

# Cherry Point's Pickled Herring



Fred Felleman. WAVE Consulting



# Recipients of Herring Nutrients





Continued.....







Semiahmoo Bay

Cherry Point

Portage Bay

Bellingham

Samish Bay

N.W. San  
Juan Is.

Int. San  
Juan Is.

Fidalgo Bay

Mount  
Vernon

Skagit Bay

Dungeness Bay

Kilisnoo Harbor

Port Susan

Sequim Bay

Discovery Bay

Holmes Harbor

Everett

Port Gamble

Quilcene Bay

Port Orchard/  
Madison

Seattle

South Hood Canal

Quatermaster  
Harbor

Wollochet Bay

Squaxin Pass

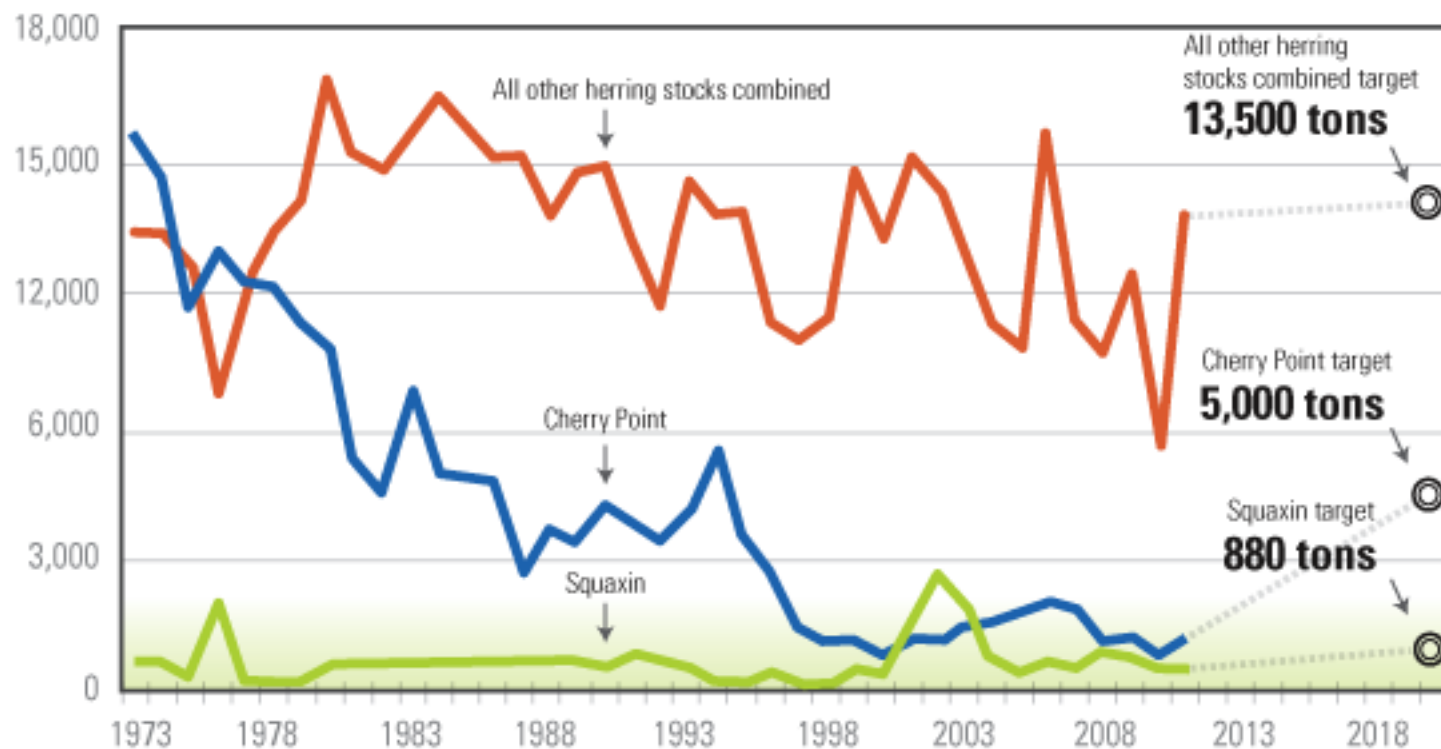
Tacoma

Olympia



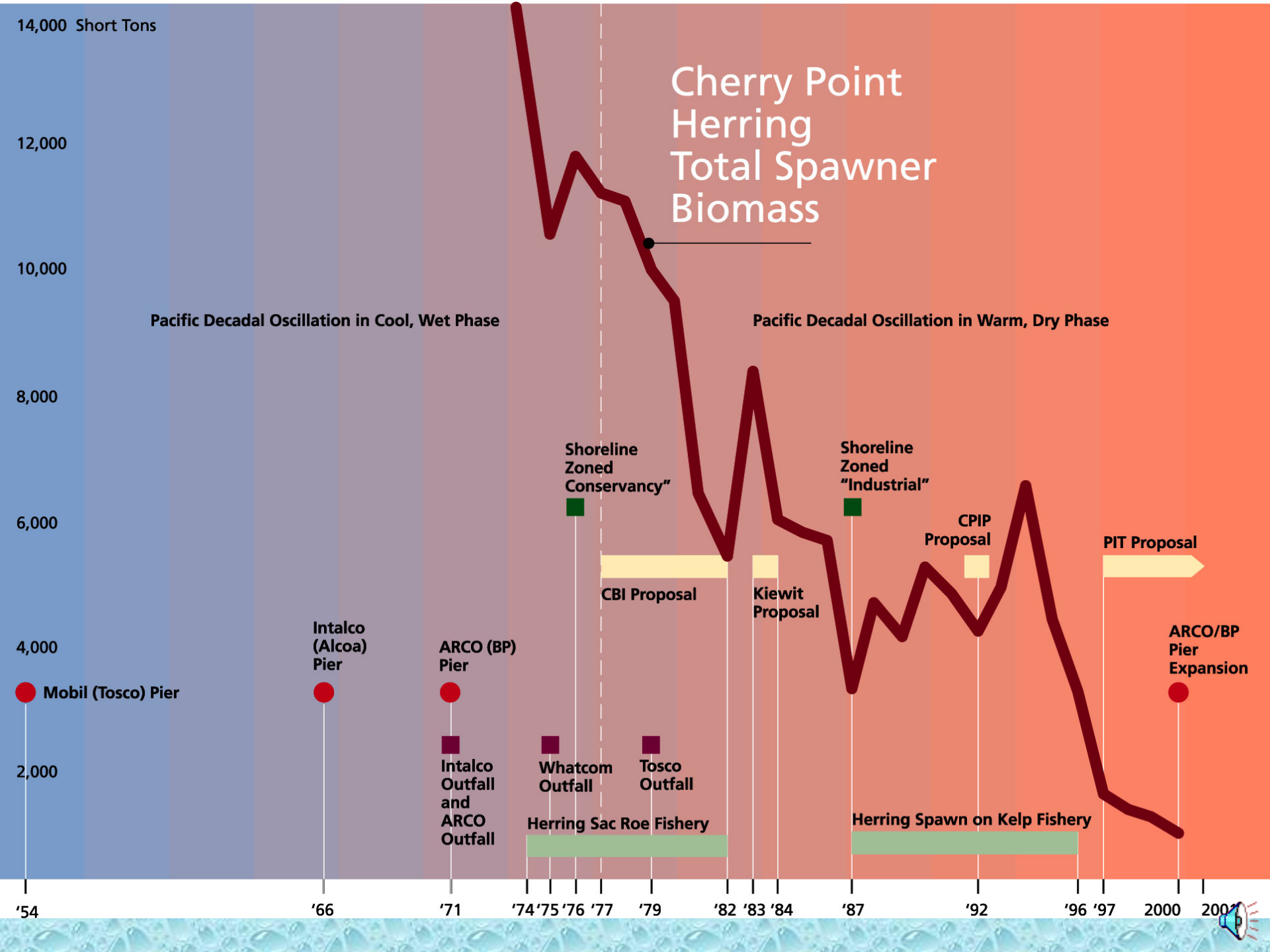
## Spawning biomass of Pacific herring stocks in Puget Sound

*In tons, 1973-2020*

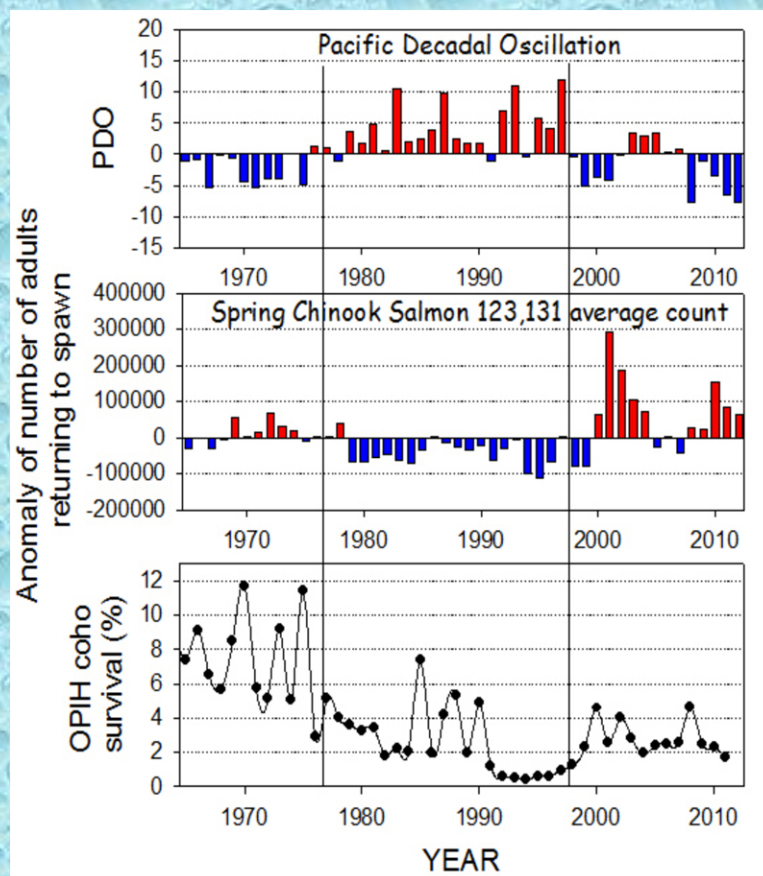


Source: Washington State Department of Fish and Wildlife



















June 16, 1972 Cherry Point, WA



**BIGGEST RED**—On display at Bellingham Fish through Saturday will be this 55-pound red king salmon caught Thursday at Cherry Point by Skipper Pete Zuanich of the Admiral. Curly Carlson (above), company operator, said the fish is the largest red king he's seen in the past 10 years. The salmon will be used at a Mount Vernon Elks barbecue next week.

