

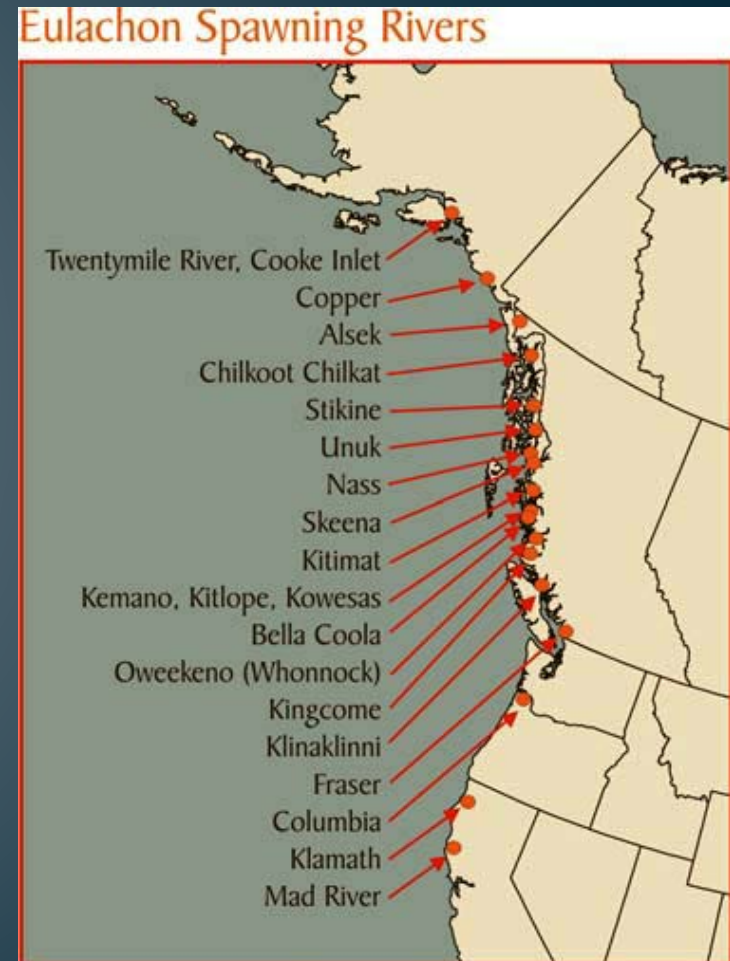


WDFW & ODFW EULACHON MONITORING AND RESEARCH

Olaf Langness, WDFW

Background

- System wide collapse of runs in 2005
- Cowlitz Tribe Petition
November 8, 2007
- NMFS Proposes ESA listing
March 13, 2009
- SDPS listed as threatened
effective May 17, 2010
- Commercial and sport
fisheries closed

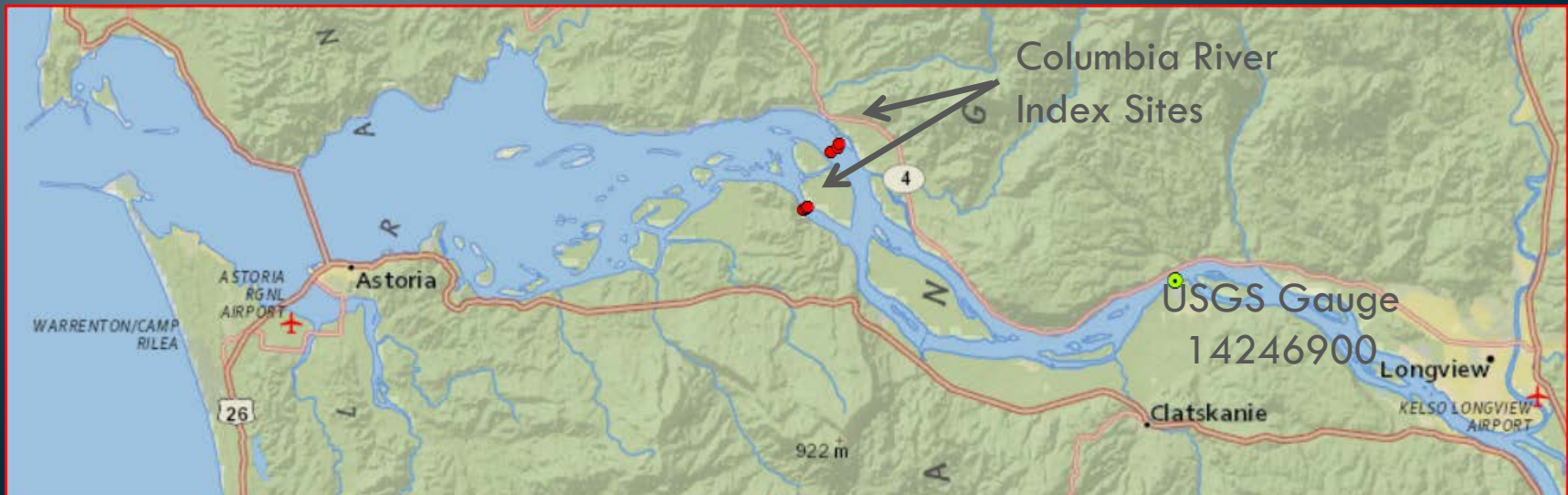
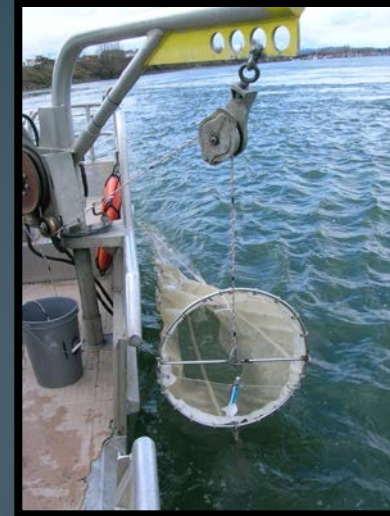


