



Copper River & Prince William Sound salmon and other fishes

Pink and chum salmon, Olsen
Creek, PWS

Why salmon?

Anadromy is an adaptation to rugged and changing environment

Prince Willam Sound,
Bear Trap Bay

Olsen Creek



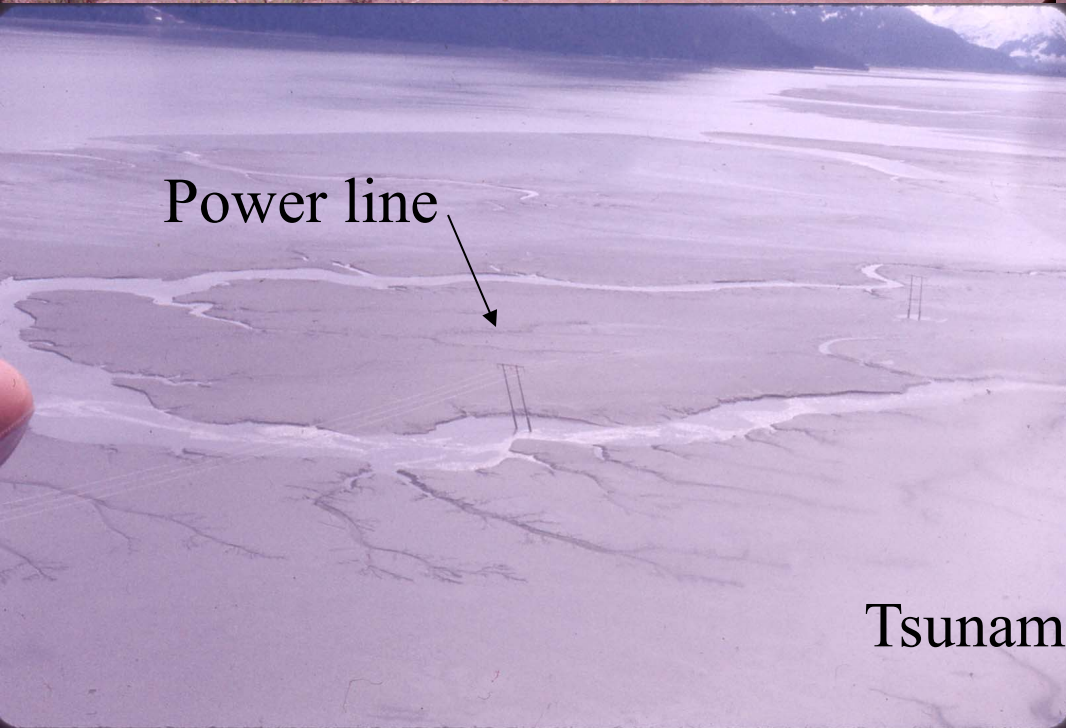
An aerial photograph of a mountain range with a large glacier system. The glacier flows from the upper right towards the center, where it meets a large, dark blue body of water in the foreground. The surrounding mountains are covered in snow and have rugged, rocky peaks. The overall scene is a high-altitude, alpine environment.

Retreating glaciers create new habitat

College Fiord, PWS, 1963

Copper River, Cordova,
August 1963.





