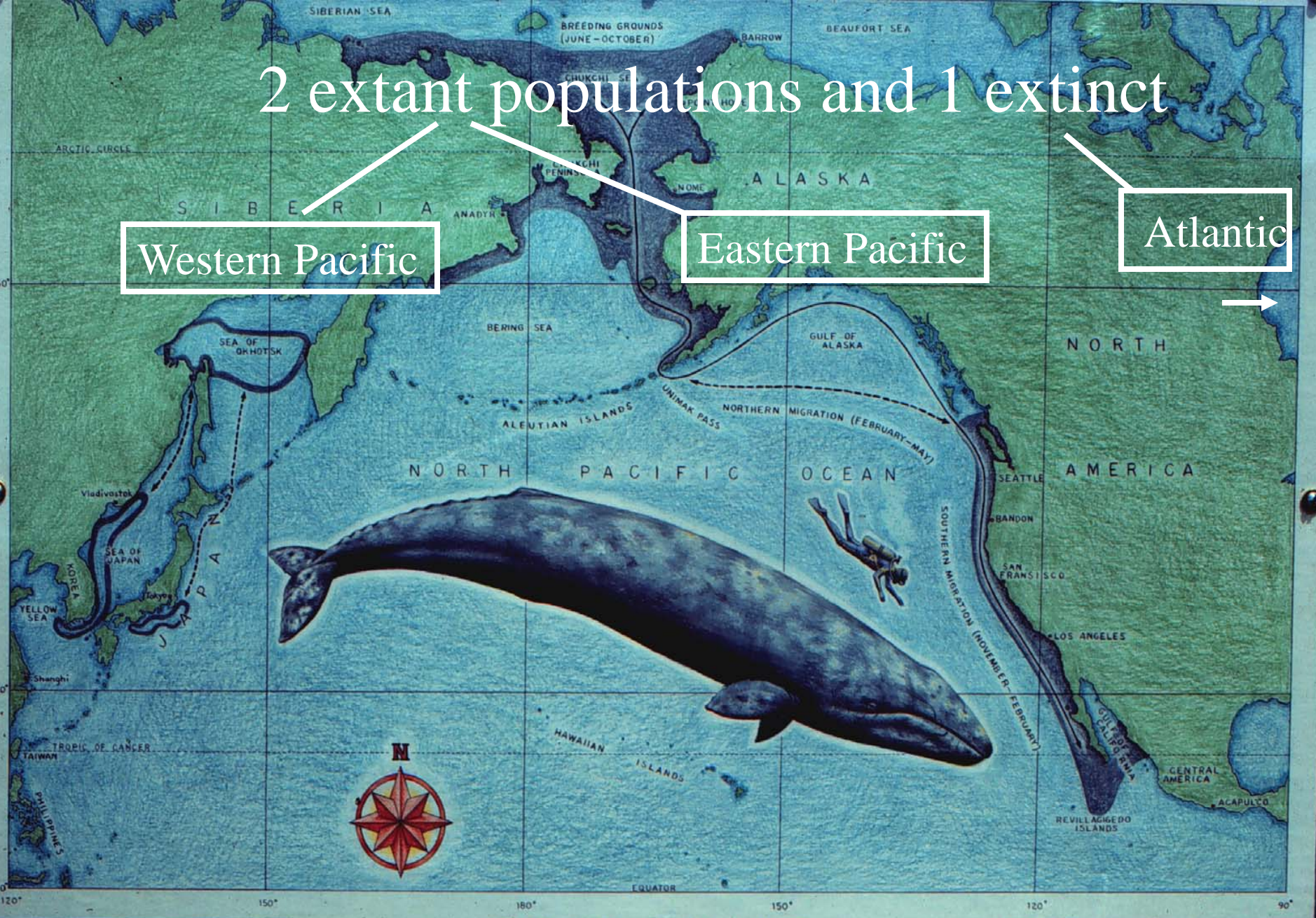


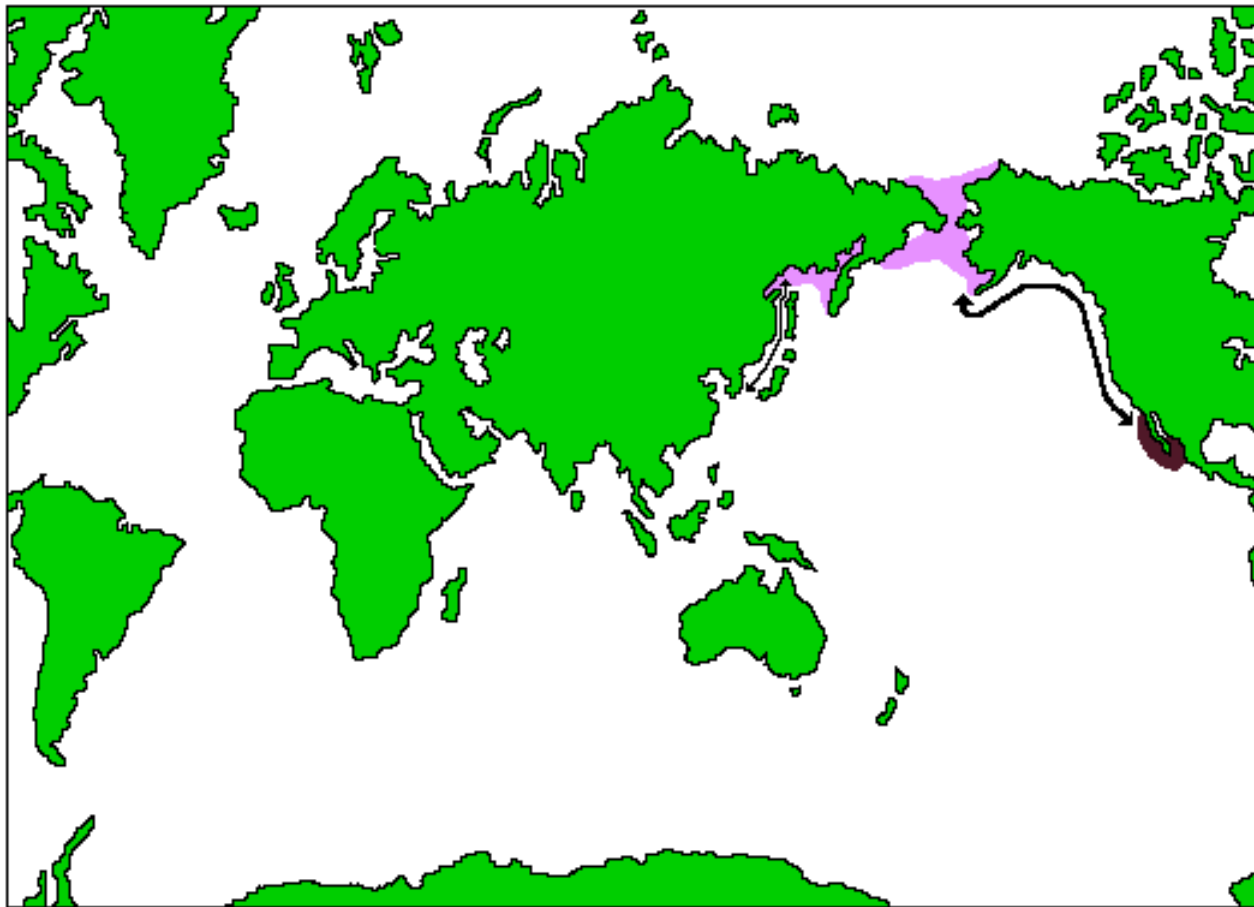
# 2 extant populations and 1 extinct

Western Pacific

Eastern Pacific

Atlantic





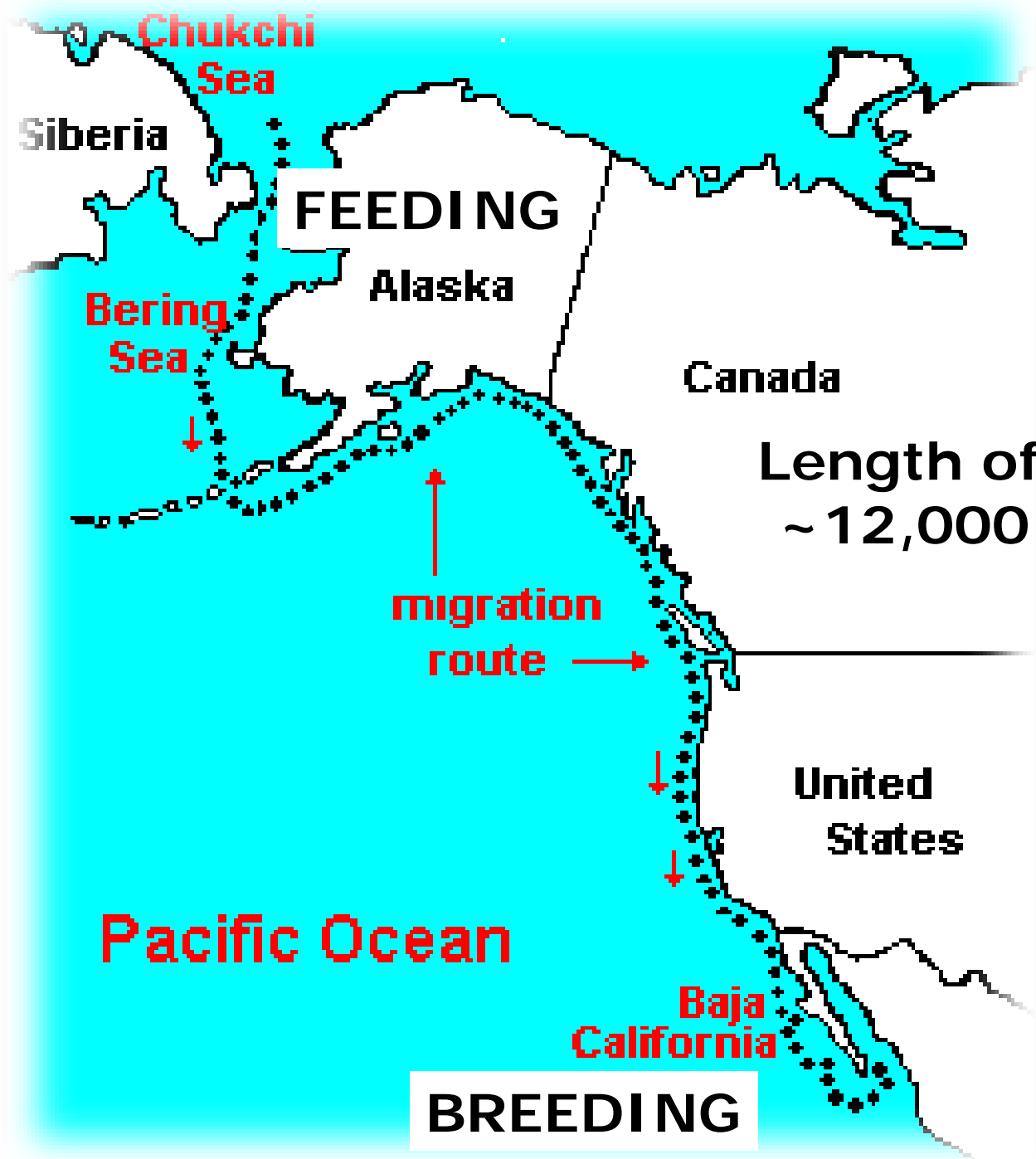
Summer Feeding Areas