Background

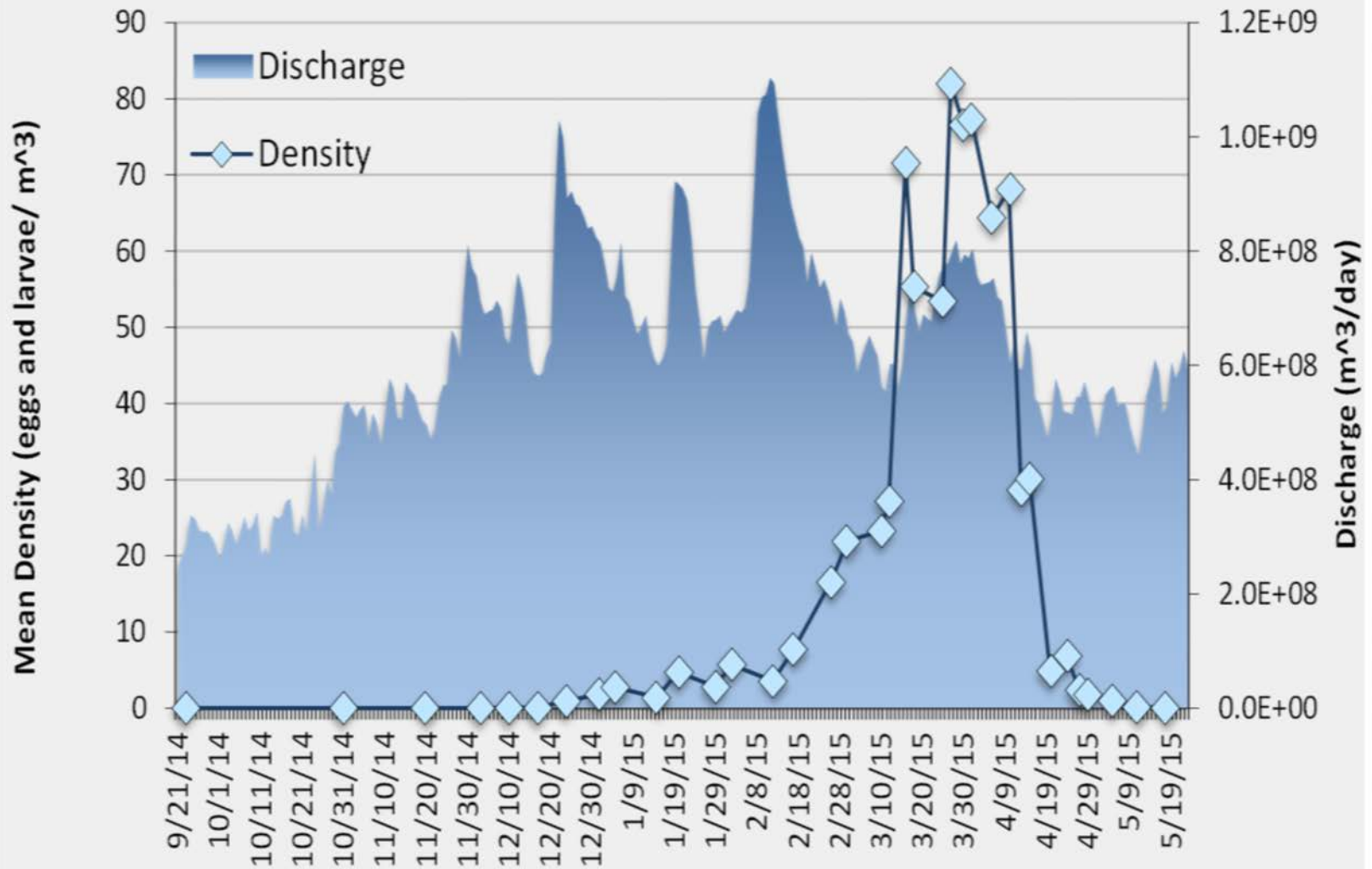
- July 1, 2010 Washington and Oregon receive 3 year Section 6 grant to estimate 2011-2013 spawning populations, explore critical habitat, and monitor eulachon bycatch in the coastal pink shrimp fishery
- July 1, 2014, WDFW and ODFW received separate Section 6 grants to continue monitoring runs in the Columbia River and to develop estimates in various coastal rivers for 2015, 2016 and 2017.
- WDFW received additional NMFS regional funding to gather data on the adult returns in 2013-2016 and estimate the 2014 run (not covered by Section 6 grants).

Spawning Stock Biomass Estimates

- Use method developed in Canada
 - Larval Densities near mouth
 - Expand for water volume over larval outflow period
 - Calculate adult equivalent



Spawning Stock Biomass Estimates



Spawning Stock Biomass Estimates

Parameter	Value
<u>Biological</u>	
sex ratio	1:1
mean female length (mm)	173
mean female weight (gram)	40.84
eggs/gram female	802.255
eggs/ female	32,766
mean fish weight (gram)	40.6
fish/pound	11.16
eggs/gram of fish	403.5
eggs/fish	16,383
egg to larvae survival	100%
<u>Bootstrap</u>	
Iterations	1,000
alpha	0.05
Confidence Level	0.95

Spawning Stock Biomass Estimates

Cumulative values for:	Plankton outflow	Number of spawners	SSB (pounds)	SSB (megagram)
Days Sampled	33			
n (per sample day)	6			
Mean egg density	1.48			
Mean larvae density	21.09			
Mean egg & larvae density	22.57			
Point estimate	2,017,000,000,000			
Bootstrap results				
Maximum	3,382,000,000,000	207,570,500	18,593,000	8,400
Upper CI	2,814,000,000,000	172,700,000	15,470,000	7,000
Mean	2,014,000,000,000	123,582,800	11,070,000	5,000
Median	1,999,000,000,000	122,700,000	10,990,000	5,000
Lower CI	1,293,000,000,000	79,400,000	7,110,000	3,200
Minimum	937,000,000,000	57,525,700	5,152,800	2,300

Eulachon Run Estimates (Pounds)

Year	Columbia River	Fraser River
2005	70,200	35,270
2006	110,500	63,930
2007	143,900	90,390
2008	216,700	22,050
2009	436,700	30,860
2010	157,700	8,860
2011	3,296,300	68,340
2012	3,197,800	264,600
2013	9,653,200	220,500
2014	16,632,100	145,500
2015	11,403,900	698,900

Spawning Stock Biomass Estimates

- In 2015
- Within the Columbia Basin
 - WDFW resumes sampling the Grays River (below the mainstem Columbia River monitoring site)



Spawning Stock Biomass Estimates

- In 2015
- Within the Columbia Basin
 - The Grays River is the only significant spawning site that exists below the mainstem Columbia River index site.

Run Year	Number of Spawners	As a % of Columbia R.
2011	8,200	0.02 %
2012	9,700	0.03%
2013	25,800	0.02%
2014	No Survey	
2015	184,383	0.17%

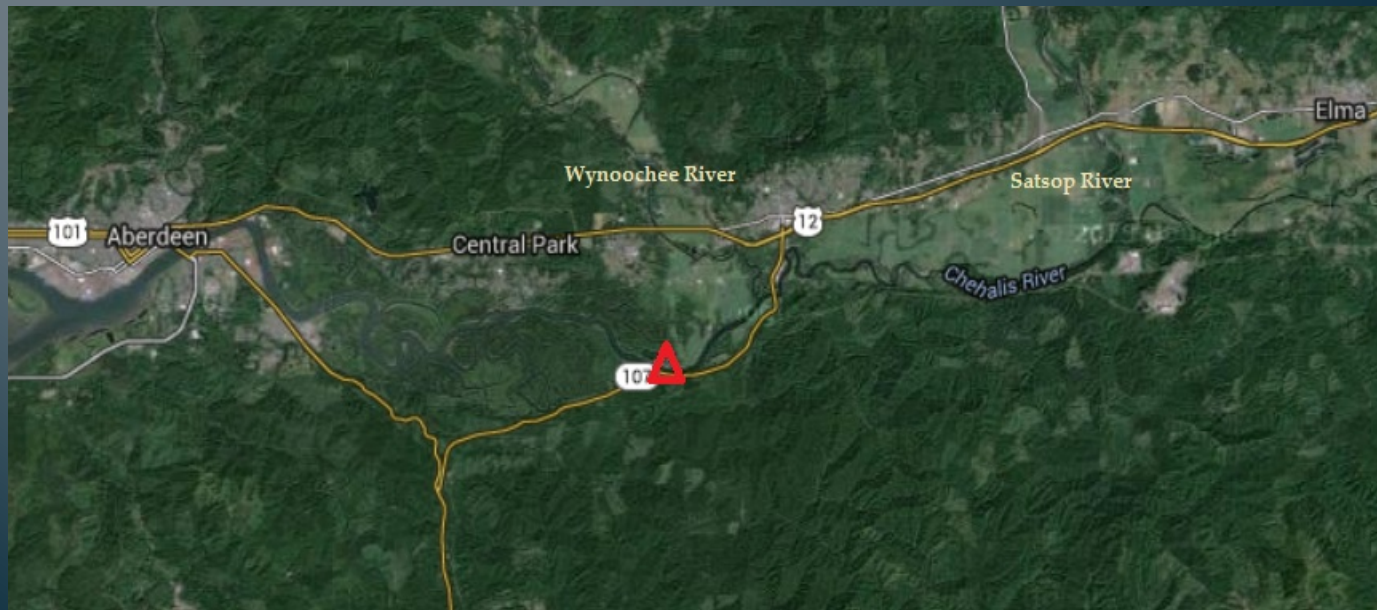
Spawning Stock Biomass Estimates

- In 2015
- Within the Columbia Basin
 - The Cowlitz Tribe F&W staff estimated an SSB for the Cowlitz River
 - Will see how much of the Columbia River production is attributed spawning in the Cowlitz River



Spawning Stock Biomass Estimates

- In 2015 Outside the Basin
 - WDFW did an SSB estimations for the Chehalis River



