History of Salmon Netpen Culture in the Pacific Northwest

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with help from many including
Kathleen Neely and Jeff Hard

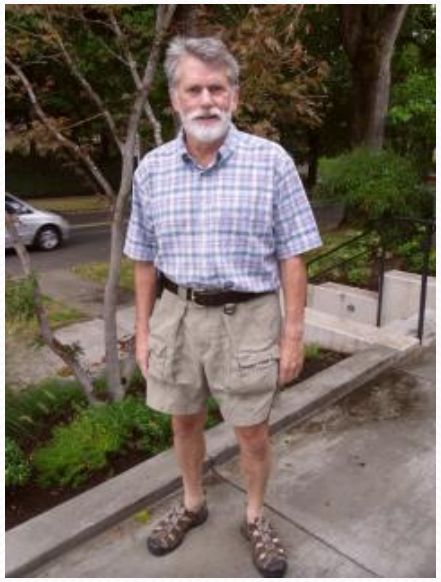
WASHINGTON -BRITISH COLUMBIA CHAPTER

SEATTLE AQUARIUM
Inspiring Conservation of Our Marine Environment

WABC Chapter meeting Kelowna BC

Objective of Talk

- Provide info on history of early netpen operations in Pacific NW
- Gather info on lesser known netpen operations.
- To develop contacts with folks who had worked at netpen sites in 1970s-2000s in WA, BC, or OR and get as accurate a history as possible of early projects.



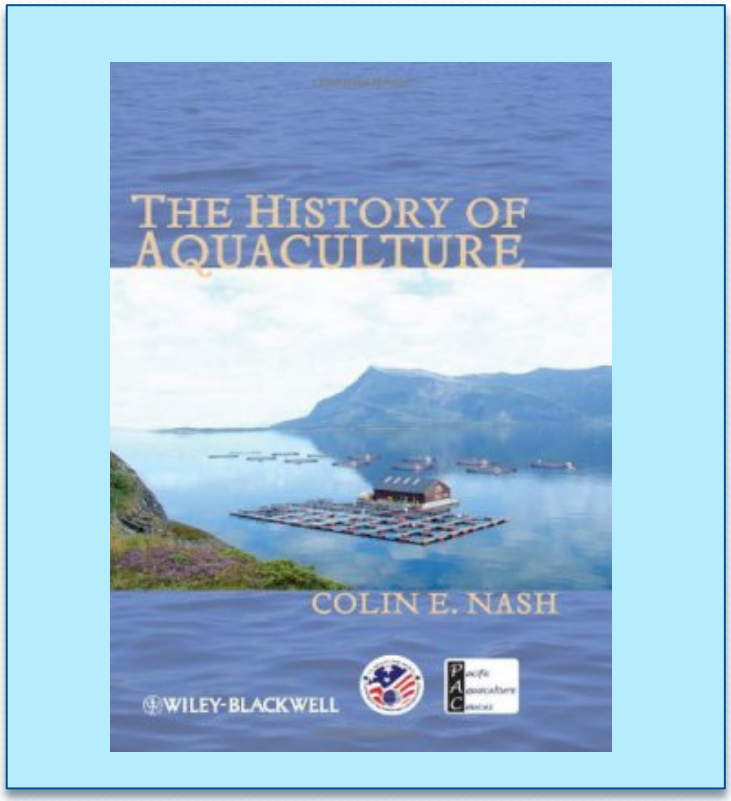
Tom Scribner fish biologist
Yakima Nation Fisheries

Paul Hickey – City of Tacoma

Photos Paul Hickey, Tom Scribner

Special thanks to Colin Nash for his insights and his 2010 *The History of Aquaculture*

A world wide survey of all aspects of aquaculture published by John Wiley & Sons, Nov 23, 2010 - - 236 pages



Salmon net pens – what are we talking about?

- Floating enclosed net pen finfish aquaculture begun in the 1960s.
- Two main types of net pen aquaculture exist in NW:
  - Commercial pens containing various salmon species raised for market, and
  - Enhancement pens raising Pacific salmonids for release into the wild.
- Hatcheries provide smolts for the pens but are not considered in this study.

