

Cold Water Sharks: Top of the Food Web Fish in the North Pacific

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Major Sharks of the North Pacific

Salmon Shark (*Lamna ditropis*)

Sixgill Shark (*Hexanchus griseus*)

Spiny Dogfish (*Squalus acanthias*)

Sleeper Shark (*Somniosus pacificus*)

Salmon shark (*Lamna ditropis*)

- Possess physiological ability to raise body temperature above ambient temperature
- Elevated temperature facilitates hunting capability
- Temperature regulation facilitates occupation of multiple temperature regimes encountered in migration paths

Salmon shark (*Lamna ditropis*)

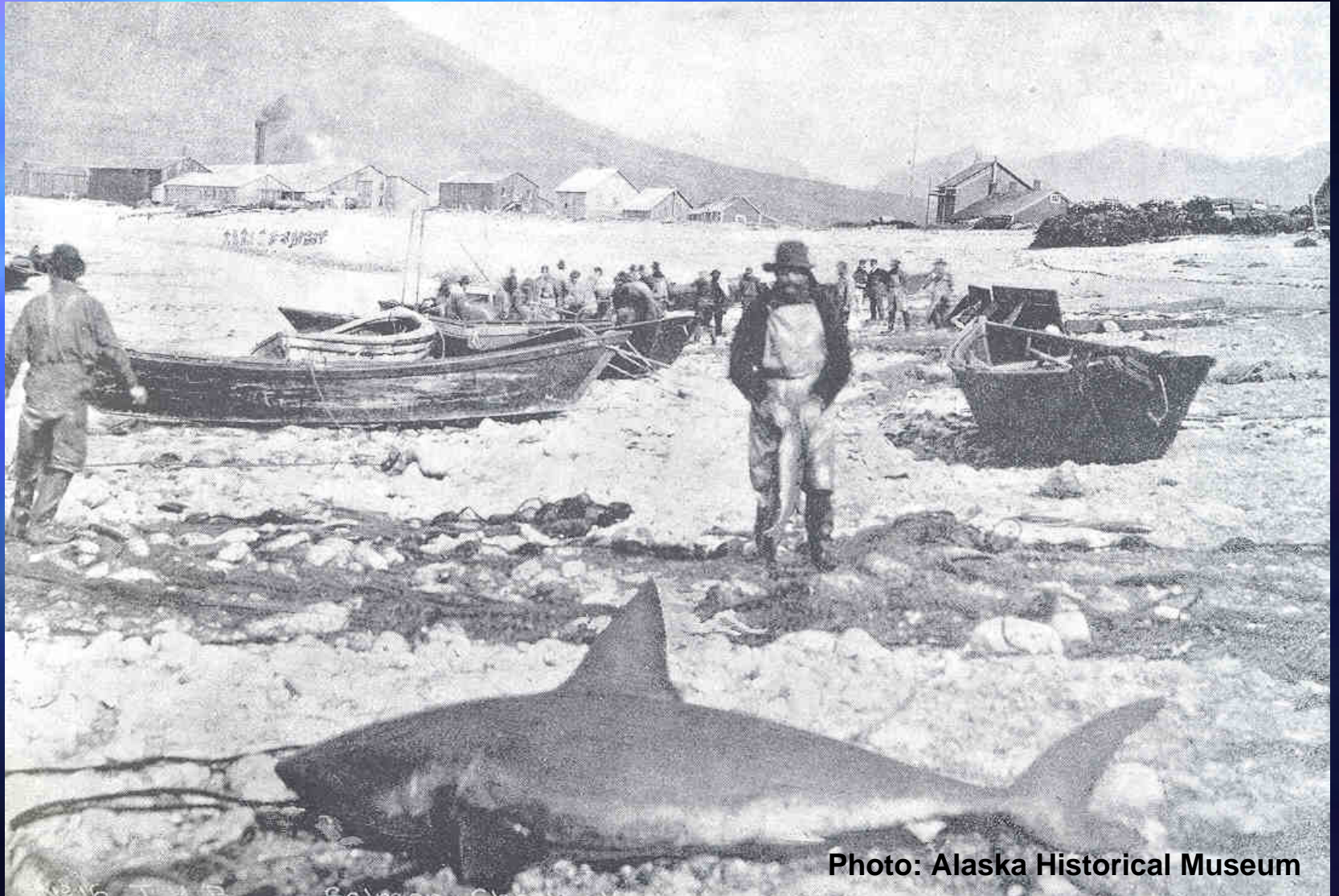


Photo: Alaska Historical Museum

Salmon shark (*Lamna ditropis*)