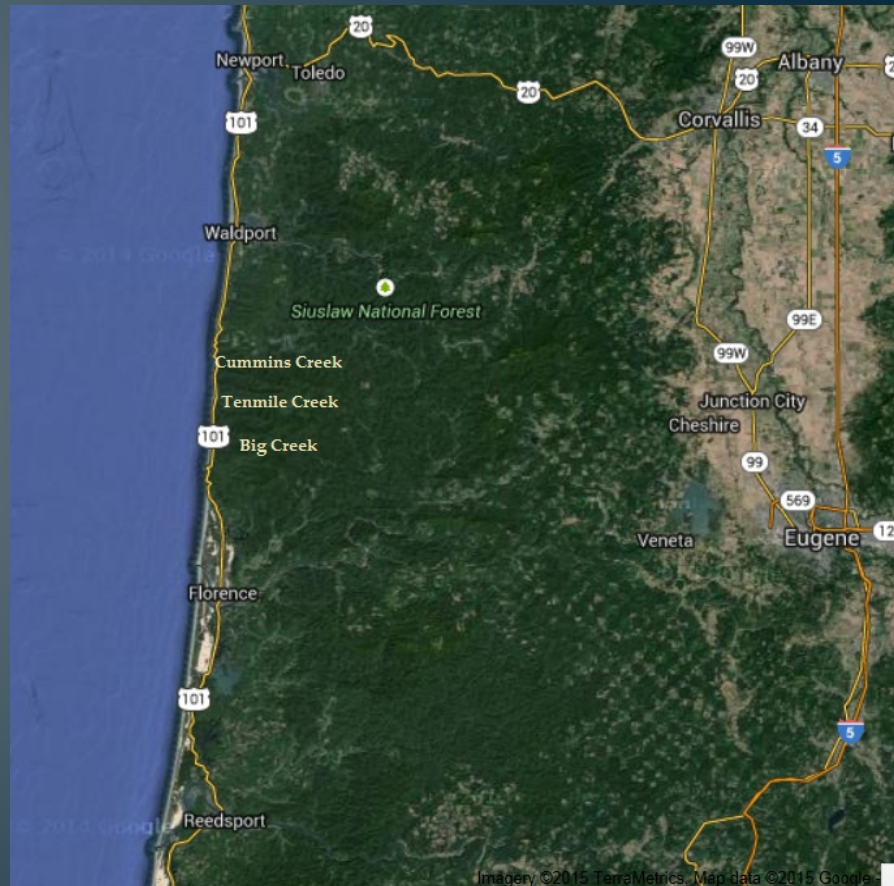
Spawning Stock Biomass Estimates

- In 2015 Outside the Basin
 - WDFW did an SSB estimation for the Naselle River



Spawning Stock Biomass Estimates

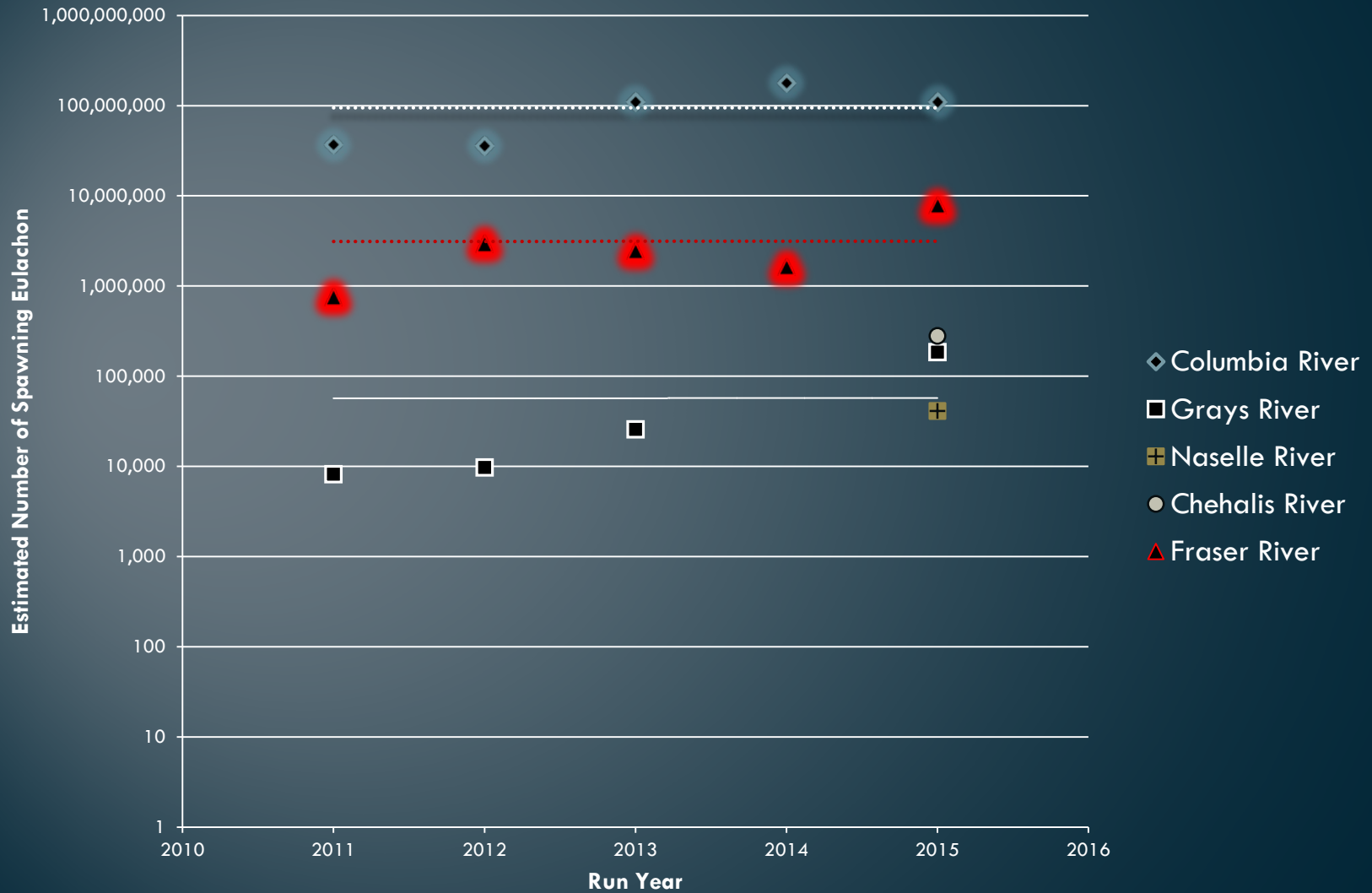
- In 2015 Outside the Basin
 - ODFW explored the possibilities of deriving SSB estimations for one or more central Oregon coastal streams (Tenmile, Cummins, and/or Big creeks)



Spawning Stock Biomass Estimates

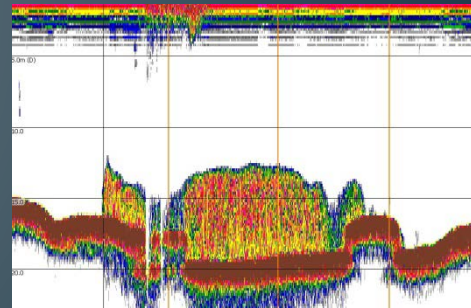
- Why should we look outside the Columbia River?
 - Can compare how runs to these rivers relate to the Columbia River run
 - Do they act as a sink for when the Columbia River conditions are not favorable?
 - Are they showing signs of recovery too?
 - Opportunity to collect genetic samples (larvae from plankton tows) from spawning locations outside the Columbia Basin

Spawning Stock Biomass Estimates



Adult Eulachon Sampling and Monitoring

- 2013 Contracted with NMFS Point Adams Research Station to collect adult bio-data used in the development of the SSB estimates
- Additional samples were provided by the Cowlitz Tribe from the Cowlitz River
- Average weight, gender ratio, and relative fecundity determined
- Genetic material collected



Adult Eulachon Sampling and Monitoring

- 2014 and 2015 we used limited commercial fisheries in the lower river to get the same data provided NMFS trawl operations in 2013
- 2014 and 2015 sport fisheries in the Cowlitz River and Sandy River were allowed
- The commercial fishery provides the adult bio-data and allows us to resume long-term monitoring of CPUE
- The sport fishery stimulates interest in the species and their protection