Winter Breeding Areas



Migration Routes

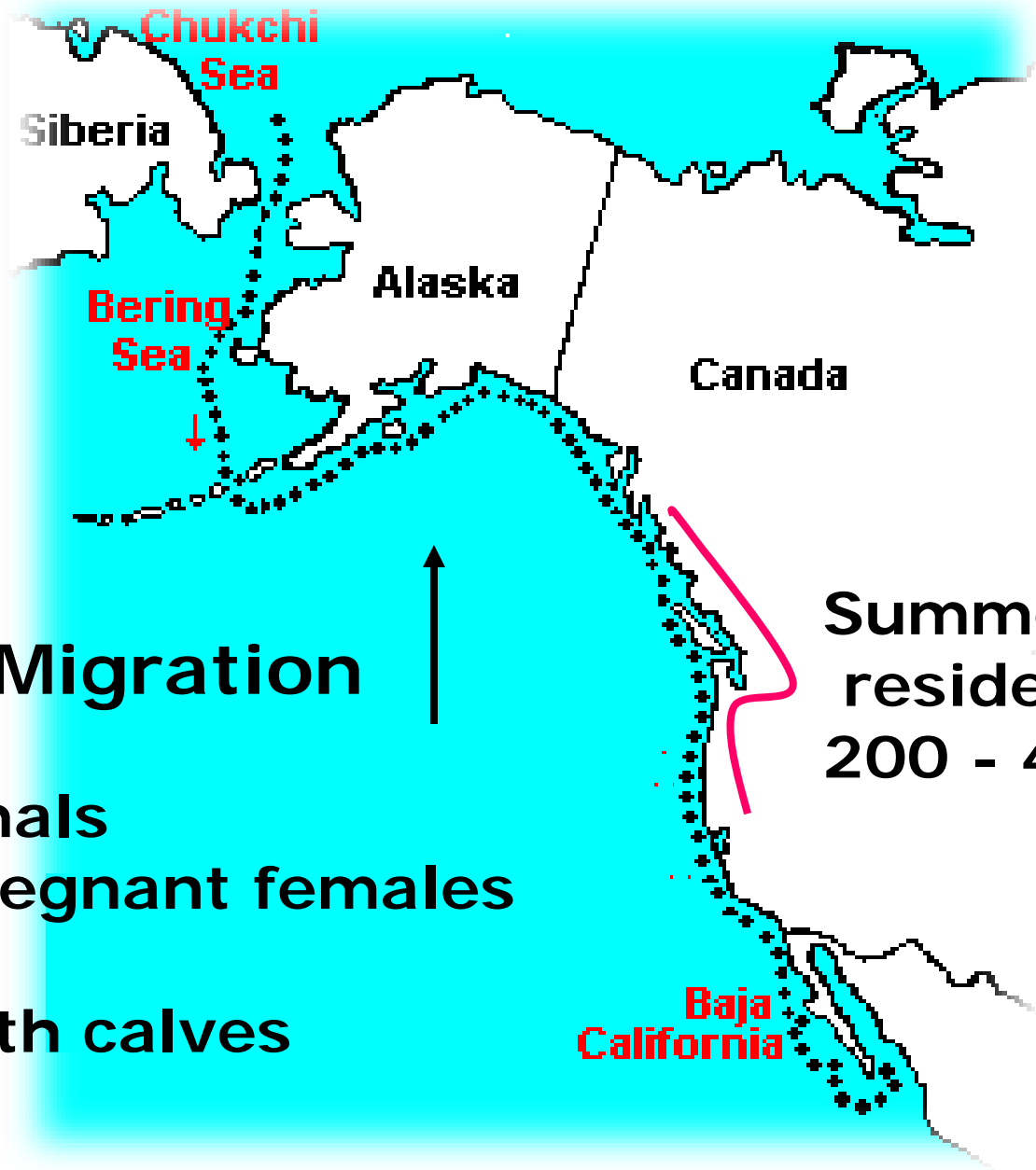


Length of migration  
~ 12,000 miles

**BREEDING**







# Northern Migration

Order

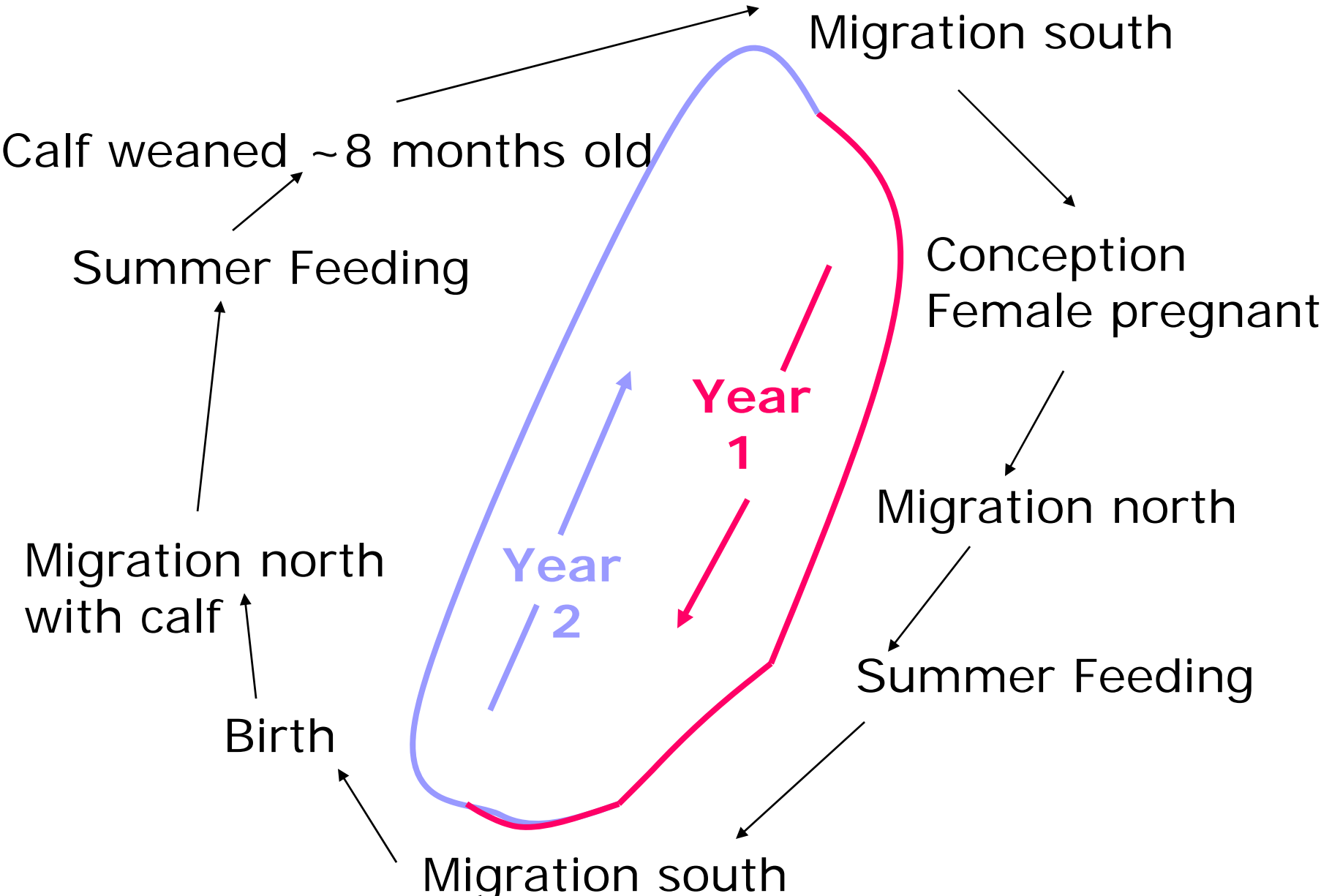
Young animals