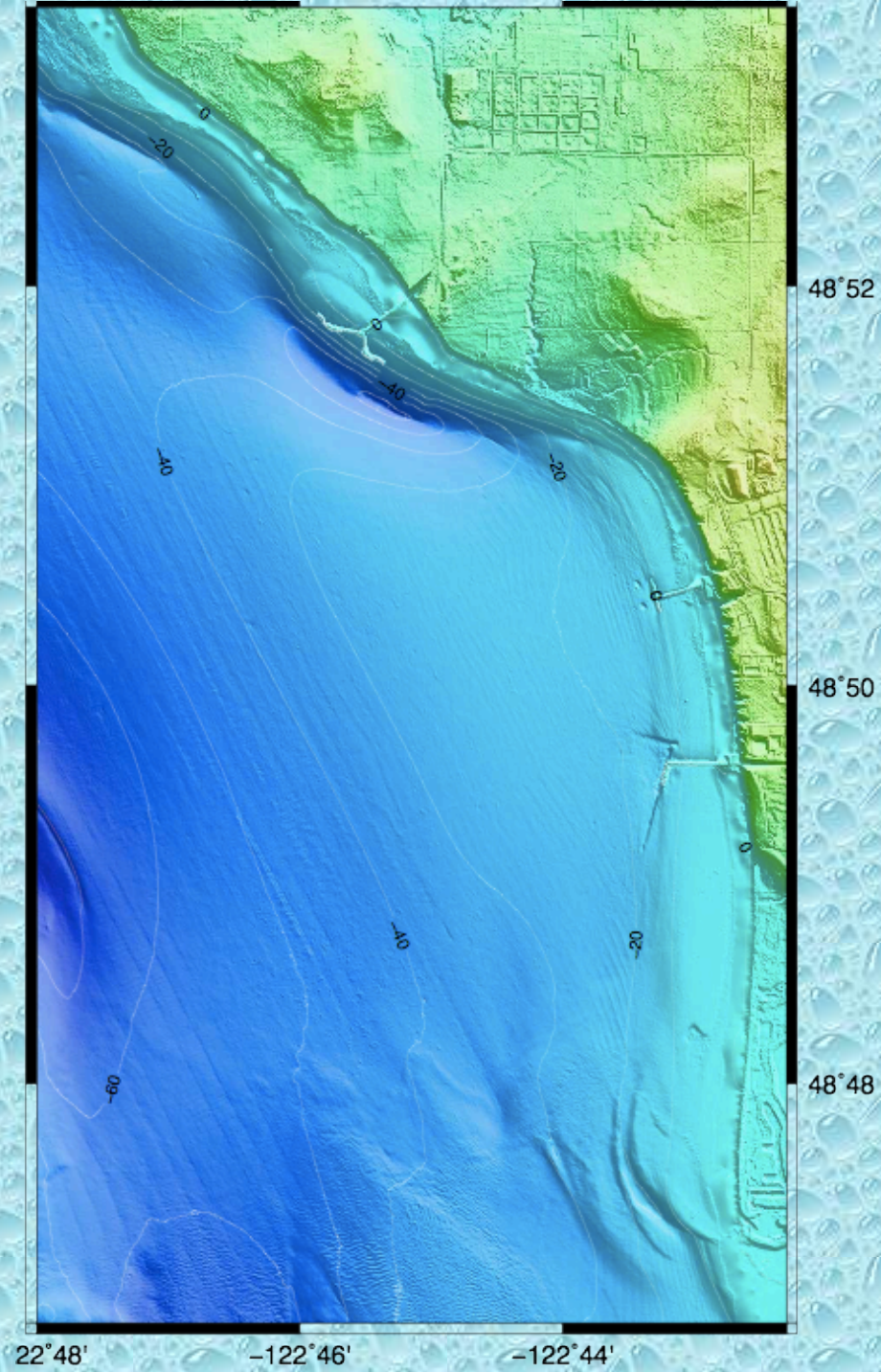
—Herald photo.



# Cherry Pt Herring Fishery

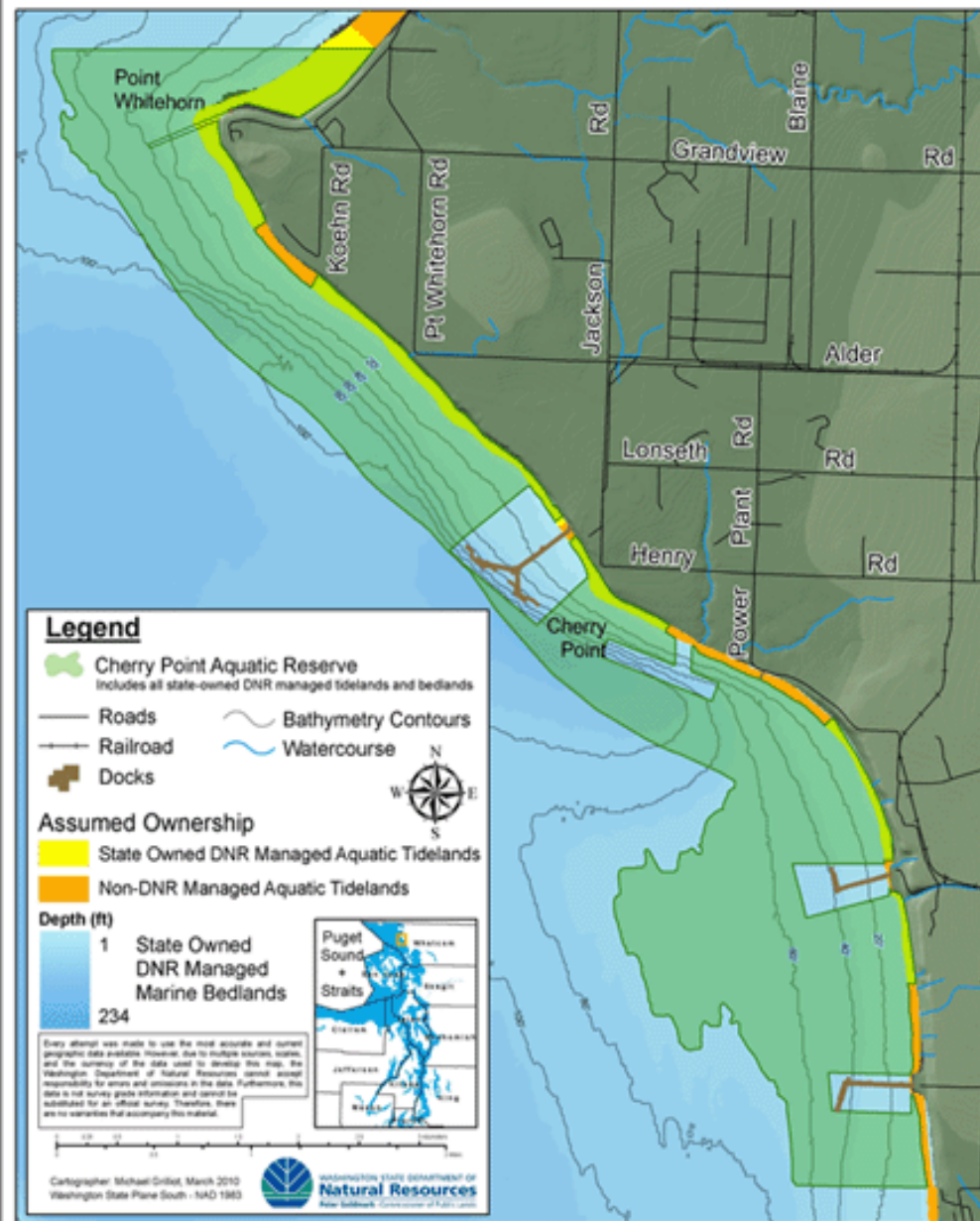








# CHERRY POINT AQUATIC RESERVE





# Cherry Pt Development



BP South Wing



ALCOA Aluminum & Pier



Conoco Phillips Pier & Oil Refinery







# Cherry Pt Herring

## A Unique Resource

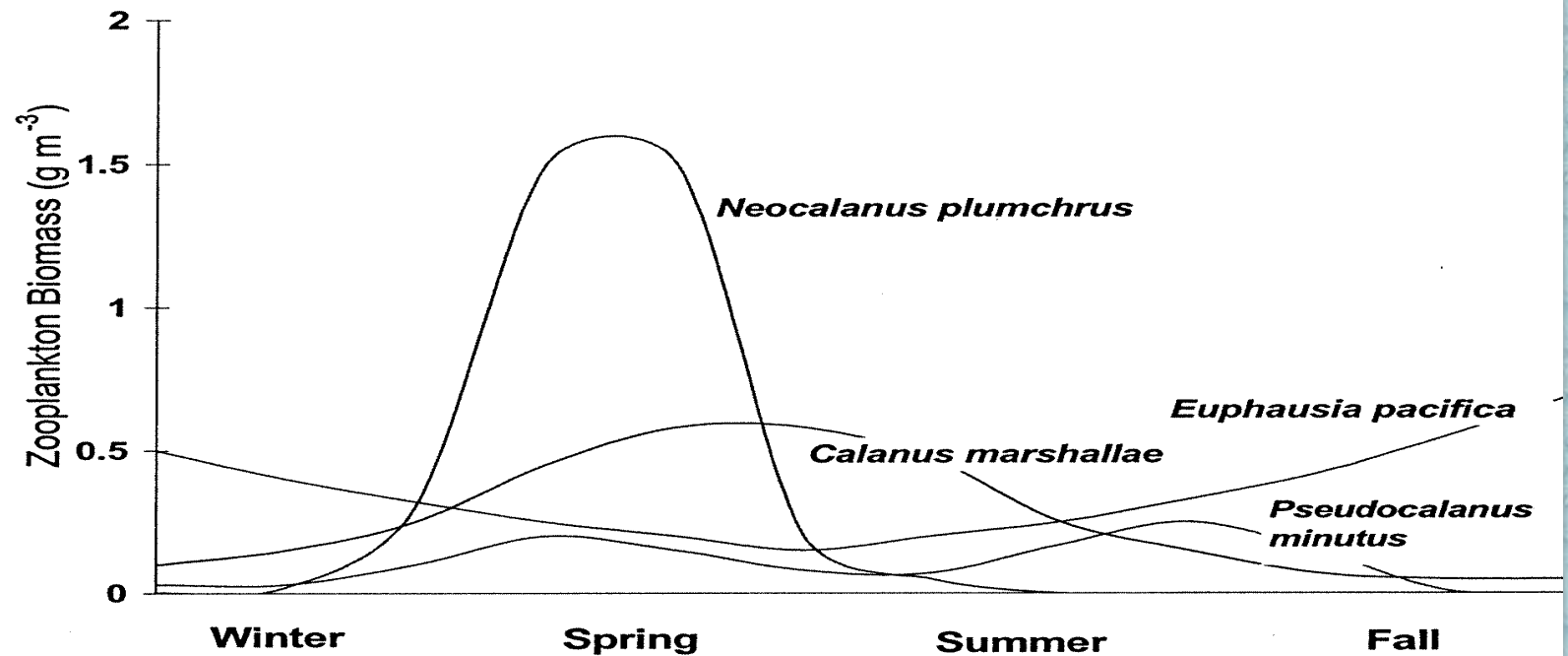


- Historically largest herring population in Washington State
- Timing
- Geographically distinct
- Biologically distinct