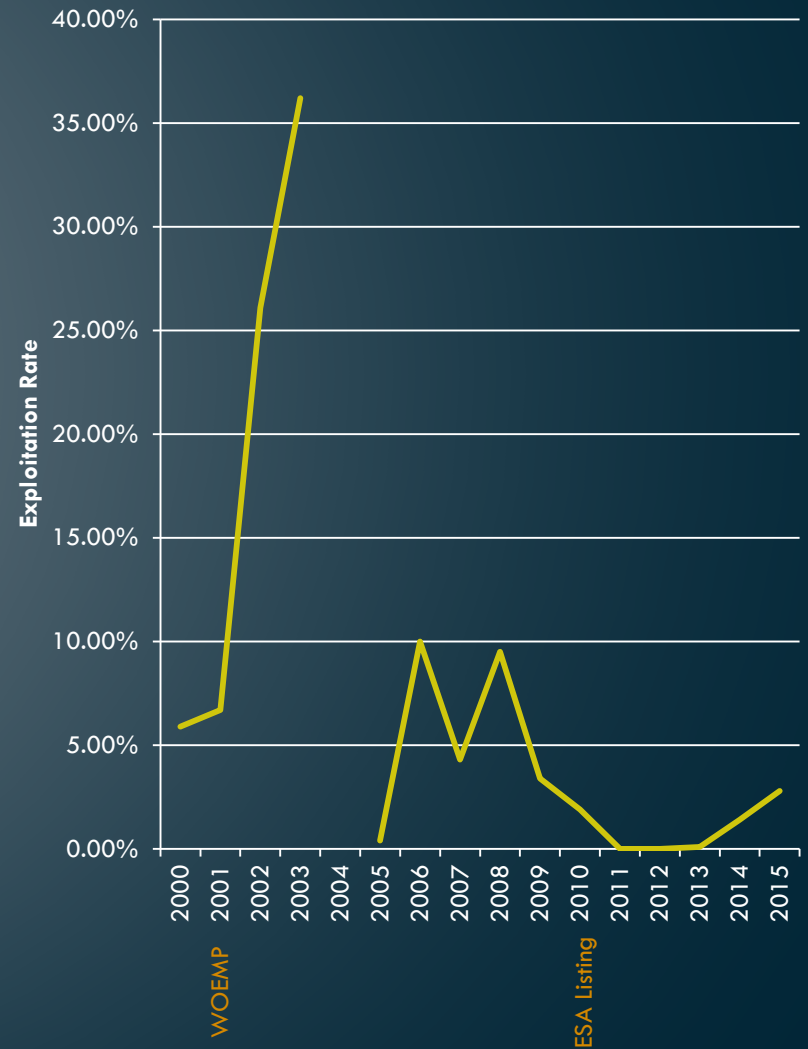
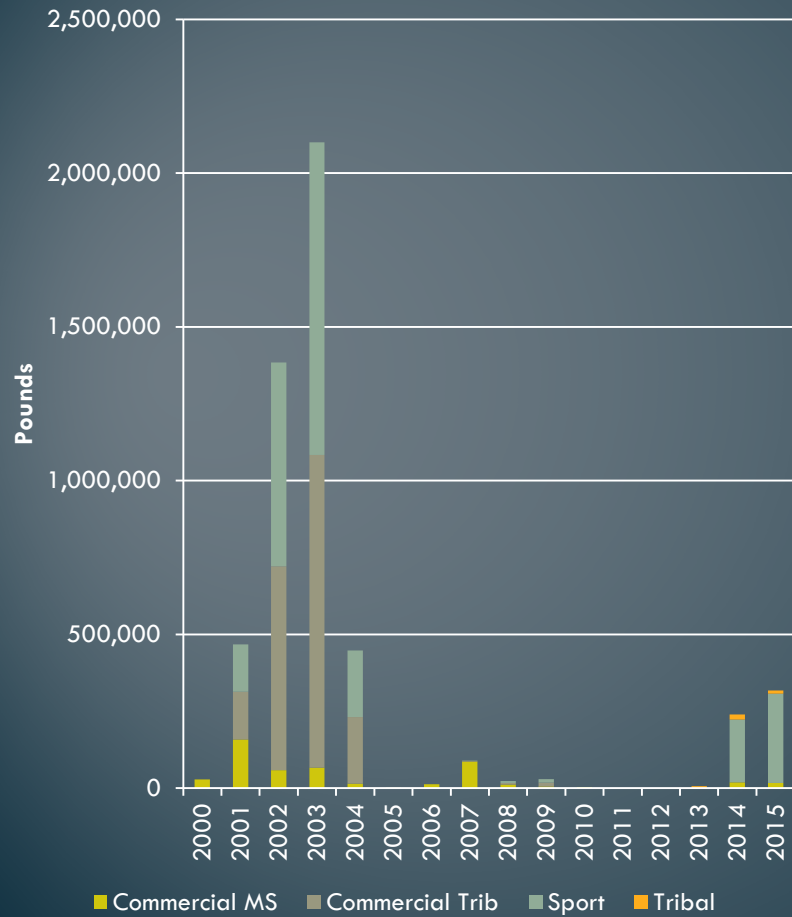


Adult Eulachon Sampling and Monitoring

- There is no 4(d) rule yet limiting take; however, as co-managers of a listed species WDFW and ODFW closed their fisheries during 2011-2013 and only opened them during 2014 and 2015 at levels below those prescribed in the WOEMP
- Prior to the listing, only the Yakima Tribe harvested smelt from the Cowlitz River
- Since the listing, the Cowlitz Tribe takes a portion of their research catch in the Cowlitz River for ceremonial purposes
- In the last two years, the Warm Springs, Umatilla, and Nisqually tribes have exerted their rights to also fish the Cowlitz and Sandy rivers

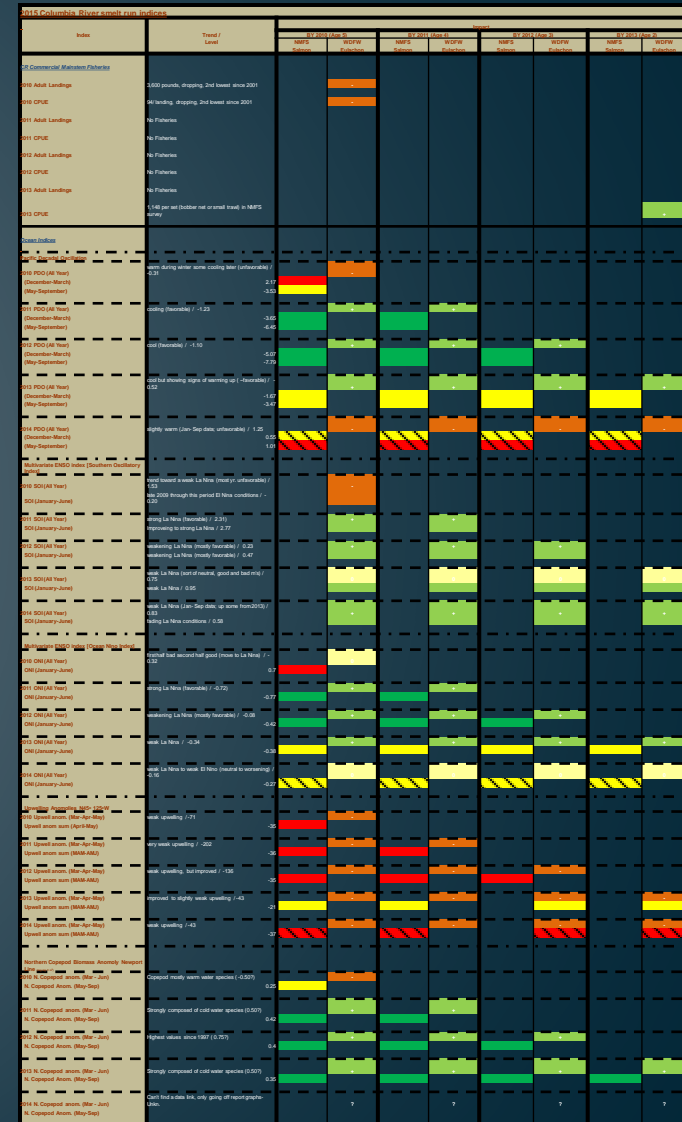


Fisheries Management



Fisheries Management

- When predicting a run, we assess the impact that various marine and freshwater conditions over the past few years might have on the return of a brood year
- 95% of a eulachon's life is at sea, so marine conditions are a strong indicator of run strength



Adult Biological Parameters

- Sex Ratios

- In 2002 Hays et al reported 1:1 ratio for the Frazier., N=2352 total.
- In Zamon et al. (unpublished, 2013) 914 fish were sampled and a 1.1:1 ratio reported.
- During our Commercial Eulachon season this year, we found that in three of our four Columbia River sampling trips, the ratio was 1:1 (N=800).
- The ratio for the Tributaries is still weighted heavily toward males
 - There may actually be more Males than Females in the tributaries
 - alternative hypothesis is that the un-equal sex distribution may be related to spatial and temporal differences that occur once the fish are in or near the tributaries.