Recently pregnant females

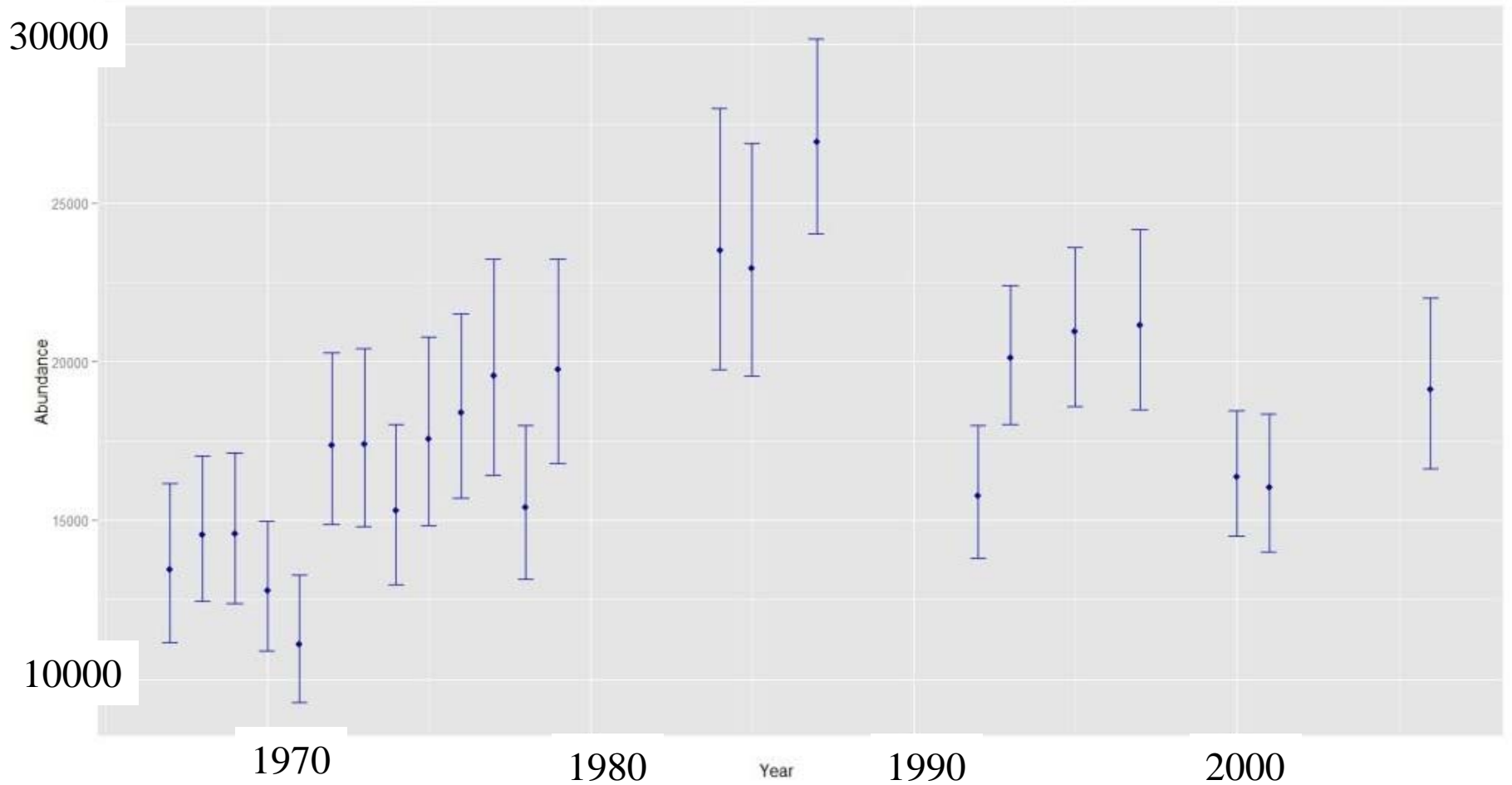
Males

Females with calves

Summer residents  
200 - 400



# How many gray whales are there?



Gray Whale Abundance estimates from NOAA