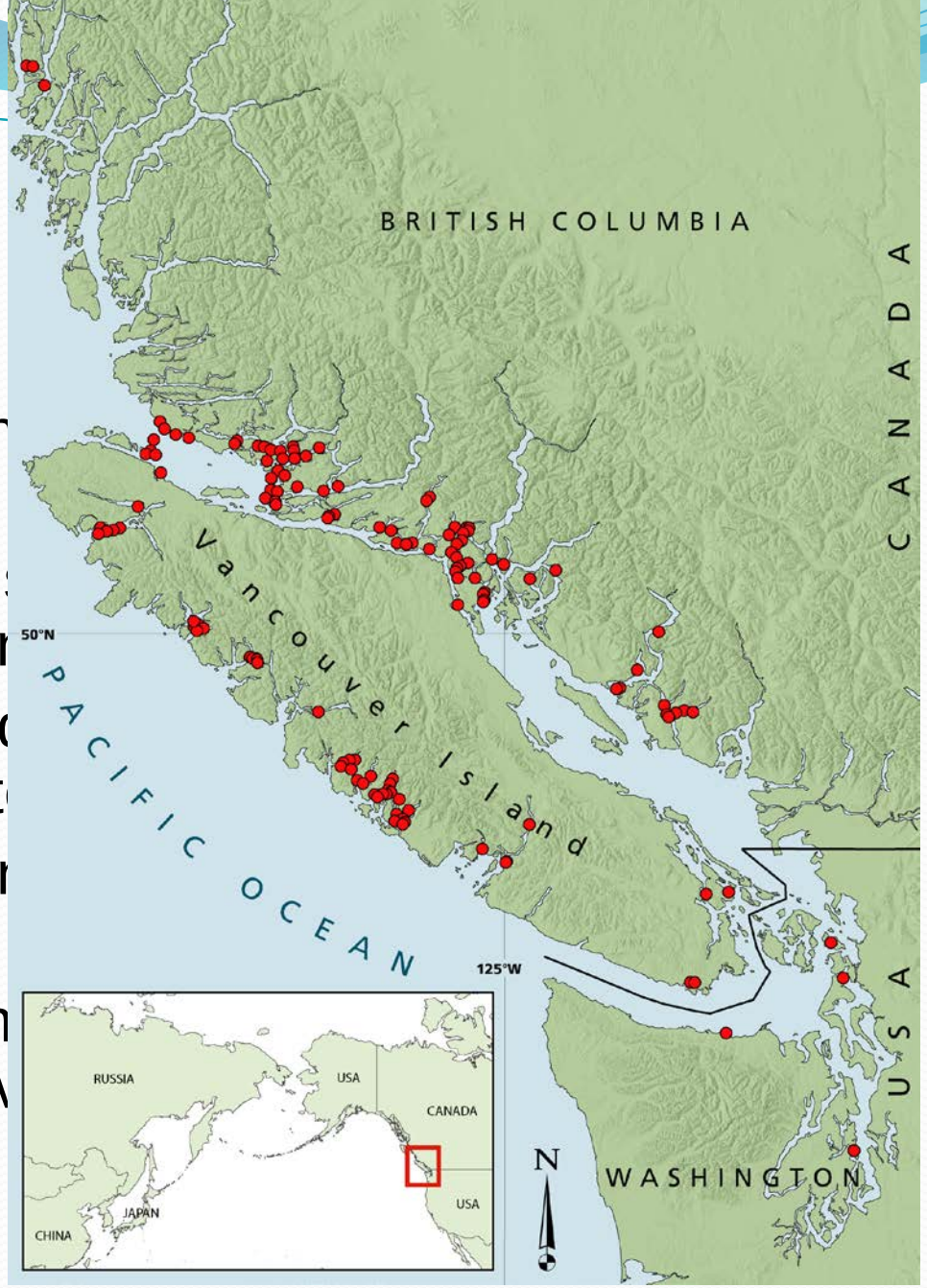
Focus on WA, but OR and BC salmon pen rearing initially developed in parallel to WA

- BC Salmon aquaculture started around 1971 with 10 farms by 1984.
- In early 1980s, production was less than 2,000 metric tons a year of Atlantic
- Rose to a peak of 135 farms approximately 50,000 mt by t
- Pens concentrated in the nort southern Johnstone Strait an on the west coast of Vancouver Island.

Dr. Gordon Bell and John Slind at Slind's farm in Sechelt Inlet in 1983 (Photo: C. Clarke)

BC Pen Rearing Today

- Initial focus on Chinook ar Atlantic Salmon
- Overall BC marine netpen variety of finfish species, i
- Number of companies hol declined from 50 in 1989 t
- Today these 75 BC salmo agricultural export
- 90% of the farmed salmon companies — Marine Harv Seafood.



Oregon – mainly salmon ranching, little info on net pens

- Although major salmon-ranching facilities were operating on Coos Bay and Yaquina Bay in the 1980-90s, there are no salmon ranches functioning now on any of Oregon's estuaries. Commercial aquaculture along coastal Oregon is focused on oysters and mussels, the latter grown only on the Umpqua estuary, near Winchester Bay.

