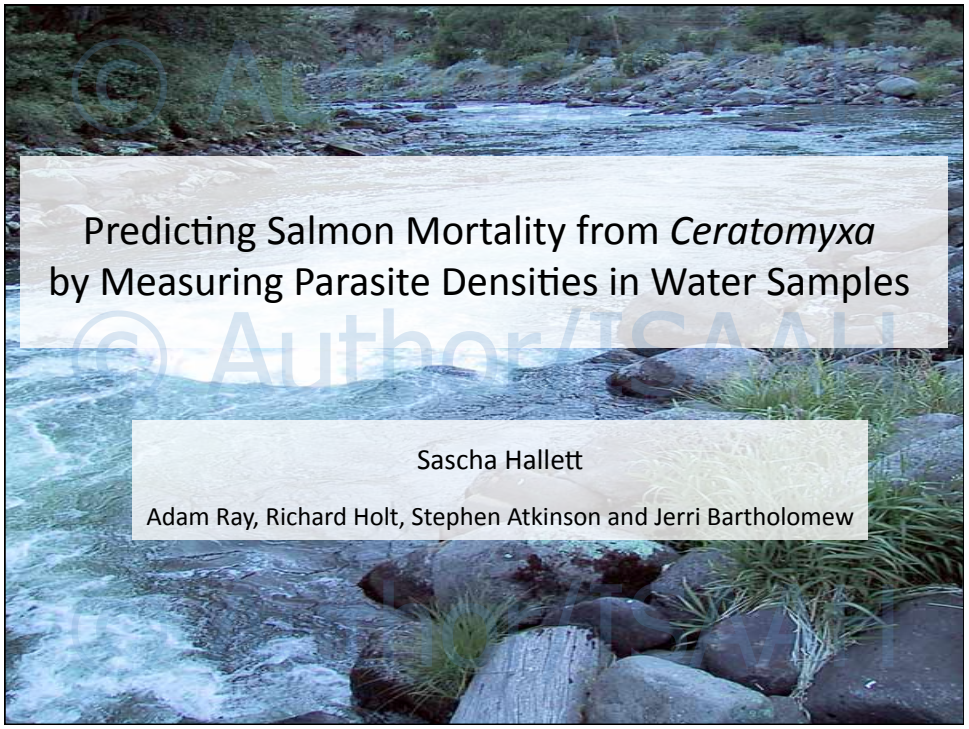


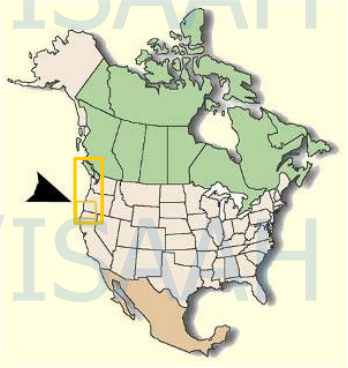
Predicting Salmon Mortality from *Ceratomyxa* by Measuring Parasite Densities in Water Samples

Sascha Hallett

Adam Ray, Richard Holt, Stephen Atkinson and Jerri Bartholomew

Ceratomyxa shasta

- Distribution limited to Pacific NW of North America
- Endoparasite of salmonids
- Primarily invades intestinal tract
- Epithelial lining necrotises, fragments, ultimately sloughs
- Heavy infections become systemic