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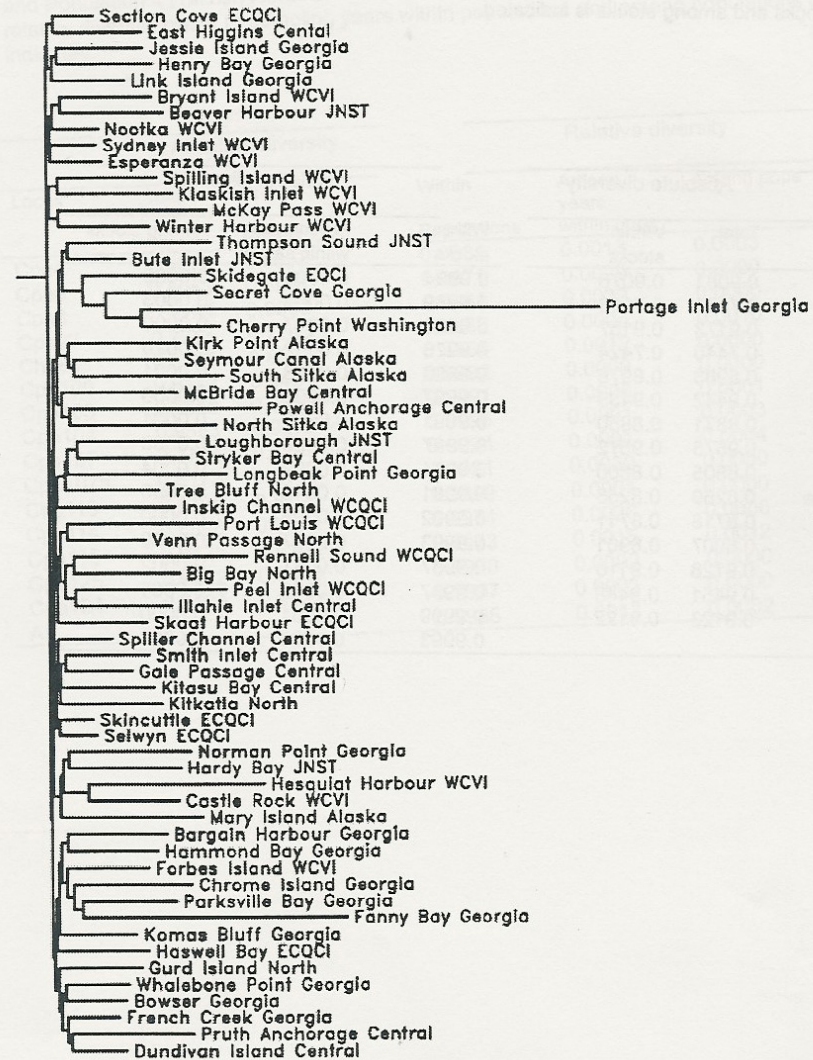




**Figure 2.** Seasonal changes in biomass of dominant zooplankton species inhabiting upper 20-50 m of the water column in the Strait of Georgia. (redrawn from Harrison *et al.* 1983)



Figure 1. Neighbor-joining dendrogram based on Cavalli-Sforza and Edwards (1967) chord distance for 65 herring samples from southeast Alaska, British Columbia, and Washington.





Stress = 0.29239

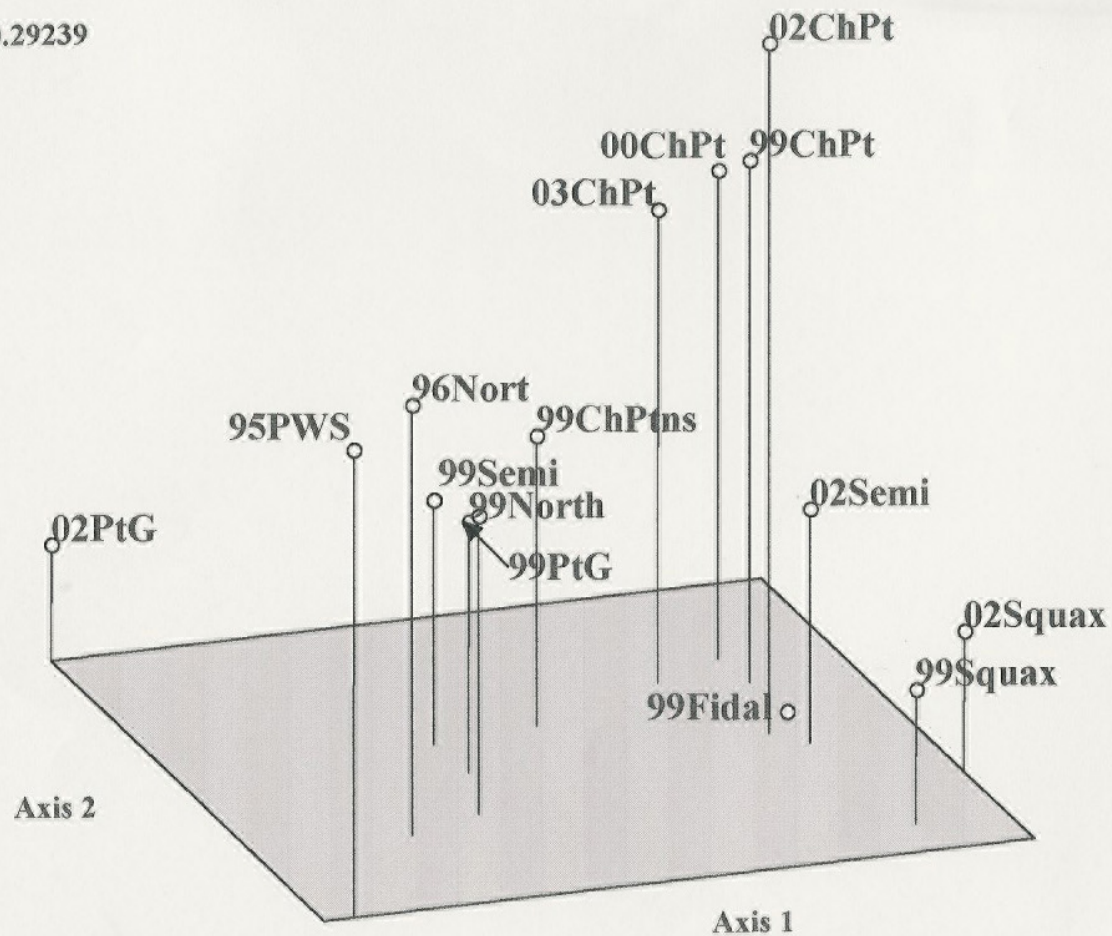
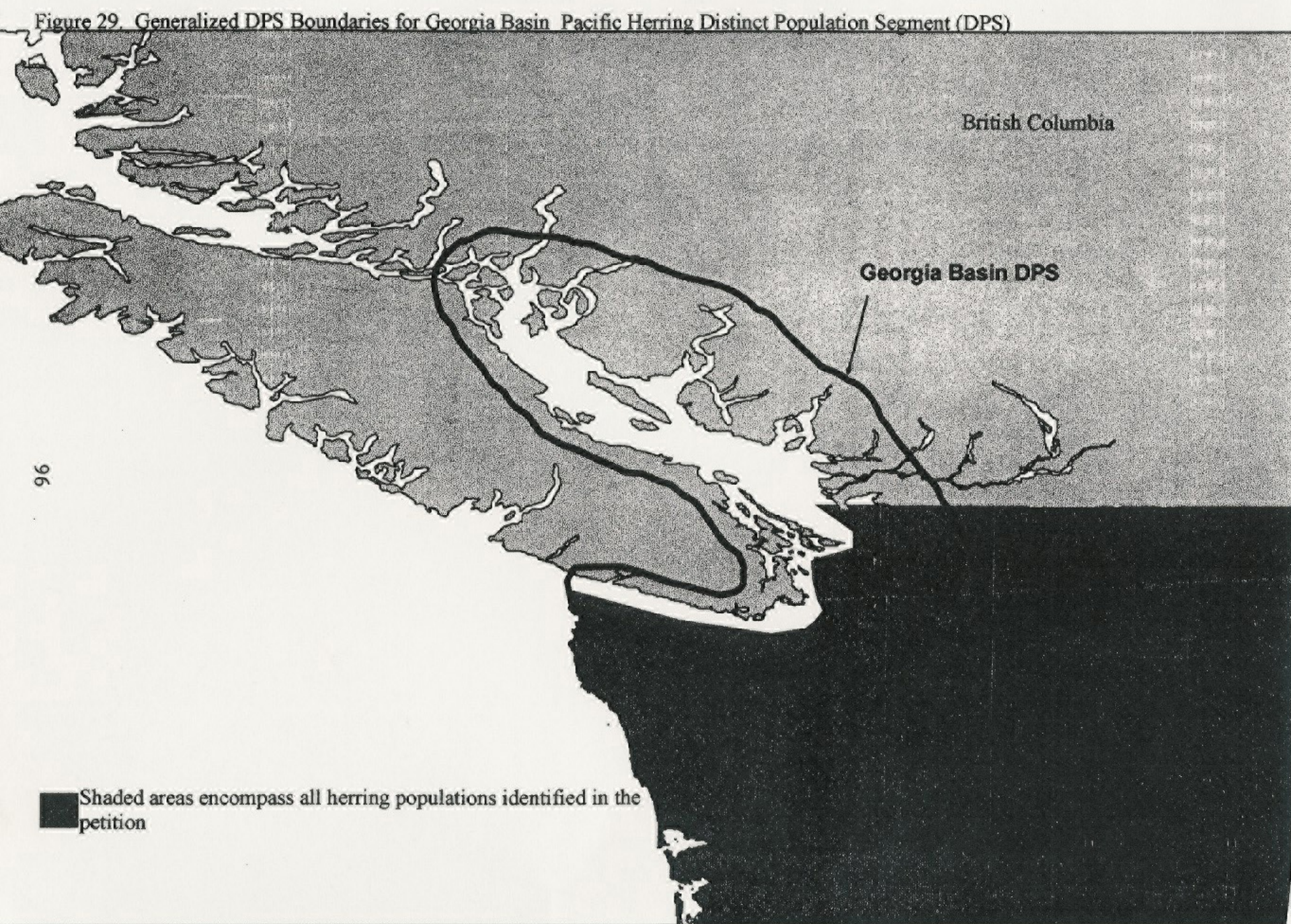


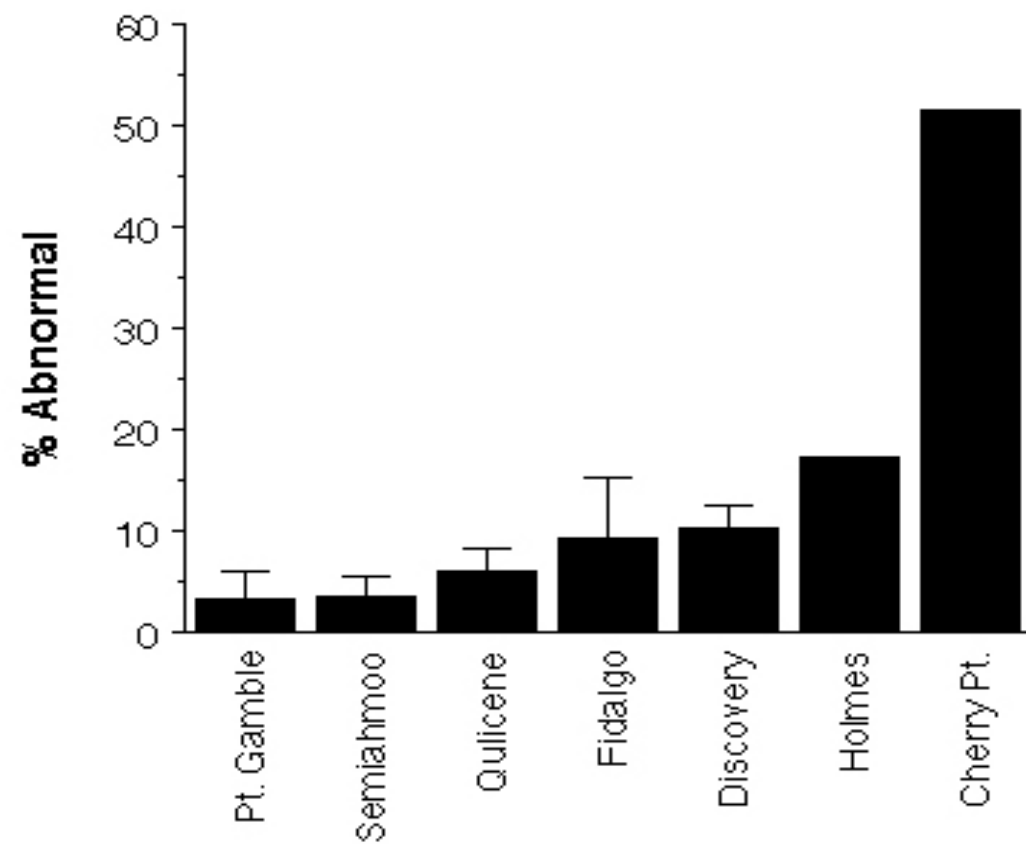
Figure 3. Multidimensional scaling plot of Nei's genetic chord distances (1983) among herring samples excluding San Francisco Bay collection. Abbreviations follow Figure 2.