Salmonid netpen techniques were initially developed in Norway and British Isles

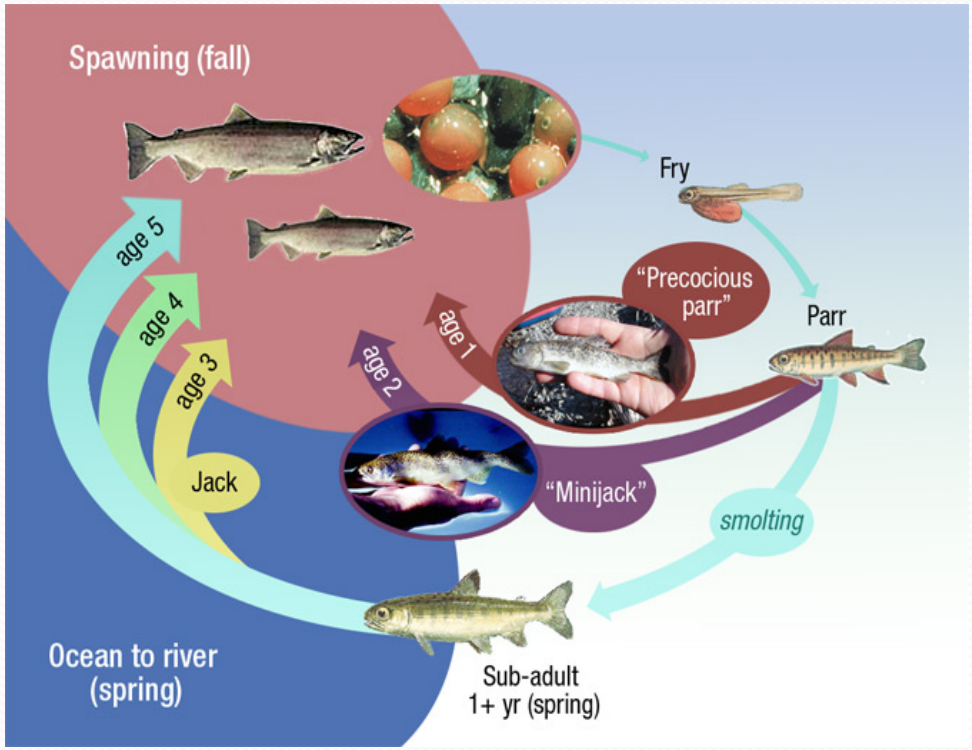
- In 1950 the Vik brothers and Ivar Heggen in Norway used floating pens to rear O. mykiss from Danish fish farms -- moving to Atlantic Salmon pen in 1959.

- In 1966, Marine Harvest in Great Britain began with projects in coastal enclosures and net penning O. mykiss. ;lkafj

- A major pioneering advancement was by brothers Silvert and Ove Grontvedt – who constructed the first octagonal cage with a fixed collar that was a servicing platform and could be covered to keep out predators. Other growers followed suit.

However, the complexity of salmonid life cycle delayed production for many years

- Poor fry to smolt survival,
- Inability to produce large numbers of smolts,
- Inability to control time of sexual maturity and
- Lack of healthy diet in seawater



The Tale of the Migrating Mini-Jack -- Don Larson and Brian Beckman
http://www.nwfsc.noaa.gov/news/features/minijacks/index.cfm

First large scale program was begun by Mowi A/S's owner Thor Mowinckel using Atlantic salmon in coastal enclosures near Bergen, Norway.

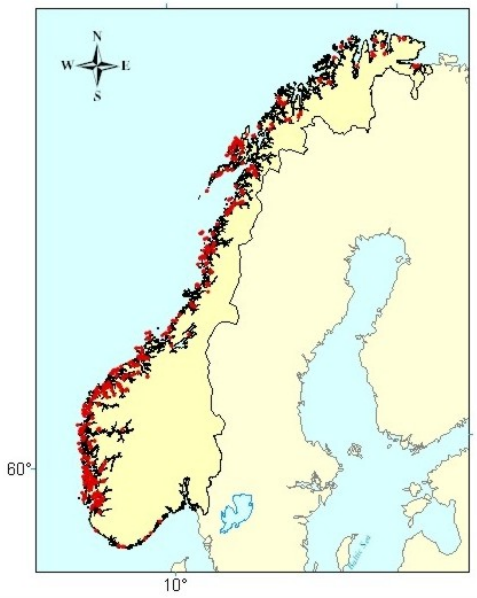
- In mid-1960s built two hatcheries for Atlantic Salmon smolts and two net pen grow-out facilities
- Spectacular success: 4600 tons by late 1960s to almost 300,ooo tons by 1980s.
- A bonanza started and many small companies and individuals on the coast jumped on the salmon band wagon.
- All kind of cages was used, they were made of wood, steel or plastic and some farmers operated with narrow bays which had been closed by steel screens or nets.

