



3

Salmon fisheries in Alaska



Home



Presentations



Readings



Video  
Resources



Questions

This module will cover five main areas:

1. Life-cycle
2. Salmon species
3. Salmon anatomy
4. Fishing vessels
5. Salmon enhancement

When viewing recorded lectures, the slides will automatically advance. The Prev and Next buttons are available but it is recommended you listen and view the recorded lectures in auto mode. You can return to the main menu of the recorded lectures by tapping the recorded lecture icon (speaker).

At the end of each of the areas there are self-check quizzes to make sure that you understand the basic student learning outcomes for each area.







By the end of this module you should be able to:

1. Map out each stage of a salmon's life cycle
2. Describe the key differences between salmon species
3. Diagram the external and internal anatomy of salmon labelling parts
4. Differentiate fishing vessels with salmon species
5. Describe the history of salmon enhancement in Alaska
6. Describe the Private Non Profit system and list the major players

A vertical stack of four fish icons: a salmon, a crab, a fish, and a shrimp.

## Fisheries Technology

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Read pp1-16 in  
Salmon.pdf in iBooks



Read pp1-2 in  
Salmon2.pdf in iBooks



## Fisheries Technology

About the Presenter

Jim Seeland, Associate Professor of Fisheries Technology – UAS Sitka

Salmon Life-cycle

Adult, egg, alevin, fry, smolt, adult (15 min)

Salmon species

Chinook, Coho, Sockeye, Chum, and Pink (25 min)

Salmon anatomy

External and internal (8 min)

Fishing vessels

Trollers, seiners, gill-netters (15 min)

Salmon enhancement

History of salmon enhancement, PNP system, legislation, hatchery locations, hatchery economics (70 min)





## Jim Seeland

Assistant Professor  
Fisheries Technology  
University of Alaska Southeast

Raised in suburban Saint Louis, MO, Jim always enjoyed fishing with his dad and brother. This got into his blood and although he meandered a bit after graduating from high school, Jim eventually got back into the study of fish and wildlife biology. He attended the University of Missouri in the mid-70's and graduated in 1977. Once graduated and looking for work, it became apparent that there were few jobs working at trout hatcheries (the goal). He had the degree, but no experience.

Jim saved up \$500 and headed west with his Volkswagon and dog (pretty much everything he owned) – not sure how this would turn out. After applying at every place on the west coast that grew anything that lived in water, Jim ended up at a private trout farm near Puyallup, WA. He worked for dirt wages but was getting the experience. Jim met my wife, Danna-Ben, here and they had their first child, Hillary.

A few years later Jim answered an ad in a fisheries magazine for a fish culturist position in Cordova, AK (which he took as Cordova, Arkansas....). Along with his (now pregnant) wife and daughter, they moved to a remote island in Prince Wm Sound and spent 2 years there working at the Port San Juan Hatchery. At the time, AK salmon aquaculture was very much in its infancy. The staff was trying ground-breaking techniques, taking over 100 million pink salmon eggs in a very short time – not something that had been done before but is now standard procedure around the state. Jim's son, Ben, was born while they were living here.

After two years, the family had an opportunity to move to Sitka where the newly formed Northern SE Regional Aquaculture Assn. was located. Jim spent the next 23 years helping to develop the Medvejie Salmon Hatchery. This was a very rewarding career as it quickly materialized into a lucrative new fishery in the Sitka area. The work was great as it required being outdoors, was physically challenging and required applied research. The staff at the hatchery was dedicated to the project which made going to work every day quite enjoyable.

Jim joined the Fish Tech Program in 2009 and continues to enjoy interacting with students, providing some outreach, especially to rural communities, and helping to develop the program. His kids are old now, but still around. Jim's daughter teaches high school in Sitka, the son is a commercial fisherman, and his wife is a Family Nurse Practitioner. The family enjoys fishing, hiking and camping all over Sitka Sound in their 27' SeaSport which also doubles as a platform for Sitka Sound Tours, Jim's one-man tour company in the summer months.



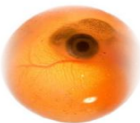


## Lifestages

Adult



Egg



Alevin



Fry



Smolt





## Egg stage

[http://www.adfg.alaska.gov/index.cfm?adfg=viewing.salmoncam#!prettyPhoto\[gallery\]/0/](http://www.adfg.alaska.gov/index.cfm?adfg=viewing.salmoncam#!prettyPhoto[gallery]/0/)







## Alevin Stage





## Fry Stage







## Parr/Fingerling/Pre-smolt Stage

- Parr marks provide natural camouflage in freshwater.
- An intermediate, freshwater phase







## Smolt Stage

How would you define the word “smolt”?

Do Pink and Chum salmon have a “smolt” stage?



- species/stock variations



What is the primary food for the Alevin stage for salmon?

- Phytoplankton
- Fishmeal
- Copropod
- Egg yolk

## salmon life-cycle

*Quiz - 3 questions*

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Chinook, *Oncorhynchus tshawytscha*

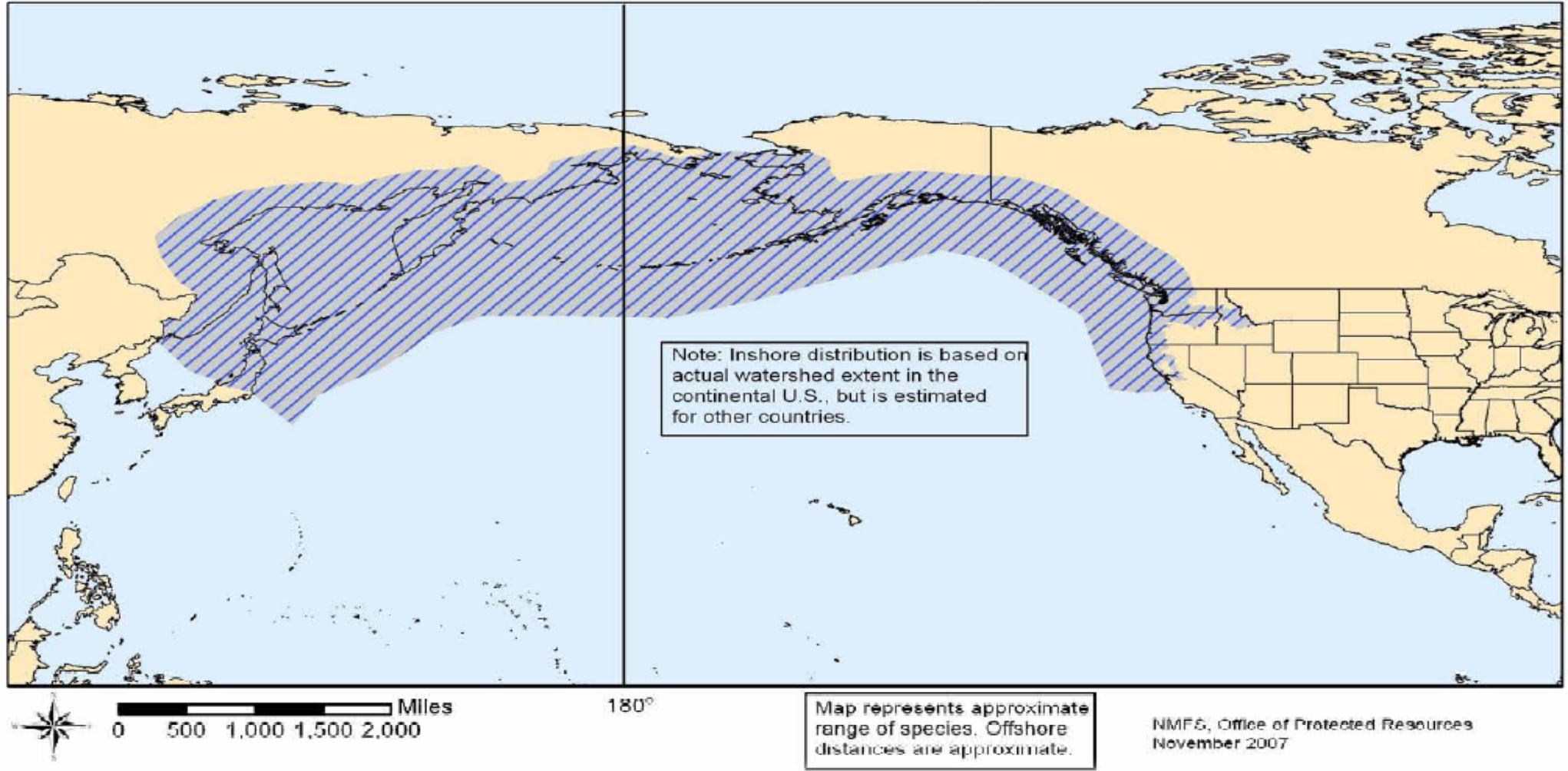
*The best fish ever.....*







## Chinook Salmon Range



Range = Monterey Bay, CA – Chuckchi Sea, AK



## Species Characteristics & Biological & Habitat Requirements – Chinook

### Common names

King, Tyee, Spring, Blackmouth

### Avg Wt/L

20 – 40lbs & 3 – 4'

### Spawning colors & Characteristics

Red to Copper almost black. Males are often more deeply colored (redder) than females. Ranges greatly in size

### Spawning Habitat

Main stem river

### Stream Incubation Period

90 – 150 days





## Species Characteristics & Biological & Habitat Requirements – Chinook

### Emergence

March – April

### Freshwater Rearing Habitat

Main stem rivers, Chickamin, Unuk, Stikine

### Freshwater Residence

Variable, can be as little as 60 – 120 days or up to 2 yrs.

