Assessment of *Ceratonova shasta* in the Clackamas River Upstream of Clackamas Hatchery

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ODFW Fish Health Services
NWFCC 2015
Current: Clackamas R water below the dam is pumped to the hatchery

2016 Plan: Place a gravity fed pipeline from reservoir above River Mill Dam

*map courtesy R. Holt
Current Rearing Program

• **Spring Chinook**- spawned but eggs hatch at Bonneville and juveniles transfer back in the fall. Juvenile rearing: November-March

• **Coho** juveniles: June-October

• **Winter Steelhead**- spawned but eggs hatch at Bonneville and juveniles transfer back in the winter/spring. 4 week acclimation spring release.
Why all the fish moving?

- Clackamas River has high summer temperatures (>65°F)
- History of Ich, Columnaris and *C. shasta*
- Large ponds prevent formalin treatment against Ich
- Coho most refractile to Ich and Columnaris during the summer
Current fish diseases

• Columnaris occurs annually but can be treated with Oxytetracycline
• Ich- coho not too bothered, if ChS in raceways can use formalin
• *C. shasta* no treatments, best to avoid but fish can recover if low dose
First *C. shasta* detected at Clackamas Hatchery 2007
C. shasta at Clackamas Hatchery 2015

- Infections annually in coho, low level loss
- 2015 hatch and rear spring Chinook - severe loss from Columnaris and C. shasta lost >60% of population
- Rainbow trout for whirling disease testing - 50% mortality by termination in May

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<tr>
<td>I</td>
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C. shasta - lifecycle

- **myxospore**
- **salmonid**
- **actinospore**
- **polychaete**
**C. shasta** and Ceratomyxosis

- Enters via gills, initially in blood

- Primarily invades intestinal tract but can affect any tissue—kidney, liver, eyes

- Epithelial lining necrotises, fragments, ultimately sloughs

*photos courtesy C. Banner and R. Holt*
Will reservoir water have a lower pathogen load?
OSU 2009 study

- Sentinel fish exposures in July demonstrated *C. shasta* infection
  - Hatchery intake (77.5%), at River Mill Dam fish ladder (72%) and at the upper Clackamas River (4%).

- Water samples for the parasite revealed:
  - *C. shasta* DNA levels equivalent to 1-10 spore/L at 5 sentinel sites in July
  - On August 25, all 37 sites had low levels of less than 1 spore/L
What we know now

- OSU results: upstream levels should be lower
- But in last 10 years the parasite went from undetected to established and causing epizootics at the hatchery

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Water sample monitoring

- Replicate 1 L water samples collected at Hatchery and 30 ft depth at Dam (new pipeline)
- Water filtered and DNA extracted
- Quantitative PCR to compare relative parasite abundance
Pipeline site

Photos courtesy of Dan Straw
Sampling water at depth

Photos courtesy of Dan Straw
Water collection and filtration

Photos courtesy of Dan Straw
DNA extraction and qPCR

- qPCR run by Bartholomew lab OSU

Slide courtesy of Rich Holt
Preliminary Results

1 spore/L lethal to susceptible Rbt

10 spore/L lethal to resistant Chinook
*Bartholomew data

Klamath R

1 spore/L lethal to susceptible Rbt
Next steps

• Continue monitoring through spring and summer
• Genotype samples to determine which species would do best at hatchery
• Special thanks to Derek Gibbs (ODFW Fish Heath), Clackamas Hatchery crew and Bartholomew lab staff especially Rich Holt, Julie Alexander, Damien Barrett