Thor Mowinckel

Salmon farm MOWI near island Sotra, Norway
https://www.was.org/meetings/ShowAbstract.aspx?Id=29376

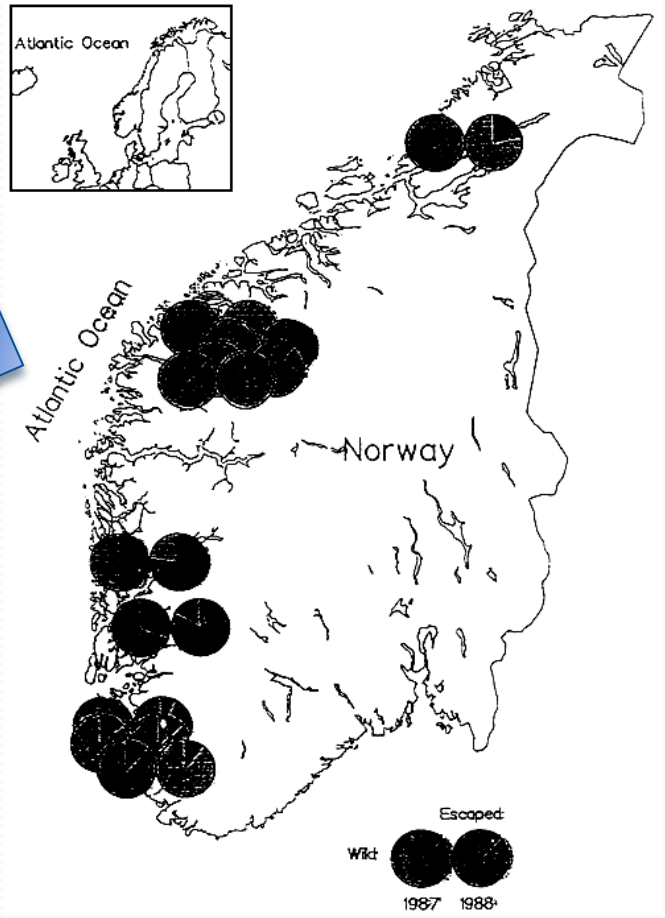
Explosive expansion of Norwegian net pens from 5 farms in 1960s to 173 farms in 1970s,

but a dark side:

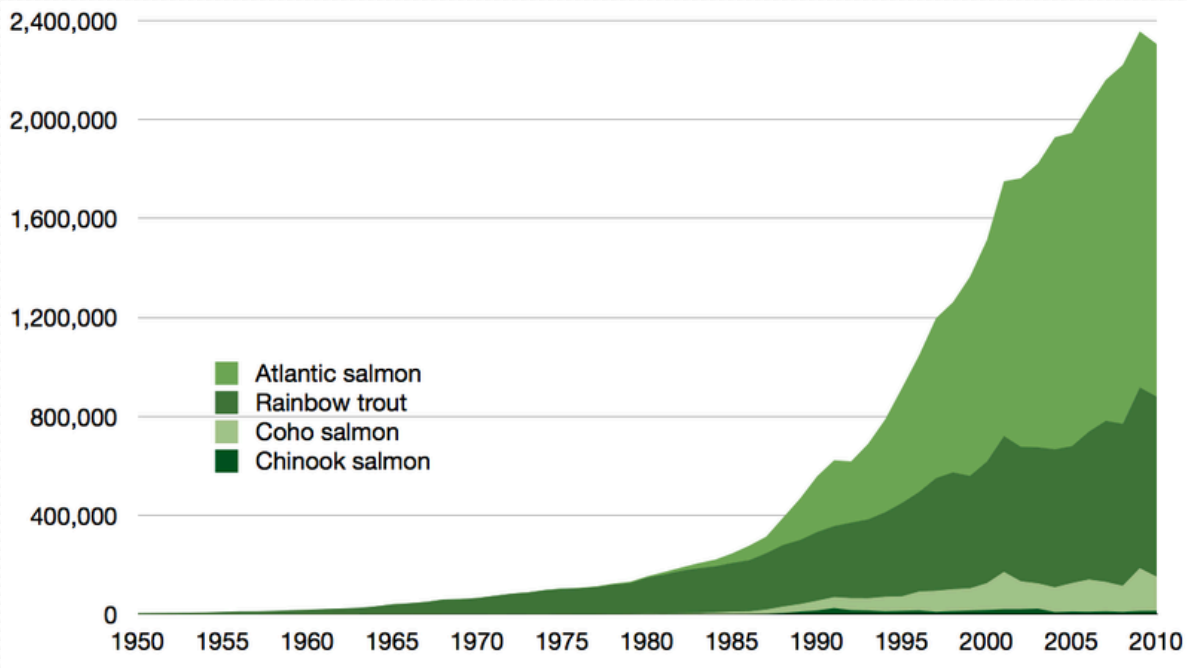


Red= net pen sites by 1990s

Many escapees and severe introgression of pen reared fish with natural populations occurred across Norway



Regardless, when a profit could be made production exploded and expanded worldwide.