6.8:1 Royal 1932

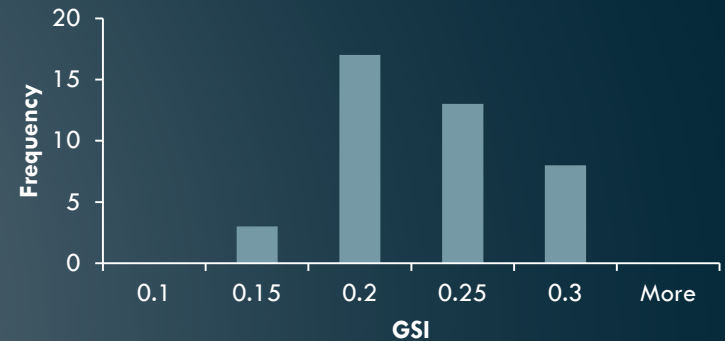
10.5:1 Unknown 1946

3:1 Smith & Saalfeld 1955

to 12:1

Adult Biological Parameters

- Fecundity
 - Wide range of published values
 - No evidence of selective sampling
 - Sample sizes unknown
 - Too small of sample



Rating

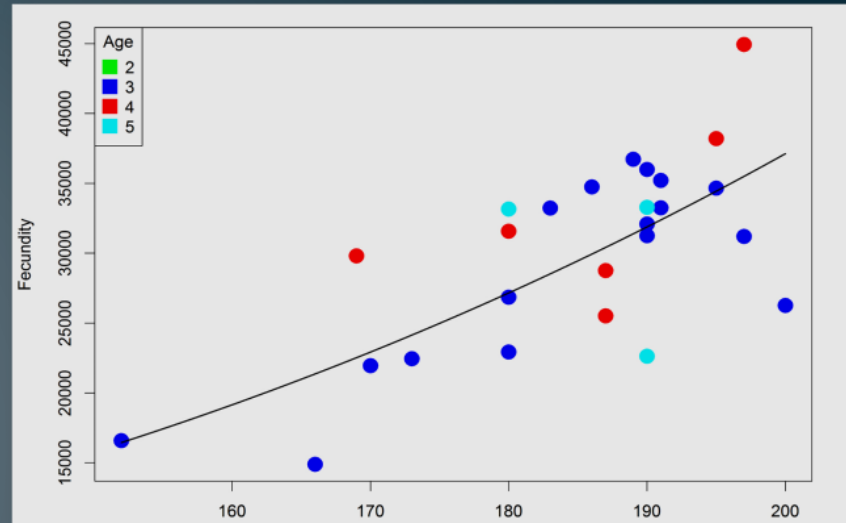
Maturation Index

- | | |
|---|--|
| 0 | Under-developed eggs, but potentially a current year spawner. |
| 1 | Tight skein, connective tissue present, ovary membrane thick. Turbidity may be high. |
| 2 | Slight reduction in all the above. |
| 3 | Decreased membrane thickness, skeins less tight (ie. eggs attaching to instruments or finger). |
| 4 | Continued reduction in membrane thickness; increase in loosening of skein. |
| 5 | Spawn-ready- eggs loose, membrane very thin, but mostly intact. |
| 6 | Spawning in progress, |
| 7 | Spawn-out-ovary bloody/flaccid, but eggs (both developed and oocytes) may still remain. |