2

Ceratomyxa shasta – life cycle

myxospore

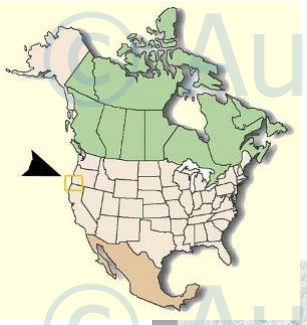
polychaete

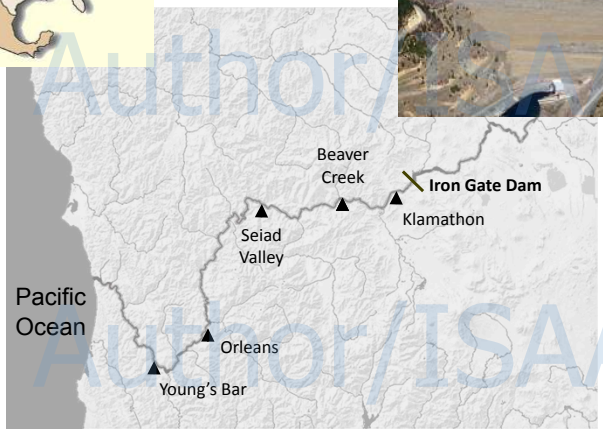
salmonid

actinospore

3

Area of Interest = Klamath River

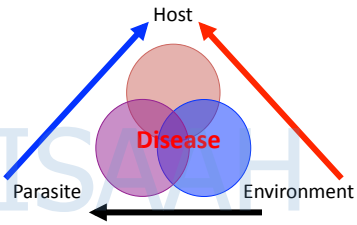




4

Ceratomyxa in the Klamath

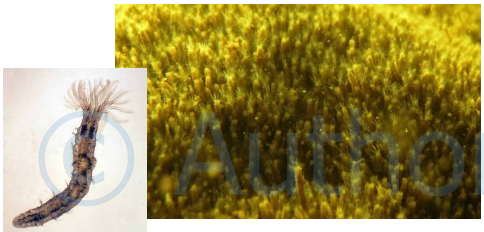
- Trapping out migrant fish over the past decade (USFWS)
  - 35-80% infection
  - Chronic mortality not easily detected
- In other rivers infection prevalence in native salmonids is low
- in the Klamath River, *C. shasta* impacts juveniles and prespawning adults
- Is a key factor limiting salmon recovery

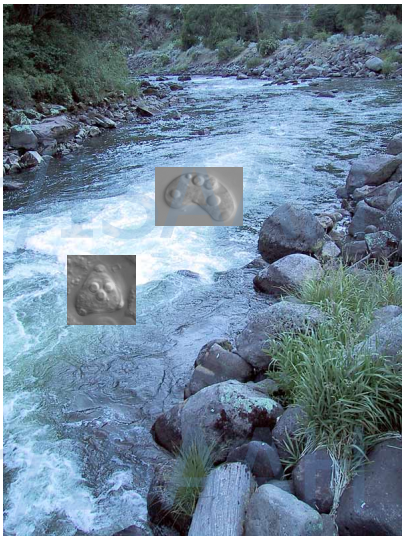


Monitoring Studies

- Presence and abundance
- Spatial & temporal

- Sentinel fish exposures
- Water sampling
- Polychaete collection

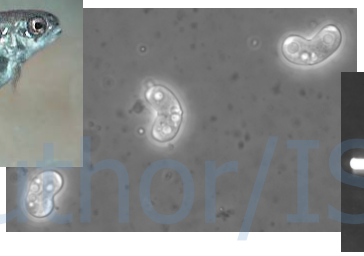
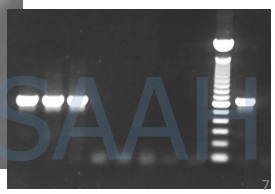