Figure 29. Generalized DPS Boundaries for Georgia Basin Pacific Herring Distinct Population Segment (DPS)









MONDAY

June 5, 1972

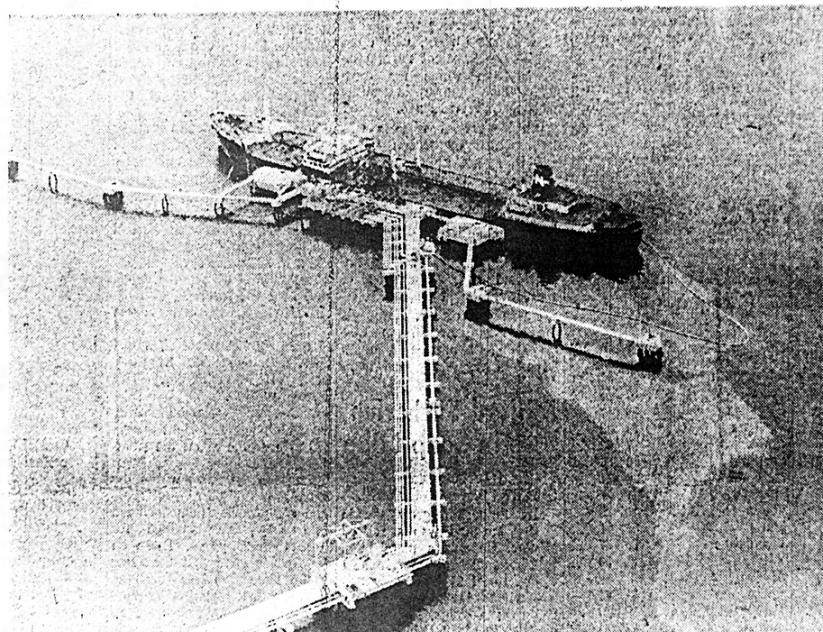
Volume 83, No. 134



10 Cents

a Gannett newspaper

Bellingham, Washington 98225



**OIL CLEANUP**—The Liberian tanker World Bond docked at the Atlantic Richfield Refinery pier is having booms placed it after a discharging mishap Sunday caused more

than 100 barrels of crude oil to spill into Cherry Point waters. Coast Guard reported the oil not trapped boom is moving southward today.—Mickey Hull

Oil being cleaned up

## Strait oil spill spreads

Cleanup operations were continuing today around a Liberian tanker which spilled several hundred barrels of crude oil while discharging at the Atlan-

tered around the tanker World Bond docked at the Arco pier. Booms were put around the ship Sunday to prevent more oil from escaping.

rels of crude spilled into the Cherry Point waters during unloading operations.

Ship's valve fails

valve failure or line apparent spilled oil into the

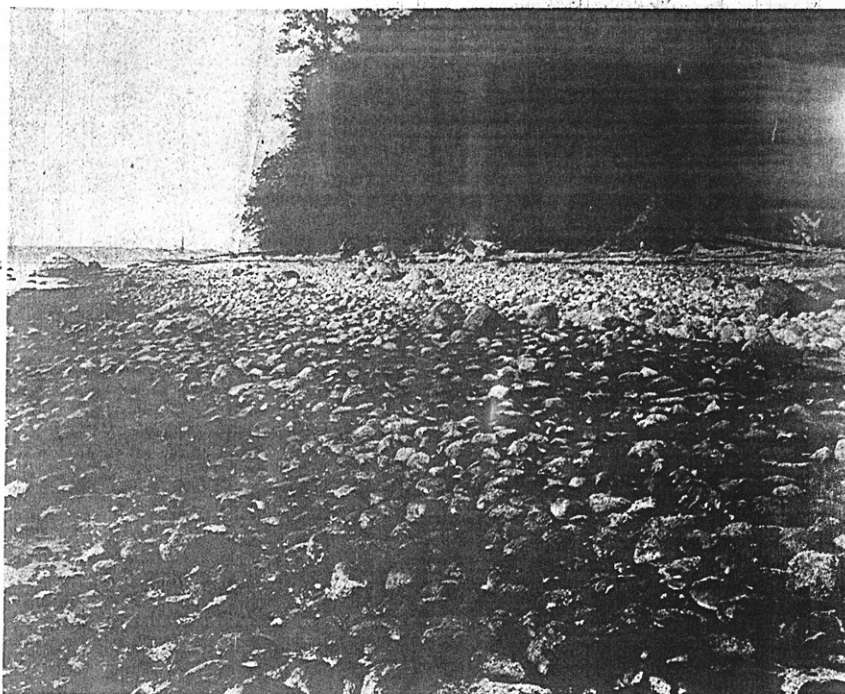
The vessel Middle East cru

## Bellingham Herald

TUESDAY

June 6, 1972

Volume 83, No. 135



**SLICK BEACH**—Crude oil was found washed up on this stretch of private beachfront on Birch Point just north of Birch Bay Monday afternoon after a tanker spilled several hundred barrels of crude into the waters of nearby

Atlantic Richfield dock. The black, slick oil coated strip was about 25 feet wide on this property owned by Merle Evers.

—Herald photo.

## Oil spreads along beaches

By STANFORD CHEN  
Of The Bellingham Herald

Patches of black crude oil were evident today on a strip of beach stretching from just north of Cherry Point to Kwomah Point in British Columbia in the aftermath of a spill that dumped 4,000 to 12,000 gallons of oil in the waters near Atlantic Richfield refinery.

Persian Gulf crude into the water.

A group of about 100 to 150 persons from Arco and contracted personnel were cleaning the oil-slicked beaches north of the Cherry Point refinery. The cleanup is expected to last into the week, an Arco official said.

Herring spawn damage?

Still undamaged by the spill is

cially vulnerable with the hatched herring eggs floating unprotected on top of the water.

A fisheries man was at the scene of some spawning areas but had no report to make.

Representatives from the federal Environmental Protection Agency and the State Department of Ecology were on hand to oversee the cleanup work. The ecology man was super-

Some have even started to clean up the oil.

According to an Associated Press dispatch, over 200 volunteers and municipal workers worked into Monday night trying to sop up oil settling along beaches in Crescent Beach, B.C., just north of the international border.

Hay spread

## Border Patrol seeks seaman from tanker

Border Patrol is investigating the desertion of a Greek seaman from the Liberian tanker World Bond today.

The man disappeared several hours after the tanker accidentally spilled crude oil into the



## Herring loss may run high from oil spill

A potentially heavy loss of newly-hatched herring may be occurring in the waters from Cherry Point to Semiahmoo Bay near Blaine from the effects of the oil spilled at the Atlantic Richfield dock early this week.

This assessment was made by the State Department of Fisheries in Olympia today.

The department has two biologists and a researcher in the Cherry Point area running tests and bioassays in the herring spawn areas, believed to be one of the largest in recent years.

### Egg deposit high

> Fisheries Director Thor C. Tollefson said the last two weeks of May showed a heavy deposit of eggs seen over 16 miles of beach area from Point Frances in northern Bellingham Bay through Hale Passage and the Lummi Island area and north to Semiahmoo Bay.

Herring usually deposit their adhesive eggs on aquatic vegetation, he said, but so many eggs were deposited this time they were observed on large boulders with many others washed ashore.

Fisheries personnel monitoring the spawning activity said most of the herring eggs were hatched last Saturday, the day before the tanker spill. The hatched larvae tend to be concentrated near the surface of the water where they are carried by the passing currents.

"It is this characteristic that makes them extremely vulnerable to oil spills," Tollefson said.

One of the biologists investigating the herring hatch said an oil slick was in the vicinity of a spawning area off Birch Bay.

Funeral arrangements are pending at Jones Funeral Home.

## Agencies probe spill damage

(Continued From Page 1)

The Coast Guard reported "heavy globules of oil" were seen going ashore on a beach north of the Campbell River mouth in the lower British Columbia mainland today.

Volunteers were on shore putting straw on the beach as the oil washed in. An Arco boat brought in straw for the cleanup.

Cleanup is continuing at Birch Bay and the Coast Guard said the work is nearly complete.

### Nature at work

Jack Racine, manager at the Arco refinery near Cherry Point, said cleanup of the oil-covered rock beaches will be left to degrade naturally by the tidal action and weather.

He said this was the recommendation by the EPA, Department of Ecology, and the Canadian fisheries experts and that one week's tidal action would be equivalent to scrubbing the rocks with detergent.

The Coast Guard said no visible oil slicks were found south of Cherry Point where a ferry passenger reported a glob of oil moving into Hale Passage Wednesday.