Norway, Chile, Scotland and Canada are the largest producers (46, 31, 10 and 7% of total production in 2005).

and into the Pacific Northwest

- Early 1960s attempts in the NW were made to rear fish in closed off lagoons, but without food or strong water exchange most fish died.

In 1960s, Tim Joyner and others began experiments to to learn what was required to rear Pacific salmon in tanks and pans. The research was at the **Montlake Laboratory, a Bureau of Commercial Fisheries research facility**, located on Portage Bay in Seattle, WA. Facility is shown in the photo above and still exists as the NOAA's NWFSC, although without the 1950s and 60s car models parked in the back.

First Field Research at NMFS Manchester Field Station

- In 1967, Montlake Laboratory formed a field station on Clam Bay near Manchester, WA
- Facility is on the western side of Puget Sound, across Rich Passage from Bainbridge Island.
- Was under the direction of Connie Mahnken, Tony Novotny, Tim Joyner, Chuck Hunter, and others.

Brown Bear and Netpen Success

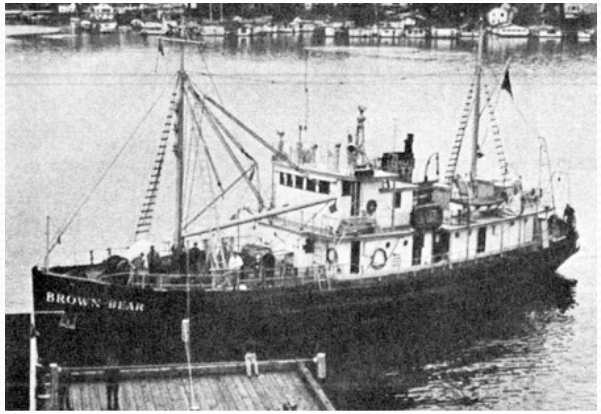
- In 1971 Tim Joyner at NMFS lab purchased a small coaster vessel from Alaska, the MV Brown Bear
- Remodeled the ship into a floating fish hatchery and rearing facility for Pacific salmon.

Fish were released in various part of Puget Sound to supplement local fisheries.

The ship moored at the Manchester Field Station and had net pens floating around the ship to enlarge the capacity to produce smolts and later bloodstock.

Developed into highly successful public-private net pen operation

- By early 1970s, the netpens around RV Brown Bear were converted into an independent netpen complex that was used to develop methods for rearing coho salmon from fry to adulthood.
- A public-private commercial scale pilot project was formed that spurred that by the mid-1980s produced over 3,000 tons/yr of 'pan-size' (0.35 kg) coho salmon in floating cages.



Photos:Bill Fairgrieve

The private portion was Global Systems founded by Jon Lindbergh in 1970

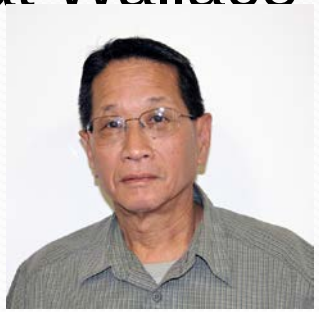
- Jon Lindbergh from Bainbridge Island in 1970 convinced the Union Carbide Company to fund a netpen based aquaculture operation named Global Systems in Clam Bay next to the NOAA Manchester netpen research facility.

Global Systems is believed to be the 1st commercial salmon farm in North America.

Jon Lindbergh in 1970s working under the bird netting in Global Systems Clam Bay operation

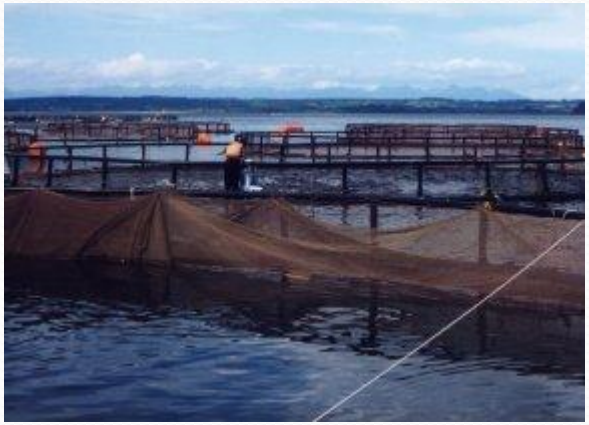
Dømsea coho selective breeding program major reason for success

- Dømsea coho salmon pedigree stock was founded by Union Carbide in 1969
- Derived from the Skykomish River coho at Wallace River WDFW Hatchery, Washington
- Acquired by Campbell Soup in 1979
- The stock, under the supervision of Dr. Robert Iwamotto, has been selectively bred for rapid growth since 1977 and has the longest pedigree of any Puget Sound salmon.