Sentinel Fish Exposures





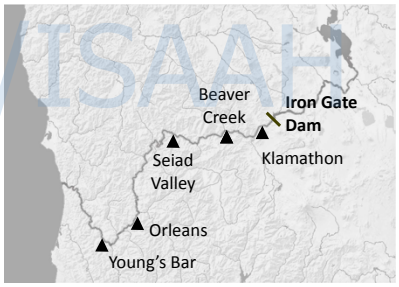
Water samples

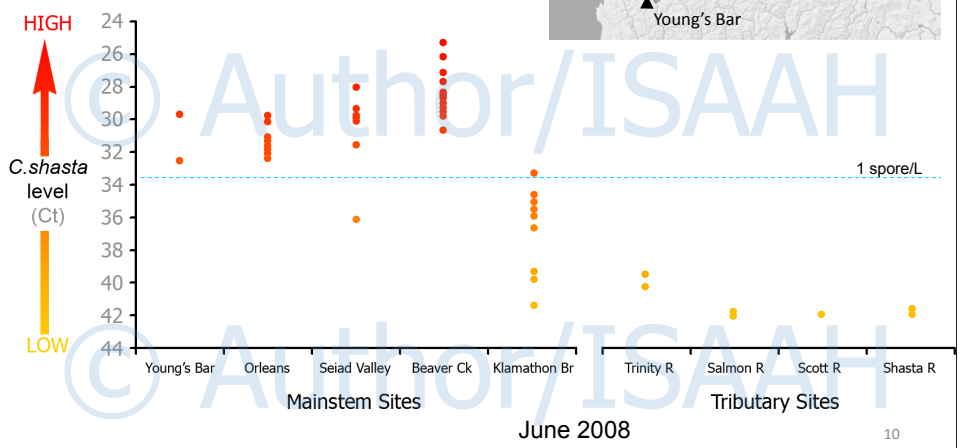





Spatial distribution

- Identify sites of high abundance





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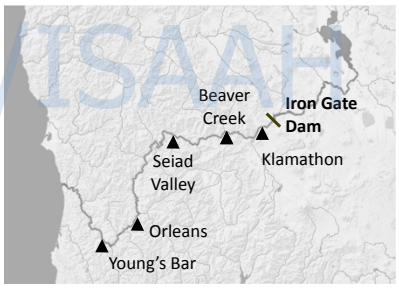
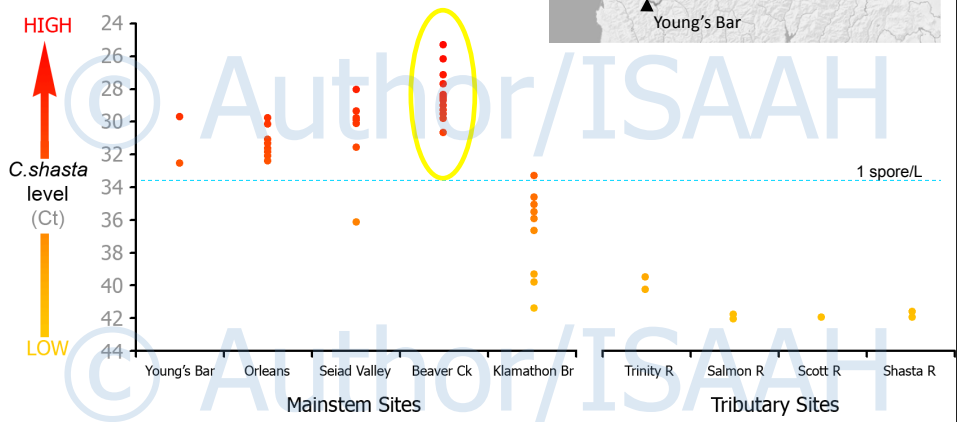
Spatial distribution