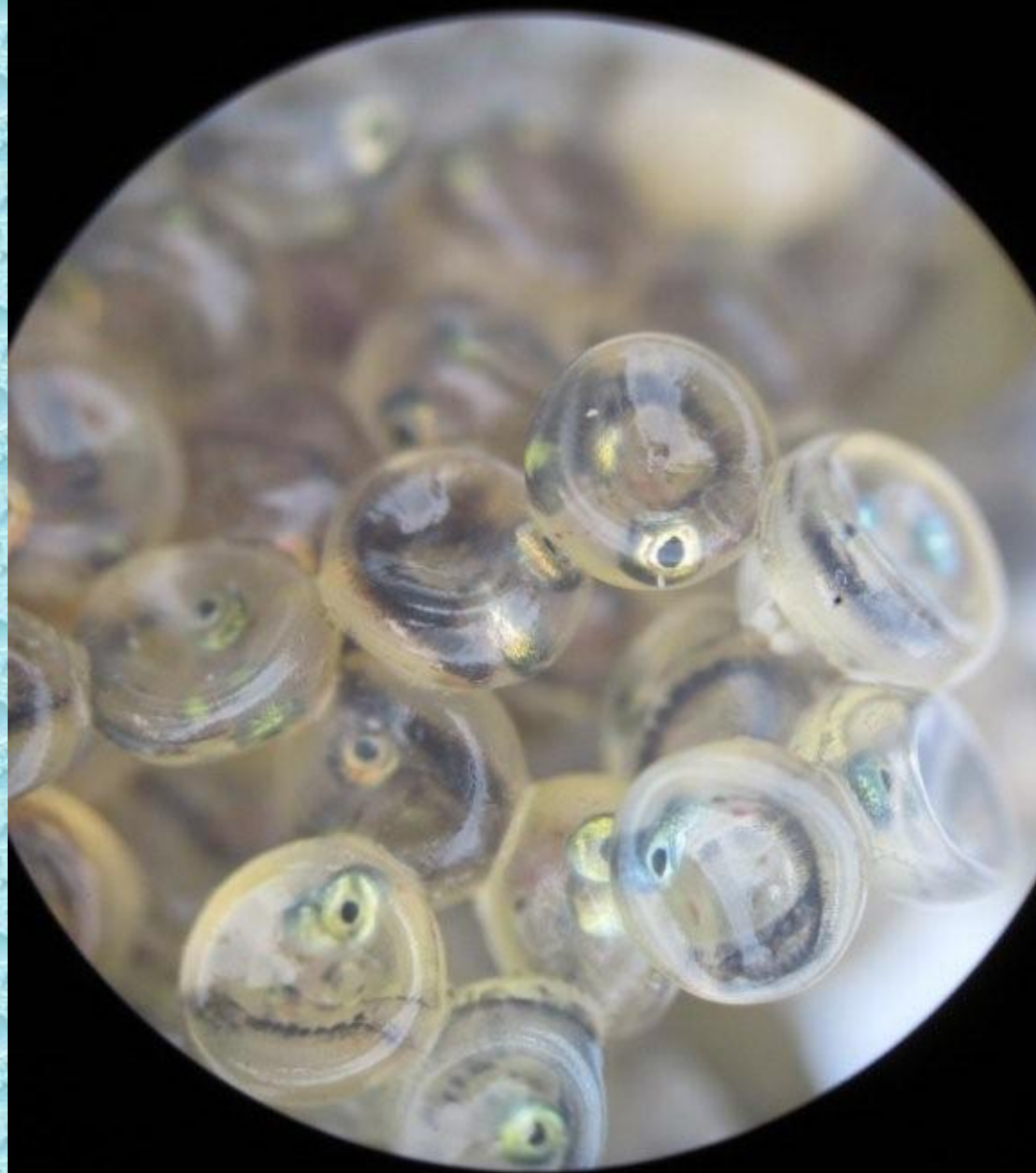
Dr. Wallace Heath, project director at the Lummi Aquaculture program, said there was a chance for the oil to enter the fish and oyster ponds since the ponds use water from Hale Passage.

### Moved elsewhere

He reported this morning, however, that no trace of oil was visible in the ponds and that the slick apparently has moved elsewhere.

An outspoken critic of oil tankers, Heath blasted the handling of the oil spill by Arco as





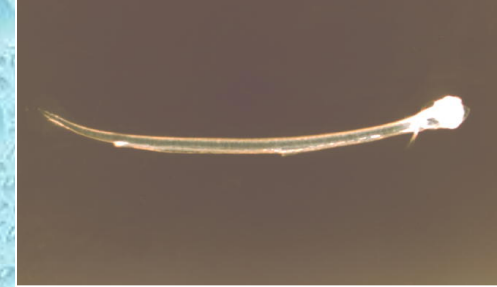


# Population Comparison

Cherry Pt Herring Larvae



Holmes Harbor Herring Larvae



- Hatching (Age 0)
- 5 Days Growth
- 7 Days Growth



Initial Contour Level 0.0001 mg/l  
Contour Interval 0.00025 mg/l

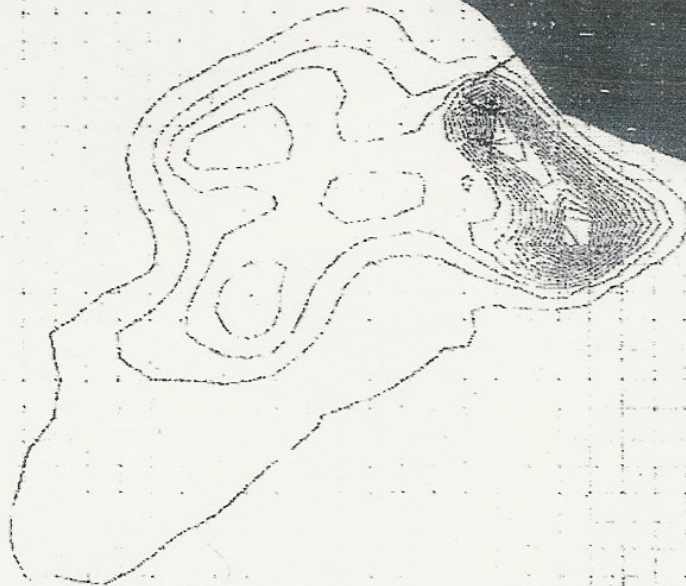
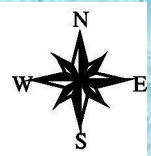


Figure 3 (from Battelle 1974) Plume from the most northerly industrial outfall, the ARCO/BP refinery.



# Cherry Point, Washington



Pt Whitehorn - **A**

Arco - **B**

Gulf Road - **C**

Intalco - **D**

Mid Pier - **E**

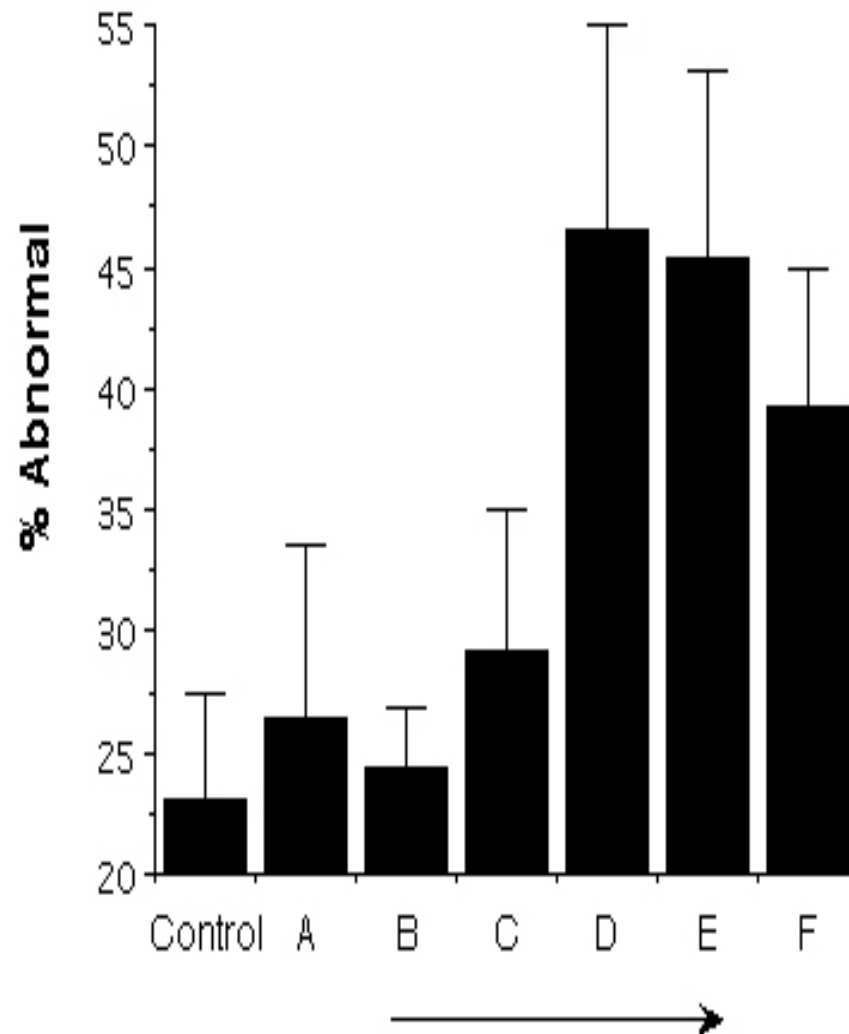
Tosco - **F**

Cherry Pt Sample Sites



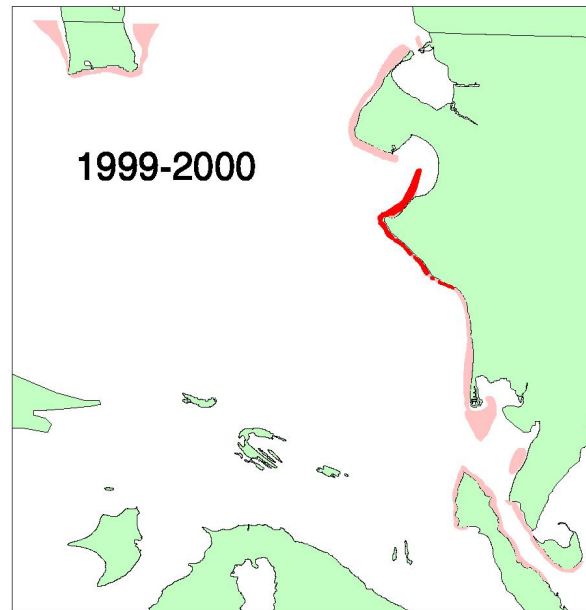
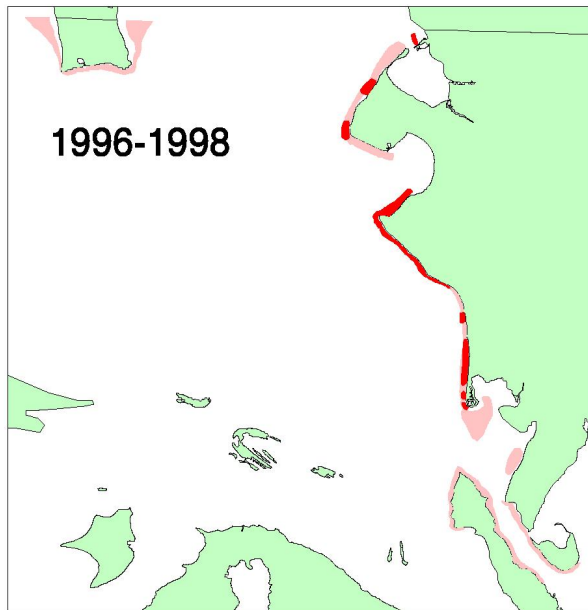
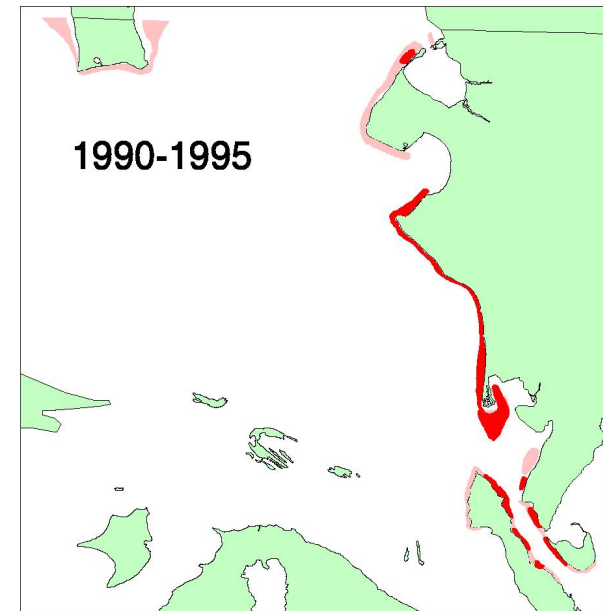
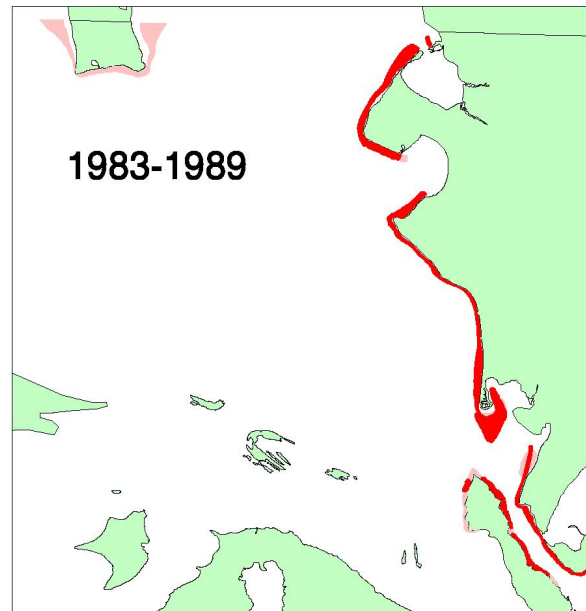
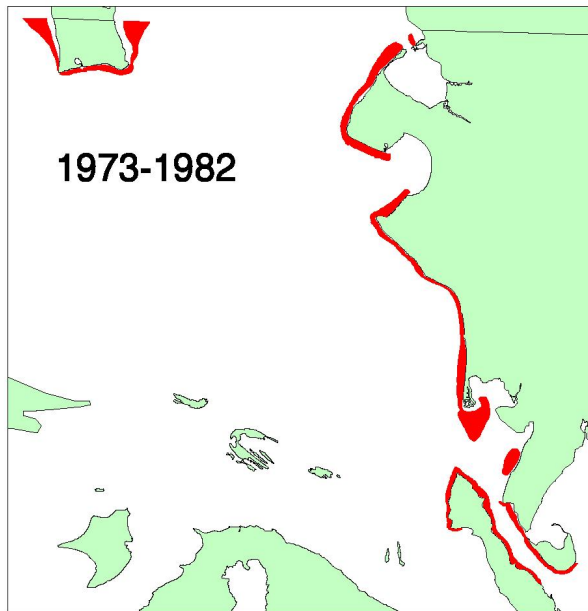