### Saltwater Residence

2 to 6 yrs

### Spawning Migration

Begin entering freshwater in July. The earliest specie locally.

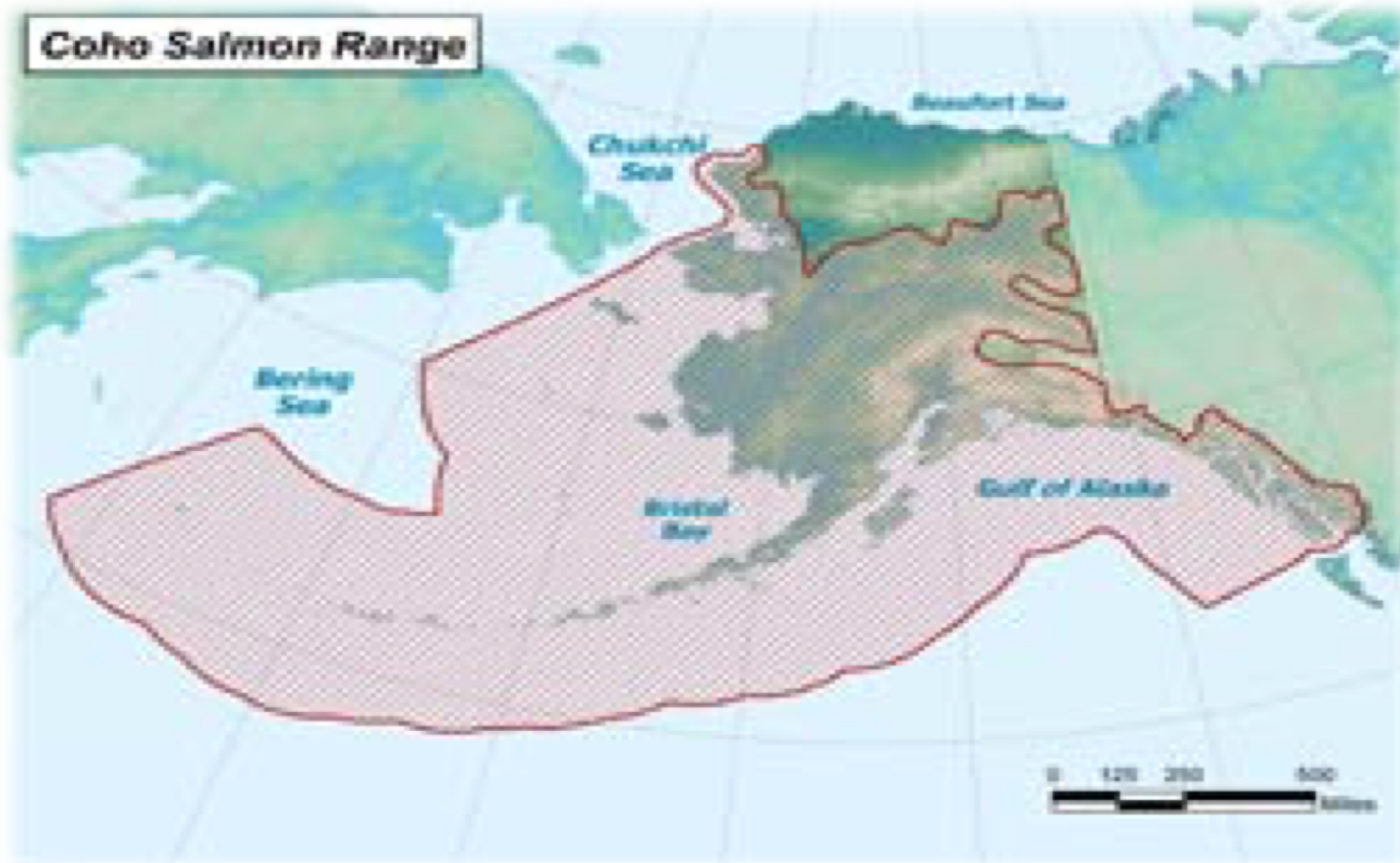
### Stock differences discussion





## Coho, *Oncorhynchus kisutch*





Range = Coastal Washington to Yukon River





## Species Characteristics & Biological & Habitat Requirements – Coho

Common name = Silver

Avg Wt/L = 8 to 12 lbs / 2 – 2.5'

Spawning colors & characteristics

Males and females both have dark backs and heads and maroon to reddish sides. Males also tend to be redder than females.

Spawning Habitat = tributaries to main stem rivers as well as lake tributaries.

Stream incubation period = 80 to 150 days





## Species Characteristics & Biological & Habitat Requirements – Coho

Emergence = April to May

Freshwater Rearing Habitat = Main stem side channels, slack water, lake & lake tributaries.

Freshwater Residence = 1 to 2yrs.

Saltwater Residence = 1 to 2 yrs. Local stocks are 1 yr ocean residence

Spawning Migration = Generally late fall, locally we have summer coho stocks that enter freshwater in late June but will not spawn until late Fall early Winter. Example Ward Lake.

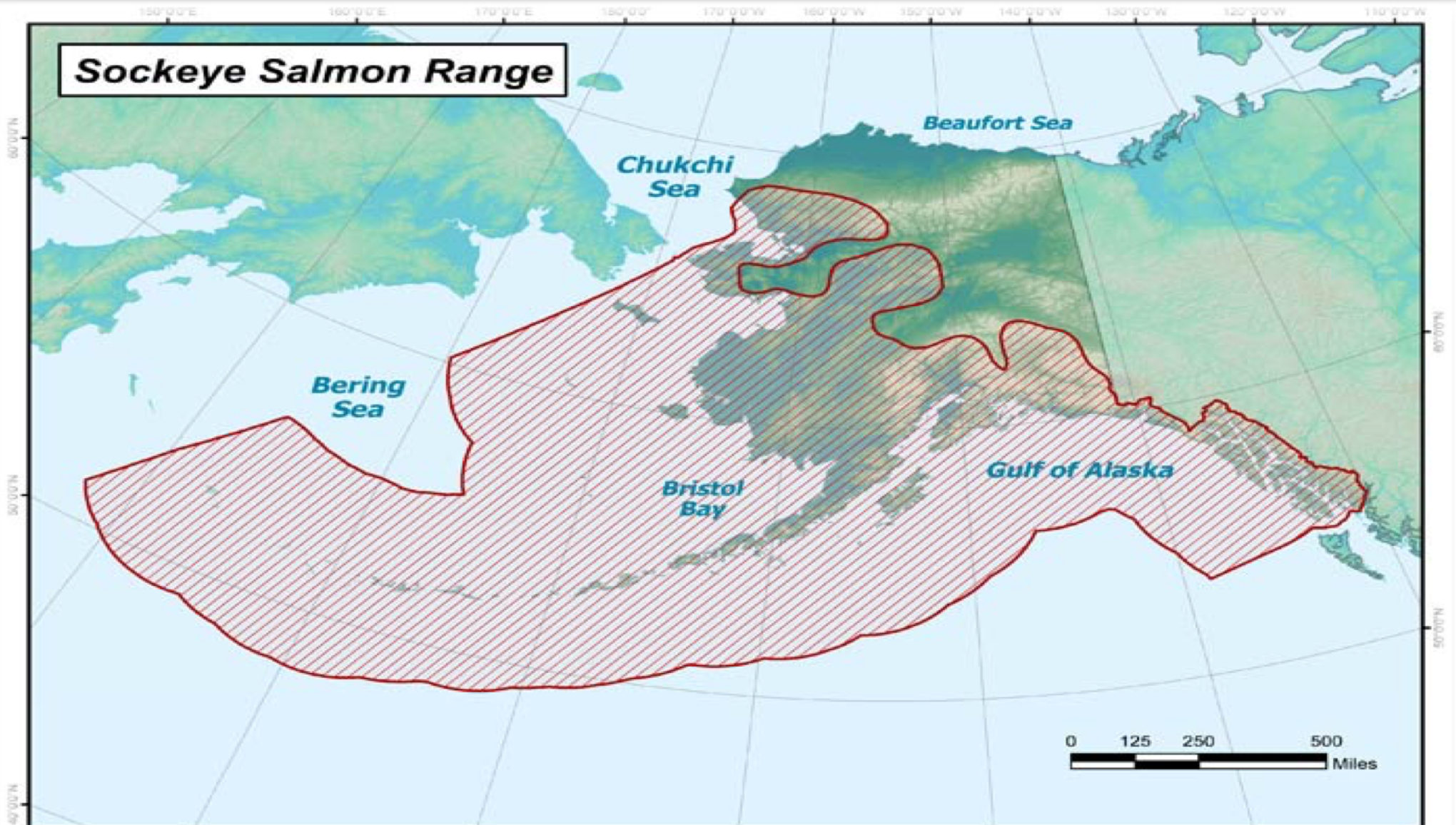


## Sockeye, *Oncorhynchus nerka*





# Salmon species



- North Pacific & Arctic Oceans. South as far as Sacramento R. Calif to Canadian Arctic



## Species Characteristics & Biological & Habitat Requirements – Sockeye

Common names = Reds, Blueback, Kokanee

Avg Wt/L = 1.5 to 2' / 4 to 8 lbs

### Spawning colors & Characteristics

Brilliant to dark red body with olive green heads both males and females. Both sexes develop teeth but more pronounced in males.