- Identify sites of high abundance



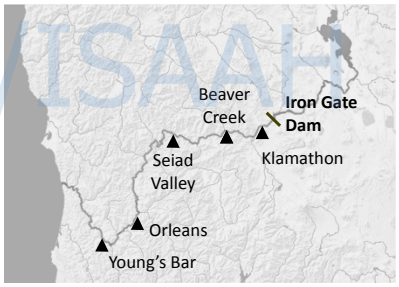


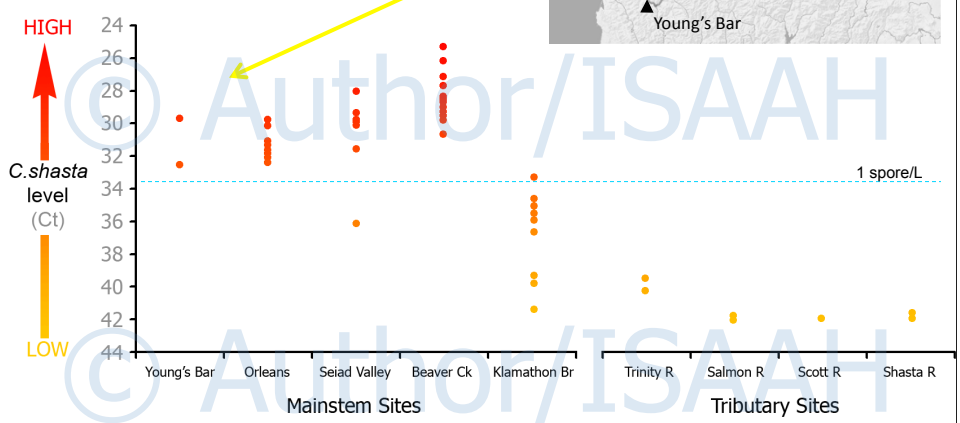
June 2008

11

Spatial distribution

- Identify sites of high abundance





June 2008

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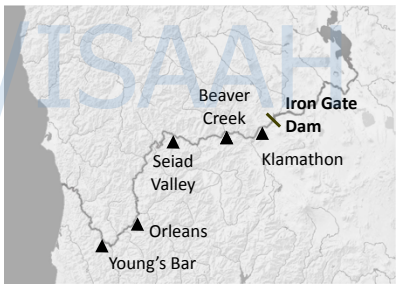
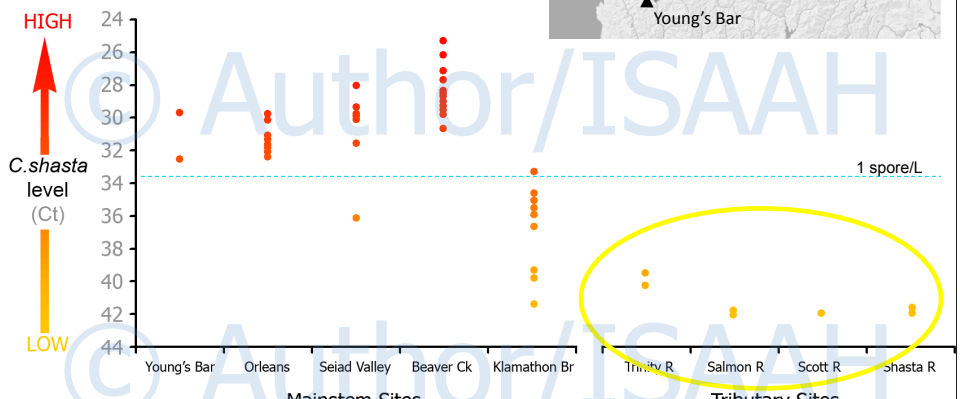
Spatial distribution

- Identify sites of high abundance





June 2008

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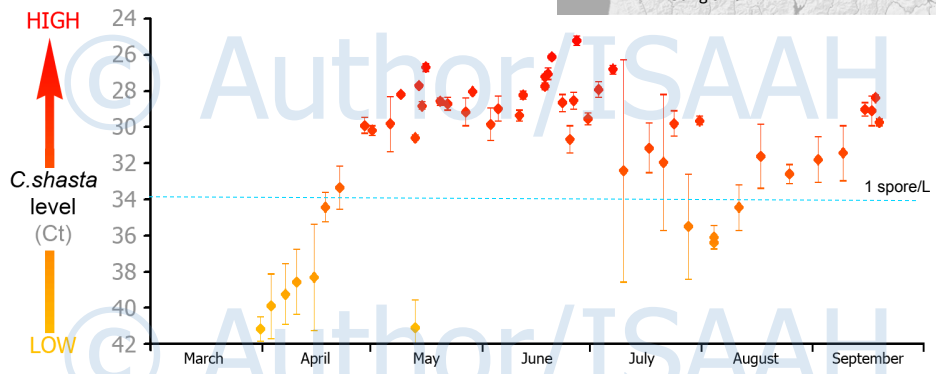
Temporal distribution



Beaver Creek, 2008

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Objective

- Determine if levels of parasite in water samples can be used as a tool to predict levels of mortality in fish

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Approach

Sentinel fish

Chinook & coho salmon, rainbow trout

4d in cages in river

May, June, September

monitored 60-90d in lab

= quantify morbidity & mean-day-to-death

Water samples

3 x 1L, filtered @5µm, qPCR

= quantify total abundance

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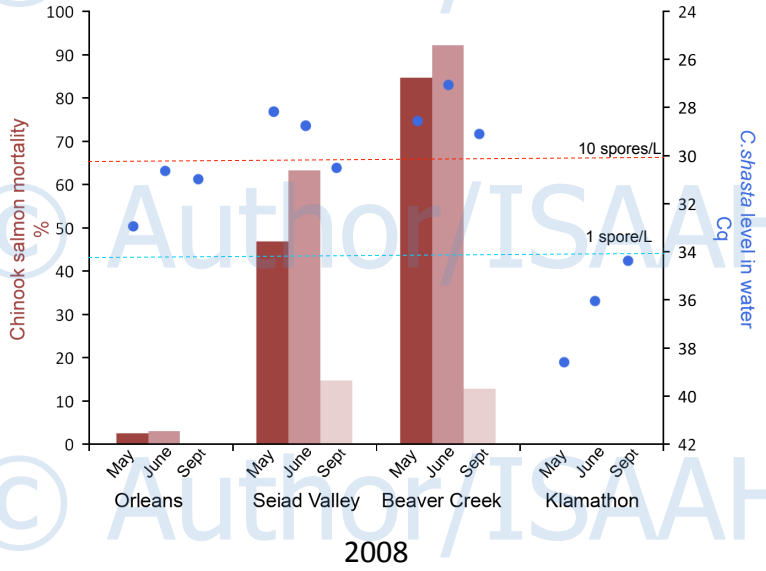
Results – Chinook & water, by month