# Cherry Pt Herring 1999





# Herring Use of Spawning Grounds, 1973 - Present



 Spawning habitat used  
 Spawning habitat not used



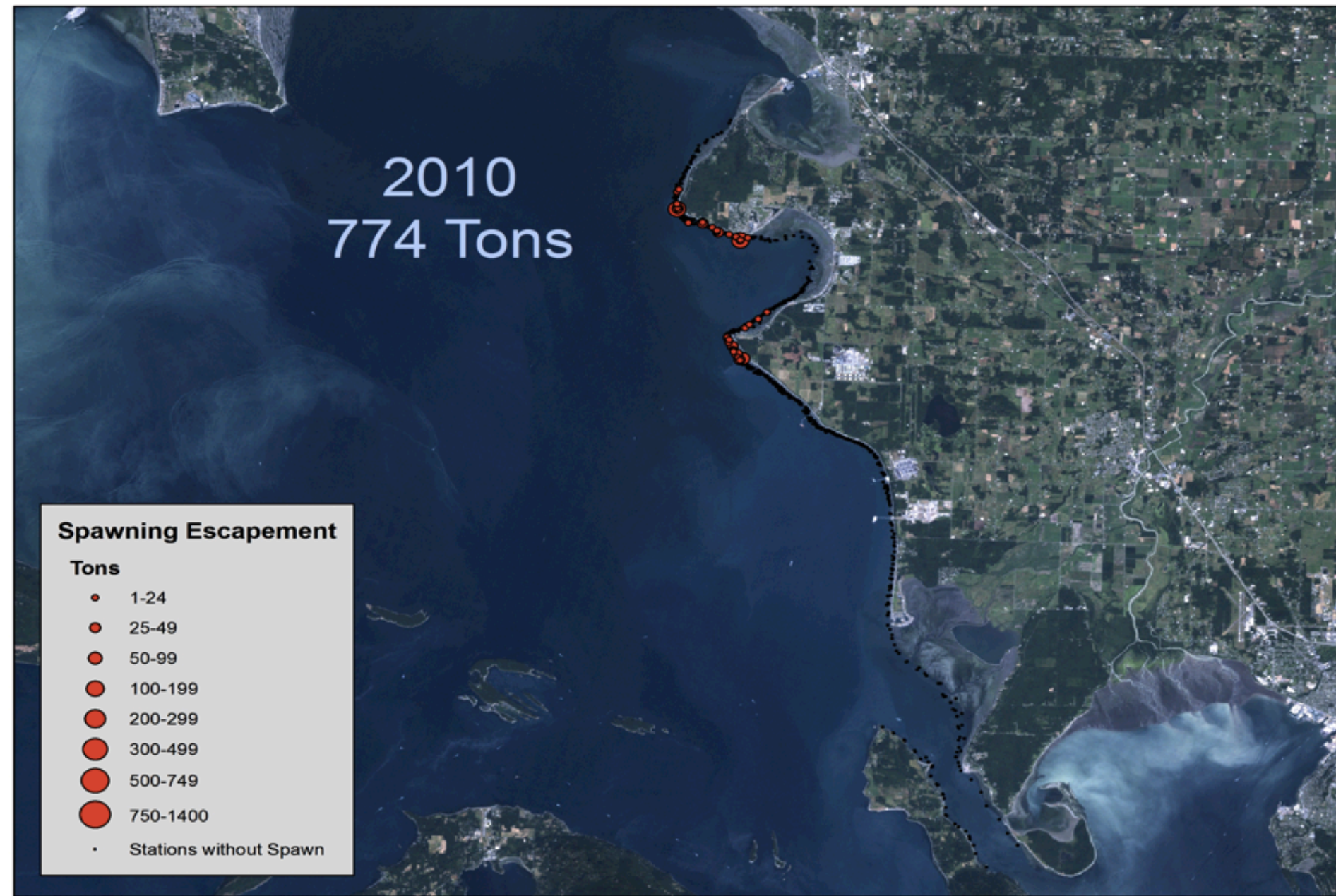
2010  
774 Tons

**Spawning Escapement**

**Tons**

- 1-24
- 25-49
- 50-99
- 100-199
- 200-299
- 300-499
- 500-749
- 750-1400

• Stations without Spawn





## Westshore Coal Terminal (est. 1970) – Roberts Bank, British Columbia





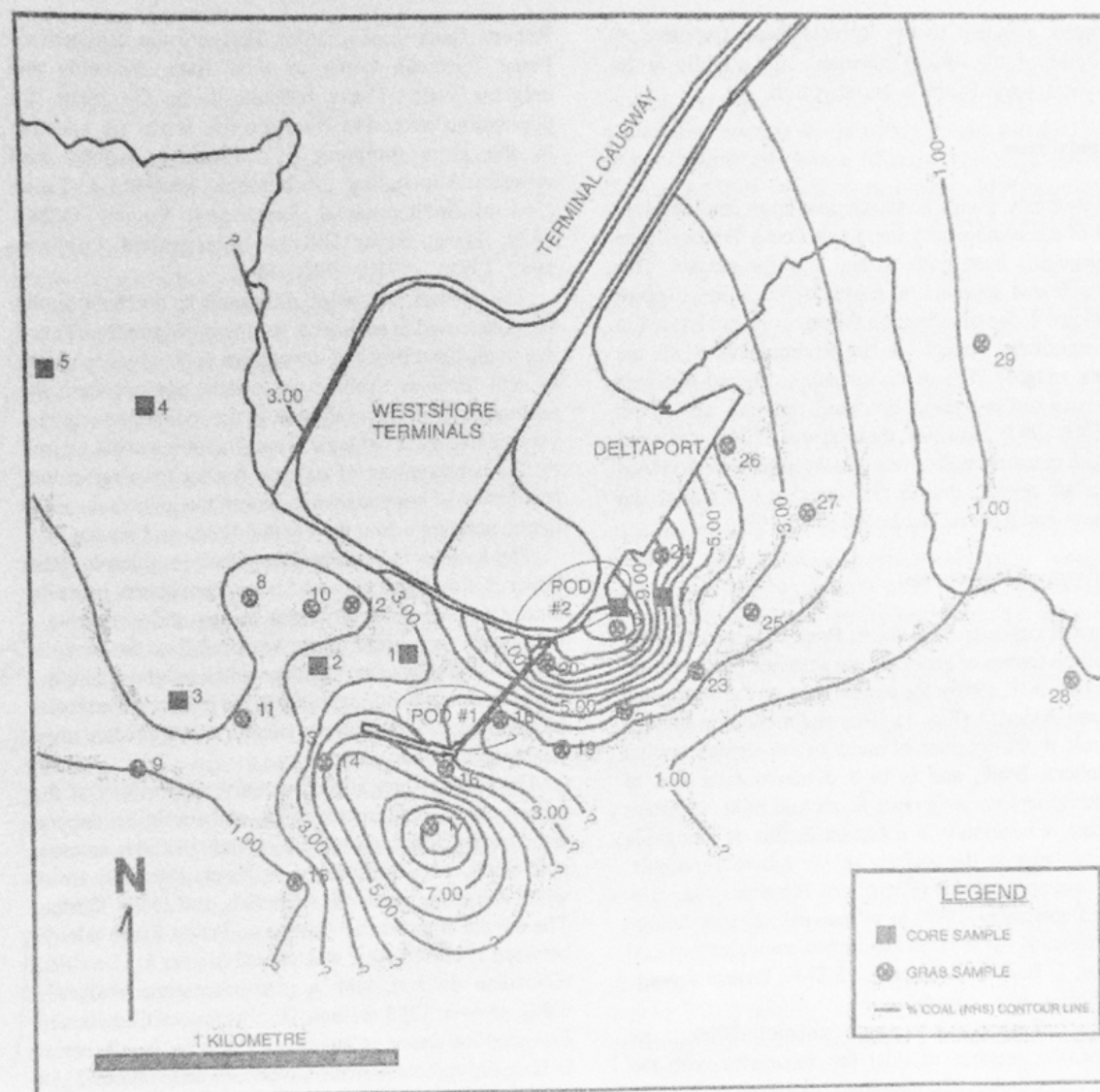
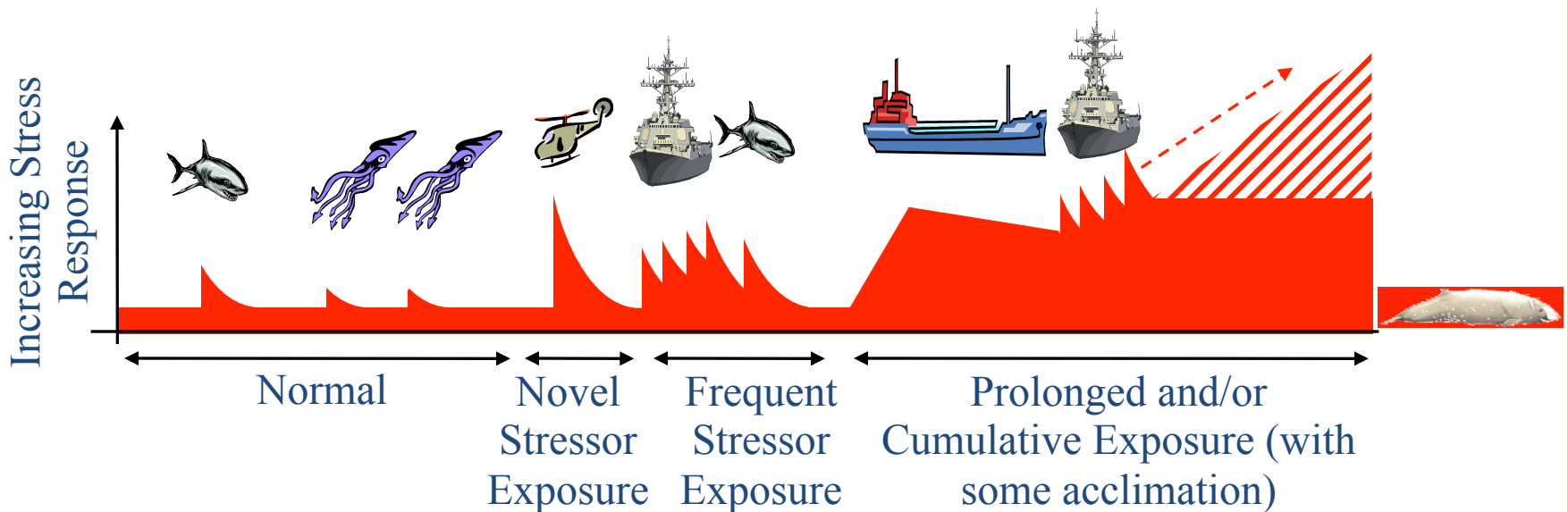


Fig. 2. Sample location and coal dust distribution in surface sediment as measured in weight percent N<sub>2</sub>H<sub>4</sub>S.