3264 × 2448 - nisquallytrout.com

Dømsea



SWEETSPRING
TASTE BEYOND THE SEA

Global Systems evolved into Dømsea and then Aquaseed

Global Systems - highly successful, producing coho salmon through the 1970s at Clam Bay, Manchester WA.

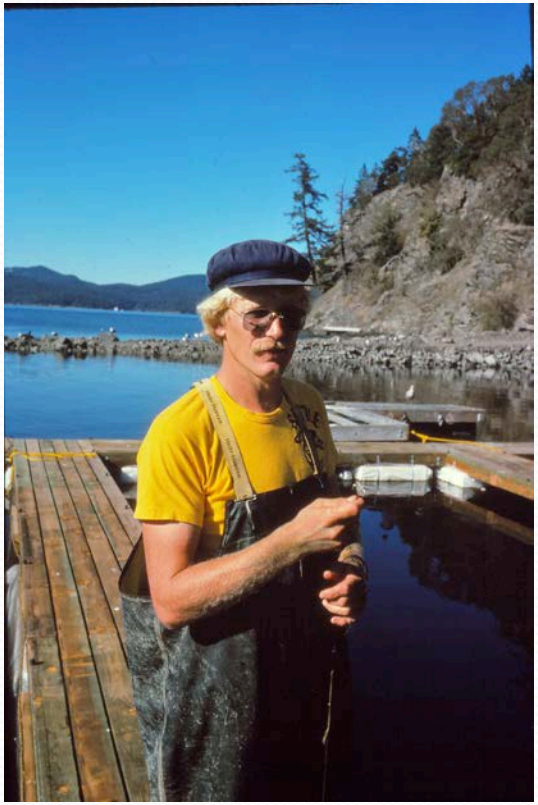
Dømsea Sold in 1979 to Campbell Soup Company and expanded to include Atlantic salmon. Highly successful in the 1980-90s, but as a net pen rearing facility went out of business in early 2000s

Aquaseed focused on O. mykiss the worldwide eyed-egg market for aquaculture and human consumption.

Sweet Spring© with expanded focus on sustainable coho salmon reared in closed recirculating system water system.

Another original was Aqua Sea Farms and Lopez Island

- Aqua Sea began in 1975 as Coho Salmon net pen operation.
- Managed by Nels Strandberg, former science teacher at the Lopez HS
- Funded by Fisher Baking Company.
- Paul Hinkey and Tom Schriber, early employees, report that it was based on the operation of the sea farms projects in Norway.
- Technical assistance by Dr. Earnest Brannon and others at the University of Washington.



Nels Strandberg, founder Aqua sea Farms, Lopez Island, 1975

Aqua Sea Pens in 70s and 80s Located North Island at Anchor Jensen's Marina

Feeding and spawning

Processing for Alaskan Airlines

Aqua Sea was very profitable until construction of new breakwater at Marina

- Revealed weakness in locating pens in marina near road access
- Breakwater reduced circulation and fish began to die
- Sold and moved to Cypress Island in 1980s.
- License held by Icicle Seafood till 2016.

By early 1990s There were 9 Independent Netpen Operations in WA

- Global Systems - Dømsea Farms
- Aqua Sea farms - Cypress Salmon
- Scan Am Fish Farmers
- Skagit System Coop
- Seafarms of Norway
- Mariculture NW
- Passage Silver
- Squaxin Island Seafarm
- Weyerhaeuser Co./Henderson Inlet

Plus other freshwater sites (WDFW 2006)

- Chelan River Net Pen near Chelan
- Deep River Net Pens near Wahkiakum on Lower Columbia River
- Lake Wenatchee Net Pens, Upper Columbia River
- South Sound Net Pens near Mason
- Speelyai Bay Net Pens, Cowlitz River, Lower Columbia River (Summer Steelhead (Oncorhynchus mykiss) Skamania and/or Merwin Hatchery Steelhead Stock) 2004

Including active netpens in Columbia River begun 1970s for Coho, Chinook, and Steelhead

Youngs Bay -- Since 1976 Clatsop County, OR has maintained a project, first set up in Young Bay, and new in Blind Slough and near Tongue Point. Fingerlings were raised and then released in the Columbia River as smolts. April 19, 2005

Net Pens, Blind Slough, Oregon. November 20, 2004.

However, many issues negatively impacting netpens in Washington eliminated most by mid-2006

- 1. Farm sites chosen for business logistics rather than fish health. Examples Clam and Shoal Bays.
- 2. Parasitic and other diseases (IHN) and algae blooms
- 3. Resistance to net pens by the fishing industry and landowners
- 4. Environmental issues such as water circulation, pollution due to fish wastes or antibiotics given to the fish.
- 5. Several land-use restrictions WA State
- 6. Rise of Atlantic salmon as the fish of choice
- 7. Escape of farmed fish and the impact escapees might have on native salmon stocks – estimated at 60,000/yr in BC (BC Aquaculture).