Damage from Great Alaska Earthquake, June 1964

Tsunami effects

High tide,
1964
Olsen Creek



High tide,
1963, Olsen
Creek research
camp

Intertidal
invertebrates,
Prince William
Sound

1963



1964





Harrassing the bears, Olsen Creek, 1964



Prickly sculpin

Photo: AFS



Threespine stickleback

Non-salmonid fishes,
Copper River



Eulachon

Photo AFS



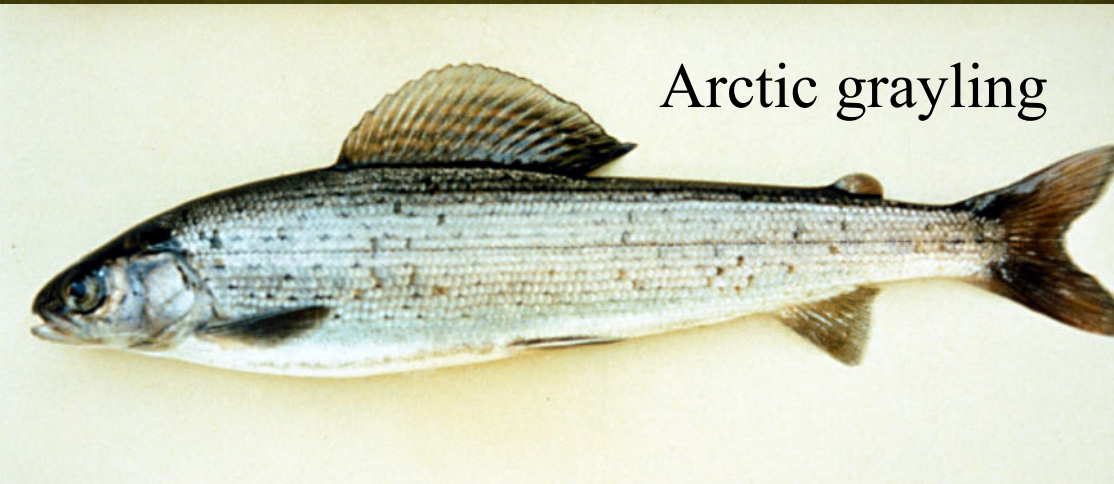
Dolly Varden

Other salmonids, Copper River



Round whitefish
afs photo is of mountain whitefish

Steelhead



Arctic grayling





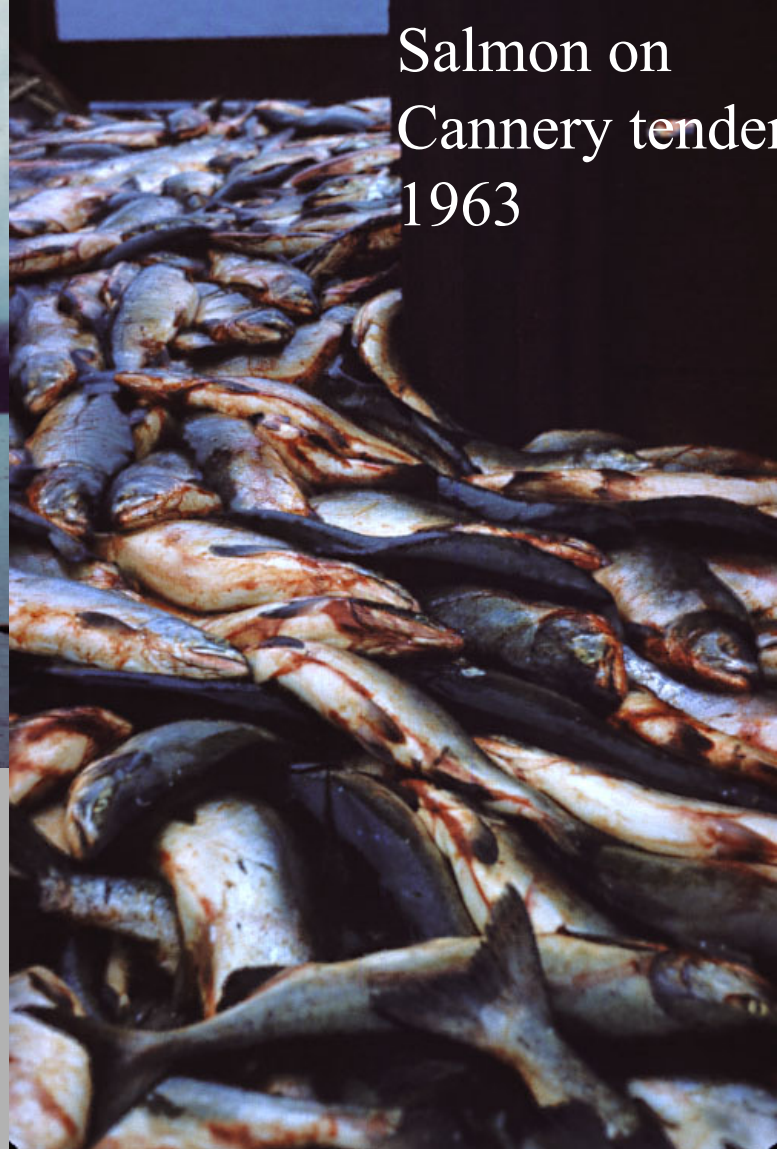
Pacific salmon,
Oncorhynchus spp.

Purse seine, 1976

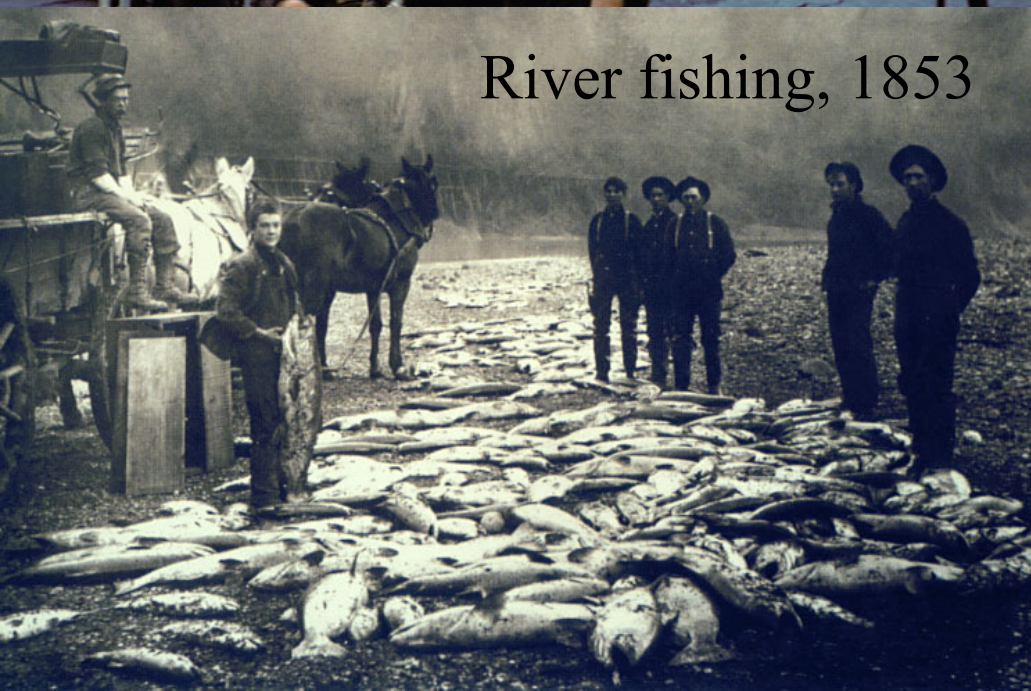
S. Katz



Salmon on Cannery tender 1963



River fishing, 1853



Salmon have a long history of exploitation

Fisheries, Copper River



Copper River salmon. (Photo: Isaac Oshima)

Subsistence dipnet fishery, Chitna River



Salmon Fisheries: Prince William Sound Area, 2001

- Chinook: 40,461
- Sockeye: 2, 261,143
- Coho: 494,135
- Pink: 35,246,524
- Chum: 3, 099794
- ***Over 41 million salmon caught!***

Copper River Fisheries

- Drift gill net fishery off mouth catches
 - 1.3 million sockeye
 - 250,000 coho
 - 50,000 other species

Copper River Fisheries

- Spawning escapement, sockeye: 300,000
- Spawning escapement, others: 17,500
- Sport harvest: 15,000
- Subsistence harvest:
 - 160,000-225,000

Chitna salmon harvest, 2000

- Sockeye: 100,000
- Chinook: 2900
- Coho: 3,500
- Commercial, subsistence, sport