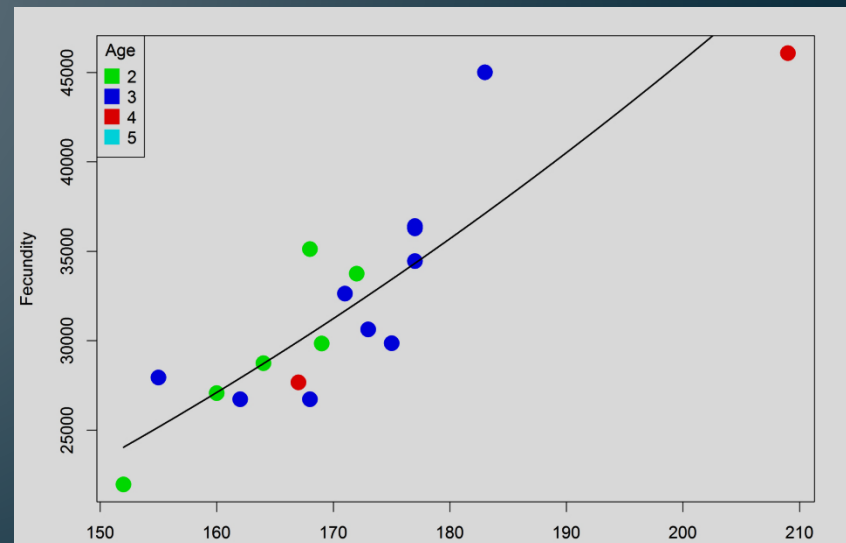
Adult Biological Parameters

- Fecundity
 - Length dependent
 - This relationship varies between years

2015

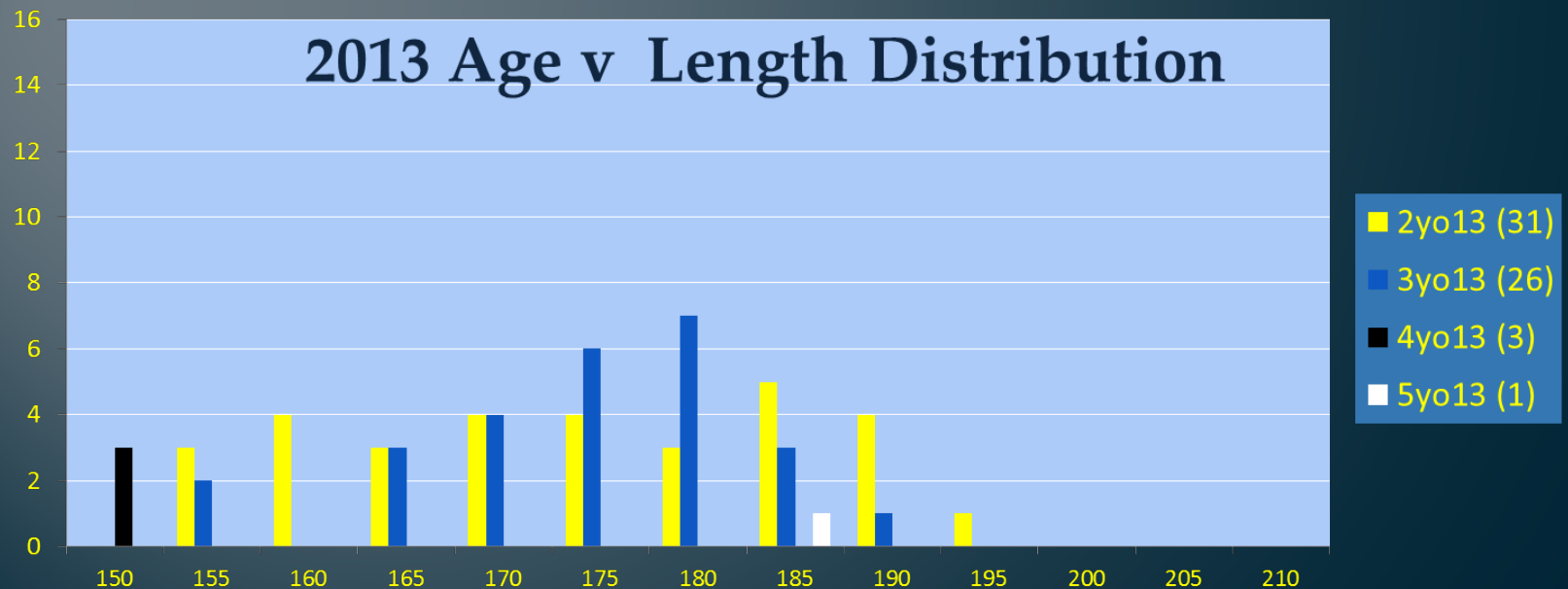


2013



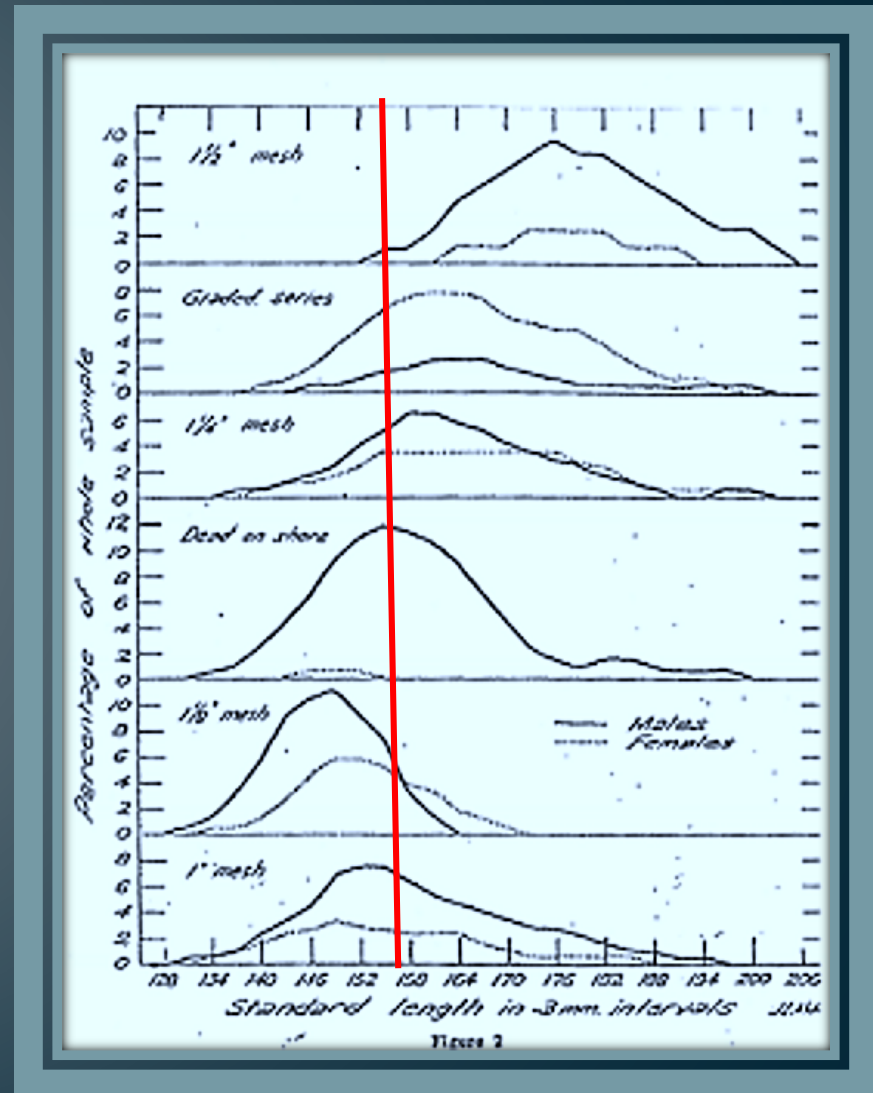
Adult Biological Parameters

- Fecundity
 - Length dependent
 - Strong overlap in lengths between age groups



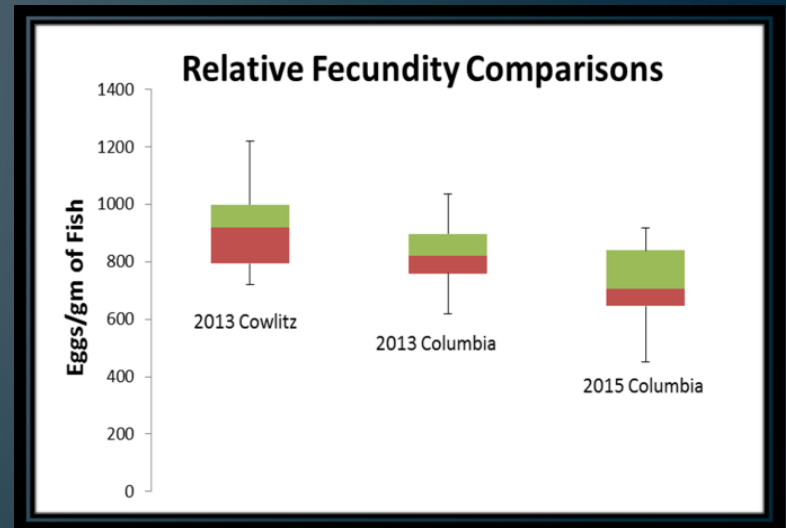
Adult Biological Parameters

- Fecundity
 - Length dependent
 - This relationship varies between years
 - Strong overlap in lengths between age groups
 - Need representative sample of the true length distribution



Adult Biological Parameters

- Fecundity
 - Wide range of published values
 - No evidence of selective sampling
 - Sample sizes unknown
 - Too small of sample
 - Length dependent
- Relative Fecundity (eggs/ gm BW)
 - Varies with each run
 - Connected to condition factor



What We Learned

- Annual Sampling is a must, for use in SSB

Length and weight

Sample throughout the run

Relative Fecundity

- Need both GSI (Gonad wt/Fish wt) and a way to analyze ovary condition
- Egg Diameter Tracking:

Could be useful

Not currently done

Marine Microplastic Debris

- Unusual materials were routinely being noticed in the gonads during counting
 - Are these just contaminated samples ?
 - Reviewed protocols
 - Changed to all glass labware
 - Contacted NMFS Ocean Debris Program for assistance
- Samples being examined by Julie Masura at the University of Washington Tacoma
 - Initial impressions it is polyethalene
 - Test equipment is still awaiting parts

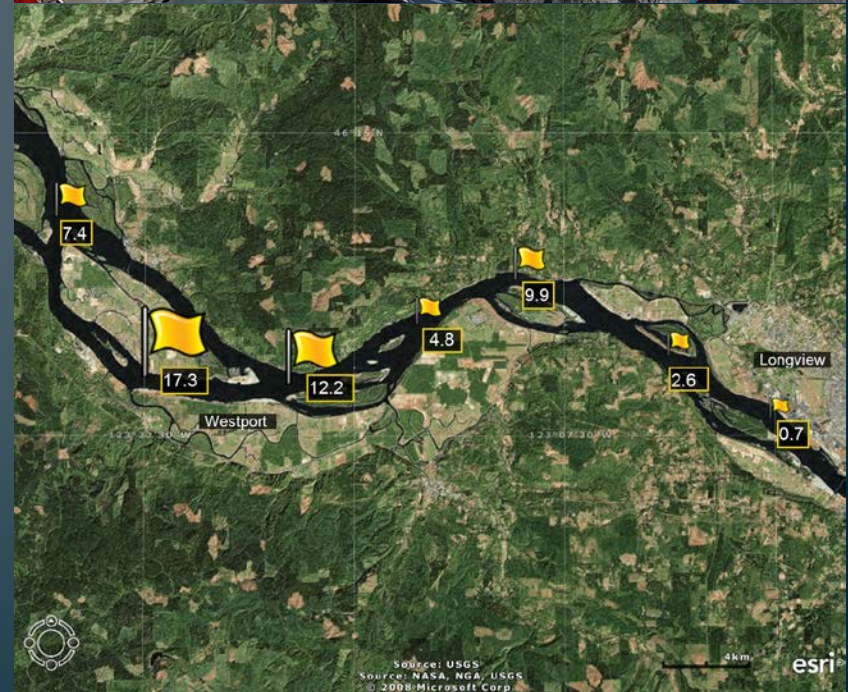


Genetics

- 2013 provided samples to the CRITFC Hagerman Lab
 - Used to develop SNP analysis
 - Some promise but still not able to separate Fraser and Columbia stocks
- Genetic samples from eulachon caught during the Pink Shrimp Trawl observation program
 - Mixed Stock Analysis on hold
- Attempted temporal comparison between the late and early components of the Columbia River run
 - Found many non-eulachon larvae complicating the comparison
 - Attempting to process more early samples to make a comparison
 - Raises some concern over what is being counted
 - Need look into Longfin Smelt