- **Distribution:** southern California to Bering Sea to Japan
- **Size:** up to 3.5 m
- **Pelagic lifestyle:** surface and midwater
- **Primary prey:** salmon, octopus, squid, others

Salmon shark (*Lamna ditropis*)



Photo: NOAA, Alaska Fishery Science Center

Salmon shark (*Lamna ditropis*)

Recent and Ongoing Research

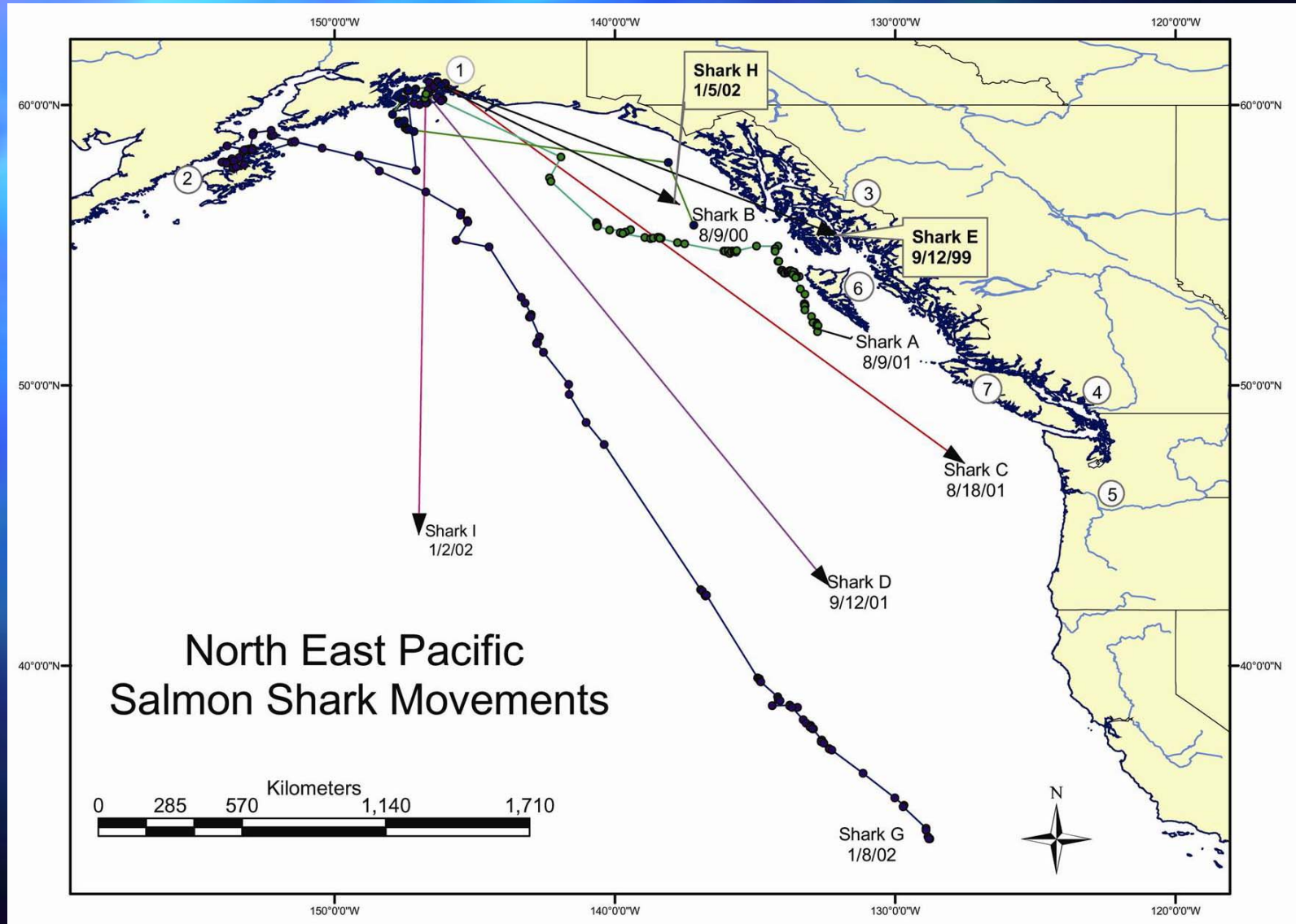
(joint NMFS and Univ. Washington)