Copper River subsistence dipnet fishery

Photos: Alaska DFG

30 salmon/person

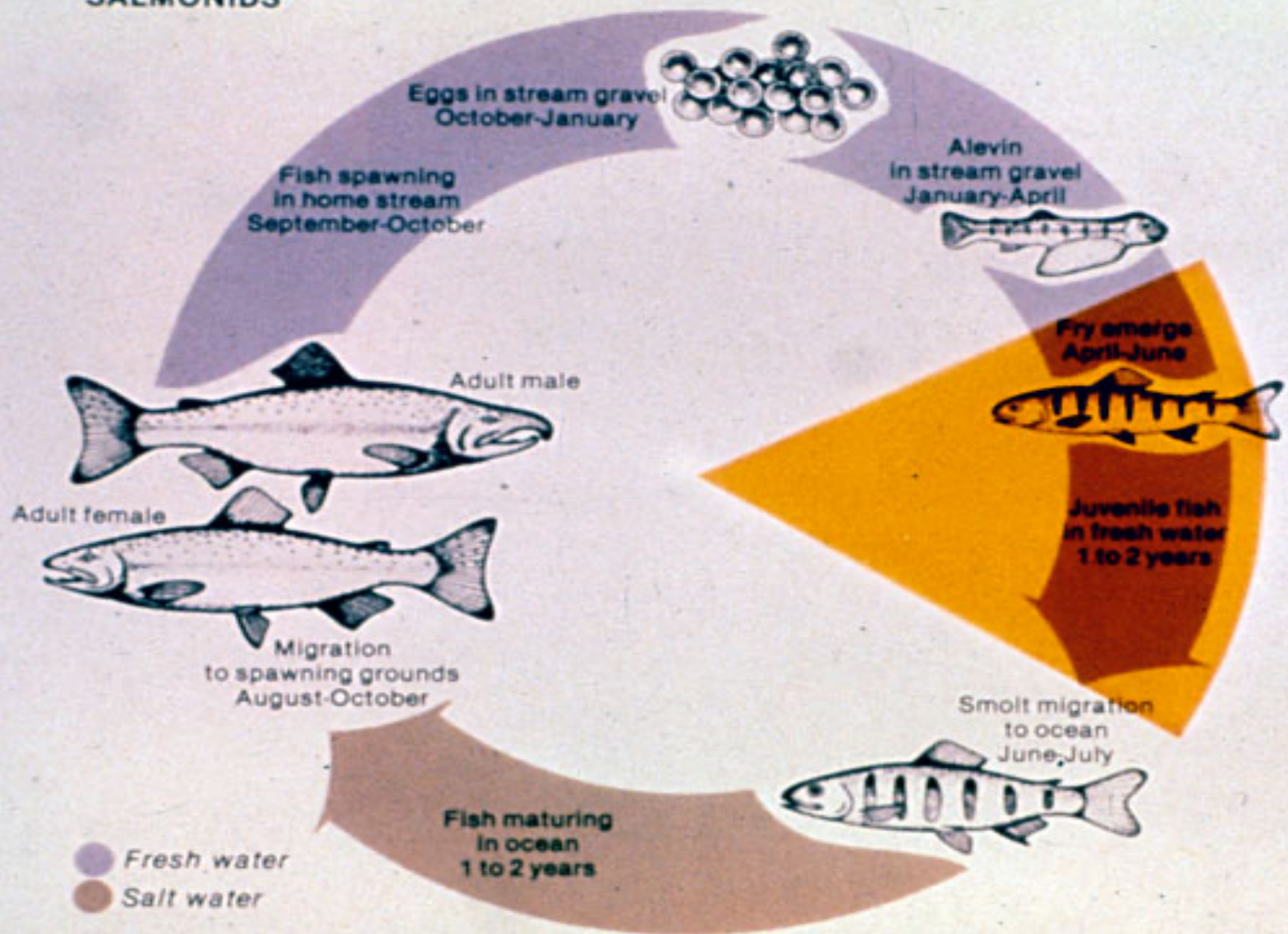
Up to 500/household with
special permission





Copper River subsistence fishery: fish wheel
The high tech alternative to dip netting.

OF ANADROMOUS SALMONIDS



Adult chinook, fresh water



Pink salmon spawning



Sockeye ascending



It always ends this way...



Embryos and alevins require cold, well-oxygenated intragravel water





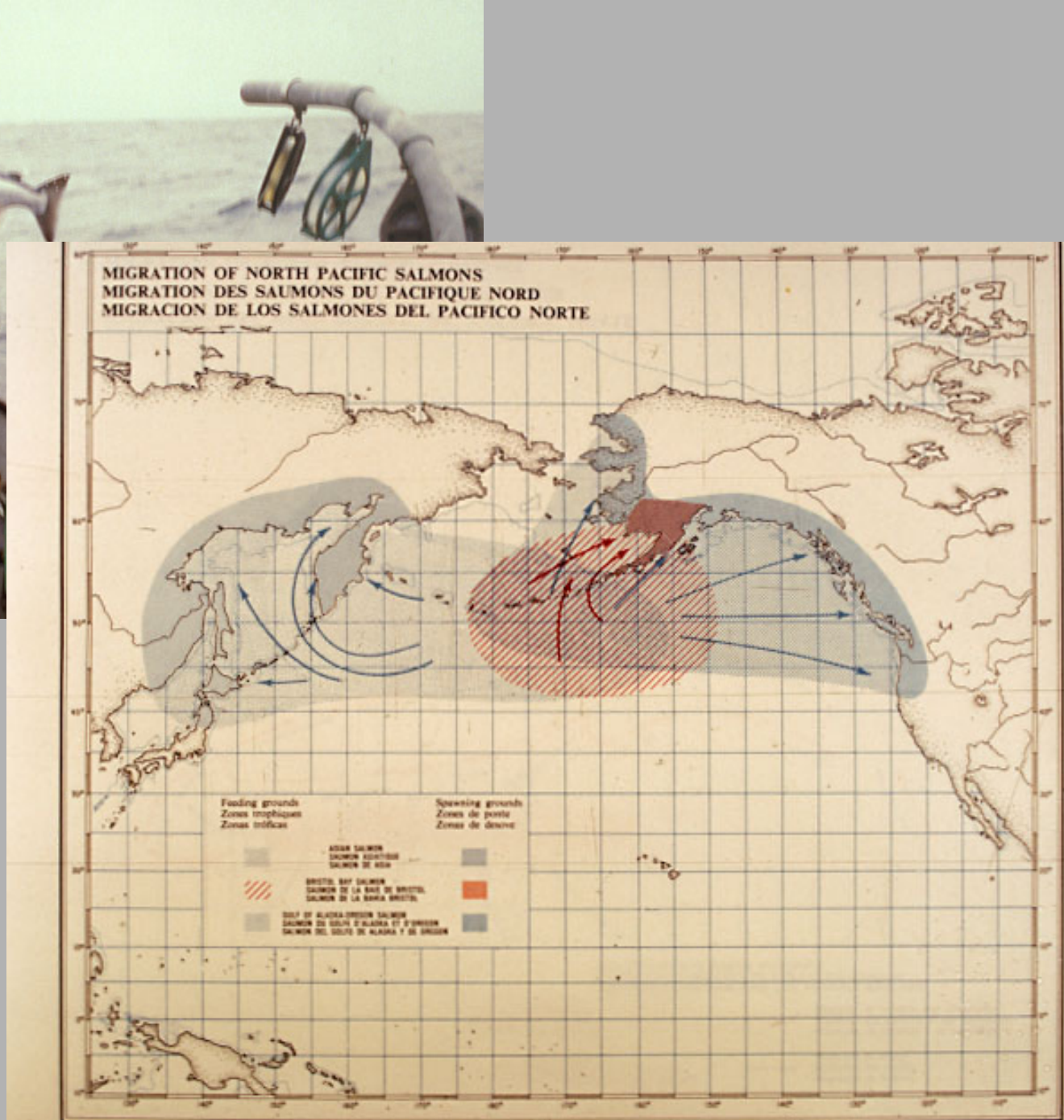
Juvenile coho and steelhead (parr), Oregon. Photo T.L. Taylor, 1999