### Spawning Habitat

Lakeshore and lake tributaries, some spawning occurs in lake outlet streams but fry will migrate upstream to rear in lake.

Stream Incubation Period = 90 to 150 days



## Species Characteristics & Biological & Habitat Requirements – Sockeye

Emergence = April to May

Freshwater Rearing Habitat = Lakes

Freshwater Residence = 1 to 3 yrs.

Saltwater Residence = 1 to 4 yrs.

Spawning Migration = Begins as early as late June.



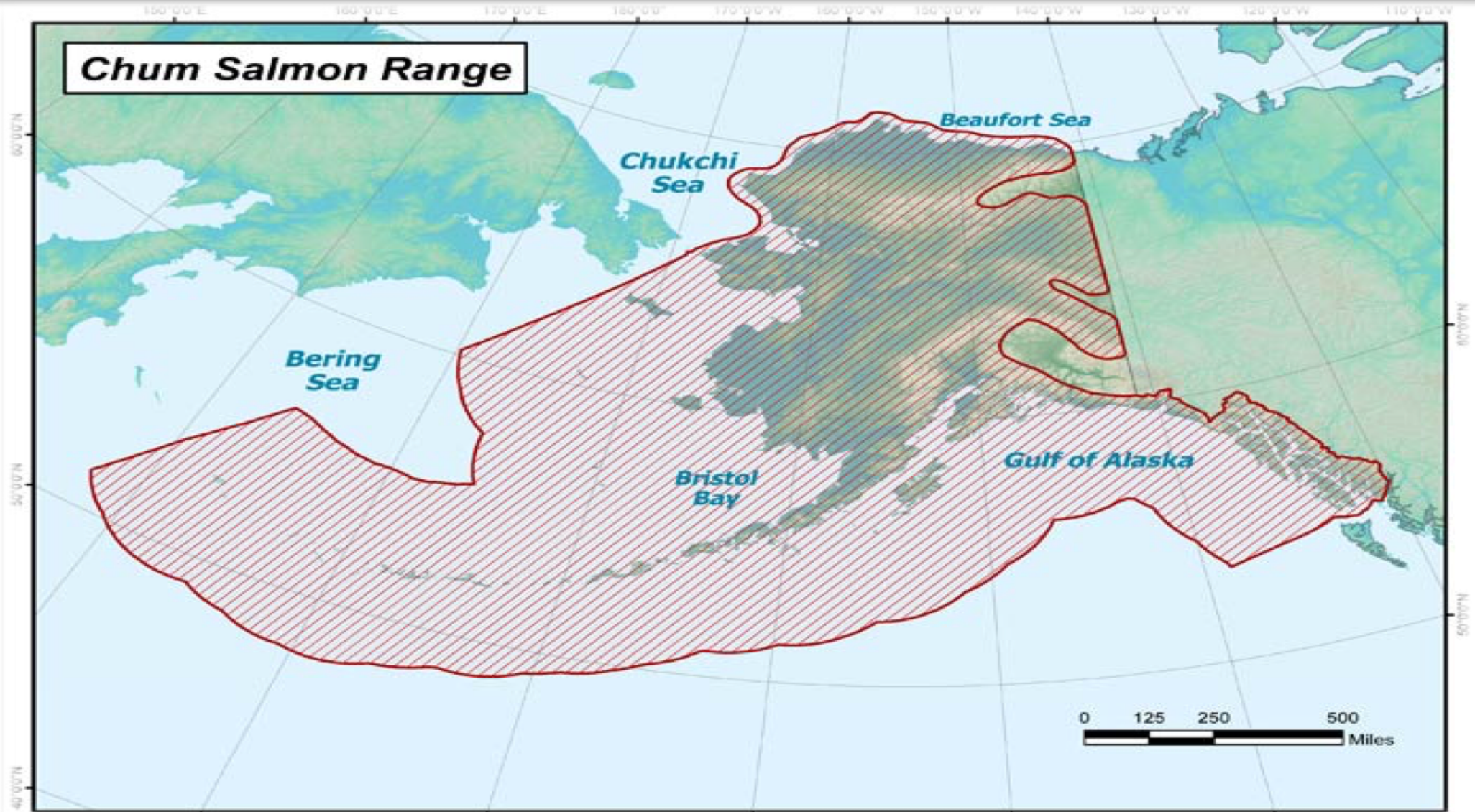


# Chum, *Oncorhynchus keta*





# Salmon species



- Sacramento R. Calif to Mckenzie R. in Canada



## Species Characteristics & Biological & Habitat Requirements – Chum

Common names = Dog, Calico, Keta

Avg Wt/L = 7 to 18 lbs / 2 to 2.5'

### Spawning colors & Characteristics

Green & purple vertical bars, less obvious on females. Females also exhibit a dark horizontal band.

Spawning Habitat = Main stem river tributaries and intertidal zone of coastal streams.

Stream Incubation Period = 90 to 150 days







## Species Characteristics & Biological & Habitat Requirements – Chum

Emergence = Late February through May

Freshwater Rearing Habitat = Does rear in freshwater, generally very short-term

Freshwater Residence = None

Saltwater Residence = 2 to 3 yrs.

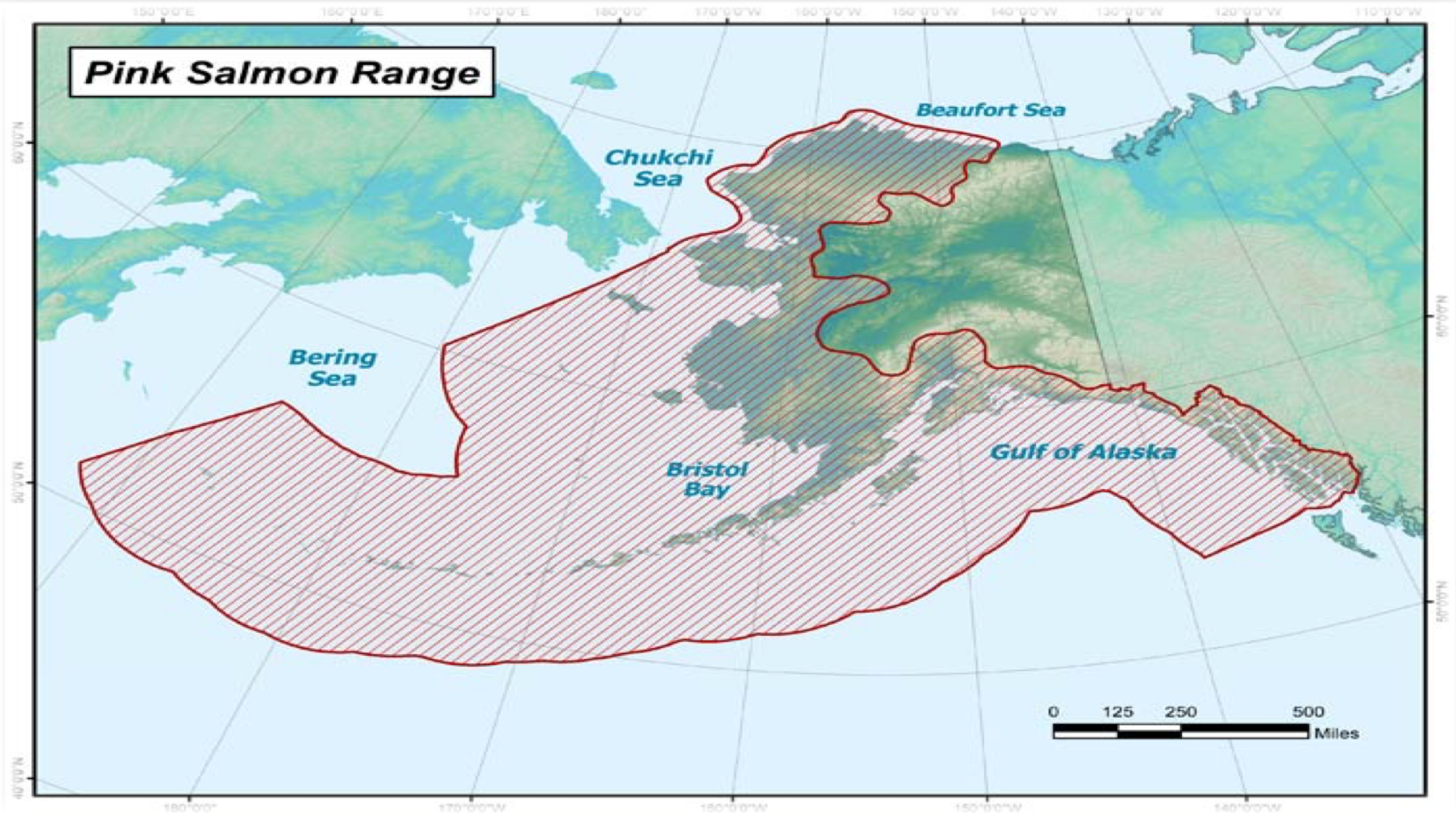
Spawning Migration = Begins in late July and continues through late fall.