- Mark-recapture and satellite tagging experiments. Use of a cradle to contain shark for marking.
- Long migration (Bering Sea to California) path possibly for reproductive purposes.
- Hormone analyses from blood samples.
- Genetic analyses.

Salmon shark (*Lamna ditropis*)



Salmon shark (*Lamna ditropis*)



Sixgill shark (*Hexanchus griseus*)

- Distribution: world's temperate oceans including North Pacific, North Atlantic, Indian Ocean, etc.
- Length: up to 6 m
- Primarily benthic feeder but often rises to near surface for feeding. Teeth adapted to crustacea and shear-like feeding.
- Occur at depths of 400 m and less in Puget Sound

Sixgill shark (*Hexanchus griseus*)



Photo: DFO, Pacific Biological Station

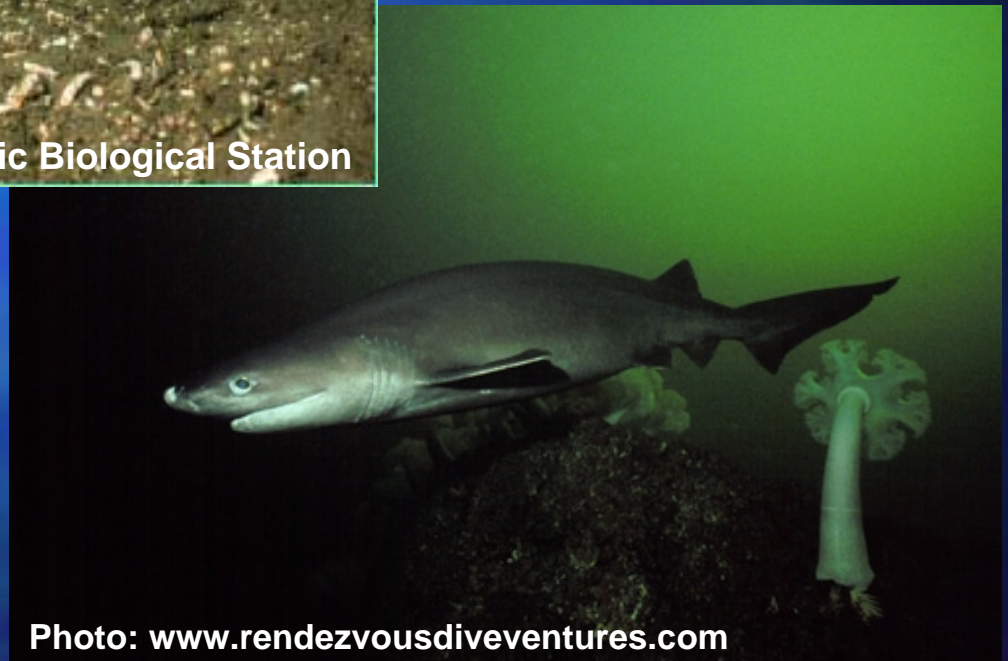
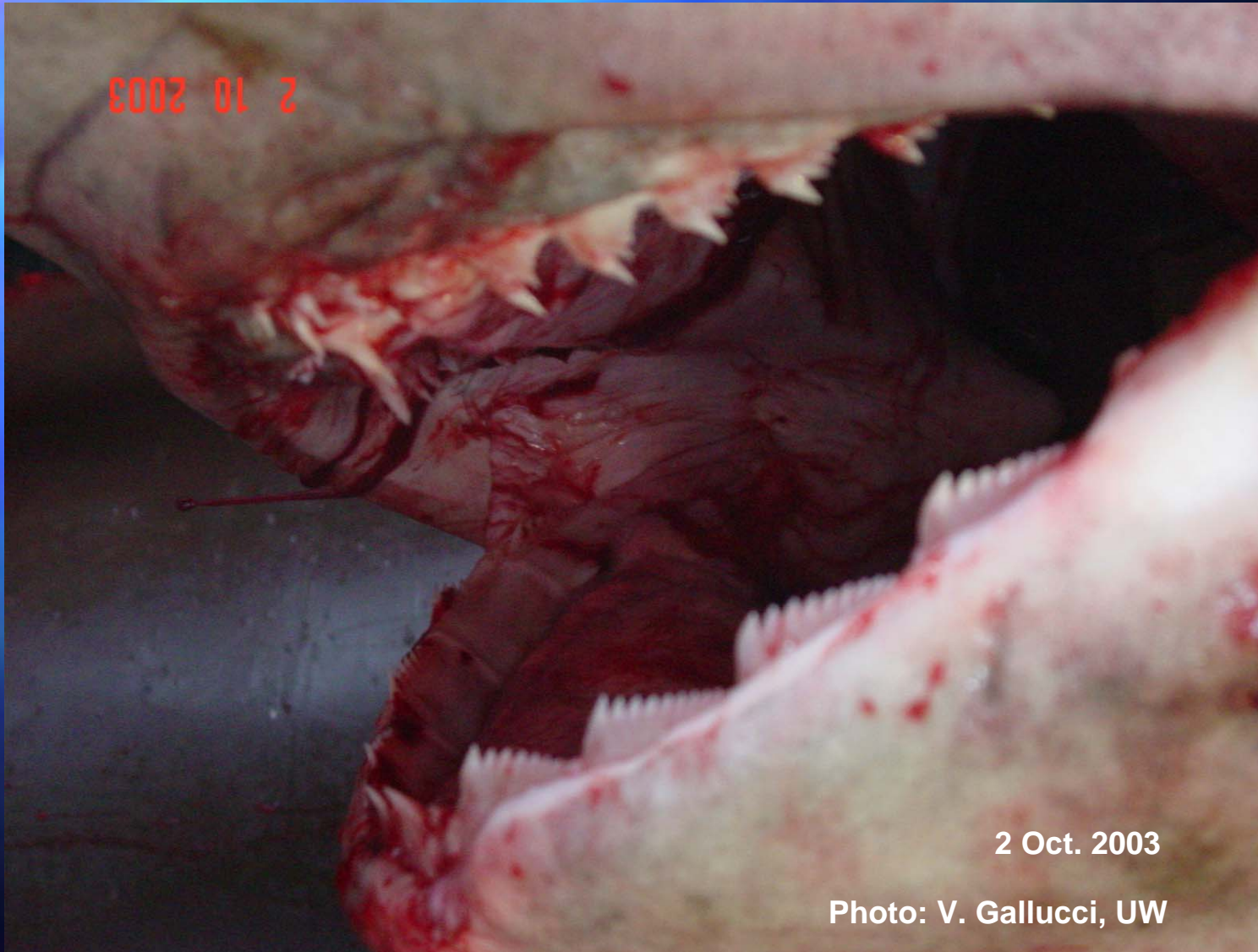


Photo: www.rendezvousdiveventures.com

Sixgill shark (*Hexanchus griseus*)

- Consumes spiny dogfish in classic bite pattern with teeth adapted for consumption of large bites
- Evidence of cannibalism
- Puget Sound a likely nursery ground with females entering from the ocean to pup
- Pups (up to 3 m) occur within city limits of Seattle and Tacoma

Sixgill shark (*Hexanchus griseus*)



Sixgill shark (*Hexanchus griseus*)