Transformation:
Parr to smolt



Chinook smolt, Sacramento
River. Note large eye,
silvery loose scales



Each species rears
In different parts
of the ocean



Chinook salmon,
Oncorhynchus
tshawytscha

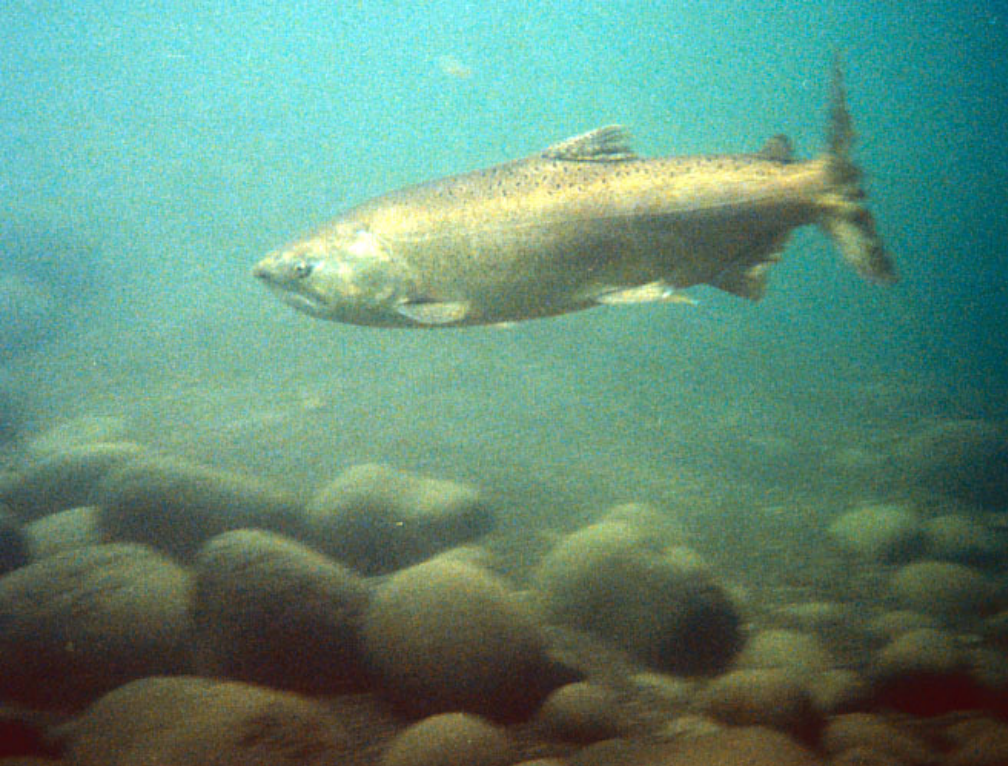
a.k.a. king salmon

96 lb, Kenai River
Ken Davis, Concord

Largest recorded: 61.4 kg



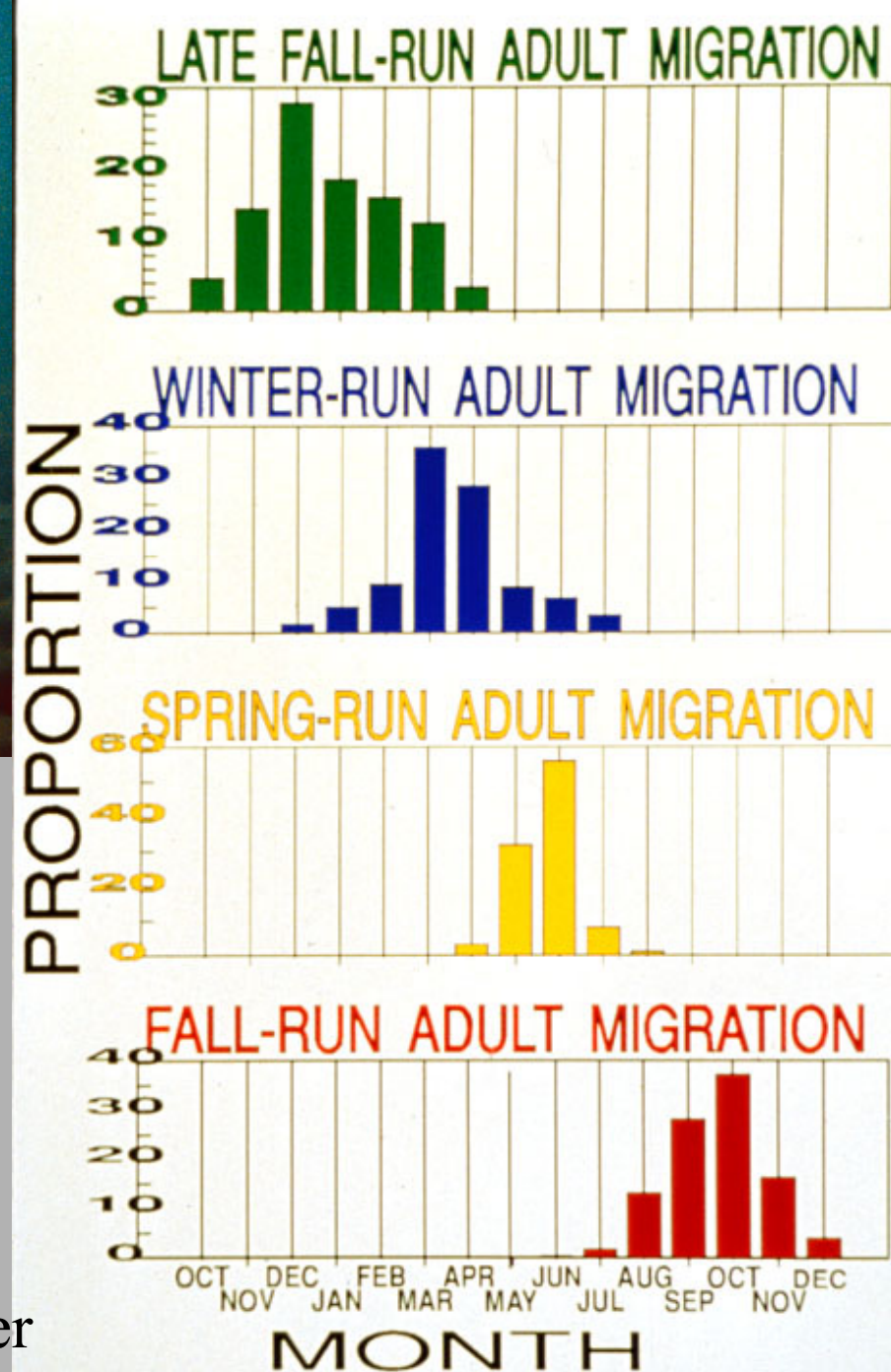
Chinook salmon parr, fall run, California