## Pink, *Oncorhynchus gorbuscha*



# Salmon species



- Pacific & Arctic coastal waters from northern California to Mackenzie R. in Canada.





## Species Characteristics & Biological & Habitat Requirements – Pink

Common names = Humpback, Humpy

Avg Wt/L = 3.5 to 4 lbs / 1.75 to 2'

### Spawning colors & Characteristics

Males are brown to black with a white belly, characteristic hump and hooked jaws. Females are olive green with dusky bars or patches and light belly.

Spawning Habitat = Main stem river tributaries and intertidal zone of coastal streams

Stream Incubation Period = 90 to 150 days





## Species Characteristics & Biological & Habitat Requirements – Pink

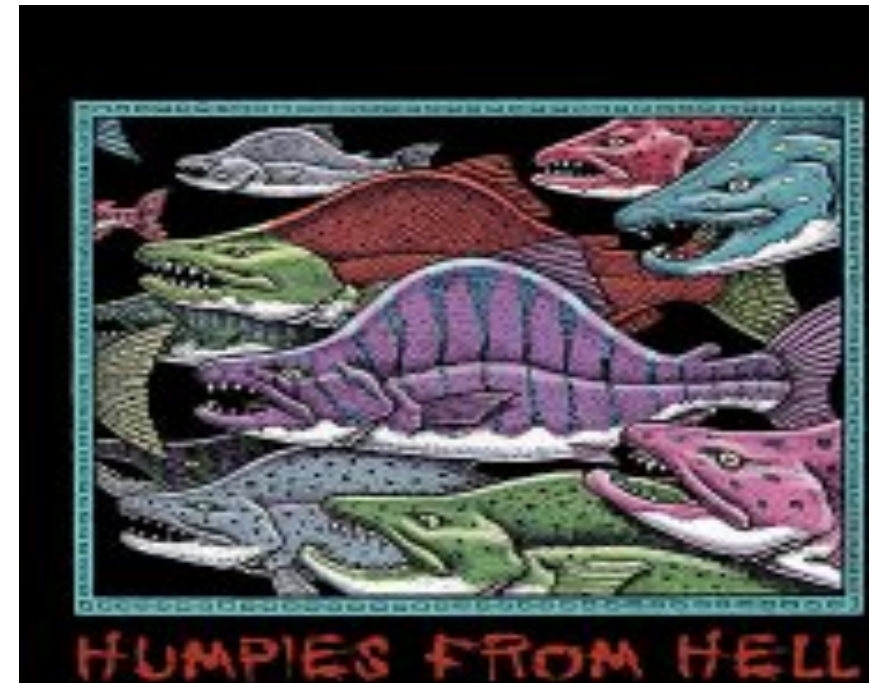
Emergence = Late January to April – May

Freshwater Rearing Habitat = Does not rear in freshwater.

Freshwater Residence = None

Saltwater Residence = 1 year

Spawning Migration = Late summer



Including Chum salmon, which of the following species of salmon spend little time in freshwater before they head out to sea?

- Pink
- Sockeye
- Chinook
- Steelhead

## salmon species

*Quiz - 3 questions*

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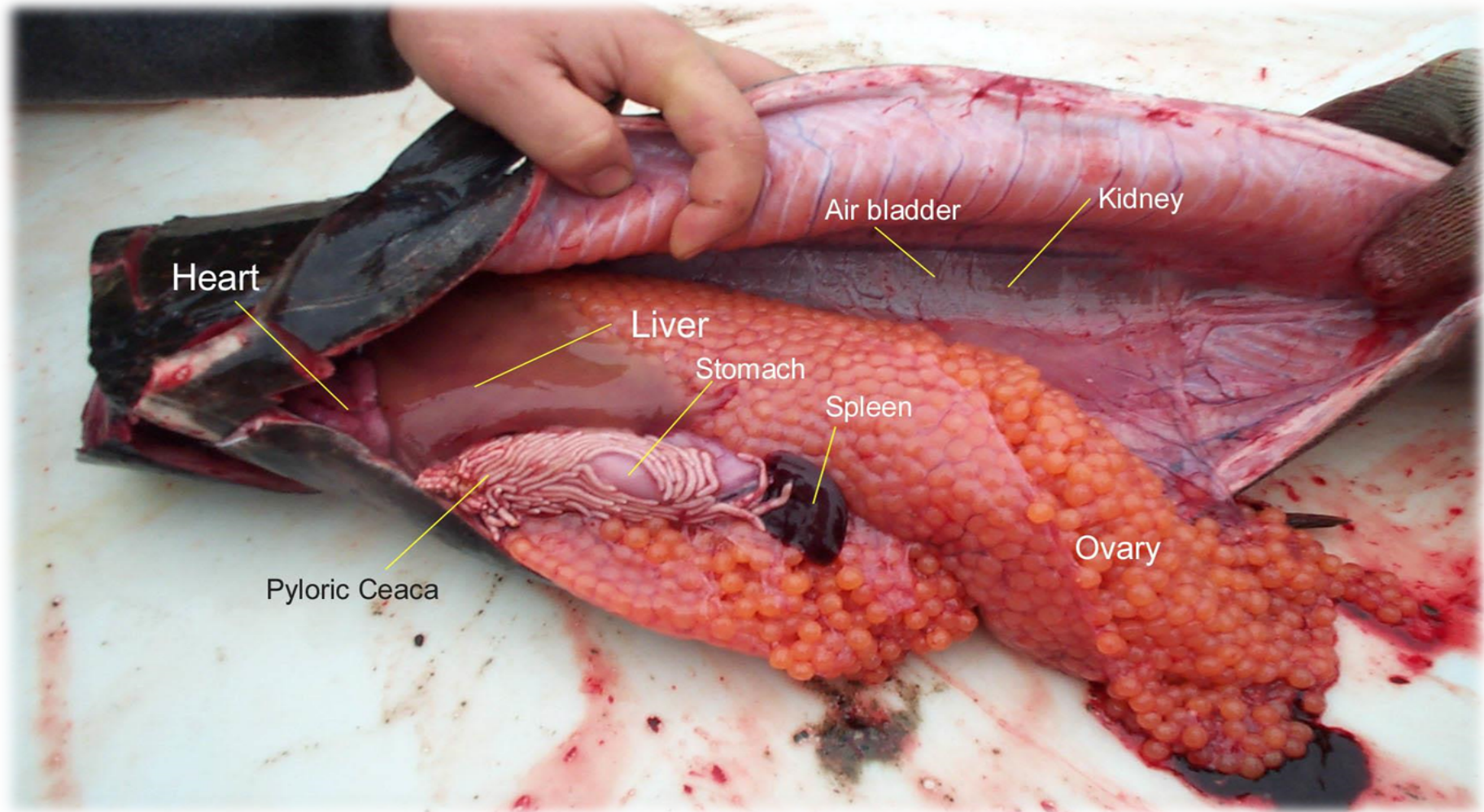
## Name that fish part!







## Name the guts!



Which of the salmon fins are responsible for propulsion (i.e. the motor)?