Photo: V. Gallucci, UW

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Sixgill Shark and Dogfish Prey



10 October, 2004

Photo: V. Gallucci, UW

Cannibalized Sixgill and Dogfish Prey



10 October, 2004

Photo: V. Gallucci, UW

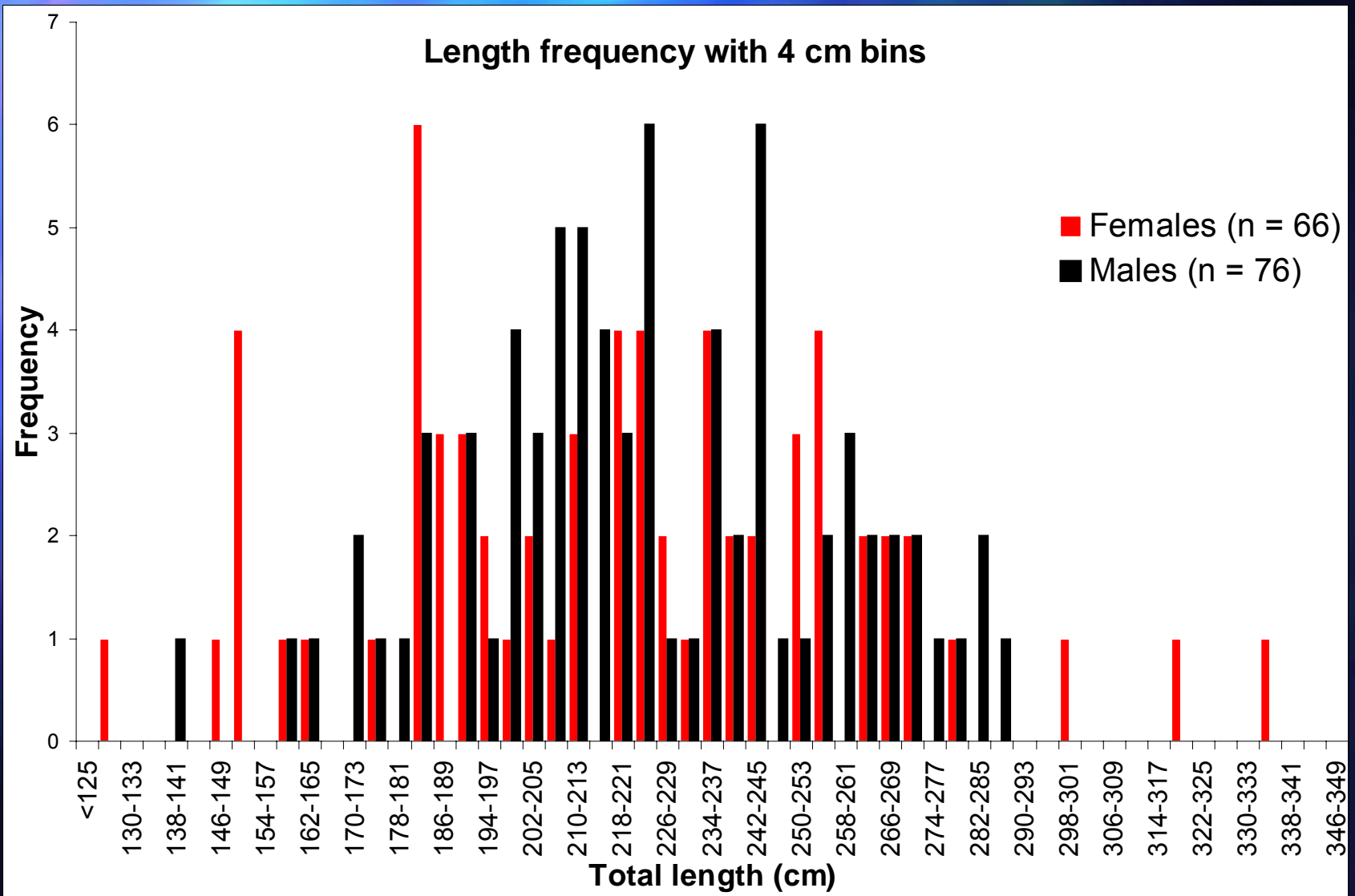
Sixgill shark (*Hexanchus griseus*)

Recent and Ongoing Research

University of Washington and Washington
Dept. Fisheries and Wildlife:

- Size frequency by sex.
- Growth curve by sex.
- Movement within Puget Sound, between ocean and Puget Sound with acoustic tags.
- Reproductive studies with crib.
- Genetic and hormone studies with crib.