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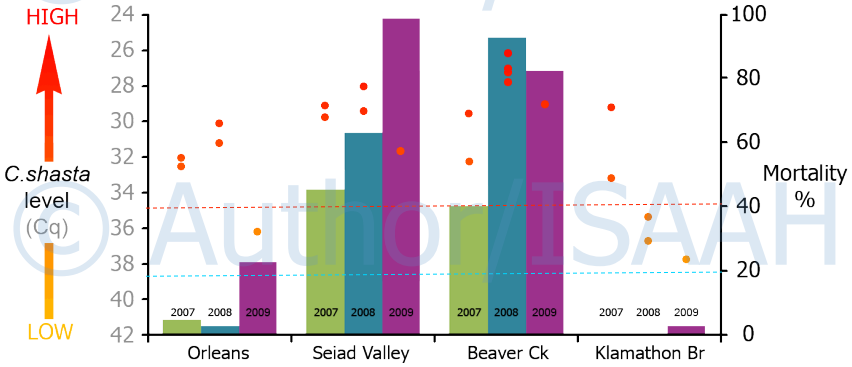
Results – Chinook & water, 2007-2009



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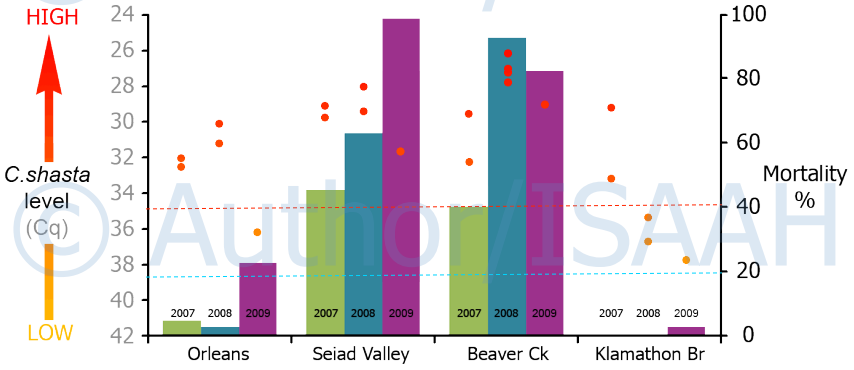
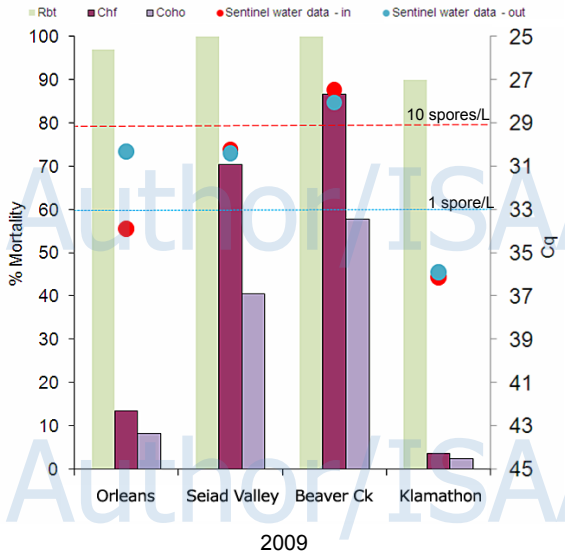
Results – Chinook & water, 2007-2009



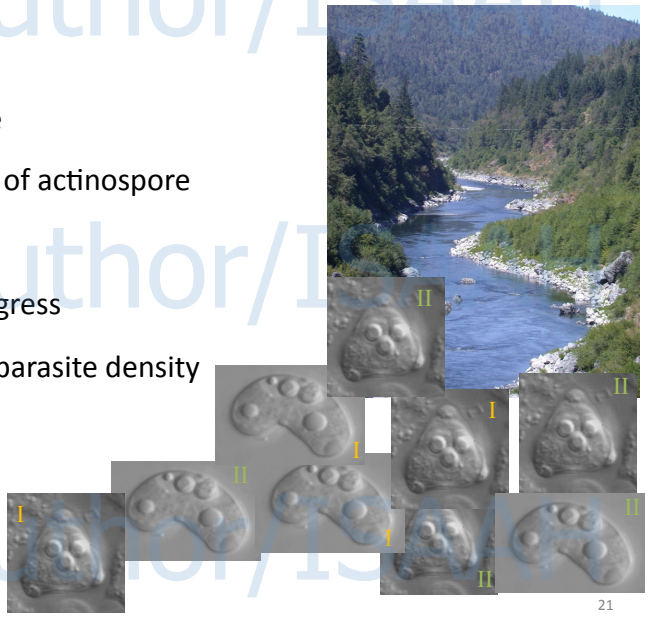
- 2 thresholds
  - 1 spore/L - any mortality
  - 10 spores/L – severe mortality ← Management target