- Pectoral
- Caudal
- Dorsal
- Pelvic

## salmon anatomy

*Quiz - 3 questions*

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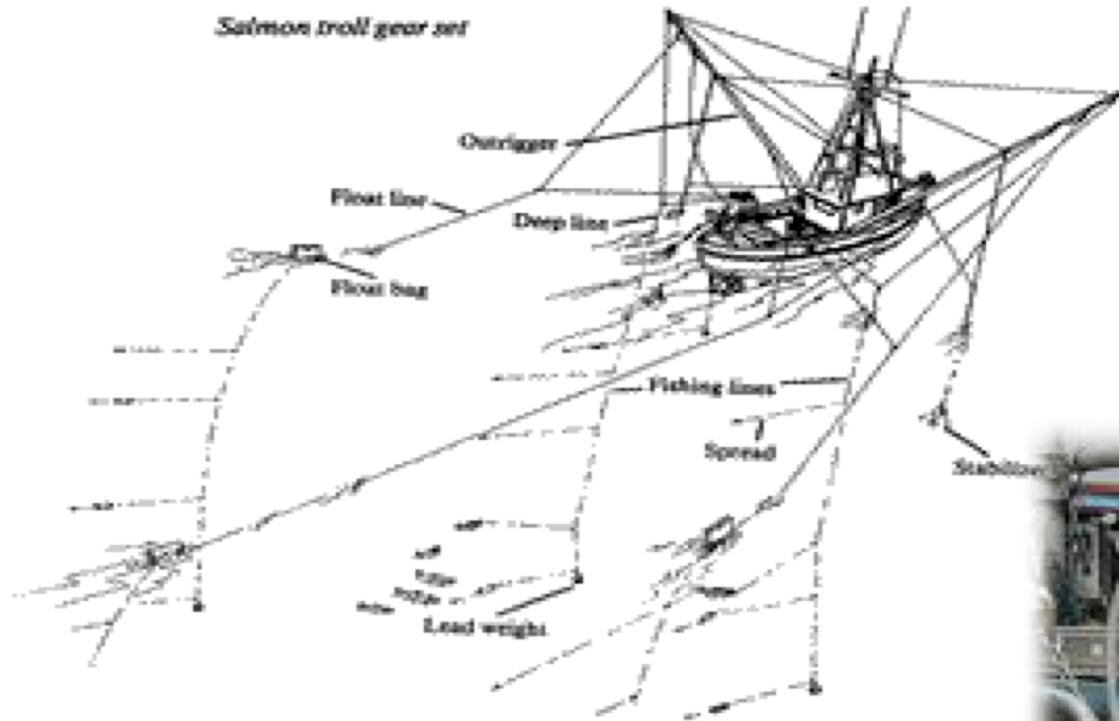


## How salmon are caught???

- Trolling
- Gillnet
- Purse Seine



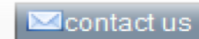
## Troller





## Troller pricing: wood vs. fiberglass vs. steel

TR12-015



**Location:** Washington

**Asking Price:** \$250,000

**Status:** Available

**Year Built:** 1989

**Length:** 42

**Hull:** Fiberglass

**Builder:** Sunnfjord

**Engine / Fuel:** Diesel

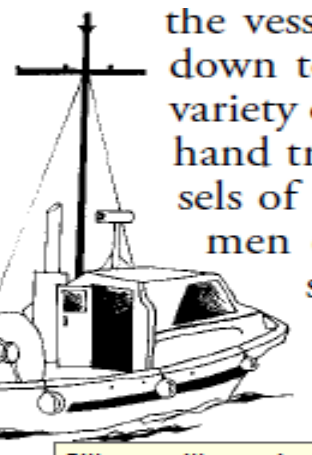
**Details:** 42'x14'x5' fiberglass gillnet/troller built by Sunnfjord in 1989. John Deere 6081 375 hp main with 1,965 total hours. ZF 285A 2:1 gear. Luger 5 kw gen set. Packs 25,000#'s in RSW. Arcturus bow thruster. Deck gear for gillnet and troll. Life raft, survival suits, EPIRB, and bridge alarm. Electronics include GPS, VHF, SSB, radar, sounder, plotter, auto pilot, and sea water temp. Asking \$250,000.



## Gillnetter



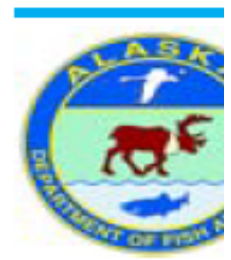
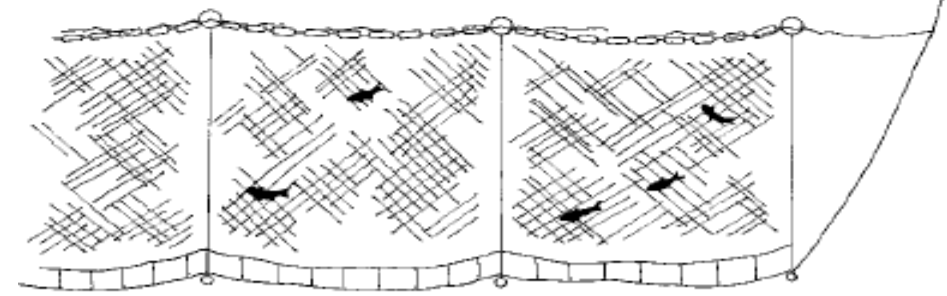
...or from shore, usually by local families using hydraulics. Nets are fixed and are anchored to shore with anchors. Gillnetters set nets—one end on shore, other end in the water. Sometimes both ends are in the water. After salmon are picked from the net, they are taken to a processing plant or delivered to large fishing *tenders*.



...the vessel is lowered down to the bottom. A variety of hand tools are used on vessels of 50 to 100 men crewed.

Gillnetter.

Gillnetter illustration showing destination





## Dock Street Brokers / Gillnetter



**Location:** Alaska

**Asking Price:** \$85,000

**Status:** Available

**Year Built:** 1980

**Length:** 32

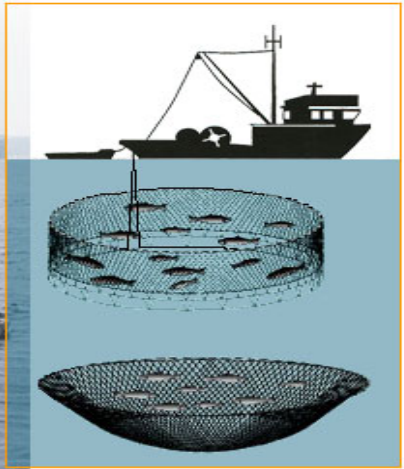
**Hull:** Fiberglass

**Builder:** Modutech

**Engine / Fuel:** Diesel

**Details:** 32'x13.5'x2' jumbo Modutech, built in 1980. Cat 3208TA rated at 300 hp., new in 2000, appr. 4,300 hrs. Major work in 2007 with new flush deck, bow thruster, fish hold circulation, and refurbished fuel tanks. Aluminum drum with Twister drive and levelwind. Electronics include VHF, SSB, ComNav autopilot, (2) GPS plotters, and more. Packs approximately 15,000#. Eager to sell, asking only \$85,000.

## Purse Seiner



**Purse seiner.**

ly pink salmon and herring  
long net and drawing  
l to capture the fish.  
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**Purse Seiner illustration**

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## Salmon Purse Seiner

Boats are 42 to 58' long

Nets are 1800' long

90' deep

Seine skiff needed

\$3,000,000 !!



Which salmon fishing vessels are known to have spreaders, cannonballs and spinners?

- Trrollers
- Seiners
- Gillnetters
- Pot fishermen

## fishing vessels

*Quiz - 3 questions*

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## Salmon Enhancement Program

Why was a hatchery program started in the first place?

What is the role of AK hatcheries today?







## Salmon Enhancement Program

Initially started in late 1800's near Kodiak

State involvement began in mid-70's

The Private Non-profit (PNP) hatchery system was formed in late 70's

By 1990 most state-owned facilities are operated by PNP's

Currently: 2 state-operated facilities (for sportfish)