Sixgill shark (*Hexanchus griseus*)



Spiny Dogfish (*Squalus acanthias*)

- **Distribution: world's temperate and subarctic oceans, including North Pacific (Baja California to Bering Sea to Japan), North Atlantic, etc.**
- **Support commercial fisheries worldwide**
- **Frequent bycatch in the following fisheries: salmon gillnet, groundfish longlines, and groundfish trawls**
- **Size: up to 1.5 m**

Spiny Dogfish (*Squalus acanthias*)

Photo: DFO, Pacific Biological Station



Photo: New-Brunswick.net

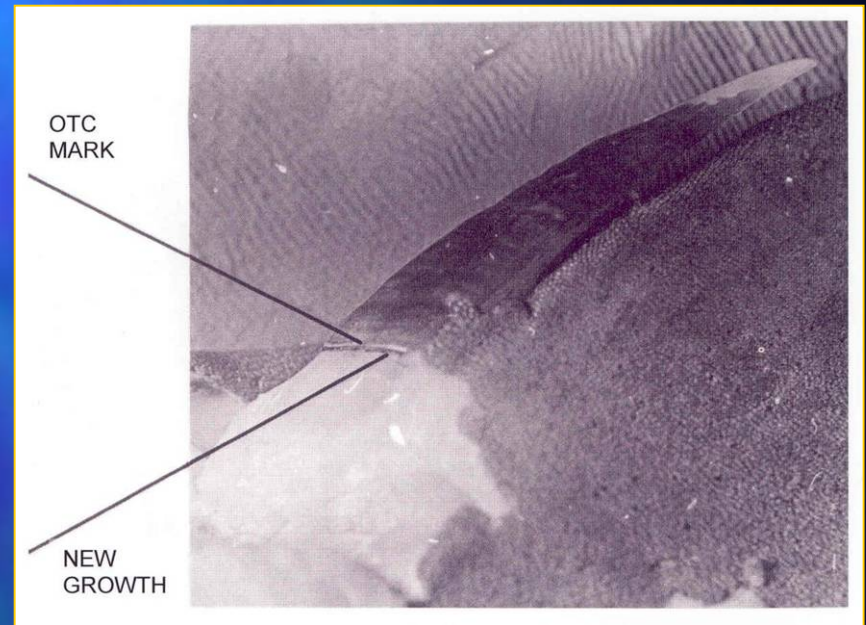
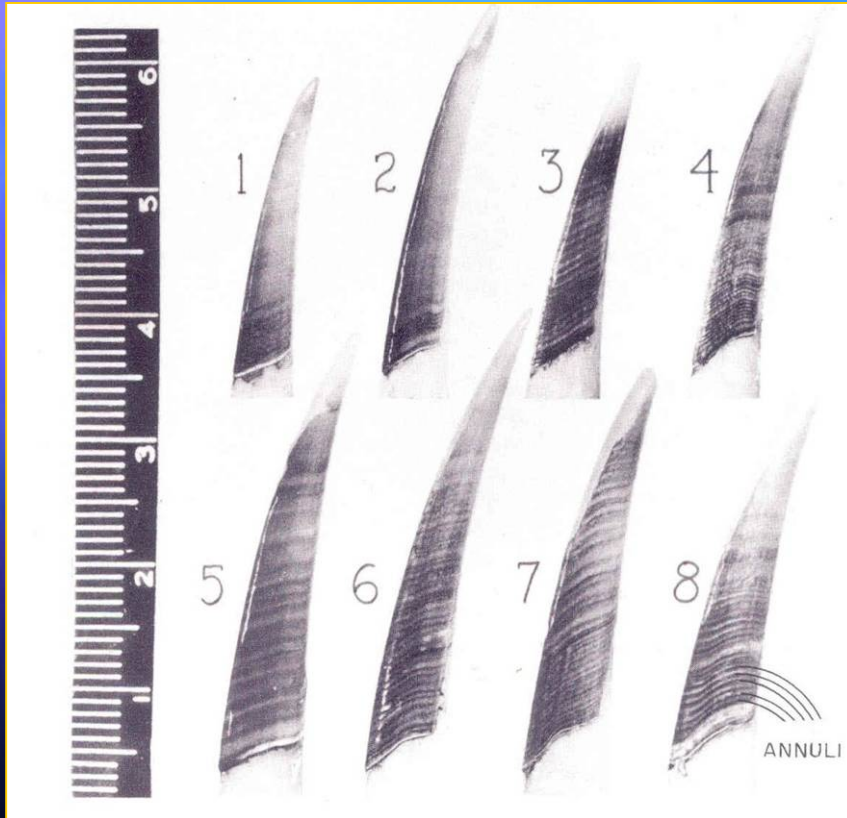
Spiny Dogfish (*Squalus acanthias*)