## How many gray whales were there?

It has been estimated...that a thousand whales passed southward daily from 15th of December to the 1st of February. Accepting this number without allowing for those which passed off shore out of sight of land...the aggregate would be increased to 47,000.

Capt. Charles Scammon, 1872 p. 23

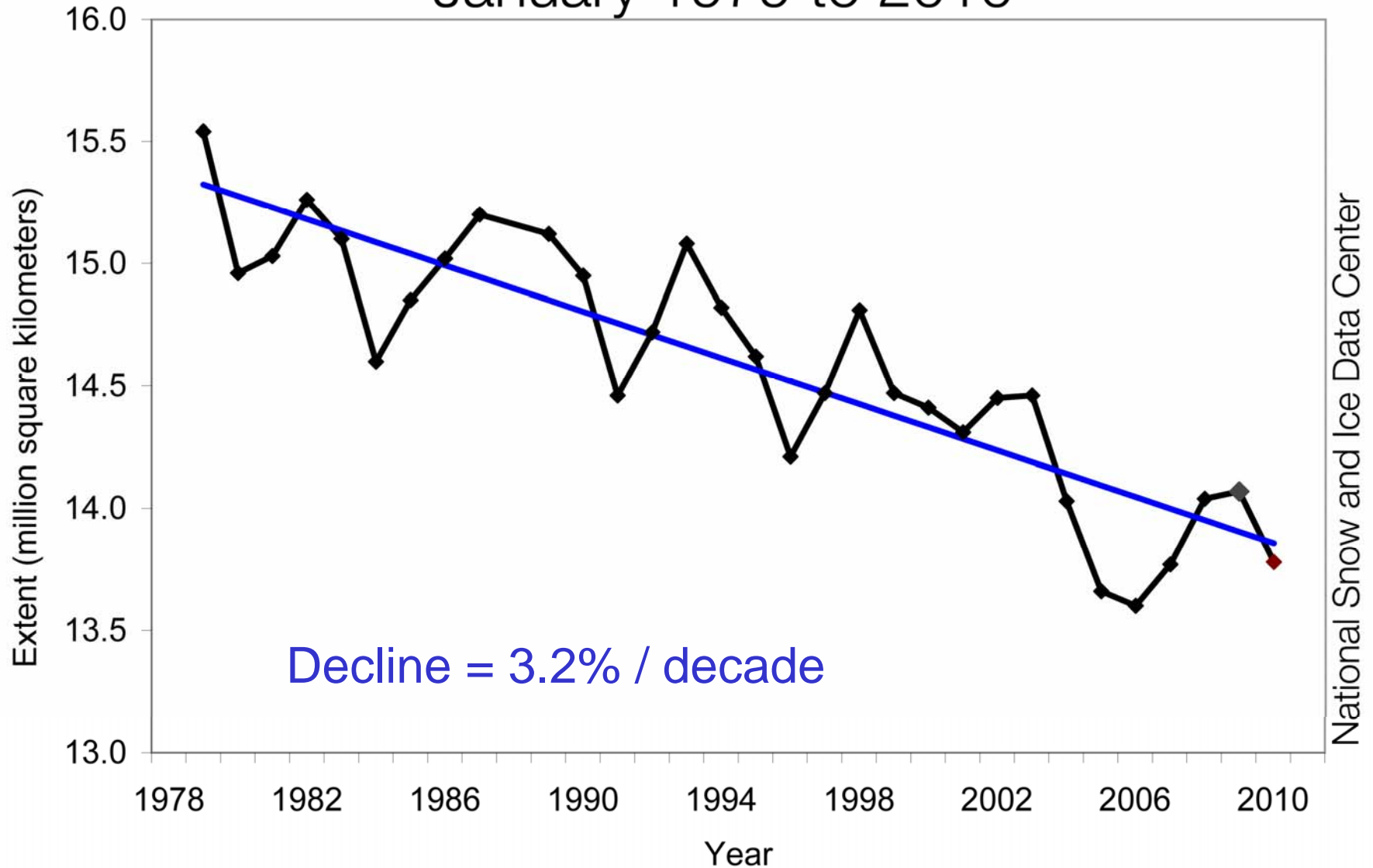
In the Bay of Monterey, they have been seen rolling, with apparent delight, in the breakers along the beach.