29 PNP hatcheries around the state





## What is the PNP system?

Operated much like a business

- Board of directors

- Generate revenue from fish sales/cost recovery operations

- Capital and operating expenses

- May use loans from State of AK revolving loan fund

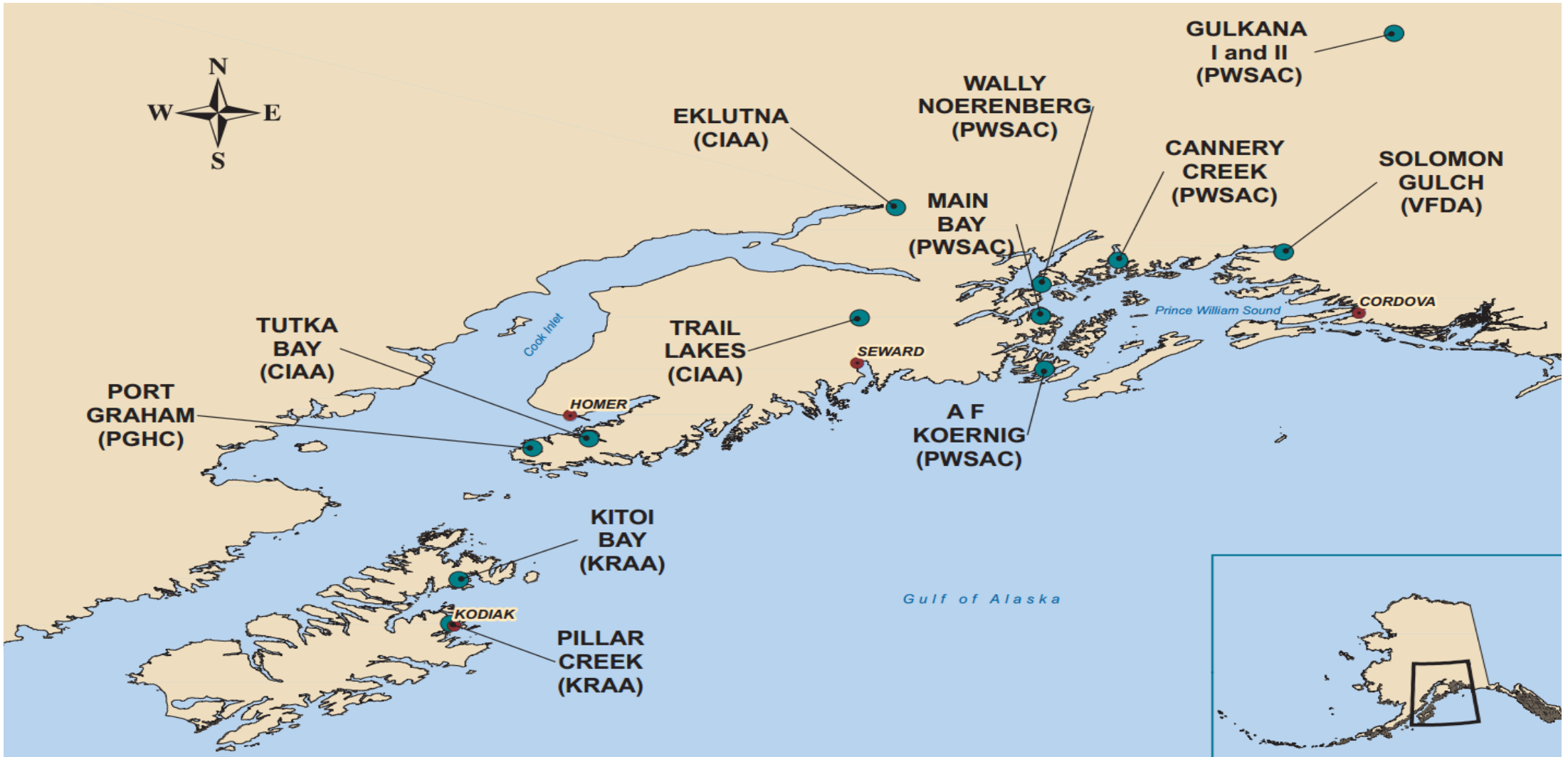
Regional and Non-regional associations

- Large and small operations

- Accountable to the State of Alaska through the permitting office

- Co-ordinate fisheries with ADFG management biologists

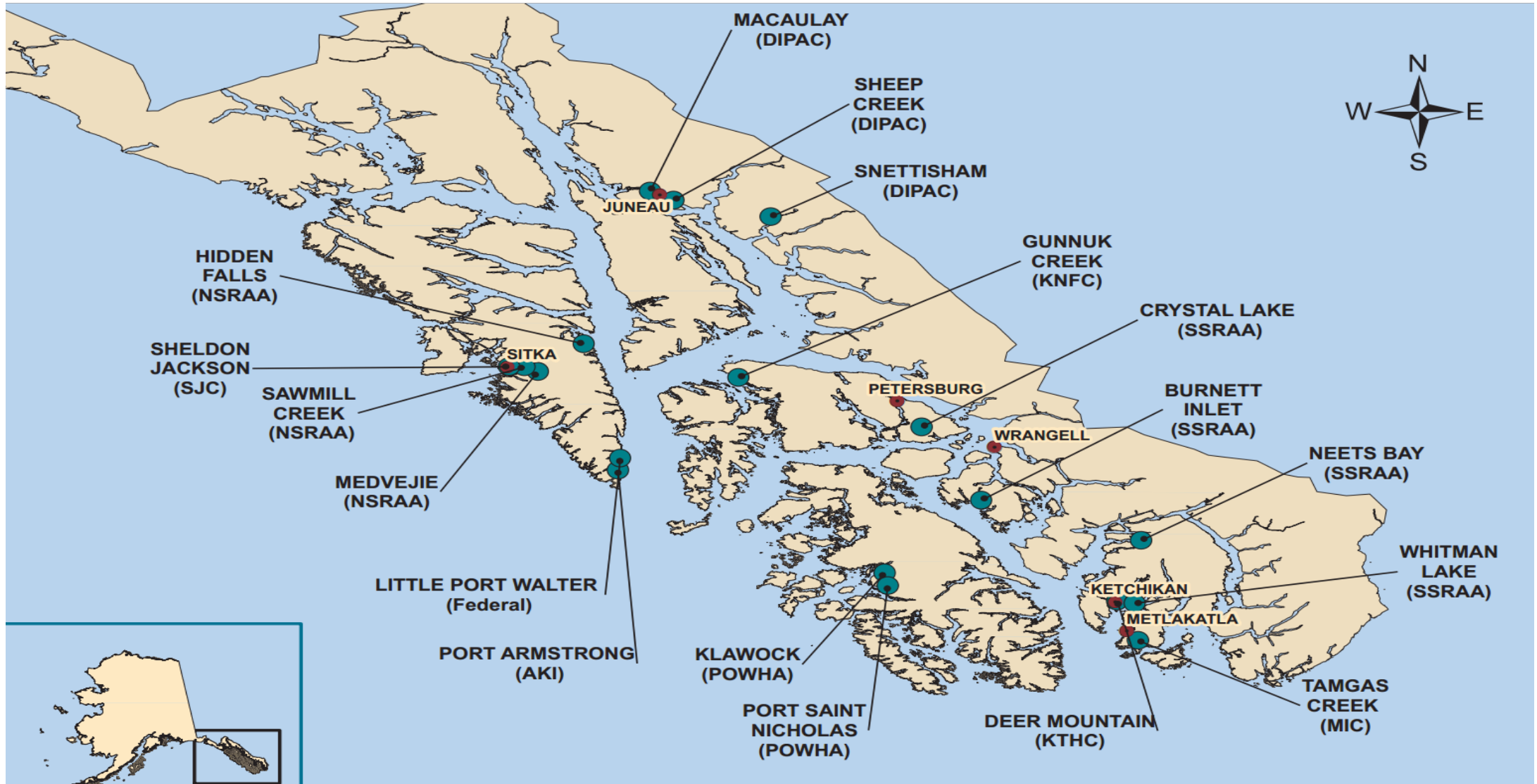
## Hatchery Locations - Southcentral/Kodiak