D. Vogel

Multiple runs means multiple life history strategies

Run timing, Sacramento River



JUVENILE RIVER RESIDENCY



Ocean vs river life histories

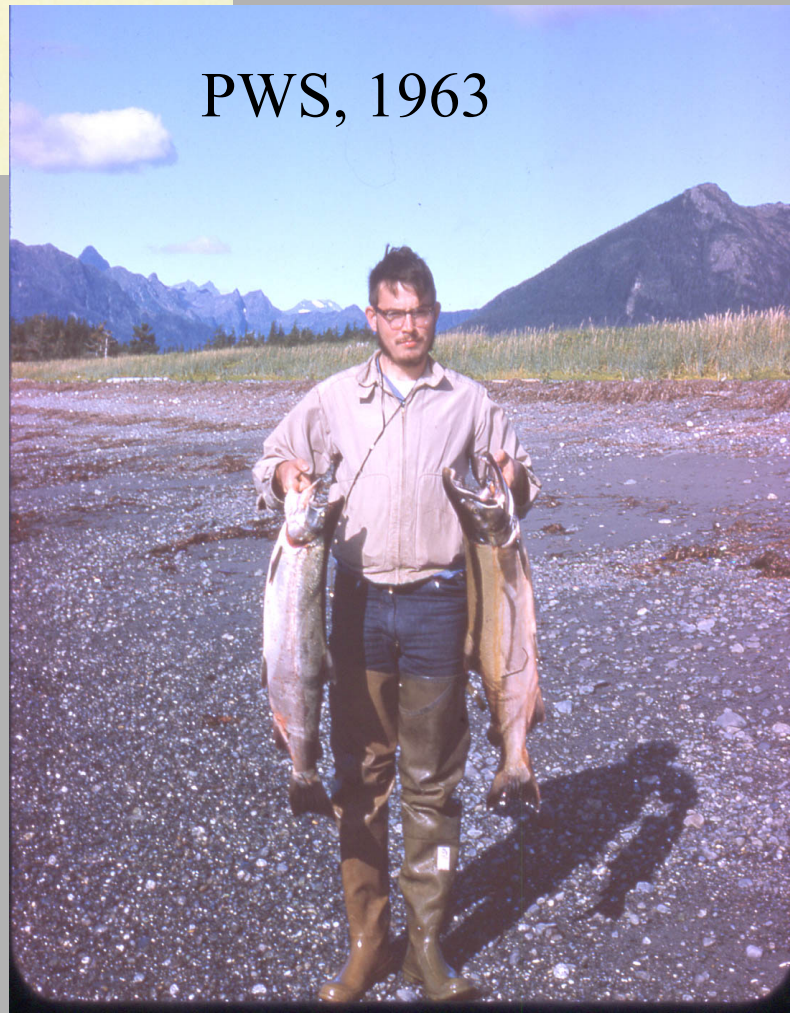
RUN DIFFERENCES

- 1. MIGRATION TIME**
- 2. SPAWNING TIME**
- 3. PHYSICAL SIZE**
- 4. AGE AT MATURITY**
- 5. FECUNDITY**
- 6. JUVENILE REARING**