Scammon 1872 p. 2

“It is impossible to describe either the number of whales or their familiarity,” with breath that “caused a most annoying stench” French explorer Jean La Perouse, 1786 in Monterey

Analysis of current genetic diversity suggest 78,000 – 110,000 as preexploitation numbers (Palumbi 2006)

# Average Monthly Arctic Sea Ice Extent January 1979 to 2010



A few hundred animals

Primarily animals that are resighted in subsequent years

# Summer Gray Whale Sightings

Identification possible due to:  
Injury



A few hundred animals

Primarily animals that are resighted in subsequent years

Boat propellers



Some site fidelity

Stay for days, weeks, months

Natural marks





exhalation

Direction of swimming

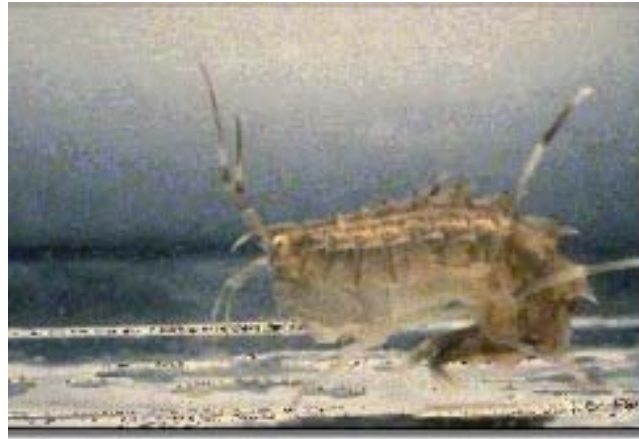
Plume of mud from feeding activity





# GRAY WHALE FOOD

Arctic



Benthic  
amphipods

Pacific Northwest



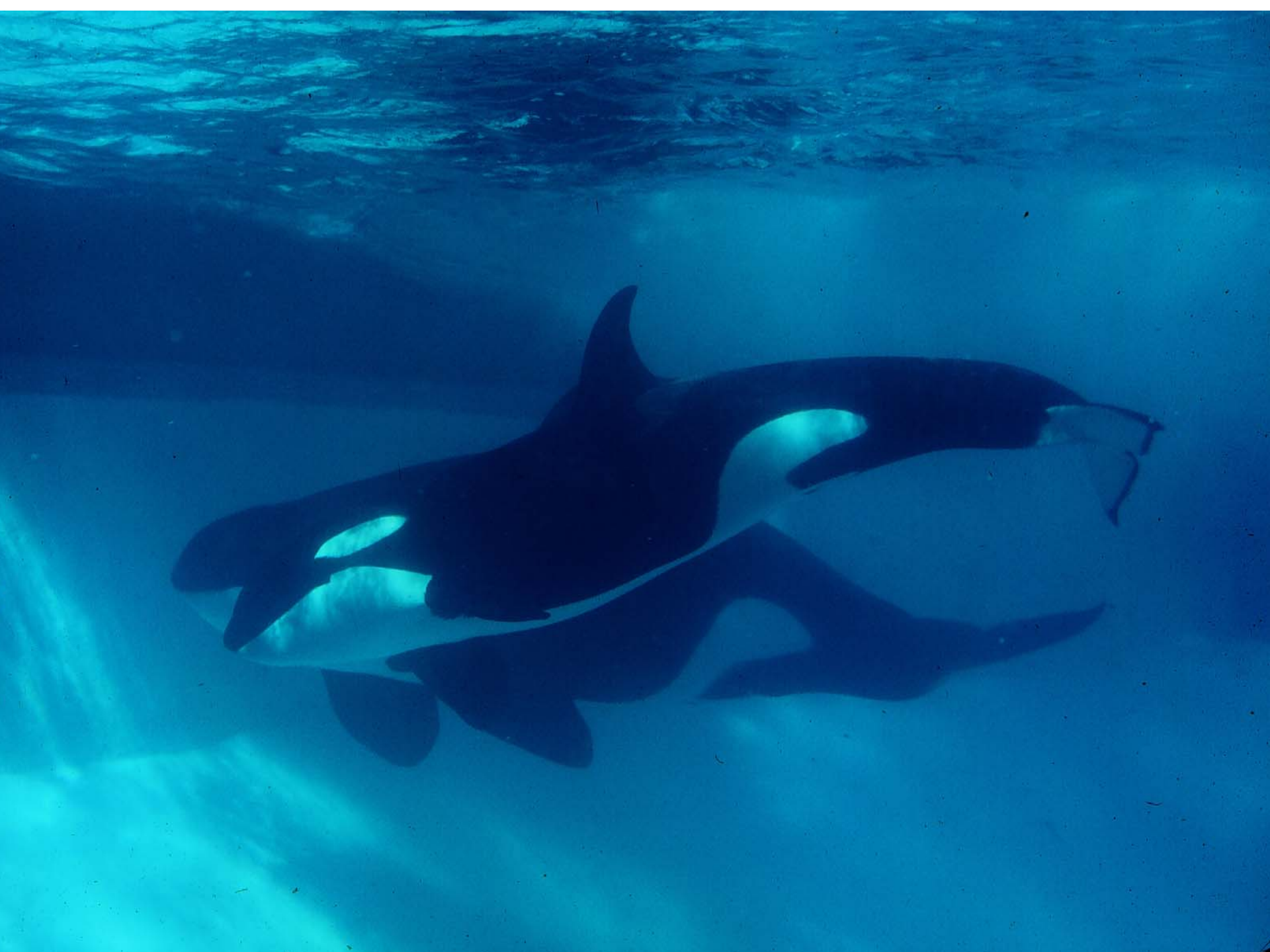
Ghost shrimp  
In sediment



Mysids commonly  
associated with kelp  
beds





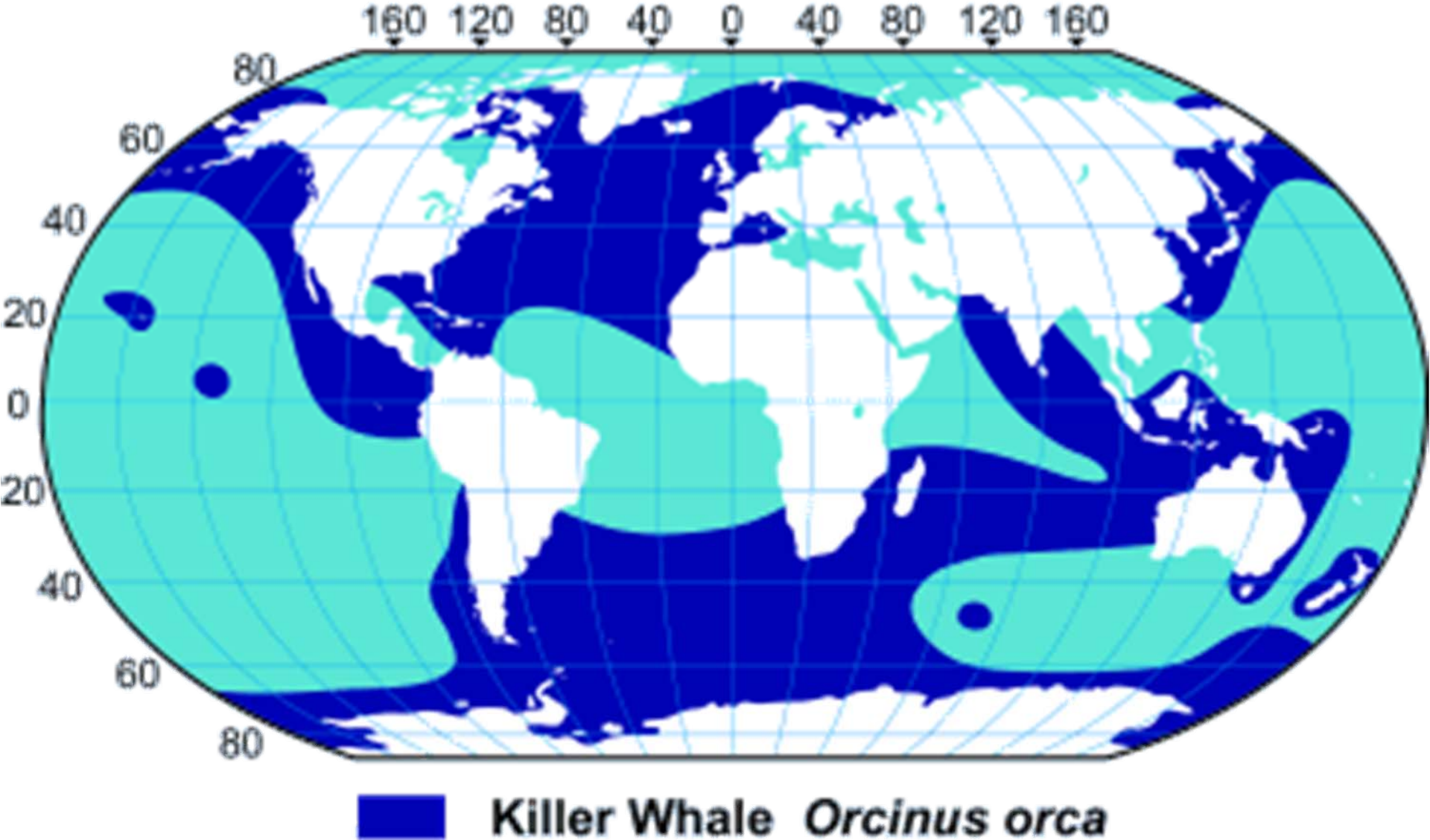


MALE

FEMALE



# Killer Whale Distribution



# North Pacific Killer Whales

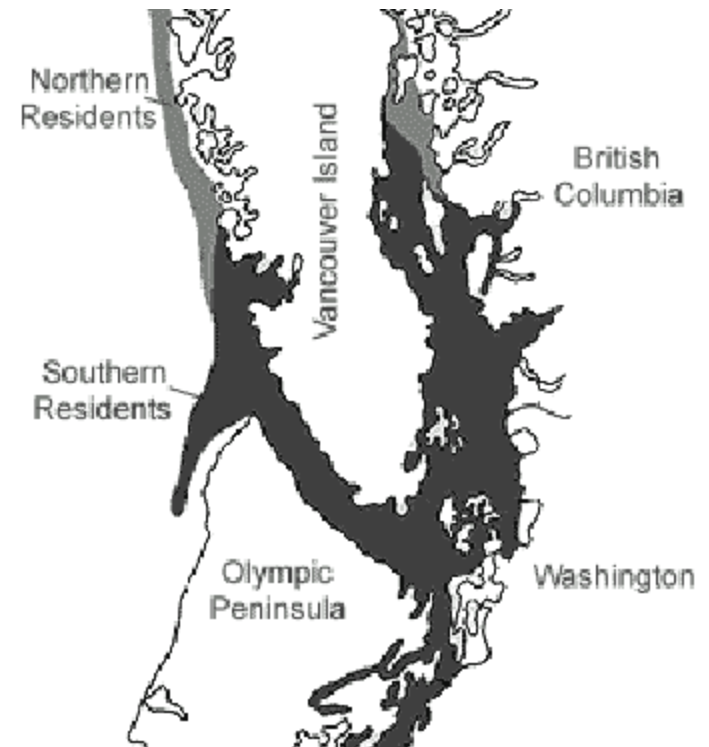
Offshore

Transients

Residents

Differences in:

- Distribution
- Social structure
- Morphology
- Food
- Vocalizations