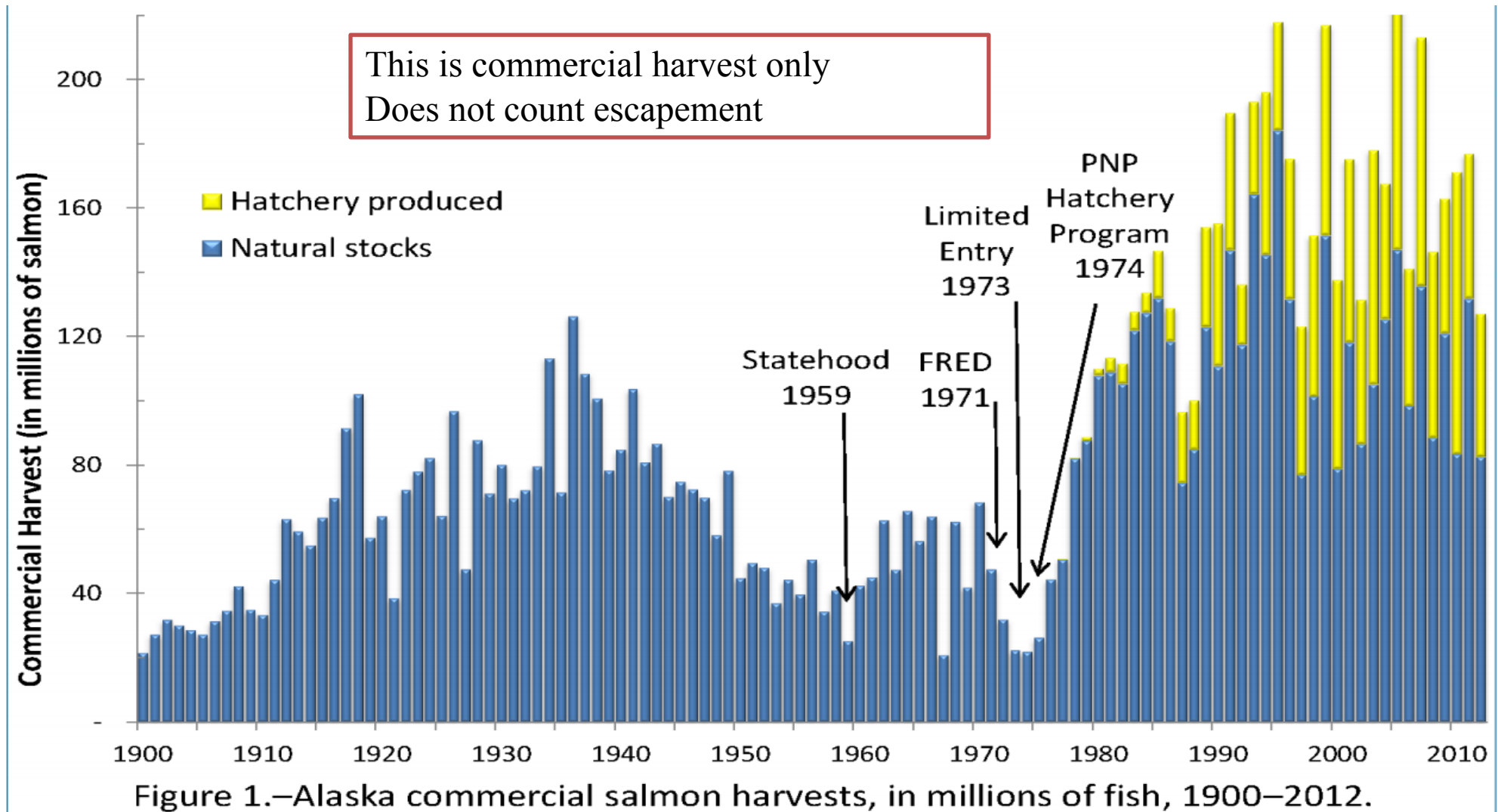


## Hatchery Locations - Southeast





Dramatically decreasing numbers of fish in the 60's and 70's prompted action



## FISHERIES CONTRIBUTION



## Summary of AK hatchery production

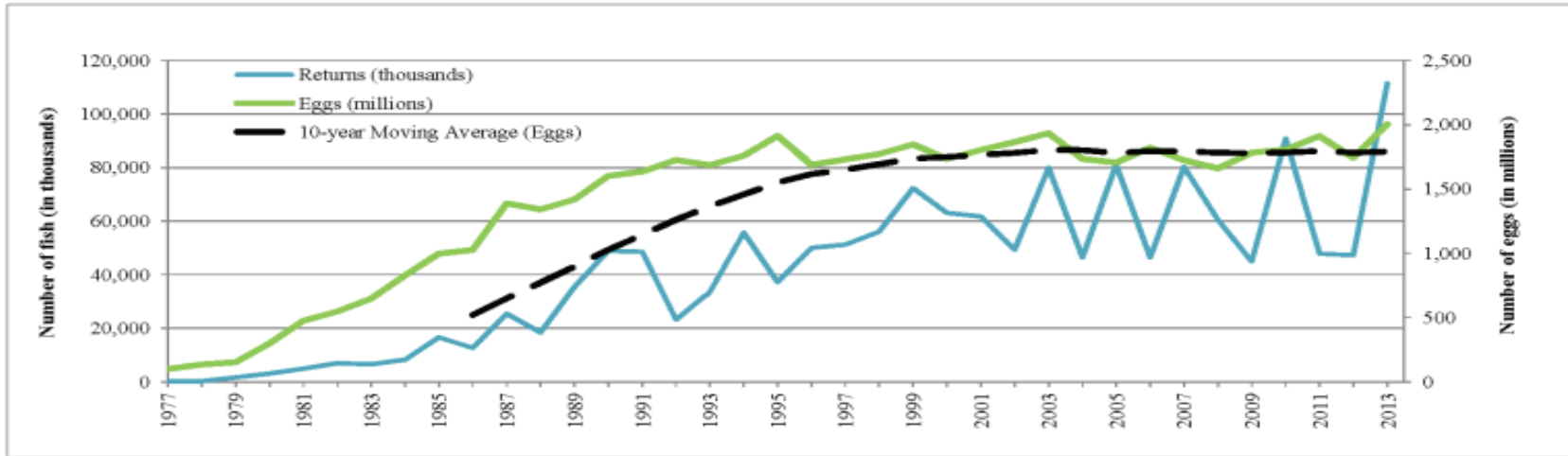


Figure 1.—Total salmon eggs collected and adult returns for Alaska salmon hatchery programs, 1977–2013.

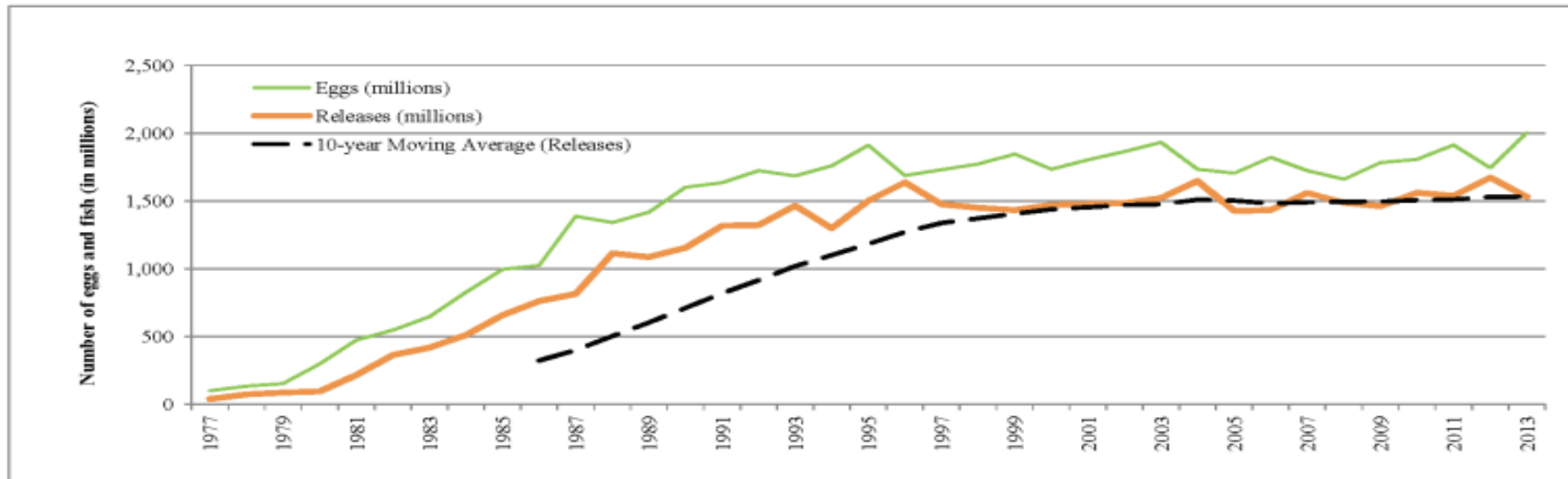


Figure 2.—Total salmon eggs collected and juveniles released for Alaska salmon hatchery programs, 1977–2013.





## % Hatchery adult returns by species - 2013

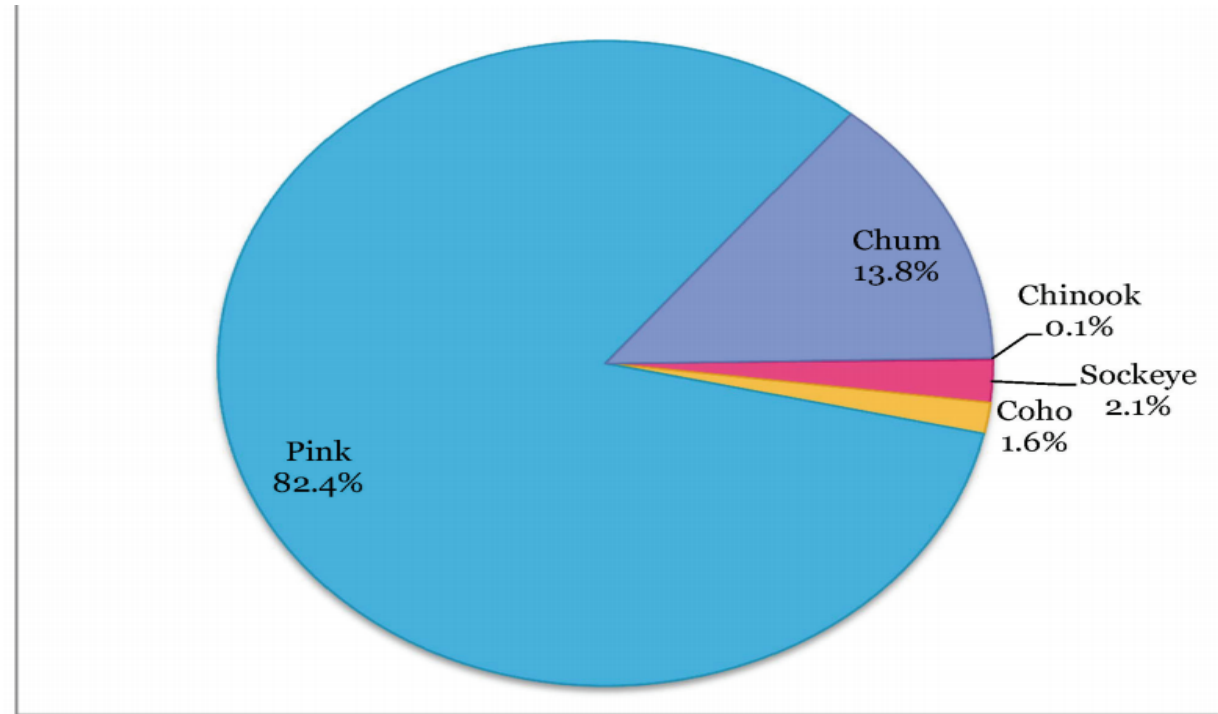


Figure 4.—Alaska salmon hatchery returns, by species, in 2013.