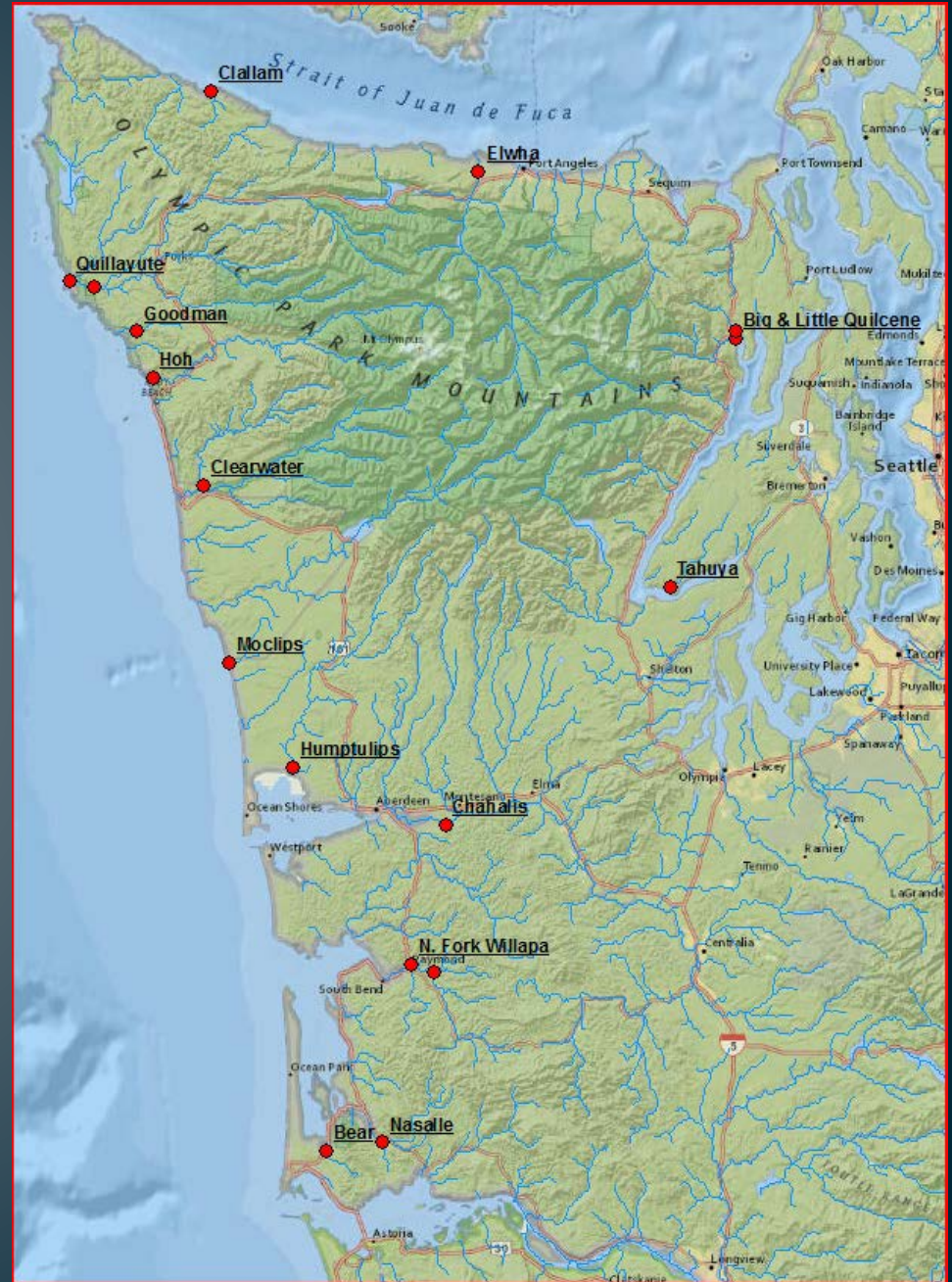
Critical Habitat

- During 2011 and 2012
 - Confirmed mainstem spawning concentrated between Eagle Cliff and the Cowlitz River (some occurs up to Bonneville)
 - Teamed with Cowlitz Tribe to determine extend of spawning in the tributaries where States found larvae
 - Discovered spawning in Skamokawa Creek



Critical Habitat

- Explored Olympic Peninsula rivers during 2011 and 2012
- Eulachon present in the
 - Chehalis
 - Willapa
 - Naselle
 - Bear



