Tetracapsuloides bryosalmonae and Proliferative Kidney Disease in Montana

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This information is preliminary and is subject to revision. It is being provided to meet the need for timely best science. The information is provided on

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Montana Fish, Wildlife & Parks

Overview

- Thank you for keeping eyes on our cages!
 The past two years...
 - No PKD disease
 - Cooler temps, more water
 - Data → minimal threat of infection
 - Expanding research to other rivers

T. bryosalmonae ("PKX")



Brief History of PKD

				2012	2016*	2017
1920	1960	1974 19	81 19	90 1999	\searrow	
PKD-like symptoms described in Europe	Probable PKD cases i N. America	PKD described n First repo U (Ida	PKD- morta Mor t PKD rted in J.S. aho)	T. bryosa identifie "PK related ality in ntana	olmonae ed as X" S Yello River	ubtle wstone fish kill
* PKD Mortalities in the				Mass M	lortality	
SF Snake River, ID			Preliminary Information-Subject to Revision			

Preliminary Information-Subject to Revision. Not for Citation or Distribution

2012*

2016*

What happened in the Yellowstone?

Hypotheses

- Unprecedented environmental conditions
- Nutrient loading
- New introduction
- New strain?
- Changes in bryozoan populations?
- Key information
 - Where is *T. bryosalmonae* now?
 - Are there important seasonal, annual, or spatial patterns?
 - When and where do bryozoans occur?

What have we been doing?

- Where is T. bryo now?
 - Screen over 1200 fish kidneys from MT, ID, & WY
 - Water sampling at 6 different rivers
- Are there important seasonal, annual, or spatial patterns in T. bryo detection?
 - Intensive water sampling in Yellowstone R.
 - Fish cage exposures for 2 summers
 - Controlled study with collaborators in aquaculture
- When and where do bryozoans occur?
 - Visual surveys
 - Bryozoan traps



Cage Results

• 2018

- 4 sites in the Yellowstone River from July-Sep
- No infections detected

• 2019

- 4 sites in the Yellowstone and 3 in the Madison from July-Sep
- No infections detected

What does an eDNA positive mean?

Collect Water

Filter Water



Extract all DNA from Filter



Amplify Target DNA

Visualize Results

Parasite DNA

S

eDNA Surveillance

Shore-Based

Correlate environment with detection

Link parasite in water with parasite in fish

Thalweg

Integration of river section as a whole

Compare Rivers









- Seasonal pattern
- No spatial pattern



- Spatial pattern
 - Seasonal pattern

Annual pattern

 Spatial and Seasonal breakdown





Current Hypotheses

- Multi-year flow drives bryozoan densities
- Bryozoan densities drive fish infection
- Temperature drives development of disease symptoms in fish
- Bryozoans are likely the lynchpin of understanding PKD
 - Also extremely challenging to collect data

- 2015 conditions increased bryozoan densities
- 2016 presented a "perfect storm" primed by 2015
 - High temps in early summer
 - Low peak flow
 - Low base flow



Opitz 2017

Yellowstone research has lead to...

- Two international PKD-focused meetings
- Joint European-USA research proposal
- New collaborations
 - Community
 - Inter-Agency
 - National
 - International
 - Private Industry



Ongoing Efforts

Yellowstone River

- Sentinel fish cage exposures
- eDNA surveillance
- Bryozoan distribution and diversity
- Bryozoan host species
- Other Rivers
 - eDNA surveillance
 - Diagnostics and surveillance at aquaculture facility
- Genomics approaches for T. bryo strain differences
- Model presence and infection as a function of environment



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Water Quality at Corwin Springs