# Salmon enhancement



Table 5.—Alaska (preliminary) commercial harvest of hatchery-produced fish, by region, in thousands of fish, 2013.

Area	Harvest	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast	Total commercial harvest <sup>a</sup>	241	975	3,864	94,787	12,578	112,444
	Hatchery cost-recovery harvest	28	49	282	1,046	1,876	3,280
	CCPH <sup>b</sup>	213	926	3,582	93,741	10,702	109,165
	Hatchery-produced fish in CCPH	68	130	925	1,455	8,613	11,191
	% of hatchery-produced fish in CCPH	31.8%	14.1%	25.8%	1.6%	80.5%	10.3%
Prince William Sound	Total commercial harvest	11	2,339	609	92,463	4,070	99,492
	Hatchery cost-recovery harvest	0	0	38	3,731	581	4,350
	CCPH	11	2,339	571	88,732	3,489	95,142
	Hatchery-produced fish in CCPH	0	1,042	220	70,886	3,059	75,207
	% of hatchery-produced fish in CCPH	0.0%	44.5%	38.5%	79.9%	87.7%	79.0%
Cook Inlet	Total commercial harvest	5	2,853	267	2,147	193	5,465
	Hatchery cost-recovery harvest	0	74	0	46	0	120
	CCPH <sup>b</sup>	5	2,779	267	2,101	193	5,345
	Hatchery-produced fish in CCPH	0	32	0	20	0	52
	% of hatchery-produced fish in CCPH	0.0%	1.1%	0.0%	1.0%	0.0%	1.0%
Kodiak	Total commercial harvest	34	2,574	269	28,192	794	31,863
	Hatchery cost-recovery harvest	0	100	0	1,629	1	1,730
	CCPH	34	2,474	269	26,563	793	30,133
	Hatchery-produced fish in CCPH	0	362	53	10,130	97	10,642
	% of hatchery-produced fish in CCPH	0.0%	14.6%	19.6%	38.1%	12.2%	35.3%
Chignik/Aleutian Islands/Alaska Peninsula	Total commercial harvest	11	5,353	352	8,676	1,232	15,624
	Hatchery-produced fish in CCPH	0	0	0	0	0	0
	% of hatchery-produced fish in CCPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Bristol Bay	Total commercial harvest	19	15,376	135	1	872	16,402
	Hatchery-produced fish in CCPH	0	0	0	0	0	0
	% of hatchery-produced fish in CCPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arctic-Yukon-Kuskokwim	Total commercial harvest	3	52	277	8	1,285	1,624
	Hatchery-produced fish in CCPH	0	0	0	0	0	0
	% of hatchery-produced fish in CCPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Statewide Total <sup>c</sup>	Total commercial harvest	324	29,522	5,773	226,274	21,024	282,917
	Hatchery cost-recovery harvest	28	222	320	6,451	2,458	9,480
	CCPH	296	29,300	5,453	219,823	18,566	273,437
	Hatchery-produced fish in CCPH	68	1,566	1,197	82,491	11,769	97,091
	% of hatchery-produced fish in CCPH	22.9%	5.3%	22.0%	37.5%	63.4%	35.5%

Source: Commercial harvest, data from Munro and Tide *In prep.*

<sup>a</sup> Total commercial harvest by all commercial gear types, including fish harvested for cost recovery.

<sup>b</sup> CCPH = commercial common property harvest.

<sup>c</sup> Some figures may not total exactly due to rounding.



## Safeguards in place to protect wild stocks:

Permitting process

Genetics Policy

Salmon Escapement Goal Policy

Transportation, Possession, & Release of Live Fish

Policy for Management of Mixed Stock Salmon Fisheries

State of Alaska oversight: pathology, genetics, area managers





## Regulations

[Regulations Home](#)

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[Subsistence Regulations](#)

[Habitat Regulations](#)

[Board Process](#)

– [Board of Game](#)

– [Board of Fisheries](#)

– [The Joint Boards](#)

– [Advisory Committees](#)

[Commissioner's Authority](#)

[Constitutional Authority](#)

[Enforcement](#)

[ADF&G Home](#) » [Regulations](#) » [Process](#)

## Constitutional Authority

Unlike many states in the union, Alaska enshrined its regard for natural resources in its constitution. [Article 8 — Natural Resources](#) lays out the framework for management of renewable resources:

**§ 2. General Authority** — The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the state, including land and waters, for the maximum benefit of the people.

**§ 3. Common Use** — Wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for common use.

**§ 4. Sustained Yield** — Fish, forests, wildlife, grasslands, and all other replenishable resources belong to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

**§ 15. No Exclusive Right of Fishery** — No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State.

**§ 15. No Exclusive Right of Fishery** [as amended in 1972 to allow limited entry] — No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State. This section does not restrict the power of the State to limit entry into any fishery for purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the state

Because fish and wildlife were recognized as critically important to the fledgling state, the Alaska Department of Fish and Game was created as a cabinet level department run by a commissioner, who answers directly to the governor. The directives of the constitution were included in statute by the legislature under Alaska Statute 16.05.020. The functions of the commissioner are to:

(2) manage, protect, maintain, improve, and extend the fish, game, and aquatic plant resources of the state in the interest of the economy and general well-being of the state.

The legislature also created the eight-member Alaska Board of Fish and Game, which was split into two seven-member boards (one for fisheries and one for wildlife) in 1975. The purpose of these boards is for conservation and development of fisheries and wildlife resources [AS 16.05.221 (a) and (b)].



## Current research regarding “straying” of hatchery salmon

### Hatcheries Research Current Research Project

Overview

Current Research Project

Findings and Updates

Because of the value of hatchery production to industry's harvest, and the mandate that hatchery production be compatible with sustainable productivity of wild stocks, ADF&G and private hatchery operators have recognized the need for a research program addressing concerns about escapement assessment, and genetic and ecological interactions between hatchery and wild stocks.

ADF&G organized a science panel composed of current and retired scientists from ADF&G, University of Alaska, aquaculture associations, and National Marine Fisheries Service. Panel members have broad experience in salmon enhancement, management, and wild and hatchery interactions.

The panel raised three priority questions:

1. What is the [genetic stock structure](#) of pink and chum salmon in each region?
2. What is the extent and annual variability in [straying](#) of hatchery pink salmon in Prince William Sound (PWS) and chum salmon in PWS and Southeast Alaska (SEAK)?
3. What is the [impact on fitness](#) (productivity) of wild pink and chum salmon stocks due to straying of hatchery pink and chum salmon?

The science panel designed a long-term research project to potentially answer some of the questions. A study plan was prepared and ADF&G solicited proposals from entities interested in conducting a research program to address interaction of wild and hatchery pink and chum salmon in PWS and SEAK.

The current research takes a long commitment and a considerable amount of funding. The legislature has appropriated a significant portion of the funding needed to ADF&G in FY 2013 Capital Budget from the General Fund. Alaska's salmon processing community has committed to a similar level of support.

Research Proposal

Genetics

Scope of Straying

Effect on Population Fitness

#### Research Proposal

Prince William Sound Science Center (PWSSC), in conjunction with Sitka Sound Science Center (SSSC), submitted the successful proposal and the contract was approved to conduct a portion of this project. Work on this project began in the summer of 2012. In the winter of 2013, PWSSC will present the first annual report for review by the science panel and department. The science panel will continue to advise the department on how to proceed.





## Some Current Issues

Whale predation

Ocean acidification

Market conditions

Fish feed prices

Maintaining “pristine waters” image

Pacific Decadal Oscillation

Carrying capacity of the North Pacific?





## Want more info re: Alaska hatcheries?

The screenshot shows the Alaska Department of Fish and Game website. The header includes the state logo and navigation links for myAlaska, My Government, Resident, Business in Alaska, Visiting Alaska, and State Employees. The main navigation menu includes Home, Fishing, Hunting, Subsistence, Viewing, Education, Species, Lands & Waters, and Regulations. A sub-menu under Fishing includes Licenses & Permits, Commercial, Sport, Subsistence, Personal Use, Aquatic Farming, Hatcheries, and Research. The Hatcheries page content includes a sidebar with links like Hatcheries Home, Planning, and Regulations. The main content area features a photo of a person at a hatchery, a list of links for Alaska Salmon Hatcheries, Hatchery Research, and Locations of Hatcheries, and a paragraph explaining the state's hatchery program. A Quick Links sidebar on the right includes Buy Licenses Online, Regulations, e-Library, F.A.Q., and Seafood Jobs in Alaska.

What is the term used for Private Non Profits that are allocated a percentage of catch to make up the cost of running hatcheries?

- Cost recovery
- Allocated allowance
- Recovery consequence
- Due process

## salmon enhancement

*Quiz - 3 questions*

Last Modified: Jul 02, 2015 at 07:53 AM

### PROPERTIES

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## Fisheries Technology

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No questions for this module