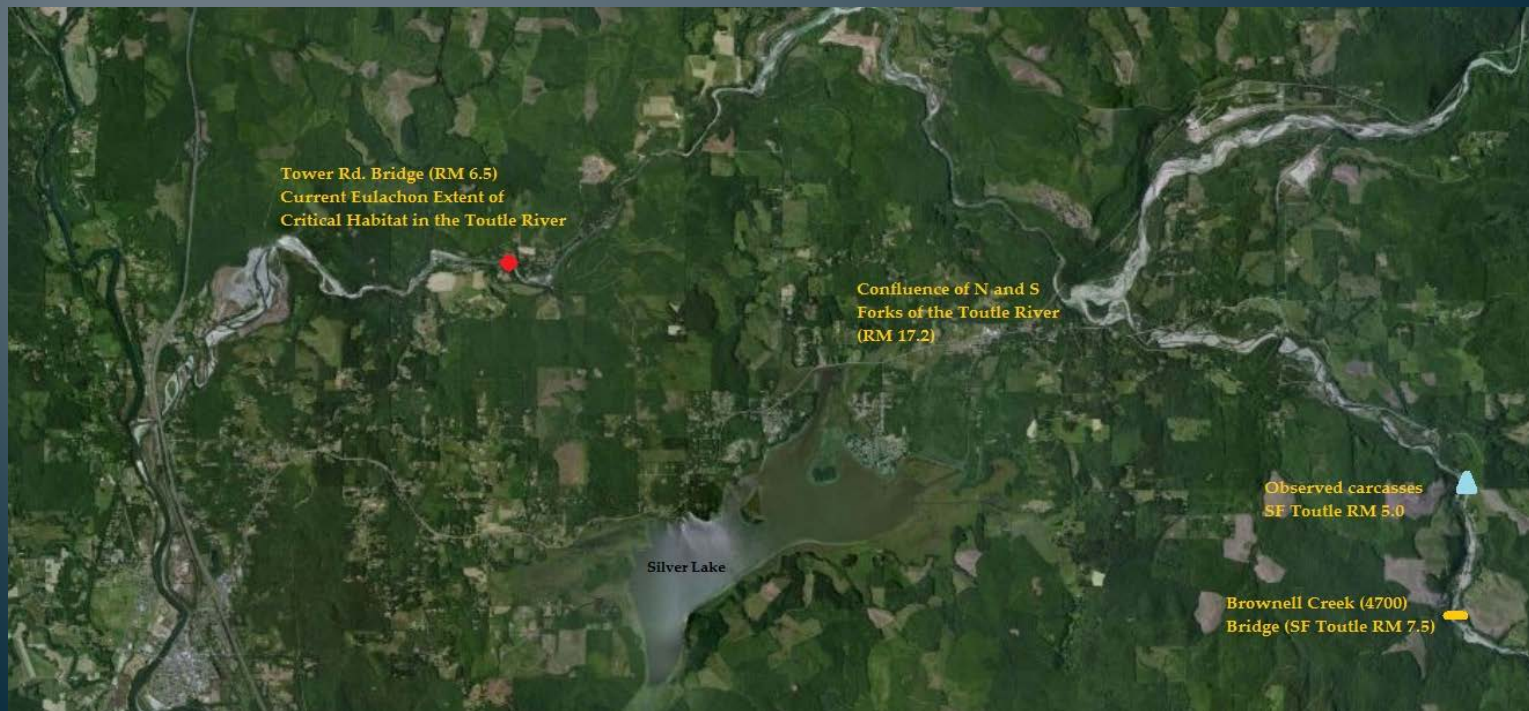
Critical Habitat

- Will continue comparing larval densities in the various tributaries of Grays Harbor and Willapa Bay during 2016 and 2017
- Coastal Watershed Institute reports hundreds of eulachon returning to the Elwha River this year (last time detected was 2005)



Critical Habitat

- Smelt observed this year 5 miles up the South Fork Toutle River—15+ miles above the Toutle River critical habitat boundary
- Smelt carcasses observed in Vancouver Lake and on the Portland and Vancouver shorelines



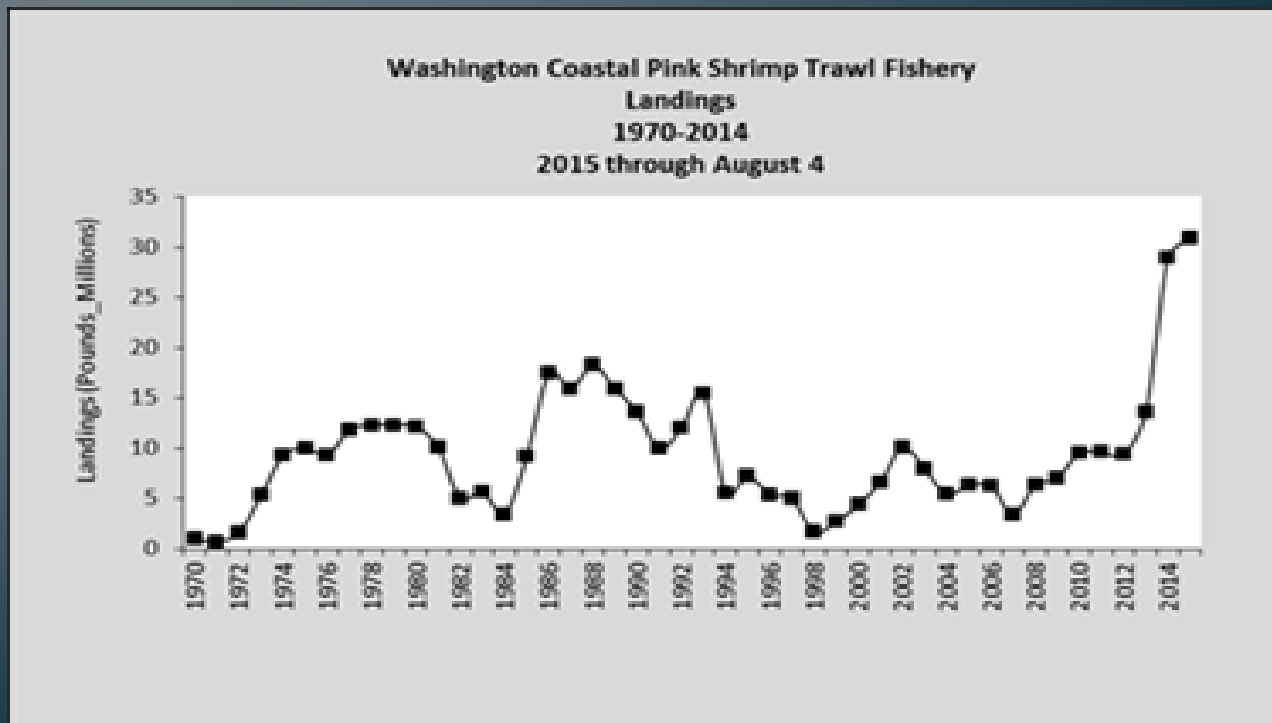
Shrimp Trawl Fishery

- Limiting the bar space in the excluder devices to < 1 inch greatly reduced eulachon bycatch in 2011
- Eulachon bycatch went up in 2012 likely due to an increase in eulachon and shrimp abundance
- WDFW Marine Resource staff monitored almost a quarter of trips made by the WA fleet during 2011 and 2012
- NMFS WCGOP assumed monitoring the fleet in 2013

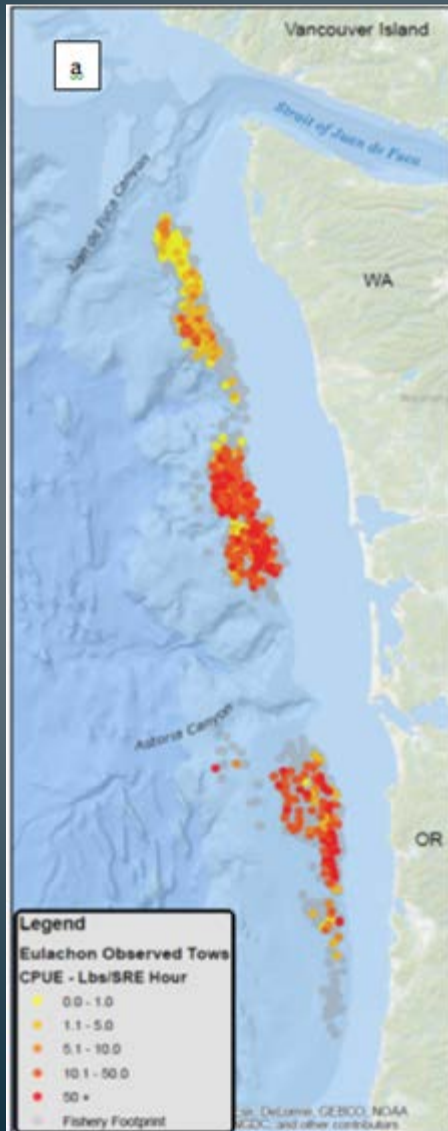


Shrimp Trawl Fishery

- Recent market demand in Europe has spurred an increase in pink shrimp trawl effort
 - Possibly increasing the bycatch despite latest excluder device and LED improvements



Shrimp Trawl Fishery



- The fleet has moved northward
 - Will this mean more fishing in the northernmost cluster of observations?
 - Will this put the fleet into areas not normally exploited, especially if the demand for more product remains?



Title: Smelt Festival
Queens—1942
Museum # 86.15.1
Cowlitz County Historical
Museum
405 Allen Street
Kelso, WA 98626

Any Questions?

Backup Slides for questions.....

Commercial Fisheries Sampling

2014

- 8 periods (2 per week)
- 38 deliveries
- 18,323 pounds harvested
- Average 482.2 pounds/ landing
- No samples taken

2015

- 8 periods (2 per week)
- 32 deliveries
- 16,524 pounds harvested
- Average 516.1 pounds/ landing
- About 118 pounds were sampled
- Average 11.2 fish/ pound
- 43.8% female
- In addition, 40.5 pounds were purchased for fecundity and aging estimations

Recreational Fisheries Sampling

2014

- Fisheries extended to 5 Saturdays
19,746 trips/participants
- 197,900 pounds harvested
- Trips averaged 22.1 min.
- Average 8.2 pounds/ trip

2015

- Only two Saturdays in February
- 34,100 trips/participants
- 287,400 pounds harvested
- Trips averaged 54.1 min.
- Average 8.4 pounds/ trip
- 17.1% female
- 81.3% females ripe
- Average size of fish similar to commercial average though noticeably small fish could be seen in samples on the 2nd Saturday