Ownership was concentrated in early 2000s when Icicle Seafoods purchased all seawater cage sites in WA

- Cypress and Hope islands in Skagit County (4 sites)
- Port Angeles at Ediz Hook (1 site)
- Southern Bainbridge Island in Puget Sound (3 sites)

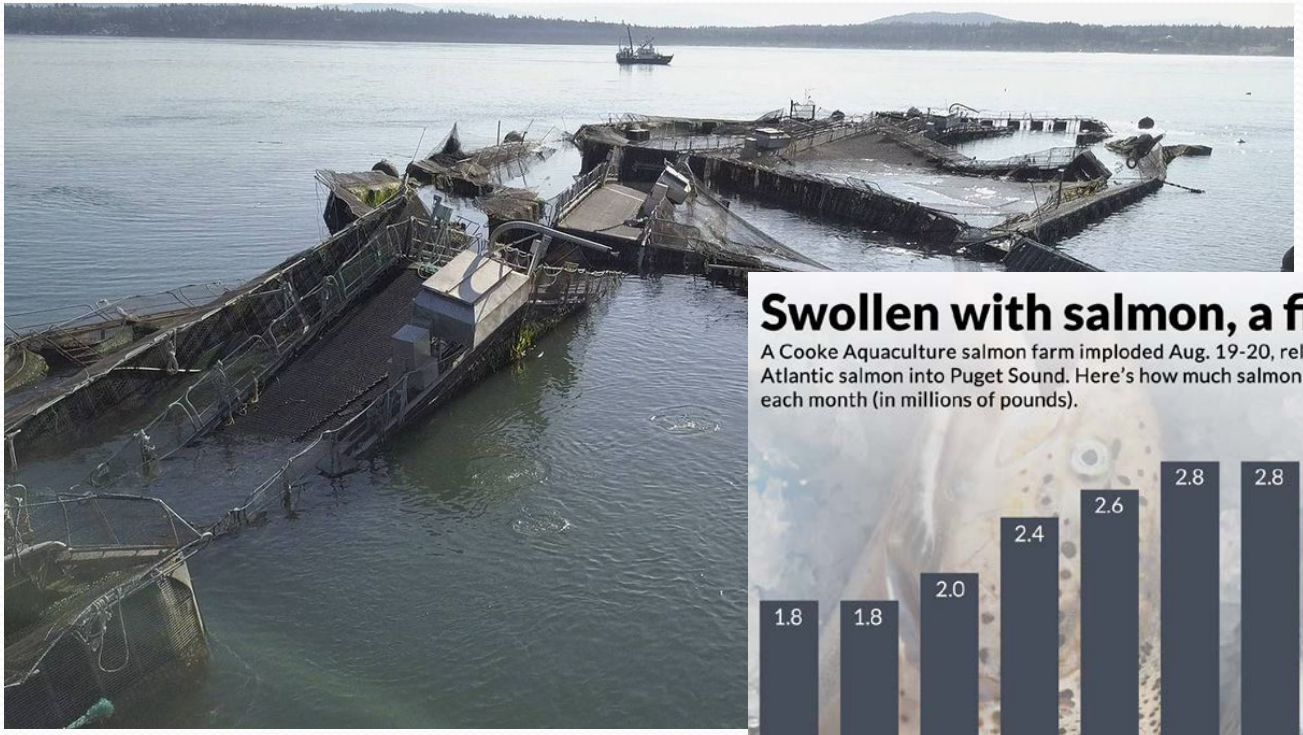
These pens produced about 10 million to 12 million pounds of salmon each year worth about $20 million.

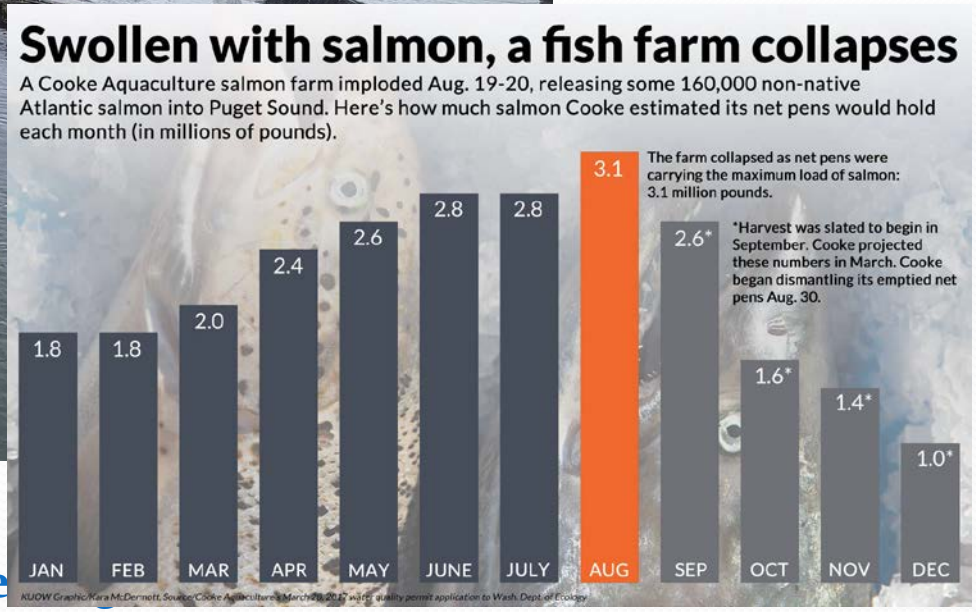
- Sold as American Gold filets by Icicle Seafoods
- All raised only Atlantic salmon.
- **And all were sold to Cooke Aquaculture in May 2016**