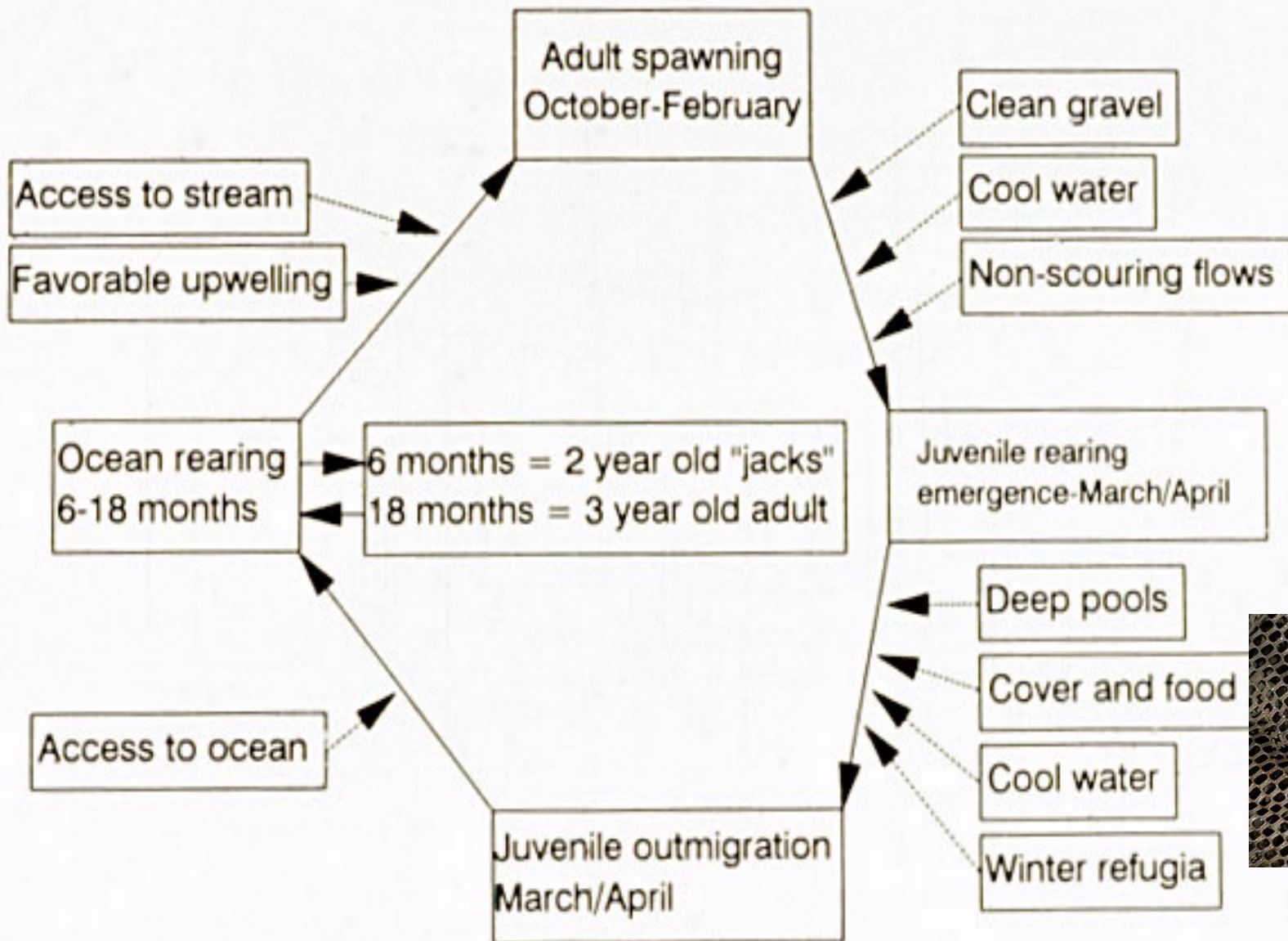
Female, photo AFS

Coho salmon,
O. kisutch
a.k.a. silver salmon

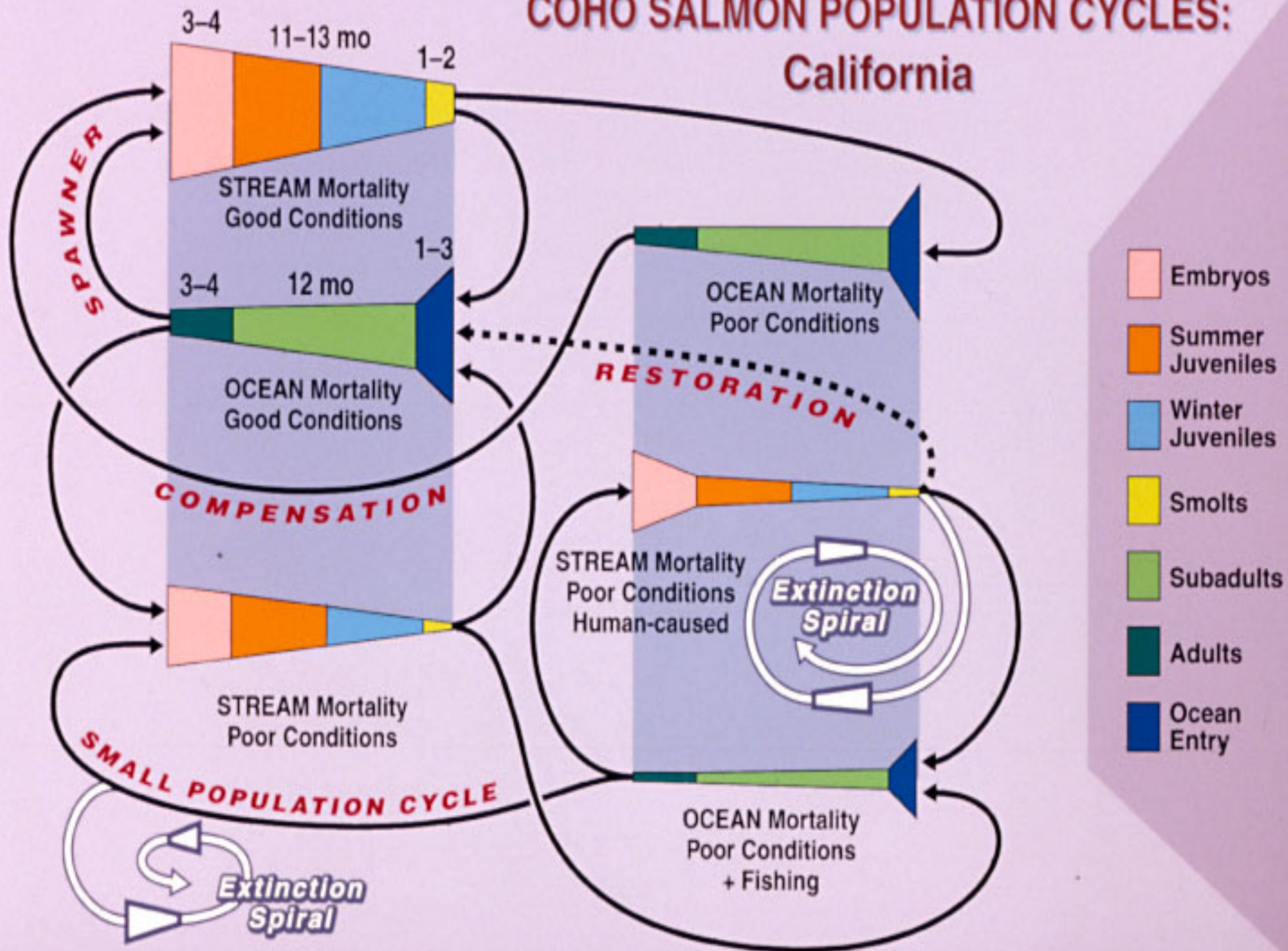


PWS, 1963

LIFE HISTORY OF CALIFORNIA COHO SALMON

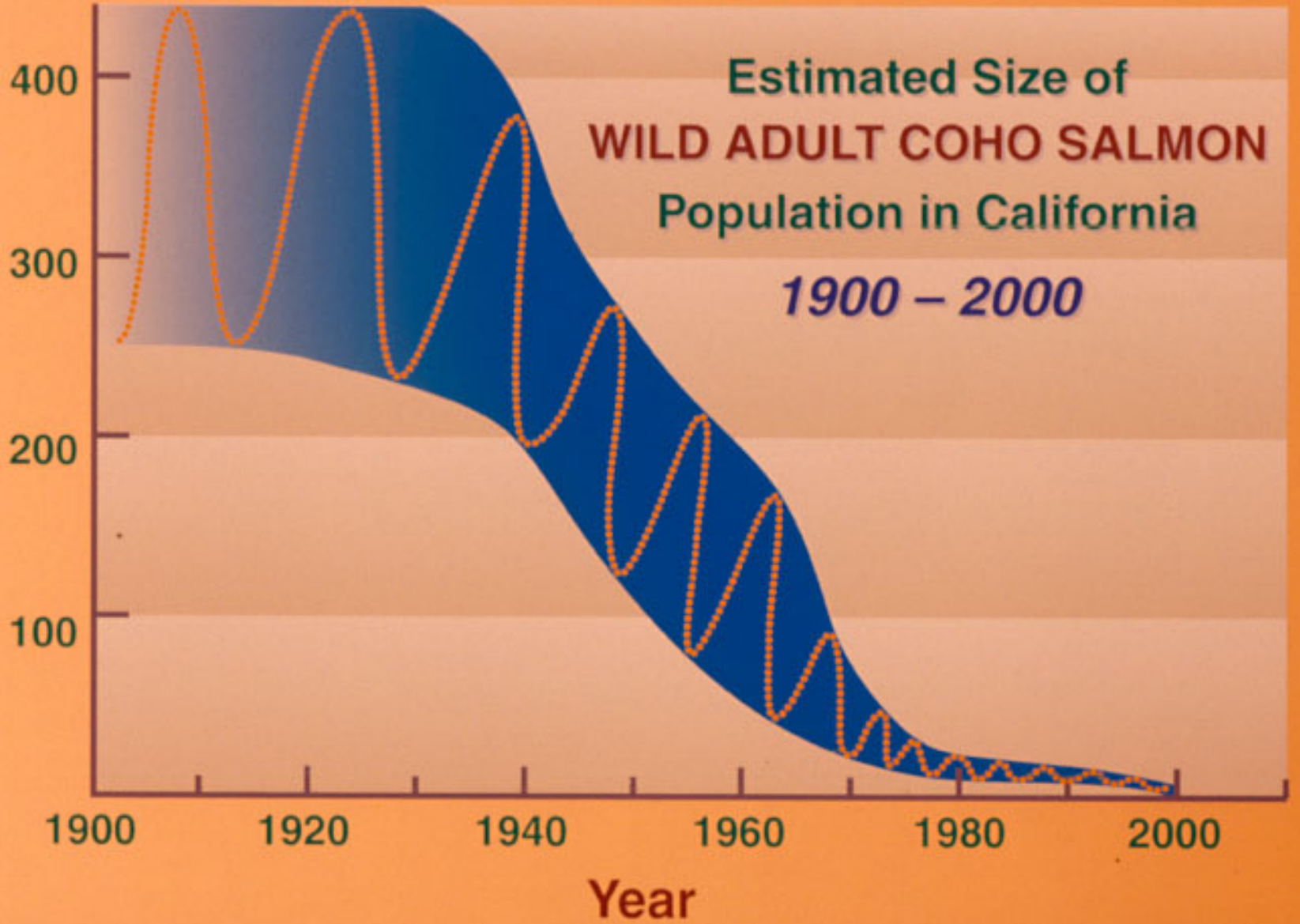


COHO SALMON POPULATION CYCLES: California



Number of Spawners X 1,000

Estimated Size of
WILD ADULT COHO SALMON
Population in California
1900 – 2000



One reason coho have declined....





Sockeye salmon,