## Orca communities

-  Northern residents
  -  Southern residents
  -  Offshores
- Transients are found in all ranges



## RESIDENTS

- Females and all offspring – including males stay together for life
- Eat fish
- Two communities – northern and southern

## TRANSIENTS

- Male offspring do not always stay in family group
- Eat marine mammals

## OFFSHORES

- Social system not known
- Eat fish and possibly marine mammals?







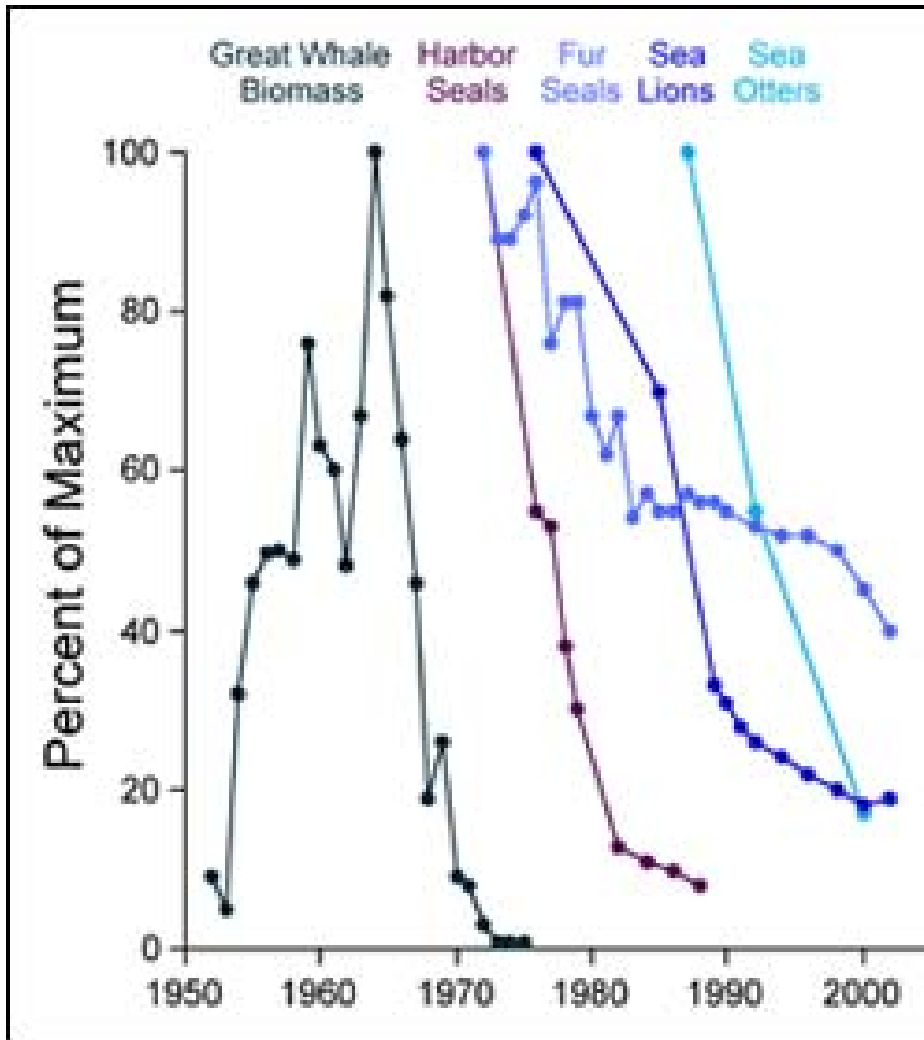
E Seal  
White Tag #334  
Born 1995  
Piedras Blancas

Eaten May 2004

# Farallon Islands 7 August 2005

## Shearwater Journeys





**Sequential megafaunal collapse in the Arctic**