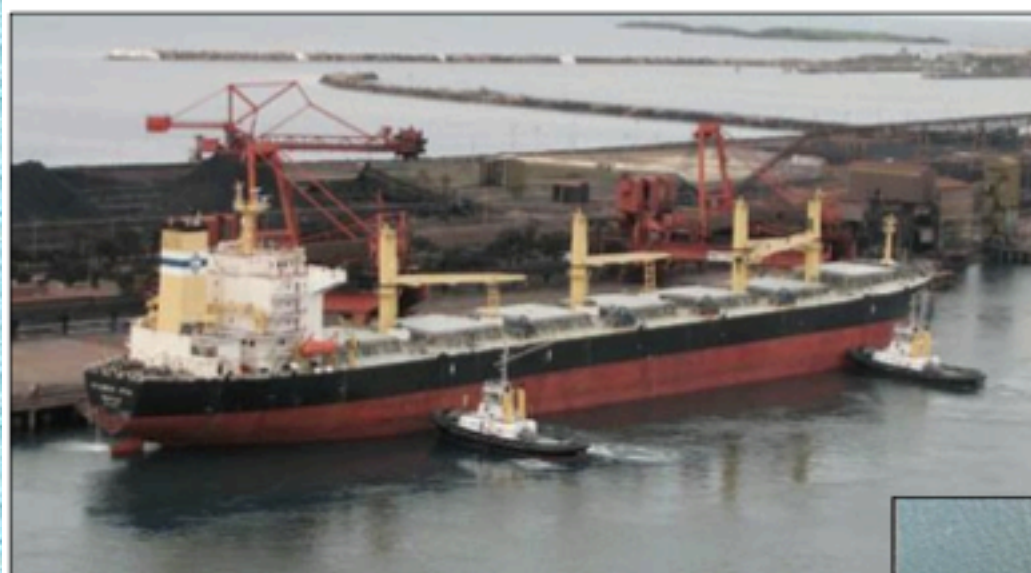


# Chronic Stress

- Noise can trigger a stress response at levels of exposure below those that induce observable behavioral reactions.
- Stress response may already be active through exposure to persistent pollutants, habitat degradation, reduction in food availability, other noise sources, etc. (i.e., cumulative or synergistic action).







## Tug Assist





# Rude noises and herring aids

It sounds like fish,  
um, passing gas, but  
it may help them  
communicate

BY ANNE McILROY  
*Toronto Globe and Mail*

The sound was unmistakably rude. University of British Columbia biologist Ben Wilson was alone in his lab late one night with a tank full of herring when he heard what he thought was somebody blowing a raspberry.

He worried his equipment was acting up or that his friends were playing a joke on him. He had an underwater microphone in the herring tank, part of an experiment to see how they reacted to killer whale sounds, and he turned up the volume on his speaker. The farting sound came again, and then again over the next few nights. It was so loud that his colleagues down the hall complained.

"They said I was being rude."

Little did they know that Wilson was in the midst of discovering what may turn out to be a new form of

communication between fish, one that will have immense appeal to 10-year-old boys.

Careful observation showed the farting noises were coming from the herring at a same time as a steady stream of air bubbles was coming out of their hind ends.

His team dubbed the noise Fast Repetitive Tick, or FRT, and found signs the herring may use it to communicate. They make the noises more frequently when there are other fish in the tank, and only at night, when they can't see each other.

On Nov. 6, Wilson headed off for a month at sea off the coast of Alaska to monitor the sounds of herring in the wild. Herring are social, in that they travel in vast schools with hundreds of thousands of other fish.

"I want to know if they are making these sounds in the wild, and what on Earth it sounds like," Wilson says.

What would it smell like? Fish farts probably aren't stinky, Wilson says. The air bubbles come from the swim bladder, which herring use for buoyancy.

There is, however, some debate about how herring get gas into their swim bladders. Some researchers believe it may come from their digestive systems.

Most fish can't hear at the frequency the herring use for their FRTs, which means they can signal each other without alerting salmon or other fish that find herring delicious. But humans can hear it.

"If you put your ear up against the tank, you would have heard it," says Wilson.

He tries to find polite synonyms for fart – including "digestive system venting" and "burst pulse sounds." A paper published by the Royal Society in Britain on his discovery avoided the f-word altogether.

If the herring use the sounds to communicate, the ability must have evolved because it helps them to survive.

This means that noise pollution caused by humans could have an impact on the health of herring populations.

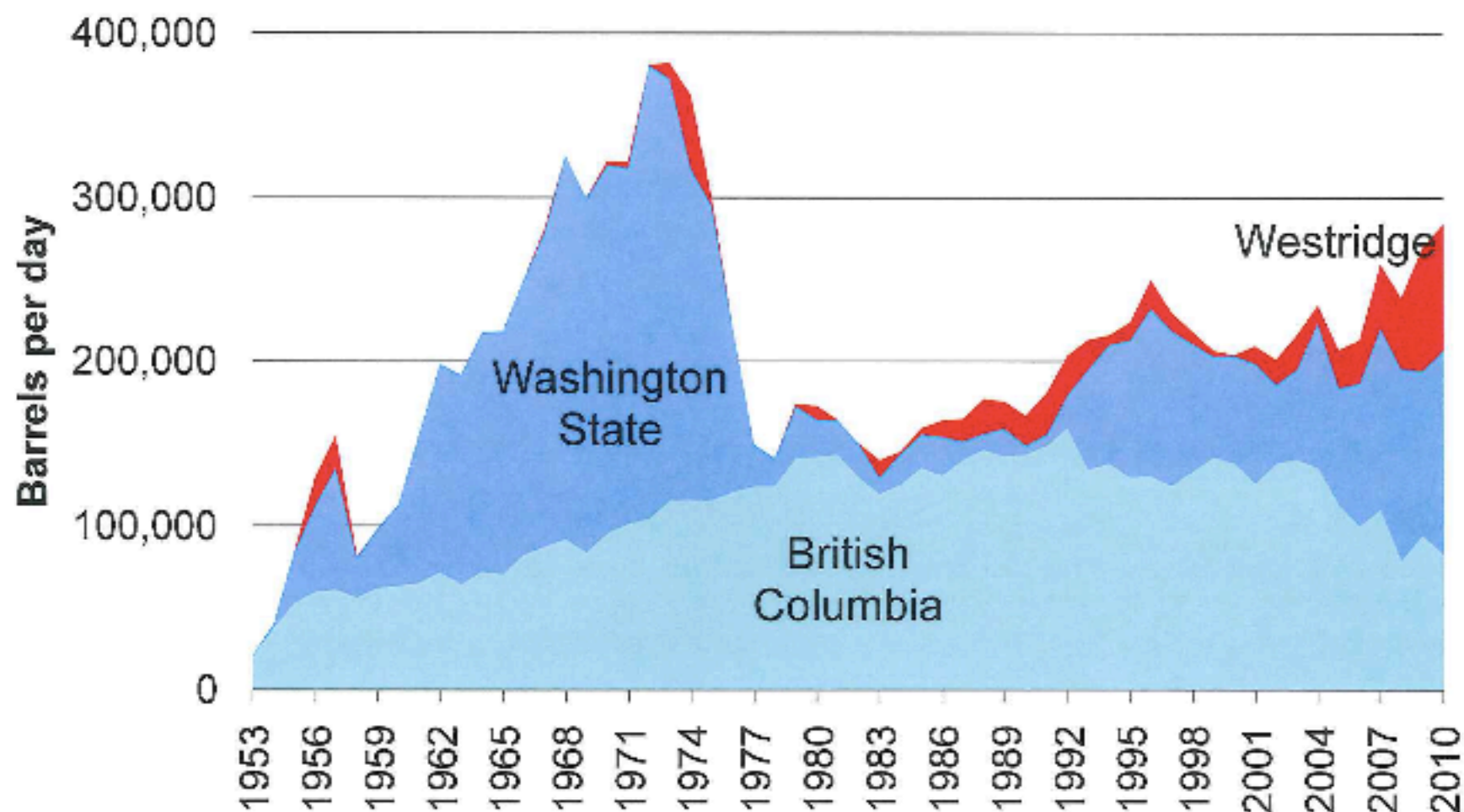
Other species of fish have been known to use their swim bladders to create grunting or buzzing sounds to attract potential sexual partners.

But this is the first time scientists have caught fish farting, says Dennis Higgs, a biologist at the University of Windsor. "No one thought these fish made any noise at all."

Do other fish may also make farting noises? "I just don't know," Wilson says.