O. nerka
a.k.a. red salmon

Most abundant salmon in
Copper River

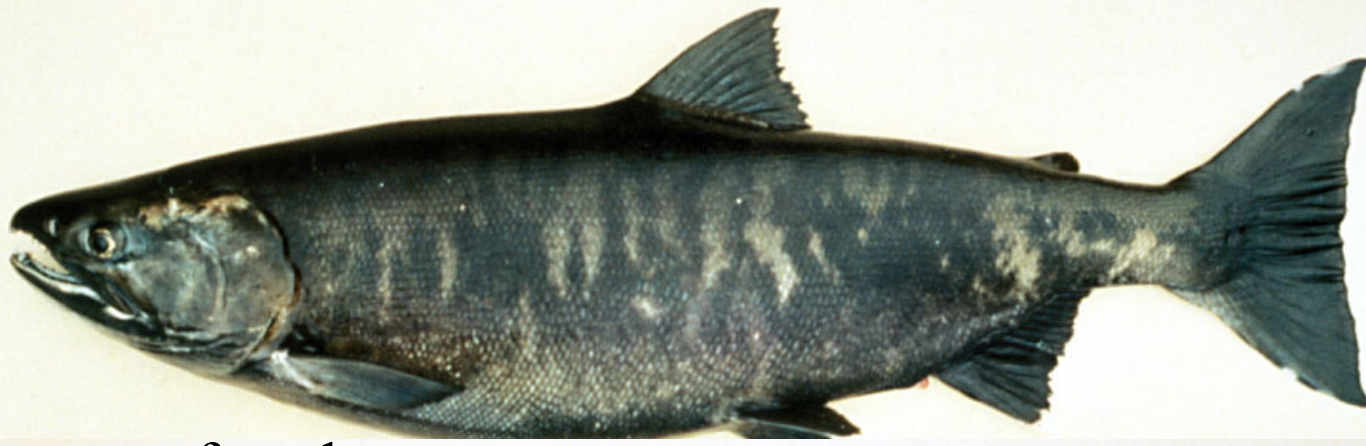
20% spawn in C.R. Delta

Zooplankton feeder





Stray sockeye mixed with pink salmon, PWS, July 1963



female

Chum salmon,
O. keta,
photos, AFS

a.k.a. dog salmon,
In stores:
“silverbrite salmon”

Feeds on jellyfish



male



Spawned out chum salmon, Olsen Creek, July 1963



male

Pink salmon,
O. gorbuscha

“humpies”

Two year life cycle.