Results – all fish compared



Considerations

- Flow
  - affects dose
  - attachment of actinospore
- Temperature
  - disease progress
- Measure total parasite density
  - actinospore
  - genotype



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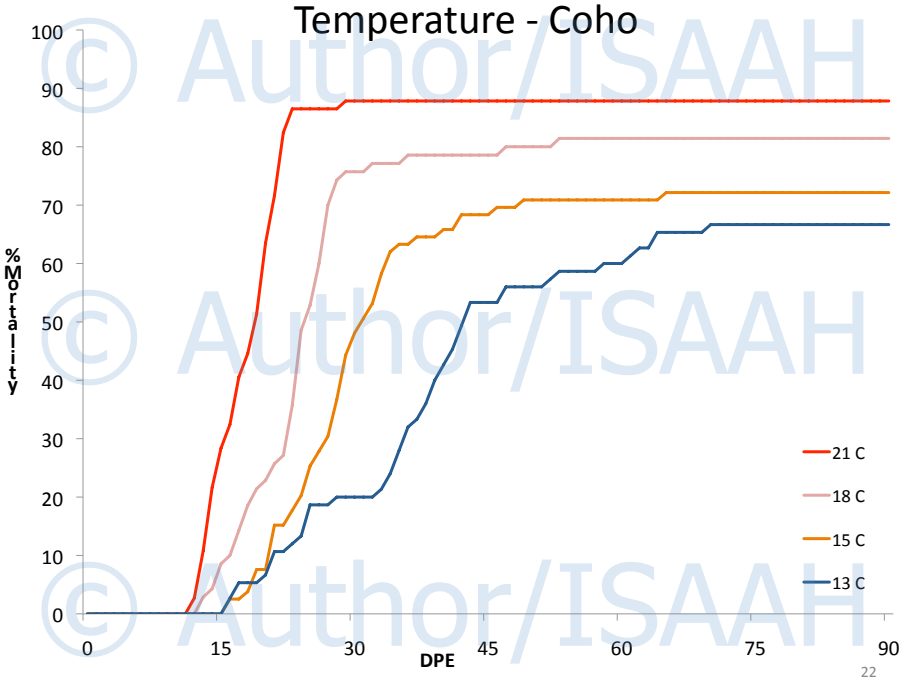
Temperature - Coho



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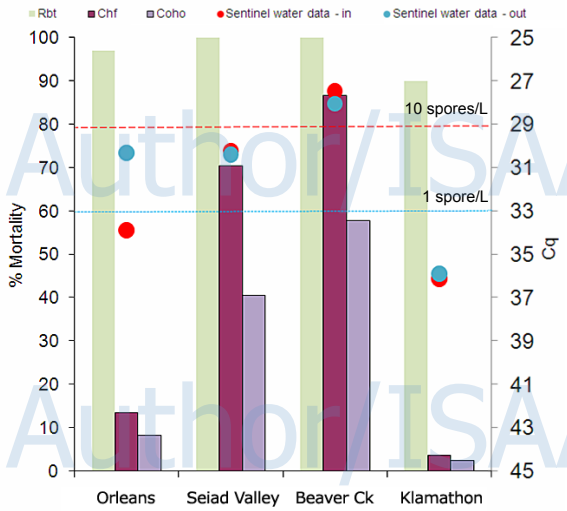
Results – genotype data added

I	Chinook	40	50	80	bdl
II	RbT, coho	60	50	20	bdl



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Acknowledgements

- PCR - fish
  - -- Jenny Dubanoski
  - -- Kyle Thames
- qPCR - water
  - – Gerri Buckles
  - – Genny Cobarrubias
  - – Zachary Semerikov
  - – Steve Christy
- Landowners
- Funding
  - – Bureau of Reclamation

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QUESTIONS?