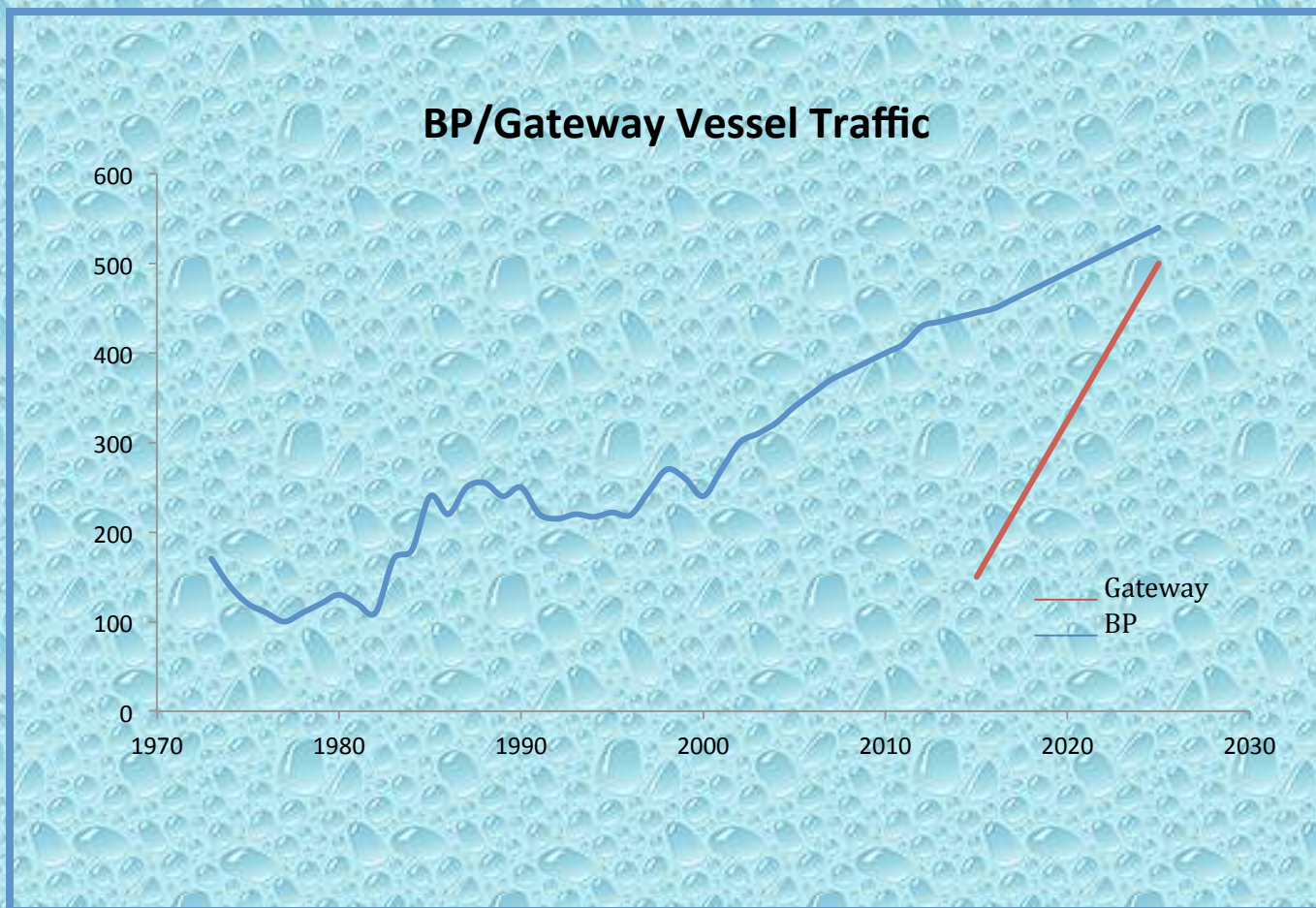


# Trans Mountain History





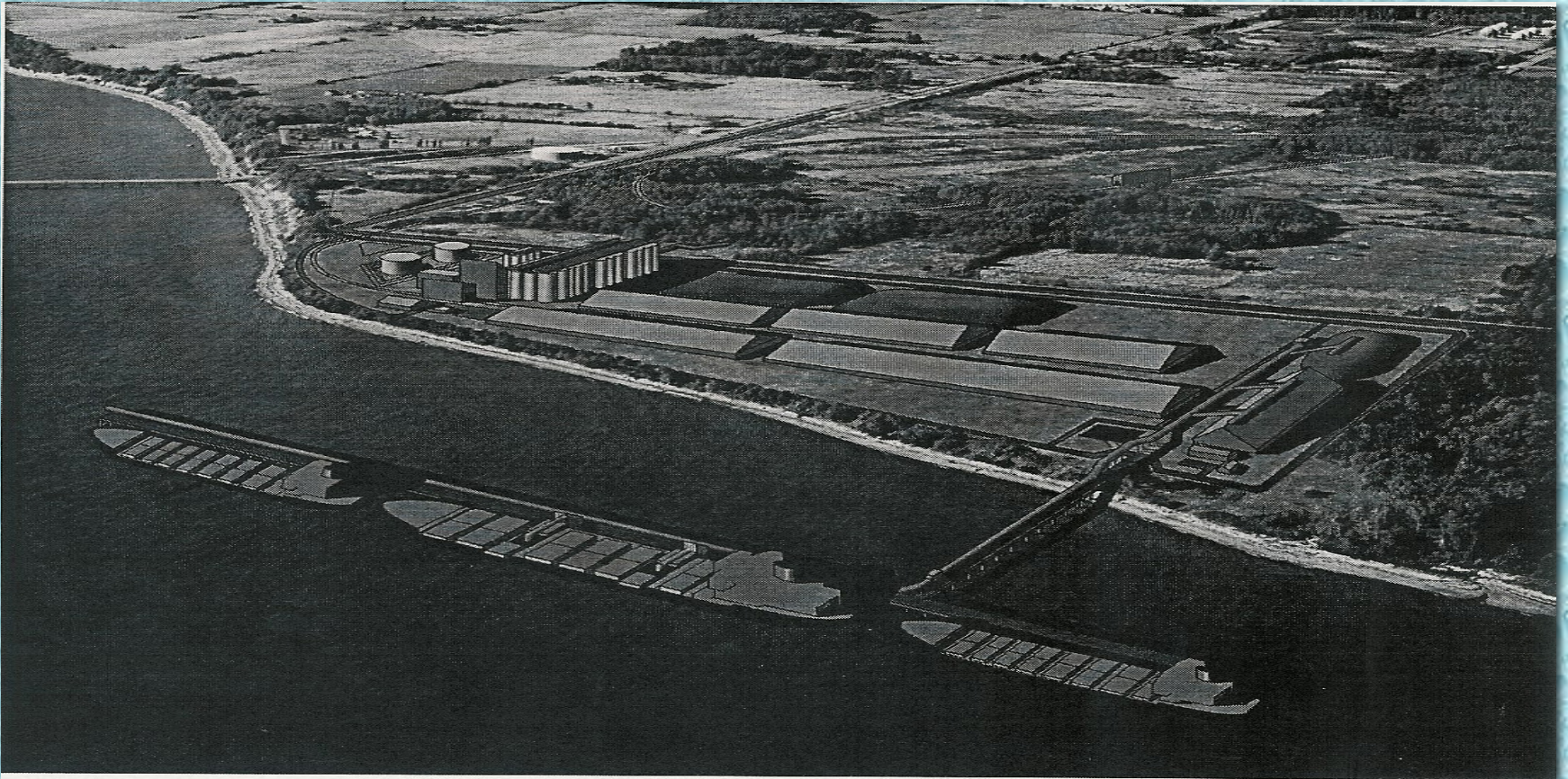
# Annual Vessel Docking at Gateway and BP



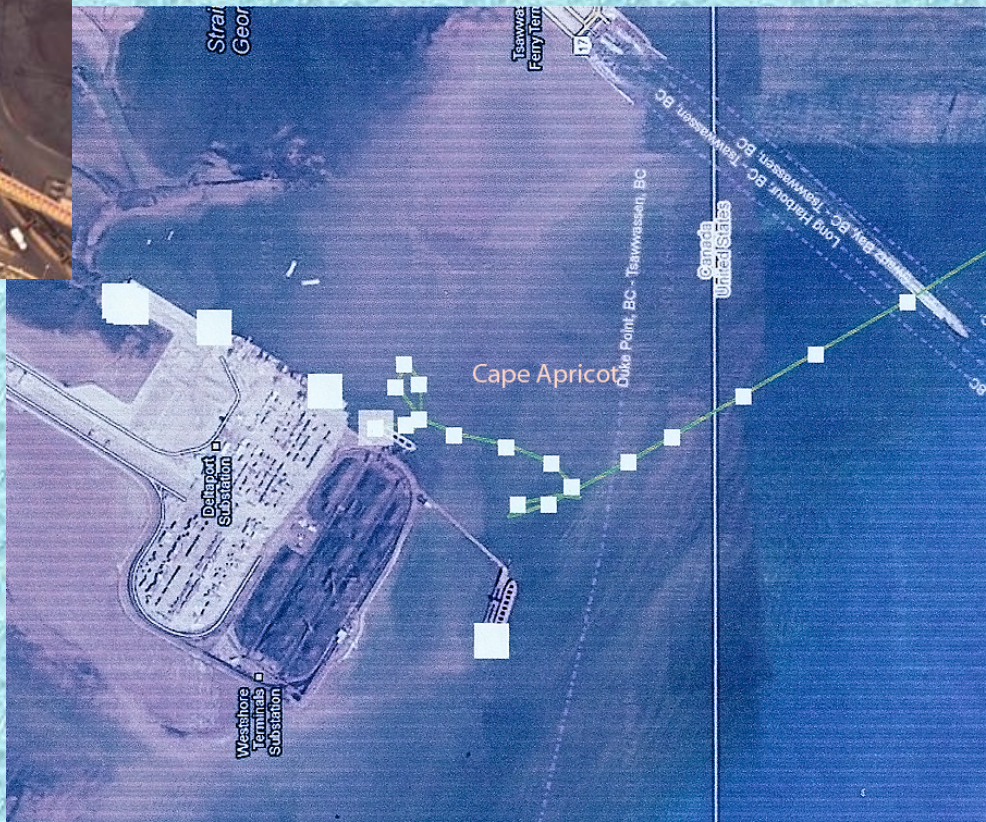


# Gateway Pacific Terminal

280-950 ship transists/year





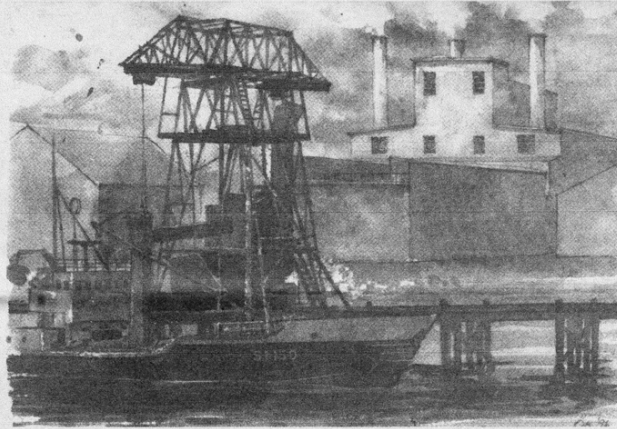


Thanks to Bob Aegeter for saving this image



The Herring Era Museum - Siglufjörður, Iceland

## Grána - Fish Meal and Oil Factory



## The Herring Adventure

- the history of herring fishery and industry in Iceland -

*Herring is one of this century's principal shapers of Icelanders' destinies. Without herring it is questionable whether the modern society that now exists in Iceland could ever have been developed. (Icelandic Historical Atlas, Vol.3, p.40)*



Around the turn of the 20th century Icelandic fishermen and vessel owners were introduced to new fisheries technology. The arrival of machine powered ships and highly efficient gear made extensive cod and herring fisheries possible. Rapid social improvements also helped usher in a new era, and widespread poverty and stagnation gradually became a thing of the past. Good herring seasons during the great depression of the 1930s, a period when overseas cod markets were closed, probably ensured Iceland economic independence and played a role in enabling the country to achieve freedom in 1944 following five centuries of Danish domination.

The events surrounding the herring fisheries were like an adventure for the Icelandic nation, the great herring adventure.

## Siglufjörður

The present day inhabitants of Siglufjörður still talk of the two Norwegian 'occupations' of the area: the first undertaken by the Viking Thormóður Rammi in the year 900 AD, the second being the 1903 influx that built the world's most famous herring town.



For years the entire life of Siglufjörður centred around the herring catch and its processing – the town's twenty-three salt-ing stations and five reducing factories were a living reminder of that.

Siglufjörður was also one of the most important ports in Iceland and on more than one occasion the herring exported from the town accounted for over 20% of the nation's total exports.

As the herring adventure progressed, a goldrush like atmosphere settled over the town, leading to Siglufjörður being dubbed the "Atlantic Klondyke". The town also became a magnet for herring speculators, becoming rich or poor with dizzying frequency. With its booming industry, Siglufjörður also became a mecca for tens of thousands of workers and labourers seeking employment.



# Thank you



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