Smallest and most
abundant salmon



Spawned-out male



Fresh female

Salmon are key part of Alaskan food webs

- Nutrients and energy carried far inland
- Death after spawning very convenient for local ecosystems
- Food more abundant for young
 - Some feed directly on carcasses
 - Invertebrate productivity 25X higher
- Bigger trees on salmon streams
- Diverse predators depend on them
 - e.g., mink reproduction changes with run timing



Adult salmon
predators

orcas



Seals and
sealions



Salmon shark caught by
purse seiner



Bear predation
selects for
smaller and
younger adult
salmon

Quinn et al. 2001
Can. J. Zool. 79:
1782-1793

Brown (grizzly) bears



Salmon escaping
from inexperienced
black bear



Successful
bear with
chum salmon





Bear and
glaucous-winged gulls



Gulls feeding on eggs
left by bear.



Glaucous-winged gull defending salmon carcass



Our national bird



Blind western toad, Olsen Creek, August 1963



Sitka blacktail deer, tide flats, Olsen Creek, 1964
Prediction: these deer will have a marine isotope signature



Gulls and spawning salmon, Olsen Creek, 1963: complex interactions

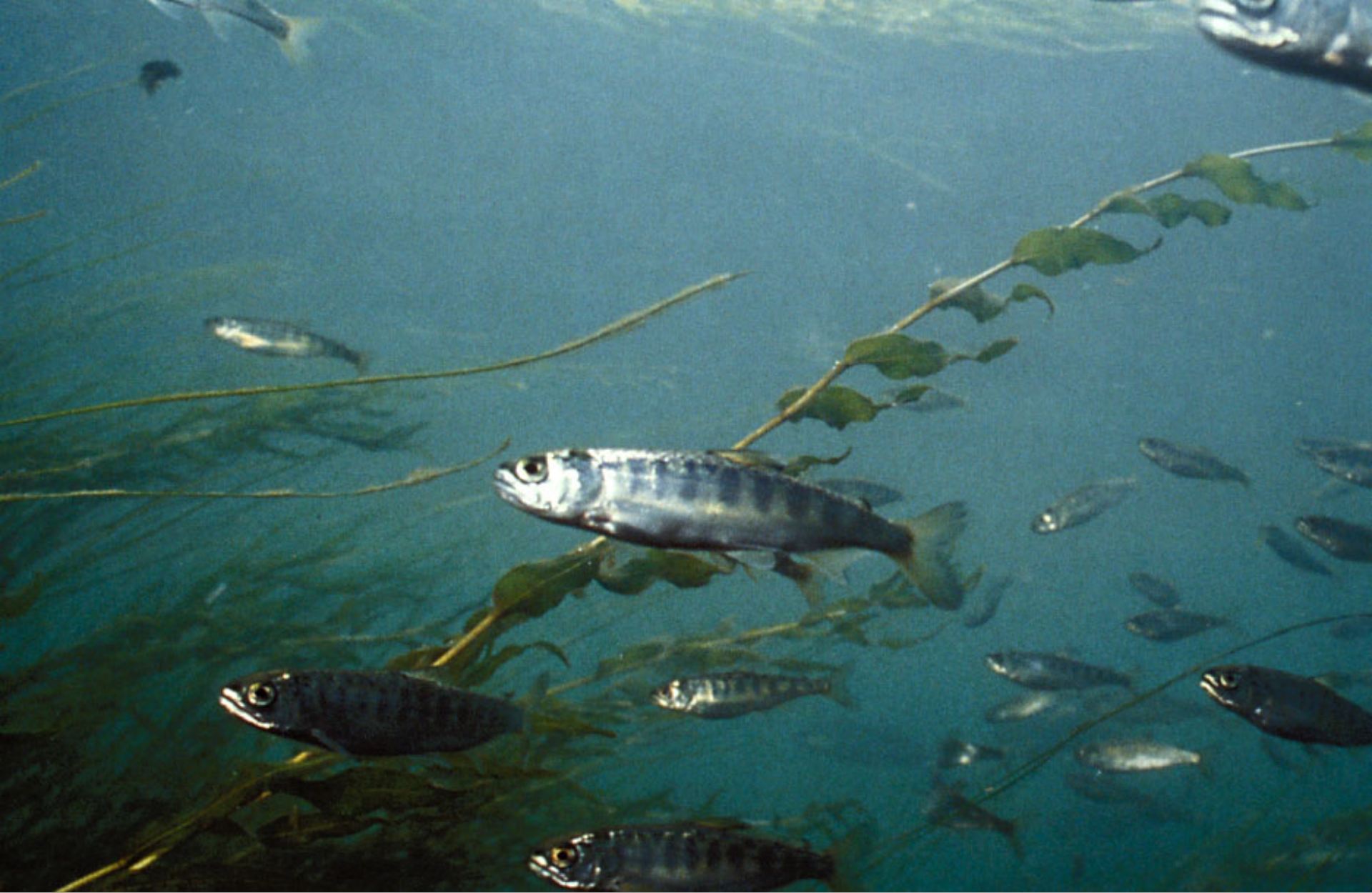


Glaucous-winged gull diving for loose salmon eggs



Predation by
sculpin on
juvenile
salmonid





Sockeye smolts, Naknek River, w. Alaska



Marine predators on juvenile salmon: ling cod, Irish lord



Kittiwakes, PWS, 1964



Cormorants and gulls, Port Gravina, 1964



Typical summer day, coastal Alaska, mouth of Olsen Creek, 1963

Predictions

Based on Murphy et al. 1989

- Fish species diversity will increase in a downstream direction
- Salmon species (juveniles) will segregate by habitat and diet
- Juv. salmon densities will be negatively related to turbidity
- Salmon lengths will increase in a downstream direction