- Primarily benthic feeders as adults
- Often form schools
- Occupy more than one niche:
 - Large prey – rockfish, other dogfish, Dungeness crab
 - Small prey – jellyfish, euphausiids, polychaetes, bivalves, forage fish, shrimps
 - Appear as major prey for sixgill sharks

Spiny Dogfish (*Squalus acanthias*)

- One of few elasmobranchs that have structure suitable for ageing
- Oldest individual was 107 years in (BC)
- Females mature at 35 years (BC)
- Important questions are raised about ability to sustain long term commercial fisheries

Spiny Dogfish (*Squalus acanthias*)



McFarlane and Beamish (1987)

Spiny Dogfish (*Squalus acanthias*)

- Dogfish are ovoviviparous
- Gestation period is 22 months (longest of any vertebrate)
- Litter size is 6-12 pups
- Important questions are raised about ability to sustain long term commercial fisheries

Spiny Dogfish (*Squalus acanthias*)



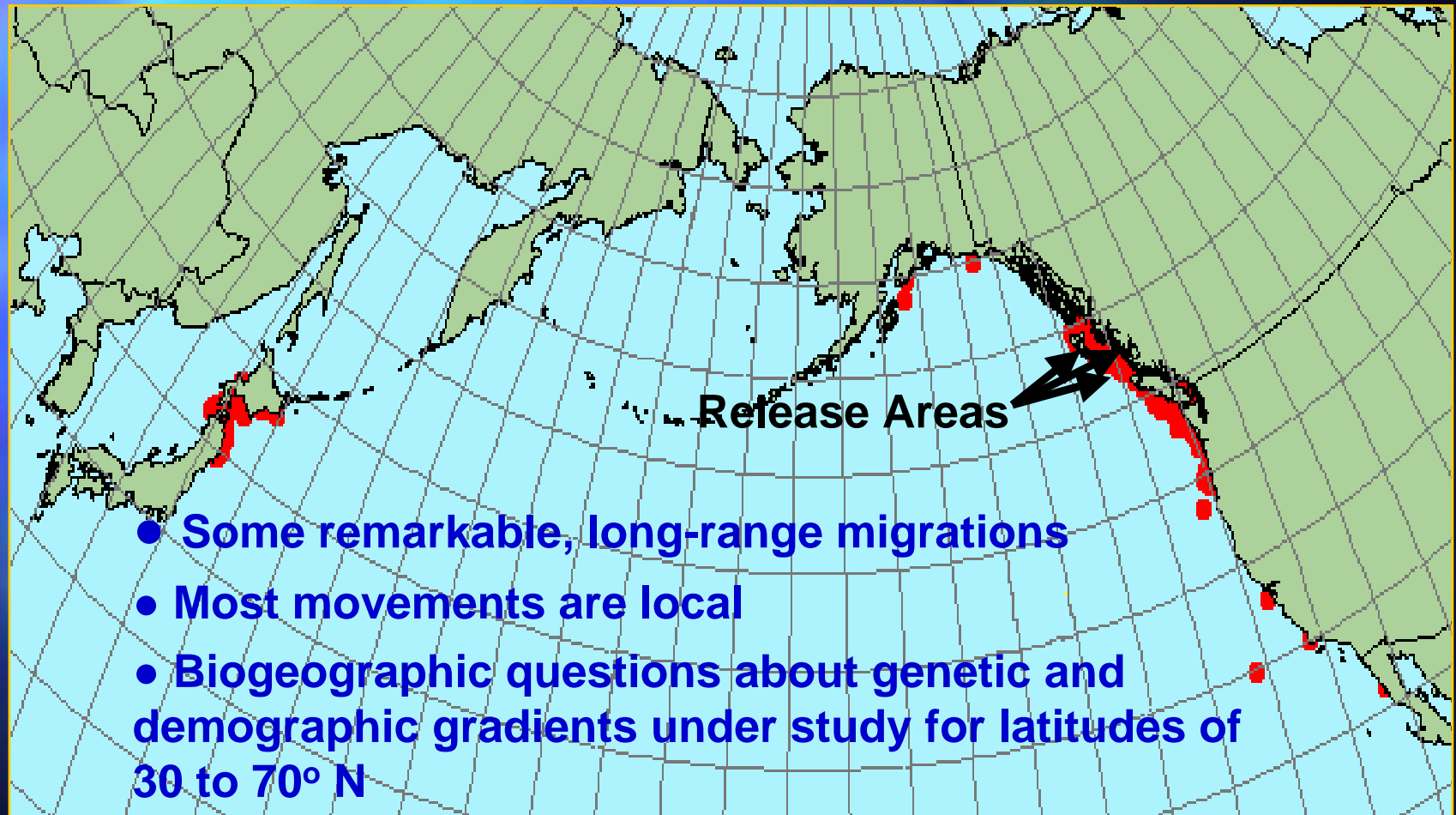
Spiny Dogfish (*Squalus acanthias*)

Recent and Ongoing Work

UW, UAF, DFO and NMFS:

- Demographics and life history
- Population dynamics & stock assessment
- Reproductive hormones
- Genetics studies
- Distribution and migration
- Habitat studies

Spiny Dogfish (*Squalus acanthias*)



McFarlane and King (2003)

Sleeper Shark (*Somniosus pacificus*)

- **Size: up to 7.6 m**
- **Distribution: Southern California to Bering Sea to Japan**