and the rest is history when in August 2017 on of the Cypress Island pens collapsed

MARK NOWLIN / THE SEATTLE TIMES

Thousands of Atlantic salmon escaped into Washington and British Columbian waters.





Beau Garreau/Children of The Se

March 2018 Legislature banned Atlantic salmon net pens in Washington Waters…

- WA State legislators voted 2 March 2018 to end Atlantic salmon farming in Washington waters by 2022.
- The bill passed 31-16 in the Senate and was signed by Gov. Jay Inslee
- The legislation prohibits new leases or lease renewals for net pens, allowing the industry to end after Cooke Aquaculture Pacific's last lease runs out in 2022.

The Past - Small farms, raising Pacific salmon

Feeding fish by hand at AquaSea

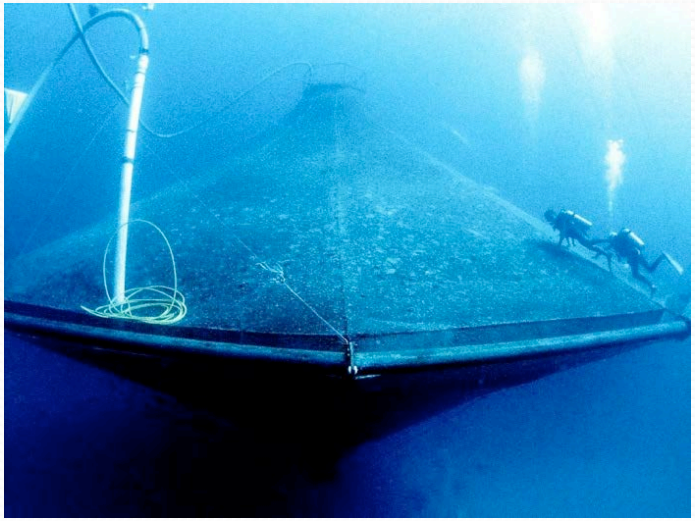
Photo by Paul Hinkey

The Future?

- **Better regulation, construction and site selection for cages**
- **Overseas farms**
- **Expansion of deep water cages**

Salmon Netpen, Chile

Deep water experimental finfish cages near Honolulu, Hawaii



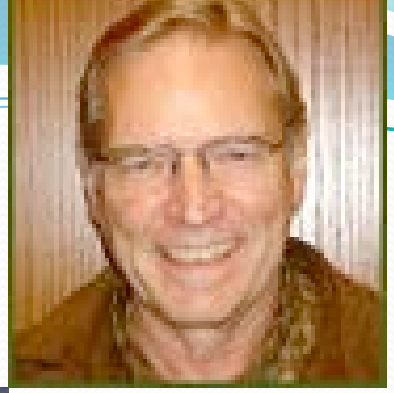
None traditional native species e.g. Sablefish (Black cod)?

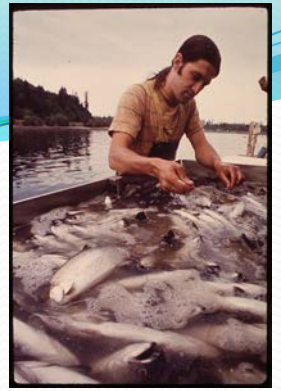
- NOAA scientists Bill Fairgrieve and Adam Luckenbach hold sablefish from a trial that was completed during the first week of May 2017, when the scientists made their first harvest of mature all-female fish raised in net pens

"This is a landmark achievement as it makes the farming of this tasty, buttery fish on a commercial scale within the grasp of US fish farmers. The fish harvested weighed an average of 5.47 lbs each, for a total of 20,227 kgs (roughly 44,593 lbs)." NOAA, 2017

Photo: Edward Hayman

Early Pioneers





Thanks and Questions