- **Often bycaught on longline, trawl and occasionally pot fisheries**

Sleeper Shark (*Somniosus pacificus*)



Photo: USGS, Alaska Science Center



Photo: USGS, Alaska Science Center

Sleeper Shark (*Somniosus pacificus*)

- Benthic lifestyle, up to 2,000 m deep
- Very little known about life history and demographics
- Prey includes flatfish, octopus, squid, crabs, and marine mammals

Sleeper Shark (*Somniosus pacificus*)

Recent and Ongoing Research

NMFS:

- Stomach contents and fatty acid analyses of diet near Steller Sea Lion (SSL) rookeries to determine whether sleeper sharks eat SSLs
- Diet includes pollock, octopus, unid. fish, salmon and marine mammals
- Mammals are 31-34% of summer diet
- Mammals are cetaceans (carrion)

Sleeper Shark (*Somniosus pacificus*)

August Sleeper shark diet (n = 86)

	Cetacean	Pollock & Cod	Salmon	Misc. Fish	Cephalapod
% Weight	31	31	9	17	12
% Occurrence	17	56	14	60	74



Photo: NMFS, Auke Bay Lab

Conclusions: North Pacific Sharks

- Sharks are apex predators
- Different shark species occupy different niches, based on feeding strategies and depth distribution
- Knowledge remains very limited about distribution, life history, demographics, and population dynamics
- Information and collaborations sought across Pacific Rim. Please contact: vgallucci@u.washington.edu

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